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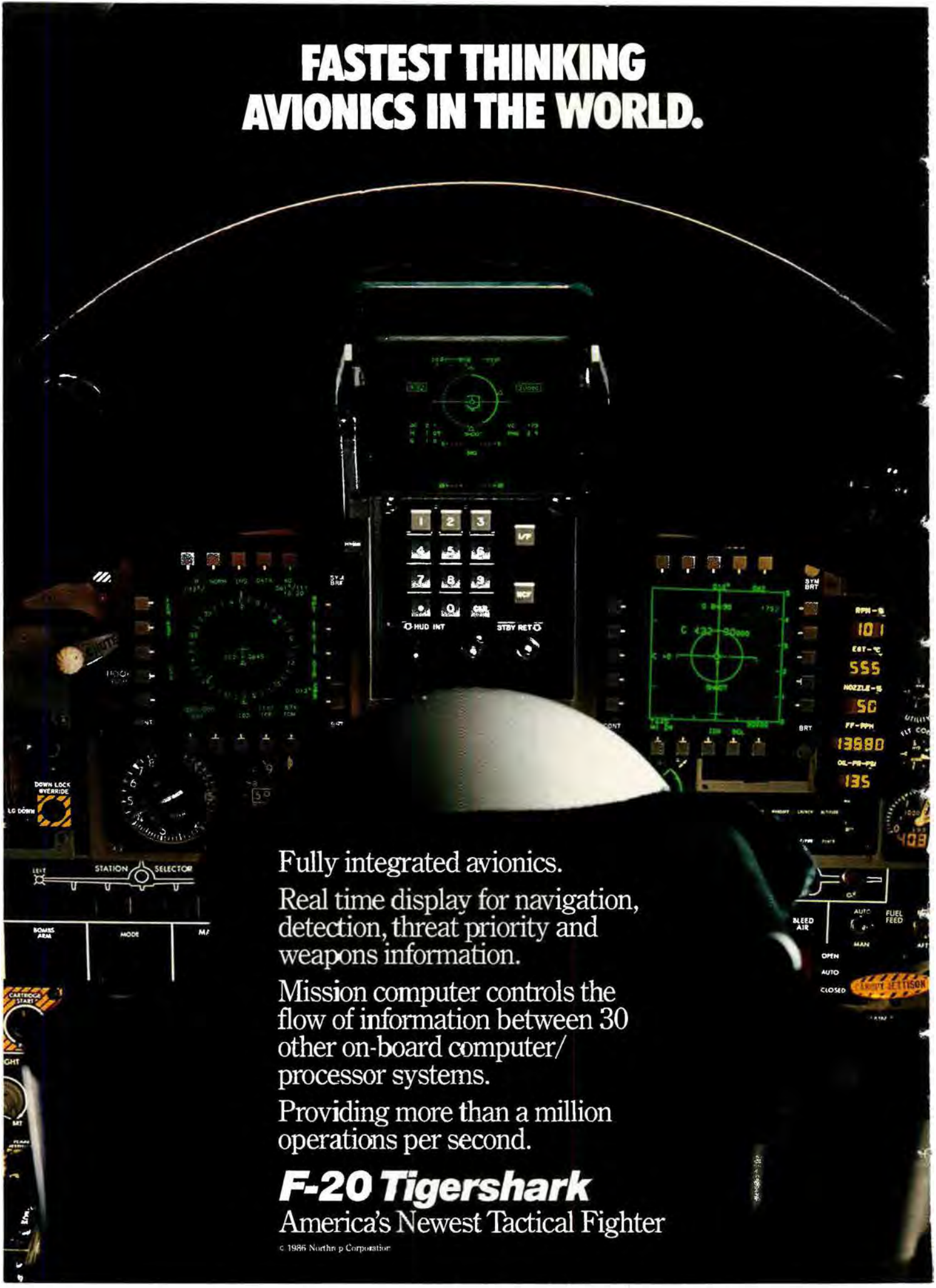

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About the cover: Our blue-suit cover collage heralds the thirty-fifth anniversary publication of the Air Force Almanac—an unmatched source of information on the composition and activities of USAF. (Design by Art Director Guy Aceto, photo by Paul Kennedy)

Air Force Almanac 1986

Reports from the Major Commands

Reports from the SOAs and DRUs

An Air Force Almanac

Departments

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AN EDITORIAL

Burros, Bureaucrats, and Reformers

By John T. Correll, EDITOR IN CHIEF

THE Packard Commission on defense management *(see p. 198)* is hardly alone in charting new directions for military procurement. Packard's final report isn't in yet, but Congress has already erupted with a gusher of new legislation about the way the Pentagon acquires weapon systems. This comes atop some 4,000 existing laws that govern—and threaten to strangle—the acquisition process.

A feature common to many of the current reform proposals is a call for major structural change, mainly reorganization of the acquisition machinery of the services and the Defense Department. While a certain amount of Pentagon reorganizing may be worthwhile, the reformers have made this too dominant an ingredient in their brew.

The armed forces have worked diligently on procurement reform for the past five years. Cost overruns on major systems, growing at a rate of fourteen percent a year in 1981, now seem to be averaging less than one percent. Baselining, a technique pioneered by the Air Force, curbs nonessential change to a system once development has begun. The percentage of defense contracts let on the bases of competitive bid and fixed price has doubled since 1980. This is not to say that the Pentagon's end of the acquisition process is perfect, but it is the end that has shown the most improvement.

Congress tends to deal with its end of the problem by pumping more legislative molasses into the works. Instability of system budgets, a leading reason why weapons cost so much and take so long to produce, is worse than ever. Another traditional problem, micromanagement of programs by levels above the program manager's head, has been checked within the services to some degree by baselining, but Congress still micromanages to its heart's content.

The major reform packages to emerge so far, including the initial report of the Packard Commission, nod toward congressional culpability. Their toughest language, though, and their strongest prescriptions are reserved for the Department of Defense.

There are several things wrong with this. The defense acquisition problem cannot simply be reorganized away, because it is not an organizational problem. And the scope of it transcends both the Pentagon and the defense acquisition process.

The Packard Commission recognizes, correctly, that there is no rational system by which the national leadership agrees on a military strategy, the forces to implement it, and funding for those forces within the context of the overall economy and competing claims for resources. In reality, defense requirements are scaled to fit available funding, which is notoriously unpredictable. The scaling is usually downward and occurs late in the process.

Planning and programming come before budgeting in this process, but much of the early work is thrown out in the wild fray of slashing and substituting as the final budget is assembled and voted on. The scramble plays merry hob with carefully crafted acquisition strategies. For reasons that have nothing to do with requirements or sound procurement practices, programs are liable to be reduced, deferred, stretched out, or funded at levels too low to ensure efficient production rates. It is difficult to see how reorganizing the Pentagon or the acquisition commands can help with this.

An often-stated objective of reorganization is to get the host of single-issue advocates off the program manager's back. Rep. Jim Courter (R-N. J.) observes that defense measures become bogged down with "extraneous provisions concerning such pressing questions as how best to resettle homeless burros." To the extent that this is the case, it's a consequence of policy, not bureaucratic structure. (Mr. Courter himself associates it with the number of congressional committees and subcommittees—forty-six by his count—exercising oversight of the Department of Defense.)

If the policymakers want all federal actions to reflect concern for homeless burros, then it makes little sense to eliminate or ignore the burro advocates in the acquisition agencies. The existence of a large bureaucracy is a function of the complexity of national policies.

The problems can't be regulated away, either. The principal effect of piling on restrictions and requirements is to make the process even more confusing and difficult to administer. The Packard Commission says that federal procurement statutes should be recodified into a single statute characterized by simplicity and consistency. This is a splendid idea, but the present deluge of procurement legislation is a reminder that congressmen are fiercely independent and disinclined to be consolidated or simplified into anything.

Yanking the Pentagon around, shuffling the organizational charts, and telling bureaucrats to do more of this and less of that may relieve the frustrations of the politicians. It may also appeal to that segment of the public that believes that acquisition of a high-technology weapon isn't much different, really, than buying a lawnmower. It may even scare some of the bureaucrats into tidying up their act in minor ways. But it will not advance appreciably the cause of acquiring the best weapons at the best price.

The real solutions are likely to be slow and dull, not quick and flashy. And a total solution will not be found if the Defense Department is the sole target for reform. ■

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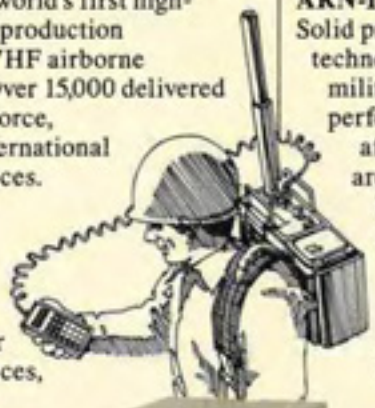

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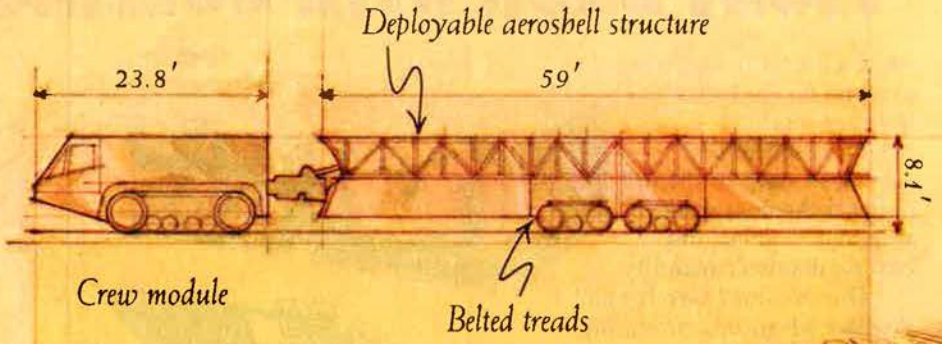

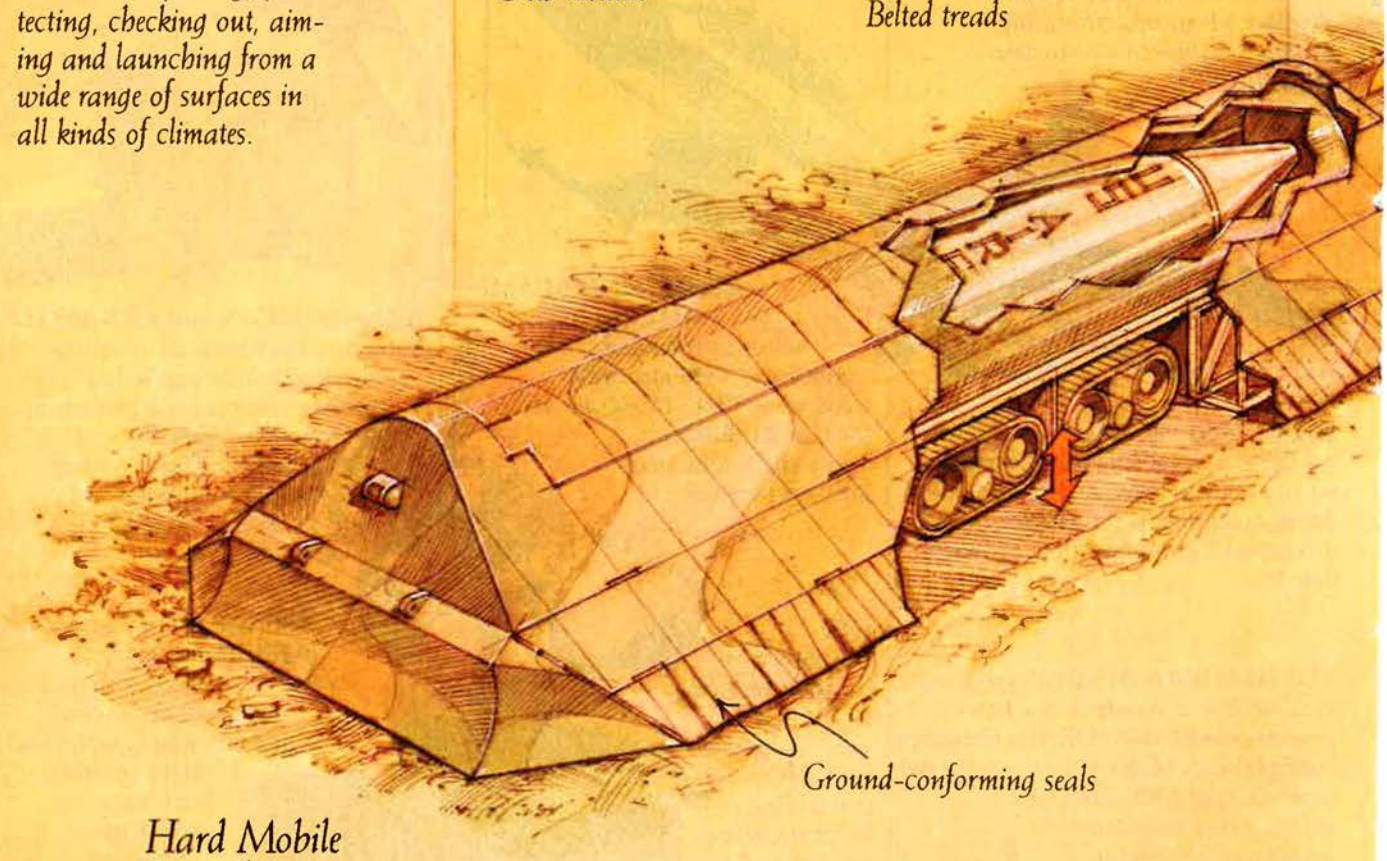

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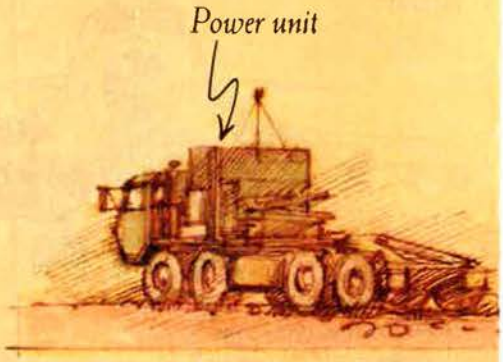

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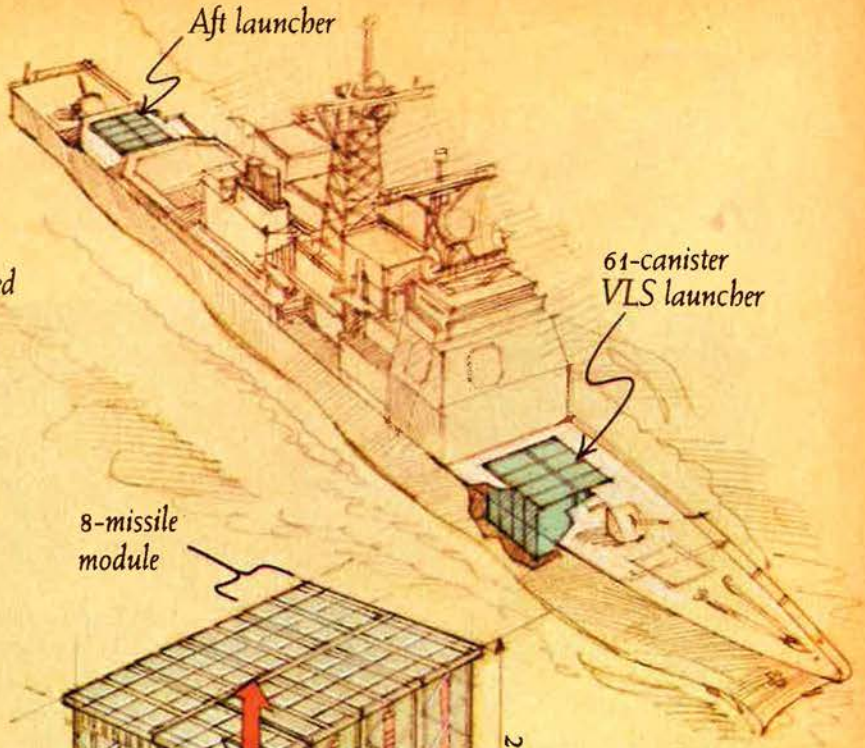

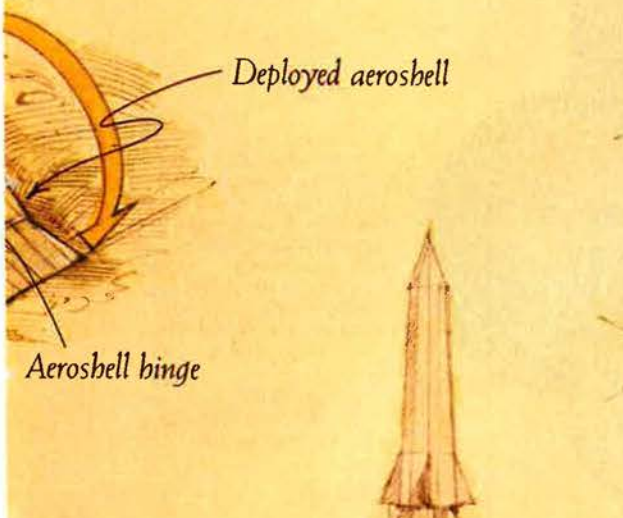

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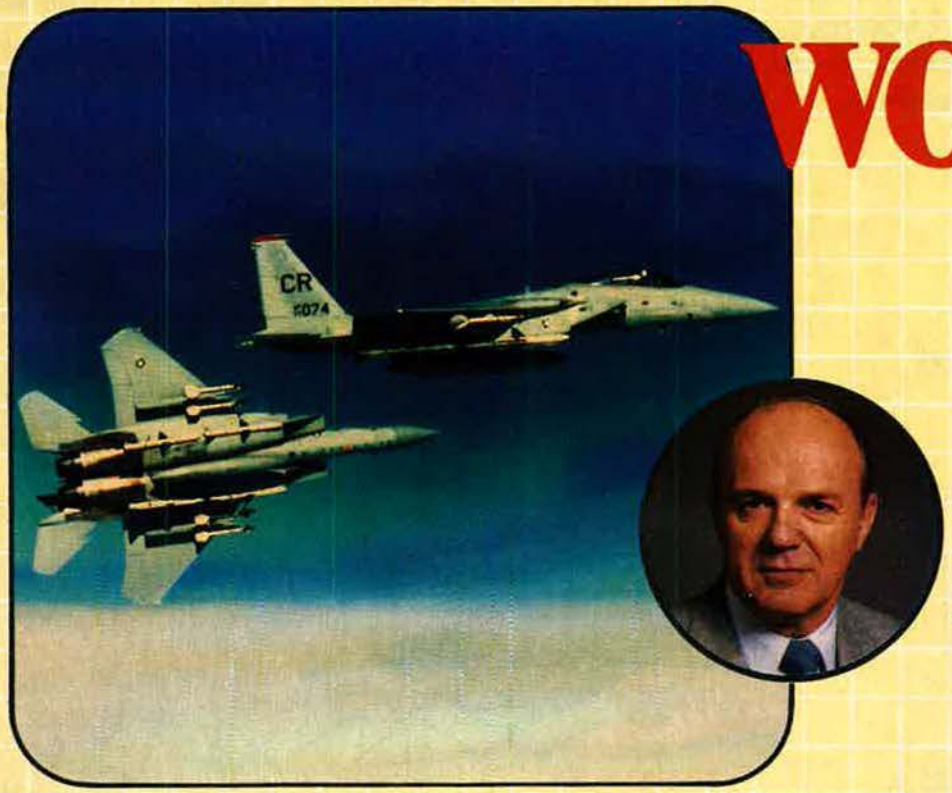

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Airlift and the C-17

In his article "The Airlift Shortage Continues" *(see "Viewpoint," p. 114, March '86 issue)*, Gen. T. R. Milton offers some prescriptions for airlift that would certainly guarantee that the shortfall will continue.

General Milton begins with the faulty premise that intercontinental transports need not be designed to land behind the front lines on improvised runways. This is the thinking of the past, locked into the tactics demanded by the limitations of our present fleet of airplanes.

Traditionally, the only way MAC has been able to deliver these forces is by a two-step process. First, we fly the forces and their equipment to a main operating base in the theater of operations. Then, the people and equipment move forward, either by truck or by air, often to those improvised, short (3,000 feet) runways that General Milton mentions.

Today, with only a C-130 fleet to perform the mission, the US has a 9,000-ton-per-day intratheater capability. Estimates on how much additional intratheater airlift is required vary from fifty to 100 percent more, depending on the scenario. The more we deliver to a main operating base, the greater the intratheater movement requirement, complicating C-130 demands. Theater commanders tell me the additional time needed to move forward could make the difference between a quick victory or a protracted struggle. Surface movement takes too long, and airlift may not be available because of other demands on the C-130 fleet. Additionally, if heavy forces must be airlifted today, half of their combat firepower has to be left behind because the C-130 lacks outsize capability.

In searching for a solution that will provide for rapid deployment and reduce the congestion and backlog that occurs at a main base, a simple, effective answer is to fly the equipment and supplies to additional airfields that are located farther forward. The C-17 is the airplane for the job.

The C-17 will provide intercontinental and theater delivery of the full range of Army and Marine Corps equipment (including outsize cargo), ground maneuverability that permits routine operations through small airfields, airdrop of troops and equipment, enhanced survivability, excellent reliability, maintainability, and availability, air refueling, improved communications, rapid ground handling, and compatibility with existing support equipment. With these features, the C-17 is not only an excellent intertheater airlifter but also an impressive intratheater transport.

All the features that I mentioned were developed by and for the primary airlift users—the US Army and Marine Corps. General Milton seems to question how seriously the Air Force should support these airlift users and argues against designing airplanes to carry the Army's heavy equipment. He explains that no matter how large the airplane, the Army comes up with something that doesn't fit.

MAC and the Army have come a long way in resolving future mismatches of equipment and airplanes. The Army, for example, recently set up an office at Fort Leavenworth to make sure that the equipment they need to move by air will fit our airplanes. In addition, we established a joint Army/Air Force Airlift Concepts and Requirements Agency (ACRA) at MAC headquarters. ACRA will ensure that the services are speaking the same language in joint airlift concepts, doctrine, and training procedures.

Finally, General Milton argues that the Air Force tends to complicate an essentially simple machine—that our transport planes need not be state of the art: "Better by far to have a lot of reliable old birds at high sortie rates than a handful of shiny new ones."

We do need a lot of reliable old birds at high sortie rates, and we have them. The C-141, for example, has been and will continue to be the workhorse of our strategic force. It's doing a great job. But the old planes won't last forever. We have to look toward the future and acquire new planes with both high utilization rates and state-of-the-art technology.

Again, this is what the C-17 offers. State-of-the-art technology will let us fly the C-17 with just three crew members. A normal C-5B or C-141B requires about six crew members, while a normal C-130 crew is five. State-of-the-art technology will let maintenance people change an engine on the C-17 in only sixteen maintenance man-hours, as opposed to about forty maintenance man-hours required for a C-5B engine change. This technology will let us fly the C-17 without having to perform an engine run after the change, as we must do for the other planes we fly.

State-of-the-art technology means we need to stock fewer spare parts. Let's look at slat actuators as an example. There are sixteen on the C-17, and they're interchangeable, which means that we have to stock only one type at the C-17 operating bases. The C-5B, however, has twenty-eight slat actuators, but there are fourteen different types. This means we have to stock fourteen types at locations all over the world.

Finally, because of state-of-the-art technology, the C-17 is warranted to require no more than 18.6 maintenance man-hours per flying hour, while the C-5B is projected for no more than forty. Those differences translate into a lot of dollars saved because of technological improvements.

I can't overemphasize the utility of the C-17. It has capabilities that just don't exist in any current airlift aircraft.

Having a large number of airplanes isn't the answer to the airlift challenge if those planes can't survive in

Do you have a comment about a current issue? Write to "Airmail," Air Force Magazine, 1501 Lee Highway, Arlington, Va. 22209-1198. Letters should be concise, timely, and legible (preferably typed). We reserve the right to condense letters as necessary. Unsigned letters are not acceptable, and photographs cannot be used or returned.

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today's combat environment. That is why the airlifter of the future must include state-of-the-art technology. In the airdrop business, minimum time over target and rapid egress are the keys to enhanced survivability. The C-17 gives us that advantage. Survivability has also been designed into the various systems on board the aircraft; redundancy, hardening, and provisions for armor, defensive systems, and self-sealing fuel lines are all part of the aircraft design. Only through such features as these can an airlift aircraft expect to survive.

We have airlift shortfalls. The answer is the C-17. It is the most affordable solution to meet the airlift demands of the future.

Gen. Duane H. Cassidy, USAF
Commander in Chief, MAC
Scott AFB, Ill.

I thoroughly enjoy, and usually agree with, the writings of Gen. T. R. Milton. However, he badly misses the mark in "The Airlift Shortage Continues" *(March 1986 issue)*. Apparently he missed the November 1985 issue, in which Senior Editor James Coyne presented an excellent description of the plans and rationale for enhancing our military airlift capability *(see "MAC's Magic Number," p. 53, November '85 issue)*.

General Milton seems to think that we can satisfy our increased airlift needs simply by providing additional crews, maintenance people, and spare parts. He presents a false choice between "a lot of reliable old birds at high sortie rates [or] a handful of shiny new ones."

The fact is that MAC and AFLC have made great strides over the past five years in providing added support for our current fleet of C-130s, C-141s, and C-5s. They now approach the maximum wartime utilization rate capabilities for which they were designed. While some added capability may be achievable, there is no way that added crews and logistics support alone can even begin to meet the needs outlined in the Congressionally Mandated Mobility Study (CMMS). You don't get twenty hours per day from each airframe, even with unlimited aircrews and logistics support.

No, if we're serious about that CMMS goal, we're really talking new airframes. Then the question becomes what kind of airframes. The airlift community has been through an exhaustive analysis of requirements, trade-offs, life-cycle costs, manning and basing modes, etc., to answer that question. Literally hundreds of blue-suit airlifters have conclusively proven that the current fleet, augmented by the acquisition of C-17s, is the most operationally capable and definitely the lowest life-cycle-cost approach.

General Milton denigrates the ability of intertheater airlifters to land on short, unimproved runways near the battle area. He apparently has not seen the analyses that show the tremendous airlift throughput increase and reduced vulnerabilities provided by such capability. Increasing three- to tenfold the number of usable runways in a theater and avoiding the delays, costs, headaches, and risks associated with intertheater/intratheater transshipments can tremendously increase capability. It can also spell the difference between success and failure in many scenarios.

As to the need to carry the Army's equipment—well, sorry, but that's the mission. The Army has made tremendous strides in ensuring airlift compatibility of its fighting forces. They know, as General Milton states, that it's still vitally important to get there "fustest with the mostest" (hence the need for airlift). But they also know that the "mostest" better be more powerful than toilet paper and C-rations.

As much as General Milton and perhaps others might wishfully think we can achieve our needed airlift capacity without having to pay for it, it just isn't so. We need new aircraft to add to our current fleet now and to replace older aircraft as they reach the end of their useful lives in the 1990s and beyond.

The C-17 is the right machine to fill that need.

Col. John C. Swonson, Jr.,
USAF (Ret.)
Colorado Springs, Colo.

Gen. T. R. Milton's "Viewpoint" on "The Airlift Shortage Continues" in the March 1986 issue of AIR FORCE Magazine is a prime example of the difficulty of understanding airlift. His historical perspective on the Berlin Airlift is a poignant lesson of the value of airlift to sustain a civilian population in the 1940s through the resupply of bulk cargo. It is not, however, an example of the introduction of a military force over long distances to conduct defensive or offensive operations in the 1980s.

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There is a considerable difference in the nature of the operation, type of cargo delivered, and penalty for loads lost or diverted. Unit integrity did not have to be maintained, modern weaponry that can survive on a modern battlefield did not have to be airlifted, and a lost or diverted load meant less food or fuel for a day. This is not the case with deploying a military unit to fight with modern weapons.

His thesis that "designing [air transports] to carry the Army's heavy equipment" is an "exercise in futility" is perhaps the greatest error in his article. The Army designs equipment to survive and operate on the modern battlefield, just as the Air Force designs aircraft for the threat and for the mission in today's environment. If modern conditions dictate heavier armor or taller helicopters, then that is what the Army has to have.

General Milton says he does not understand the delivery of Army equipment to forward areas, yet he quotes Nathan Forrest, who urged "getting there fustest with the mostest." "There" is the forward area, and "mostest" is the modern equipment. If Nathan Forrest had to fight in the Middle East or Northern Europe today, I'm confident that he would want the "ponderous, slow-moving, heavy guns" that are required for modern armies to move, shoot, and survive. For the Army to design their equipment for air transports of the 1950s and 1960s would mean compromising their mission. However, with 1980s technology, an airlifter can be designed that will compromise neither the Air Force nor the Army mission.

I agree with General Milton that "airlift is an absolute essential to any meaningful national strategy," but only if that airlift can do the job—move today's Army to today's battlefields.

Lt. Col. Leonard R. Tavernetti, USA (Ret.)
Dana Point, Calif.

Too Cool Tacair?

Today's arrival of the March 1986 issue of AIR FORCE Magazine was eventful for me, as I saw the many articles dealing with my favorite subject: airlift. One article disturbs me, though.

As an original "trash hauler" (I was a crew member with a 315th Air Division C-130 squadron when the term first came to be used to describe the C-130 mission in Southeast Asia) with several years in troop carrier/tactical airlift at Pope AFB, Naha AB, and Clark AB, I am somewhat disturbed by Michael Skinner's description of the modern-day airlift crew member as being noted for nonflamboyance and only interested in safety *(see "Casevac Cool," p. 106, March 1986 issue)*. If this is true, I am very worried.

In Tactical Air Command and PACAF C-130 squadrons, there was a very high level of mission orientation and very high morale. Crew members' main topic of conversation was the exploits of other C-130 crews and those of their own. I have sat around in many a session shooting the bull, talking about the narrow escapes of my peers and about those who did not escape.

Of course, in those days, the life of a C-130 crew member in many cases was more exciting than that of a fighter pilot. While fighter pilots were chasing each other around the sky and around the bar, TAC and PACAF C-130 crews were getting shot at and making headlines in India, the Congo, the Dominican Republic, and elsewhere. In fact, 315th Air Division C-130 and C-123 crews were getting shot at long before the first jet fighter flew a combat mission in Southeast Asia.

In those days of the tactical airlift mission, the mission came first, and safety was secondary, unlike in MATS, where the reverse was true. In TAC, the C-130 crew relied on their knowledge of the airplane, the mission, and their own good judgment to get the job done, and there were very few accidents.

When the Vietnam War gained momentum and many MATS crew members were assigned to PACAF units, they were often noted for their strict adherence to written procedures and consequently often caused the mission to suffer because of strict adherence to "the book" and an attitude of nit-picking. Some crew members actually developed an adversary relationship with the very people they were supposed to be supporting—the Army grunts.

Unlike the airline-type environment of strategic airlift, the tactical airlift mission calls for flexibility and the selfless willingness to place one's own self in a position of some risk in order to deliver the goods to troops who might otherwise be in danger of losing their lives. Such an attitude does not call for flagrant disregard of safety, but does call for an attitude in which good judgment is paramount, rather than one of strict adherence to written procedures.

If what Mr. Skinner says about the MAC tactical airlifters is true, then it is obvious that the attitude of the old MATS has now permeated the realm of tactical airlift in the decade since MAC assumed control of all the airlift assets of TAC and PACAF.

What concerns me is not that tactical airlifters may have lost the old *esprit de corps* of the TAC and PACAF troops, but rather this: When the time comes when push comes to shove and the book goes out the window, are the MAC tactical airlifters going to be able to cope as well as their predecessors?

Samuel E. McGowan, Jr.
Greenup, Ky.

Soviet Almanac Accolade

I just wanted to let you know that I thought your March 1986 issue featuring the "Soviet Aerospace Almanac 1986" was outstanding.

Keep up the good work!

Glenn Velasco
Milpitas, Calif.

Aardvark Indignation

The January 1986 "Aeronautics" issue on "The Next Generation of Combat Aircraft" was the last straw. We read the article, "Acid Test for Aeronautical Technology" *(p. 38, January '86 issue)*, hoping to see some change in TAC's infatuation with air-to-air and disinterest in air-to-ground. Unfortunately, it was still the same. Any new fighter will apparently be air-to-air first, with "not a pound for air-to-ground."

The new developments are the same we've read about for years.

- The LANTIRN system is recovering from its developmental problems (isn't it always?) and will soon give tactical aircrews their first ability to deliver weapons accurately by day or night.
- The F-15E is all the Air Force could ask in a deep interdiction aircraft: "The F-15E is going to have the longest, lowest, toughest tactical interdiction mission in the Air Force," according to Col. Michael J. Butchko. Senior Editor James Canan writes, "Given its demanding mission (each F-15E will go it alone, not in formation), the dual-role fighter . . . will require the latest and best in electronic countermeasures gear."

It may surprise some of your readers to learn that the Air Force already has a tactical aircraft capable of delivering precision munitions at any time of day in any weather—the F-111. Oh, sure, the air-to-air support pilots will say how easy it is to jump us, we can't

turn, we can't shoot back, etc. The fact is that our squadron routinely flew through weather at 450 knots at 1,000 feet AGL at night in support of Reforger this winter. No one jumped us then; what chance will they have when we're doing Mach 1.2 at 200 feet AGL? As for shooting back, we have AIM-9s, too—and the tapes to prove that anyone's "six" can be had. We have no doubt that LANTIRN will eventually prove to be very useful, because it will allow other aircraft to do what we're doing now, but don't kid yourselves. It will take years to mature; we're still fine-tuning our terrain-following procedures after more than fifteen years.

We hate to rain on Colonel Butchko's parade, but the F-111 is already doing the "longest, lowest, toughest tactical interdiction mission in the Air Force." The F-15E's realistic interdiction mission will have a shorter range, lighter bomb load, equal low-altitude capability, and no chance to equal the F-111's speed. Yes, we know it could turn and fight if threatened, but it would have to jettison its bombs to do it. A fox-two kill after jettisoning your ordnance is still a miss in the interdiction business. Someone's going to have to hit that target tomorrow.

F-111s already do their "demanding mission" single-ship, and we must say that we do it *without* "the latest and best electronic countermeasures gear." We also do it without an HUD (except for F-111Ds), without a modern ground-mapping radar, and without a word of recognition or praise from such publications as AIR FORCE Magazine and *Fighter Weapons Review.*

Every month we read about new improvement packages for planes not even five years old. Now the F-4 is getting new engines and an F/A-18 radar! If people want to improve an existing airframe, how about the Aardvark? With new engines and modern streamlined avionics for the F-111D/E/Fs, there would be no need to augment our interdiction capability. The money saved by consolidating the F-111 fleet's maintenance requirements and closing two of the three F-111 RTUs would go a long way to paying for the conversion.

How about finding room among all your stories on new technologies to talk about dedicated flyers in a fifteen- to twenty-year-old airframe doing a demanding job so well that F-15Es that are still to be built won't be able to do it better?

Let the F-15s maintain air superiority; they're the best in the world at it. But wars are won by carrying iron "downtown." We'll do it day or night, in any weather. We can do it better than anyone. We can do it today.

47 USAF Officers
RAF Lakenheath, UK

AIRMAIL

F-4 for Air Defense?

Before Edward Collom dismisses the F-4 upgrade out of hand, he would be wiser to examine the potential of such an aircraft *(see "Airmail," p. 13, March 1986 issue).* I agree when he says that an F-4, even an upgraded one, would be a poor match for an Su-27. On the other hand, an F-16 may not be a very good choice, either, in a BVR air combat scenario.

However, an updated F-4 would be a far more effective air defense fighter than either the F-16 or F-20. The F-4 has two engines (an important consideration, since forward staging at Arctic bases is being planned), it is a two-seater (a definite asset in a heavy ECM environment), and it carries more air-to-air missiles and (with the APG-65) would have a more capable radar.

NORAD needs the updated F-4 to counter the growing Bear H/AS-15 threat as well as the threat that will be posed by the new Blackjack bomber when it becomes operational. In a perfect world, all NORAD squadrons would have F-15s; however, as Capt. Jeffrey Canclini's letter in the March '86 issue implies correctly, this is not possible under the current budgetary climate.

An upgraded F-4 will offer comparable capability at an affordable price. It's a shame that Canada doesn't have any F-4s to upgrade.

Capt. J. Haazen, RCAF
Southport, Manitoba
Canada

Veterans Statue Project

After the Civil War, a tradition began when towns and counties across America erected statues to honor those who had served in uniform. This tradition of honoring veterans with statues continued after the Spanish-American War and, to a lesser degree, World War I.

The statues served as a public statement of thanks to and praise for those brave men and women who had answered America's call to arms. The statues also served as a reminder to the entire community that the freedom that they enjoyed was not free, but was paid for by those who had served.

For whatever reason, the tradition was not continued after World War II. Few towns and counties erected statues honoring those who served in World War II or Korea. Few statues stand to honor the bravery of those who served during the Vietnam War, which produced more than 230 recipients of the Medal of Honor.

The Veterans Statue Project is an effort to revive the tradition of erecting statues honoring those who have kept America free. We are working with one of America's leading art foundries to produce a series of full-size statues honoring veterans and those who currently serve. The statues are six feet tall and made of bronze. Three different statues are of infantrymen, and there are two statues of pilots. The statues will be available to communities, groups, and individuals.

As an Air Force Association member, I hope that AFA chapters and individual AFA members will consider this opportunity to encourage and assist their communities in erecting a statue to honor veterans. Some communities are using the statues to honor all veterans, while others are honoring individual veterans or veterans of specific conflicts.

I encourage anyone interested to contact the Veterans Statue Project for more information.

Donald P. Grimes
Veterans Statue Project
P. O. Box 177
Franklin, Mich. 48025
Phone: (313) 855-8121

86th Fighter-Bomber Gp.

We are looking for pictures of aircraft (P-47s) that were flown by the 86th Fighter-Bomber Group during World War II and that were decorated with unofficial nose art. The USAFE Commander in Chief has approved an initiative to commemorate our unit's WW II history by painting our commander's aircraft with a design from one of its predecessors.

The 86th FBG comprised the 525th, 526th, and 527th Fighter Squadrons. We would also appreciate any photographs of aircraft from the 512th Fighter Squadron, which was assigned to the 406th Fighter Group and which is now part of our wing.

Photographs will be copied and returned. If there is an aircrew member or crew chief who would like to memorialize their "warbird," we would really appreciate their help.

Capt. Tom Ragland, USAF
86th TFW/MAAM
APO New York 09012

A tactical military radio for vehicles or base stations is based on a dependable and proven high-frequency Manpack radio. The AN/GRC-213 extends the capabilities of the AN/PRC-104 Manpack to meet tough mobile applications. Large-scale integrated circuits and modern design add to the reliability and flexibility over earlier radios. The compact 20-watt unit can be installed easily in virtually any wheeled or tracked military vehicle. Fully automatic tuning reduces operator training and requirements to a few simple operations. Now adopted as the U.S. military standard, the AN/GRC-213 is in production at Hughes Aircraft Company for the U.S. Army, Navy, Marine Corps, and Air Force. The radio meets international needs as well.

The Amraam missile may become the next-generation weapon for protecting U.S. Navy surface ships against threats that have slipped through the outer defense shields. Sea Amraam, under study for ship self-defense, would be essentially the same as the advanced medium-range air-to-air missile in full-scale development by Hughes for the U.S. Air Force and Navy. However, compared with existing missiles, Sea Amraam would increase a ship's firepower because the missile's guidance system is much less dependent on the ship's radars. Many missiles could be fired at different targets simultaneously, and they could home in even if the targets were outside the field of the ship's radar systems. Sea Amraam is also faster, more maneuverable, and can fly farther than current ship self-defense systems.

A Very High Speed Integrated Circuit (VHSIC) chip 10 times more powerful than conventional microprocessors is being developed for signal-processing computers for future tactical aircraft radars and for possible upgrading of the APG-65 radar on the F/A-18 Hornet Strike Fighter. The new signal processors will perform up to 30 times faster than current systems, enabling future radars to incorporate such advanced capabilities as simultaneous multimode operation. The chips will allow systems to test themselves and trace faults to the chip level, improving reliability and maintainability. Hughes builds the APG-65 for the U.S. Navy and Marine Corps F/A-18.

A night vision system for helicopters and light aircraft significantly reduces pilot workload by eliminating wasted movements, simplifying controls, and providing excellent video images and object detection in reduced visibility. The Hughes Night Vision System (HNVS) is a low-cost, forward-looking infrared (FLIR) system that provides a pilot with automatic tracking and digital video processing. It superimposes FLIR video, flight symbology, and navigational data on a single display, which can be mounted on the flight panel or in a helmet visor. The helmet visor display projects a FLIR image onto a biocular holographic combiner on a see-through visor. A helmet linkage, which moves the FLIR as the pilot's head moves, reduces the pilot's workload further and enhances flight safety. HNVS, designated the AN/AAQ-16, is in production at Hughes.

NATO will upgrade its air defense network with eight long-range radars for four of its member nations. The new HR-3000 radars are a new generation derivative of the Hughes Air Defense Radar (HADR) operating in West Germany, Malaysia, and Norway. The radar is fully transportable and can be set up and torn down in hours. It also has better electronic counter-countermeasures, improved capability for rejecting clutter, and a faster rotating antenna to accommodate NATO's requirement for a higher data rate. The radars will be installed in Turkey, Greece, and Italy. They will be integrated into the Hughes-developed NATO Air Defense Ground Environment (NADGE) system. In addition, another radar will be installed in Portugal.

For more information write to: P.O. Box 45068, Los Angeles, CA 90045-0068

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C-135 Aircraft

I am an English author who is seeking contact with aircrews, maintenance crews, project officers, or anyone else connected with the Air Force's various versions of the Boeing C-135 aircraft. I would like to learn of any experiences with the C-135 for a forthcoming book.

I also need to hear from fighter, attack, or bomber crews who "were never so pleased to see the SAC tanker in the right place when returning from a mission over North Vietnam." Any stories, reminiscences, or other information would be very much appreciated.

Please contact me at the address below.

Bob Archer
3 Abbot Close
Bury St. Edmunds
Suffolk IP33 3UD
United Kingdom

Korean T-6s

We are seeking contact with any individuals in the Republic of Korea who would be willing to photograph the three T-6 aircraft on display at Hq. ROKAF, Kimhae, and at the ROKAF Academy. We also need the serial numbers of these aircraft (from the manufacturer's plate, if possible).

This request is part of a project we are initiating to attempt recovery of one of our Mosquito aircraft that served with the 6147th Tactical Control Group during the Korean War. Our intent is to restore the aircraft to combat configuration for presentation to the USAF Museum.

Anyone who can assist us should contact the address below.

The Mosquito Association
% Gene Risedorph
402 Washington Dr.
Arlington, Tex. 76011

Operation Field Goal

I am presently working a research project on the T-33 in foreign service. I would like to correspond with anyone who was involved in an operation code-named Field Goal. This involved the use of borrowed RT-33s from the Philippine Air Force. The RT-33s were used by USAF personnel and flew with Laotian markings.

I am particularly interested in the markings, the number of RT-33s involved, and any information about the missions. Any assistance on this project will be greatly appreciated.

MSgt. John H. Grier,
USAF (Ret.)
4735 Splendid Circle S.
Colorado Springs, Colo. 80917

US Personnel in SEA

I am a freelance writer who is searching for military and civilian personnel who served in Laos and Cambodia during the Vietnam War. This would include military aviators and intelligence officers, ground troops, CIA personnel, Air America pilots, indigenous forces, US government authorities, and so forth. Collected information will be used for a history book and related articles.

Please contact the address below.

J. M. Reed
4229 Albemarle St., N. W.
Washington, D. C. 20016
Phone: (202) 966-2346

AIRMAIL

Air War Over Czechoslovakia

I am currently collecting information about American airmen killed or missing over Czechoslovakia during World War II. I would like to hear from former crewmen or from relatives of airmen who were killed.

If you have any information, please contact me at the address below.

Manuel F. van Eyck
12365 Cohasset St.
N. Hollywood, Calif. 91605

Maxwell Officer Quarters

The Air University Office of History, in conjunction with the Maxwell-Gunter Officers' Wives Club, is attempting to compile a list of pre-1946 residents of the senior officer quarters at Maxwell AFB, Ala. We are particularly interested in contacting anyone who lived in those quarters or who knows someone who did.

Any available documentation or memorabilia (such as base directories, envelopes, letters, etc.) that might suggest residency in these quarters will be greatly appreciated. Please contact the address below.

Jerome A. Ennels
AU/HO
Maxwell AFB, Ala. 36112-5001

AFROTC Det. 925

The Richard I. Bong Squadron of AFROTC Detachment 925 is starting a "Wall of Fame" at our detachment. One hallway will honor University of Wisconsin Air Force ROTC graduates who are successful officers in USAF. Biographies and pictures of these distinguished graduates will be posted to show cadets what the real Air Force is like.

The main purpose of our "Wall of Fame" is to inform current cadets about the careers and opportunities in USAF. "Wall of Fame" candidates need not have extraordinary careers or fit any special criteria. All experiences will aid our cadets' understanding of the world that awaits them.

If you know of any University of Wisconsin graduates who have made the Air Force a career or are a graduate yourself, our squadron would like to hear from you.

Charles R. Conard
AFROTC Det. 925
University of Wisconsin
1402 University Ave.
Madison, Wis. 53706

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Strike Leader to Ops:	**Request vector for rendezvous with tanker**
Ops to Strike and Escort A/C:	**EW aircraft reports enemy jamming and firing SAM's**
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AFROTC Det. 835

Since its creation in the fall of 1984, the Alumni Association of Detachment 835 has grown to approximately fifty members. Its purpose is to locate other alumni and find out where they are and what they're doing now. The association would like to locate other graduates of Detachment 835 at North Texas State University.

If you join the association, you'll get a membership card and a two-year subscription to our newsletter, *The Alumni*.

If you're from North Texas State University or know someone who is, please contact us at the address below.

Director of Alumni Operations
AFROTC Det. 835
North Texas State University
Denton, Tex. 76203-5398
Phone: (817) 565-2072

AFROTC Det. OL55A

The Arnold Air Society of AFROTC Detachment OL55A, Loyola Marymount University, is conducting a search for this detachment's alumni.

Many of our alumni have lost touch with the detachment, and we have lost touch with many alumni. Our alumni association hopes to bridge this gap.

If you are interested in your old Arnold Air Society and our alumni association, please contact us at the address below.

Arnold Air Society
AFROTC Det. OL55A
Loyola Marymount University
Los Angeles, Calif. 90045

Roll Call

On Friday, April 27, 1951, an Air Force B-36 assigned to Carswell AFB, Tex., and an F-51 fighter assigned to the Oklahoma Air National Guard's 185th Fighter Squadron collided in midair south of Perkins, Okla. Fourteen airmen died, and four survived.

I am researching this accident as part of a history of the Oklahoma Air Guard's 137th Tactical Airlift Wing, which traces its lineage to the 185th. I would like to contact the four men who survived this tragedy, if they are still around.

They are Lt. Elroy A. Malberg, MSgt. William Blair, TSgt. Dick Thrasher, and SSgt. Ellis Maxon.

I would like to correspond with any of these individuals. They or anyone knowing their whereabouts should contact me at the address below.

Dennis R. Lindsey
3124 Del View Dr.
Del City, Okla. 73115

Collectors' Corner

My son graduated from the Air Force Academy this past summer (Class of '85). He is now in UPT at Reese AFB, Tex., and will graduate in August 1986.

I was privileged to swear him in as a second lieutenant at his graduation and gave him my original second lieutenant bars.

I'm looking for a pair of original pilot wings for his UPT graduation. So far, the only wings I've been able to get are those sold in the BX. The kind I'm looking for are the sterling silver types that were produced until about ten years ago.

Can anyone give me a lead in locating these wings?

Col. Edward L. Parero, USAR (Ret.)
1798 Bryn Mawr Dr.
Newark, Ohio 43055

I am a collector of patches of the various organizations of the Air Force, and I would like very much to hear from other collectors.

If you would like to trade or donate patches, please contact me at the address below.

Kelly Robison
8374 Pine
Fairchild AFB, Wash. 99011
Phone: (509) 244-9988

I am just starting to collect Air Force patches. I would like to hear from anyone who might wish to donate their old patches to me.

I am especially interested in old color patches predating the Air Force's change to subdued patches for fatigues.

Anyone having any such old patches is asked to contact me at the address below.

Jason Dachlet
203 Villa Rd.
Streamwood, Ill. 60103

I am an ex-Air Force C-130 crew chief interested in trading squadron and wing patches with anyone wishing to do so. I have several patches from former OMS units. I am mostly interested in TAC patches, but will gladly trade for patches from any command.

Please contact me at the address below.

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IN FOCUS...

Posturing on Arms Control

By Edgar Ulsamer, SENIOR EDITOR (POLICY & TECHNOLOGY)

Tall talk from the Soviets about their eagerness to bargain is undercut by peak levels of encryption and proposals cleverly designed to produce an impasse.

Washington, D. C., Apr. 3

The Soviets are continuing to encrypt telemetry data that is needed by the US to help gauge Moscow's compliance with the terms of SALT and other arms-control accords, according to Assistant Secretary for International Security Affairs Richard N. Perle, the Defense Department's top arms-control expert. While he volunteered that Soviet encryption of ballistic missile flight data has reached peak levels, he declined to comment on whether or not Moscow is still blinding those US sensors defined by SALT as the "national technical means" of verification, or NTMs for short. Last year, AIR FORCE Magazine disclosed—and Administration officials subsequently confirmed in congressional testimony—that the Soviets were attempting to jam such US NTM sensor systems as the ground-, shipboard-, and aircraft-based Cobra Dane, Cobra Judy, and Cobra Ball radars.

The history of Soviet encryption of data essential for arms-control verification includes an ironic twist, Secretary Perle disclosed: Encryption has reached near total levels "as one of the perverse results of the negotiating process." After the Soviets found out from US arms-control negotiators that this country depended on "reading" Soviet ballistic missile flight-test data to assess treaty compliance, Moscow started to intensify the level of encryption. As a recent Pentagon memorandum to the White House pointed out, the agreement with the Soviets "on prohibiting encryption necessary for verification purposes . . . was followed immediately by extensive Soviet encryption."

Once the Soviets became aware of the US requirement for test data, the Pentagon memorandum pointed out, they "set about denying it to us. And they have never looked back. Encryption, in addition to other concealment and deception measures, has spread like a range fire ever since." This Soviet tendency to subvert bona-fide US suggestions aimed at coordinating and codifying verification techniques of mutual benefit has caused this country's arms-control negotiators to be leery of discussing verification provisions because Moscow "might turn them around and do the exact opposite," Secretary Perle said.

In suggesting that the prospects were bleak for reaching any arms-control accord with the Soviets in the near future, Secretary Perle charged the Soviets with stalling in even the most promising area under discussion—the capping of intermediate-range nuclear forces (INFs). The Soviets, he said, are "content with the appearance of progress, [but have in fact] structured their own proposal so as to make it unacceptable to the US and our allies." The latest Soviet terms concerning an INF accord, Secretary Perle suggested, are even more at odds with Western positions than Moscow's previous offers and, in effect, "seek to end independent British or French nuclear deterrence."

Soviet insistence that there be no further modernization of the INFs in Europe takes advantage of the long-standing, vigorous upgrading of their own theater nuclear forces, on the one hand, and the state of the French and British INFs, on the other. Secretary Perle described West European INFs as being "on the verge of obsolescence. Either they are replaced by newer systems, or they will cease to have any deterrent effectiveness."

At the recent round of INF talks in Geneva, the Soviets insisted also that their SS-20 MIRVed intermediate-range ballistic missiles not located in the vicinity of Western Europe should be exempt from any treaty ceilings, according to Secretary Perle. To back up this curious logic, the Soviet negotiators came up with an arbitrary line of demarcation—roughly corresponding to where the eighty-degree line of longitude bisects the USSR—and asserted that any SS-20s situated east of that line should be exempt from the INF talks. This position flies in the face of the fact that the SS-20s are fully land-mobile and, in addition, can be transported readily by the C-5-like Soviet Condor airlifter. The latter circumstance enables the Soviets to take SS-20s located in Western Siberia and fly them within hours to various sites in Eastern Europe.

In general, the Soviet stance at the INF talks suggests that Moscow's recent proposals are, in fact, meant to produce an impasse, even though they are being huckstered as evidence of Soviet willingness to make concessions, Secretary Perle said. He nevertheless considered it noteworthy that the Soviets appear to be willing to accept in principle the US position that an INF accord separate from the strategic arms-reduction talks (START) offers the best hope for reaching limited arms control over the near term.

At the same time, the Pentagon's top arms-control expert warned that Soviet leader Mikhail Gorbachev's recent grandiose proposal to eliminate all nuclear weapons by the year 2000 and to hold a special meeting on nuclear weapons testing "opens a whole Pandora's box of new issues that [deflect attention] from the narrow issues that emerged from the [East-West] summit" meeting last November. Secretary Perle suggested that questions about verification and procedural approaches on how to reduce the number of strategic nuclear weapons on both sides by fifty percent appear to be the only major remaining "sticking points" that are holding up START—other than basic Soviet intransigence.

Gorbachev's proposal to eliminate all nuclear weapons by the end of this century differs fundamentally from President Reagan's plan to make offensive nuclear strategic weapons obsolete by means of comprehensive

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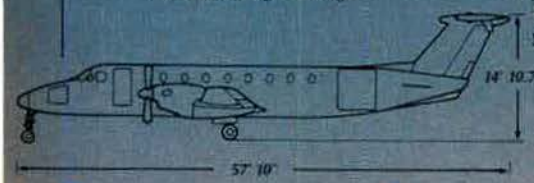
Maximum ramp weight	*16,710 lbs./(7,579 kg.)*
Maximum zero fuel weight	*14,000 lbs./(6,349 kg.)*
Empty weight	*8,700 lbs./(3,946 kg.)*
Useful load	*8,010 lbs./(3,633 kg.)*
Total luggage capacity	*182 cu. ft./(5.15 m³) 1,910 lbs./(866 kg.)*
Maximum cruise speed	*256 kts.*
Accel—stop distance (at maximum gross weight)	*4,156 ft./(1,265 m.)*



Air Force, Navy, Army, Marines.

The C-12J is a result of the continuing development of the Beechcraft Super King Air turboprop, of which more than 270 are now in service with four branches of the U.S. military. The C-12J offers enhanced versatility with a forward airstair door and an aft cargo door, larger (457 cu. ft.) main cabin, and extended c.g. range. A pair of 1100 hp Pratt & Whitney PT6A-65B turboprops deliver a cruise speed of 256 knots.

Special Assignments.

The Beechcraft C-12J is well-suited for a wide range of military special missions. Electronic intelligence, medevac, maritime surveillance, and anti-submarine warfare are among the duties that can be assigned to the C-12J.

BASI Support.

Full logistics support for the C-12J is available from BASI, Beech Aerospace Services, Inc. This worldwide organization now supports more than 270 aircraft, plus target missiles for the U.S. and allied nations.

For more information about the C-12J write: Beech Aircraft Corporation, Aerospace Programs, Wichita, KS 67201.

Beechcraft
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strategic defense systems embodied in the Strategic Defense Initiative (SDI) concept: "I don't know of anybody who believes the Soviets could be trusted to [scuttle all their nuclear capabilities]. It would be a dreadful mistake for the United States to turn in its last nuclear weapon on the assumption that the Soviets would do the same. [President Reagan's approach to a *de facto* elimination of offensive nuclear weapons is predicated on] the deployment of defenses without which no one in his right mind would trust the Soviets to give up every last nuclear weapon in their inventory." But it is "another matter altogether" to move toward the elimination of the offensive nuclear arsenals on both sides by means of defenses "so that we could protect ourselves against cheating on the Soviet side that almost certainly would take place," he suggested.

Secretary Perle commented scathingly on a political initiative by liberal House Democrats that urges the Administration to halt all nuclear weapons testing and in effect to accept Soviet verification standards: "There is no limit to the irresponsibility to which some House Democrats can sink." He explained that his stinging opprobrium applied to the House sponsors of legislation, known as "H.J.Res. 3," which had "the effect of Congress legislating the Soviet position . . . while Americans were sitting at the table" trying to work out verification measures needed to put into effect an equitable test ban.

The result of H.J.Res. 3 was that Congress "not only pulled the rug out from under our negotiators but also [from under] the first promising development [in terms of an accord on mutually acceptable on-site inspection standards] in four years." Several days prior to H.J.Res. 3, faint diplomatic signals became audible, suggesting that the Soviets would consider improved verification arrangements concerning the unratified Threshold Test Ban Treaty (TTBT) that prohibits underground tests with a yield of greater than 150 kilotons.

The US had earlier proposed to the Soviets, "Let's sit down and talk about ways of improving the verifiability of TTBT. Their response was negative. We then took the first step and invited [Soviet inspectors to come to the US and bring] whatever equipment they deemed necessary to measure the yield of [future US nuclear weapons tests] at our Nevada test site. We offered that on a unilateral basis. They rejected" the US offer and "countered with plans for a moratorium on all nuclear testing and conclusion of a comprehensive test ban [CTB] that would preclude nuclear testing of any kind."

The White House countered that the Soviet plan "is not in the security interests of the US, our friends, and allies." The White House explained that "the US has learned through experience that moratoria cannot be counted on to lead to the enhanced security desired," adding that "while the total elimination of nuclear weapons remains an ultimate goal, nuclear weapons remain [essential] to deter aggression and secure the peace."

Secretary Perle claimed that Soviet leader Gorbachev was being disingenuous when he offered to permit on-site inspection under a CTB: "There is nothing to inspect under a CTB. The idea of verifying anything useful by simply roaming the USSR is preposterous."

The problem with the TTBT is that the US, given existing verification methods and procedures, can't establish the yield of Soviet underground tests, according to Secretary Perle: "Their tests could greatly exceed the 150-kiloton limit without our being able to establish that fact." In light of these conditions, the US has proposed additional verification arrangements that—if accepted by the USSR—could lead to US ratification of TTBT, according to Secretary Perle.

The central facet of the recommended verification procedures is that both sides must have the right to monitor, through on-site inspection teams, any and all underground nuclear tests by the other side. This US recommendation, Secretary Perle claimed, is "eminently reasonable," because the nuclear test sites of both countries are "in the middle of nowhere" and hence can't be seen realistically as targets of "legitimatized espionage."

This formula, he added, would establish a high degree of confidence—which couldn't be obtained on the basis of remote sensing—in each country's ability to measure the yield of the other's nuclear weapons tests. This relatively innocuous form of on-site inspection could open the doors to other forms of unambiguous verification of compliance with various arms accords. Included here, Secretary Perle suggested, might be on-site inspection of production facilities to establish whether or not the production of outlawed weapon systems had ceased.

Paramount Importance of MX

The US clearly needs a force of 100 operationally deployed MX Peacekeepers in order to correct "the greatest and most destabilizing shortfall in our nuclear force structure [that is caused by the inadequate] capability to hold at risk hardened Soviet ICBM sites and command centers," SAC's Commander in Chief, Gen. Larry D. Welch, recently told Congress. Testifying before the Senate Armed Services Committee's Subcommittee on Strategic and Nuclear Forces, General Welch stressed the overriding importance of convincing Soviet war planners that "we possess the forces necessary to promptly disrupt a Soviet attack and preclude successful follow-on attacks."

This precondition of high-confidence deterrence, he added, translates into credible prompt hard-target kill capability that, over the near term, can be accomplished only with Peacekeeper. "It is this perspective that makes clear the requirement for a full complement of 100 Peacekeepers. Until we possess that level of prompt retaliatory capability, the disparity in the military capability of US and Soviet nuclear forces will continue," General Welch testified.

The fact that some seventy-five percent of the Soviet nuclear force structure resides in that country's ICBM force compounds the current shortfall in prompt hard-target kill capability, General Welch told the Senate panel. Because of this imbalance, he explained, "many of the Soviets' most valued assets could not be damaged to the level required for high-confidence deterrence during the critical first hours of a nuclear conflict." The Soviets are sheltering their most powerful ICBMs in "the hardest operational silos in the world."

In addition, they are hardening the associated command control network and are placing increased emphasis on the mobility of their strategic assets in order to enhance survivability. This relentless effort to erode the effectiveness of the US retaliatory forces extends to the development of mobile strategic command and control facilities and expansion of what is already "the most extensive strategic defensive system in the world," the head of SAC told Congress.

To maintain effective deterrence in the future, "we must build strategic forces capable of holding at risk increasingly hard, mobile, dispersed, and well-defended Soviet strategic of-

fensive forces." The ensuing imperative is for a range of accurate, responsive weapons in all three legs of the strategic triad, according to General Welch. As an interim measure, the "$1.5 billion spent on B-52G upgrades over the past five years has more than doubled the near-term capability of this bomber and [has] extended its useful life into the 1990s."

Similar stopgap measures have brought "B-52 readiness to an all-time high by increasing the fully mission-capable rates from an average of forty percent in the early 1980s to more than sixty-five percent today." Other bootstrap programs are upping the reliability and maintainability of the Minuteman force, thus extending the operational utility of that weapon "to at least the year 2000 and [providing] . . . alert rates [averaging] more than ninety-eight percent."

Over the longer term, General Welch asserted, the US ballistic forces need to be augmented with the Small ICBM to provide endurance "through even a prolonged nuclear attack" and with the D-5 SLBM to shore up a "much-needed counterforce capability and strategic force planning flexibility." But even in the longer term, strategic bombers will remain the most flexible strategic assets, contributing more than forty percent of the total attack capability of the triad. The bomber, General Welch said, "can readily perform the essential tasks of real-time damage assessment, striking relocatable targets, and providing follow-on coverage to achieve required damage levels." The B-1s, he told the Senate panel, will be able to penetrate Soviet defenses until the 1990s and strike hard targets that are "less time-sensitive."

After the Advanced Technology Bomber ("Stealth") assumes the high-threat penetration role, the B-1 will be equipped with cruise missiles, the head of SAC testified. The ATB, in turn, will remain "an effective penetrating bomber well into the twenty-first century—assuring continued ability to penetrate even the most sophisticated defenses."

Stressing the Air Force's strong commitment to ATB, General Welch said that fielding that weapon system "will ensure a highly credible capability against the full spectrum of Soviet targets—fixed, hardened, and mobile. The ATB is the most promising weapon system to counter the relocatable target threat."

Washington Observations

★ The Soviet Union, a senior Defense Department official (who declined to be identified by name) told this writer recently, apparently sees no need to develop a "stealthy" strategic bomber, presumably because of the absence of credible US air defense capabilities. The Soviets instead are directing their stealth efforts toward reducing the detectability of their ballistic missile warheads and cruise missiles. The motivation in the first instance is obviously to negate US strategic defense capabilities, such as SDI; the purpose of suppressing the radar signatures of cruise missiles is probably meant in the main to increase the lethality of these weapons against defended naval targets.

IN FOCUS...

★ After protracted internal wrangling, the Defense Department released—and at the same time unambiguously distanced itself from key findings of—the Defense Science Board (DSB) Task Force Report on ICBM Modernization. Chaired by MIT's John M. Deutch, the Task Force recommended that the weight of the Small ICBM, pegged at 30,000 pounds by Congress, be upped to 37,000 pounds to permit "full target coverage, penetration aids, and the capacity for future payload variations—including a Maneuvering Reentry Vehicle (MaRV), or two warheads of smaller size than the baseline configuration of a single Mk 21," the warhead of the MX Peacekeeper. The report further recommended that full-scale engineering development of the SICBM should be started in FY '87 with an eye on operational deployment beginning in 1992 aboard hardened mobile launchers (HMLs) capable of resisting overpressures of at least thirty pounds per square inch.

The Task Force's report evaluated the cost-effectiveness of deploying 500 SICBMs of this type against the options of either putting fifty Peacekeepers in a "patterned array" of superhard silos or deploying them in a "carry-hard" configuration, meaning in "hardened canisters deployed among a large number of low-cost vertical shelters." The study concluded that given current Soviet accuracies and current US cost estimates, MX deployments in either patterned arrays or in carry-hard configuration would have the edge in terms of cost over SICBMs on HMLs. But that condition would be reversed if Soviet ICBM accuracies approach or exceed 300-foot circular error probable (CEPs). The Task Force's report drew instant fire from some members of Congress who felt that the panel had failed to furnish adequate documentation for some of its cost-related assertions.

Secretary of Defense Caspar Weinberger released the report with a cover memorandum addressed to him and signed by Under Secretary for Policy Fred C. Iklé and Under Secretary for Research and Engineering Donald A. Hicks. The memorandum characterized the panel's study as being "not a complete and final answer" and disclosed that in order to broaden the analysis, the Defense Department "tasked the Air Force [subsequent to the completion of the Task Force's report] to furnish more detailed information for the SICBM DSARC [Defense Systems Acquisition Review Council, the body that would authorize program go-ahead] on alternatives to the baseline program now under development."

Citing the Deutch Panel's conclusions concerning the relationship between cost-effectiveness and the number of surviving US RVs on SICBMs deployed in HMLs, DoD's memorandum stressed that "a comparative analysis of cost-effectiveness of alternative weapons that imposes a requirement for a larger number of surviving warheads would probably favor a larger, MIRVed missile because of its lower cost-per-surviving warhead." Secretaries Hicks and Iklé claimed that the Task Force "did not conduct an in-depth analysis of a two- or three-RV missile [and] did not have the information necessary to evaluate assertions about mobility or cost of such systems."

The Defense Department's memorandum concluded that there is a categoric need to examine various trade-off approaches as well as to consider strategic requirements, with the result that "when we consider the [Task Force's] report later on during the DSARC process, we must reexamine it under alternative conditions and new information that should become available later this year. Until then, we cannot support certain observations and recommendations that we know to be dependent, rather critically, on assumed conditions that can only be recognized as a hypothesis" now.

There are indications that some senior Air Force officials, while sympathetic to DoD's request to broaden the basis of the analysis, worry that a "redesign" of the SICBM could lead to a slowdown or even an unraveling of the entire ICBM modernization program. ■

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L T V : L O O K I N G A H E A D

CAPITOL HILL

By Brian Green, AFA DIRECTOR OF LEGISLATIVE RESEARCH

Washington, D. C., Mar. 28

Senate Panel Approves Defense Cut

The Republican-controlled Senate Budget Committee has approved a spending package that slashes $25 billion from the FY '87 defense budget proposed by President Reagan.

The Committee's budget resolution includes defense authority of $295.1 billion ($280 billion in outlays), $18.7 billion in increased tax revenues, and modest cuts in domestic spending. In contrast, President Reagan's budget includes $320.3 billion for defense (all defense functions), no tax increase, and much deeper cuts in domestic spending. The Committee estimates that the authority reduction will save $16 billion in outlays in FY '87.

The $295 billion defense figure, according to Committee calculations, amounts to an inflation-adjusted freeze. The resolution calls for one percent real increases for defense in FYs '88 and '89—far less than the three percent increases advanced in the Reagan five-year defense program.

The Committee's budget must still pass several hurdles, including challenges on the Senate floor. The tentative deep defense cuts approved this early in the budget process, however, will place greater pressure on other committees to approve lower funding levels for DoD.

AMRAAM Certified

One day before his March 1 deadline, Secretary of Defense Caspar Weinberger certified to Congress that the Advanced Medium-Range Air-to-Air Missile (AMRAAM) had met its technical and cost requirements. Without the Secretary's action, the program would have been canceled automatically. He certified that:

- The design of the AMRAAM has been completed.
- System performance has not been degraded from original performance specifications.
- The flight-test program has incorporated changes in the missile to reduce system cost.
- A fixed-price research, development, test, and evaluation contract of not more than $557 million has been signed.
- The total production cost for 17,000 Air Force missiles will not exceed $5.2 billion (in FY '84 dollars).

In an accompanying statement, the Secretary pointed out that the cost figures were based on a total purchase of 24,000 missiles and a total production cost of $7 billion. The Navy plans to buy the additional 7,000 missiles. He also noted that full congressional funding, in phase with the schedule requested by the Administration, is essential.

In spite of the certification, AMRAAM is not yet out of the woods. The General Accounting Office (GAO) issued a report at the request of the House Armed Services Committee (HASC) that concluded that the "estimated production cost . . . is based on a number of assumptions which cumulatively reduce confidence in the estimate." Chairman of the HASC Les Aspin (D-Wis.) and ranking Republican William Dickinson (R-Ala.), citing the GAO report, have both argued that the AMRAAM certification needs to be scrutinized carefully.

House Acts on Test-Ban Resolution

The House of Representatives has passed, by a vote of 268–148, House Joint Resolution 3, which calls for the negotiation of a comprehensive ban on all nuclear testing. The legally nonbinding resolution states that "at the earliest possible date" the President should submit to the Senate for approval the 1974 Threshold Test Ban Treaty (TTBT) and the 1976 Peaceful Nuclear Explosions Treaty (PNET) and "propose to the Soviet Union the immediate resumption of negotiations toward conclusion of a verifiable comprehensive test-ban treaty." The TTBT limits underground nuclear tests to 150 kilotons.

Congressional and Administration opponents of the resolution expressed concern over the apparent and repeated Soviet violations of the TTBT and argued that passage would indicate to the Soviets that Congress was pursuing its own arms-control agenda at the expense of that of the Administration. Most favored a substitute measure that called for the negotiation of improved verification techniques for the TTBT and PNET and proposed continued efforts to achieve a comprehensive test-ban treaty only after mutual, verifiable, and significant arms reductions had been achieved.

SASC Approves Defense Reorganization

The Senate Armed Services Committee approved a comprehensive set of defense reorganization proposals on March 6. The package is primarily aimed at enhancing service "jointness" and streamlining defense administration. It strengthens the position of the Chairman of the Joint Chiefs of Staff (CJCS) by designating him as the principal military advisor to the President, National Security Council, and the Secretary of Defense. It also designates a Vice Chairman as the second-ranking military officer (beneath the CJCS). The Vice Chairman would serve as Acting Chairman in the Chairman's absence—unless the Secretary of Defense decided otherwise—but would not normally vote at JCS meetings.

The Senate bill would strengthen the authority of combatant commanders by explicitly vesting the CINCs with full operational command over all forces assigned to their command, including all aspects of military operations, joint training, and those assigned aspects of administration necessary to fulfill their mission. The CINCs would also acquire much more control over the personnel in their commands by gaining the authority to disapprove selection of senior officers for their command and to suspend from duty officers in their command.

The Senate measure also attempts to streamline defense administration by proposing a reduction of about ten percent in Defense Department headquarters staff. The bill also offers measures to reduce congressional micromanagement of DoD. ■

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AEROSPACE WORLD

Including Bulletin Board

Compiled by Jeffrey P. Rhodes, STAFF EDITOR

Washington, D. C., Apr. 3

★ In early March, Rockwell International Corp. made an unsolicited offer to the Department of Defense to build an additional forty-eight B-1Bs for the Air Force at a greatly reduced cost.

Rockwell Chairman Robert Anderson stated in a letter to Secretary of Defense Caspar W. Weinberger that the company could likely produce the forty-eight aircraft at a total cost of $9.63 billion. That figure constitutes a cost of $195 million per plane in FY '86 dollars or $140 million per copy in FY '81 dollars, the base year when the original 100 B-1Bs were ordered.

Congress appropriated the funds last year to buy out the final forty-eight B-1Bs of the original contract. Cost at that time for each of the bombers was $283 million in FY '86 dollars or $205 million each in FY '81 dollars, so the cost savings under Mr. Anderson's proposal would be significant.

The new proposal assumes delivery of four aircraft per month and an interruption of unspecified length between the production of the 100th and 101st airplane. In order to procure long-lead items and to ensure that the new aircraft are built economically and with as little interruption in production as possible, Rockwell officials noted that funds must be made available in FY '87.

The Air Force currently plans to obtain 100 B-1Bs and an undisclosed number (but thought to be roughly 130) of Advanced Technology (or Stealth) Bombers from Northrop. Under Secretary of Defense for Research and Engineering Donald A. Hicks has said that the ATB program was within two to three percent of the B-1B's cost, so if the estimates for both the new B-1s and the ATB hold true, the cost of each of the additional B-1Bs would be roughly one-third the cost of the ATB.

★ Three Air Force missile programs in various stages of testing—Peacekeeper, AMRAAM, and IR Maverick—have all recently recorded major successes.

The eleventh successful test launch of the LGM-118A Peacekeeper was completed March 7. The missile was fired from a modified Minuteman III silo at Vandenberg AFB, Calif., and flew 4,100 miles in thirty minutes to a target area in the Kwajalein Missile Test Range in the Pacific.

This test was the first conducted by an all-Air Force launch crew and was the third silo launch of the Peacekeeper. Previous launches had been conducted by an all-contractor technician team with Air Force supervisors.

The test missile carried eight unarmed Mk 21 reentry vehicles, and the flight was designed to analyze the functional performance of the launch facilities and the systems of the four-stage, seventy-eight-foot-tall ICBM. Martin Marietta Aerospace, Denver Div., is responsible for the missile's assembly.

The Advanced Medium-Range Air-to-Air Missile (AMRAAM) program, which Secretary of Defense Caspar W. Weinberger certified in early March as being able to meet cost, contract, and performance specifications, completed its fifth and sixth successful test flights in as many tries.

Both of the tests of the AIM-120 took place during March over the White Sands Missile Range in New Mexico. The fifth test, which took place March 7, investigated the missile's aerodynamic and control design parameters. It was fired from an F-16 flying at Mach 1.20 at 10,000 feet, and the missile flew a preprogrammed flight path.

The sixth test shot, held on March 25, involved the removal of a target drone from the inventory. An F-15 flying at Mach 0.95 at 40,000 feet fired the missile in a long-range, front-aspect shot at a QF-100 drone. Prior to launch, the missile received target information from the F-15. When the launch aircraft brought the twelve-foot-long, 335-pound missile within range of its own transmitter, the missile switched to its terminal mode by activating an on-board radar, located the target, and launched. The drone, which performed a navigation turn at Mach 0.95, was destroyed. It marked the second direct hit AMRAAM has scored in its test program.

Hughes Aircraft Co. is the primary source for construction of the AIM-120, and Raytheon is the second-source contractor.

Aldridge Nominated Air Force Secretary

Edward C. "Pete" Aldridge, Jr., has been nominated by President Reagan to be Secretary of the Air Force, succeeding Russell A. Rourke, who resigned April 7 for personal reasons. Mr. Aldridge was formerly Under Secretary of the Air Force, and he has provided oversight for the USAF space program since 1981. Secretary Rourke had written the article on p. 70 of this "USAF Almanac" issue before his resignation.

The Air Force Operational Test and Evaluation Center at Kirtland AFB, N. M., recently completed follow-on operational test and evaluation (FOT&E) of the AGM-65D Imaging Infrared (IR) Maverick. The missile scored twenty-five direct hits in twenty-nine live-fire launches from F-111s, F-16s, and A-10s. The launches against mobile and static targets took place under day and night conditions in all types of weather.

The missile was tested at Eglin AFB, Fla., Nellis AFB, Nev., and at the inactive Air National Guard base at Volk Field, Wis. The Volk Field site was chosen for its resemblance to central Europe and its total unfamiliarity to the test aircrews.

Final results proved that the IR Maverick is operationally effective in an unfamiliar environment, that it provides a credible night weapon not previously available, and that production versions of the AGM-65D are more reliable and maintainable than other versions of the Maverick.

★ Maj. Gen. John M. Loh, Director of Operational Requirements in the Office of the Deputy Chief of Staff for Research, Development, and Acquisition, said recently in testimony before the House Armed Services Committee's Subcommittee on Procurement that "it is now time to take a serious look at unmanned reconnaissance vehicles for the Air Force inventory."

General Loh stressed strides in remotely piloted vehicle (RPV) technology since USAF's experience with the BQM-34 RPV, which was removed from Air Force service in 1977 because of a navigation system that was sometimes inaccurate and also because of the high operating and support costs of the vehicle. General Loh testified that "we believe technology can now provide us with reliable and affordable engines, structures, precision navigation systems, solid-state sensors, and recovery systems [that would provide] an unmanned option against . . . challenging crisis and wartime reconnaissance targets."

General Loh then outlined the joint Air Force/Navy medium-range reconnaissance vehicle program called Unmanned Air Reconnaissance System (UARS). This program will rely on off-the-shelf equipment as much as possible.

Under a Memorandum of Agreement (MOA) with the Navy, the UARS will be developed to meet the needs of both services. The MOA assigned concept definition of the UARS to the Navy, while the Air Force will be the lead service for electro-optical (EO) system development. A Request for Proposal (RFP) for the system will be issued by the Navy in the third quarter of this fiscal year, General Loh noted.

The UARS vehicle will fly at medium to high subsonic speeds at low to medium altitudes and have a combat radius of at least 300 nautical miles. The RPV will also have a precision navigation system, a day/night capability, and the ability to store and link EO data imagery intelligence to a ground station in near real time. The UARS will be able to be air- and ground-launched and will be recoverable. Funding for the program will be included in the FY '88 budget.

"We believe the unmanned vehicle has overcome its technical limitations and that it's time to get on with the definition and fielding of a UARS to complement our manned systems," General Loh concluded.

★ Many congressmen are concerned about the effects of the pending Gramm-Rudman-Hollings (GRH) budget cuts on the Veterans Administration.

In the House, the Chairman of the Veterans' Affairs Committee, Rep. G. V. (Sonny) Montgomery (D-Miss.), has already stated his belief that veterans' benefits must be sheltered from the GRH reductions. Mr. Montgomery, who voted to pass that bill, has told his colleagues that "the legislation was not perfect. In fact, we knew there were many areas that would require adjustments based on . . . priorities."

Some of the adjustments he favors are contained in legislation he has introduced with Rep. John Paul Hammerschmidt (R-Ark.). These adjustments include:

- Restoration of benefits to some 26,000 veterans with service-connected disabilities who are enrolled in a program of vocational rehabilitation.
- Revocation of cuts made in payments for education and training assistance to some 51,800 veterans and survivors who are totally disabled as a result of service-connected actions.
- Replacement of a $3,000 cut from individual grants for roughly 455 veterans that enable them to modify their homes to accommodate wheelchairs.
- Putting back money cut from grants to severely disabled veterans that enable them to buy equipment to modify automobiles in order to make it possible for these veterans to drive.

In related news, Sen. Dennis DeConcini (D-Ariz.) has vowed to lead a campaign to restore proposed cuts in VA health care and job training for veterans.

Another senator on the Veterans' Affairs Committee, Alan Cranston (D-Calif.), has also voiced concern about the prospect of reduced medical care. Specifically citing proposed cuts within California VA facilities, he charged that, under the proposed cutbacks, VA hospitals in that state would handle 5,600 fewer patients in FY '87. Outpatient visits, he claimed, would drop by 164,000.

★ Air Force Systems Command has

A new type of station-keeping propulsion system for satellites is being investigated in a series of programs managed by Britain's new National Space Center. This new system uses ionized particles of xenon, krypton, and argon that are accelerated to high velocities by electric fields and are then ejected to keep the satellite in its proper orbit. The new type of thruster could lead to a fuel savings equivalent to a twenty percent increase in the payload.

defined its Science and Technology (S&T) Program Investment Strategy by dividing current technologies and problem areas into three distinct categories.

These classes fall roughly along the lines of long-term advances (revolutionary/pervasive technologies), ongoing projects in testing that promise more near-term benefits (integrating technologies), and those areas currently in being that need to be improved (chronic problem areas).

The high-promise ideas named by the recently completed Project Forecast II studies *(see "In Focus . . ." and "Aerospace World," April '86 issue)*, such as the Swarm option and the National Aerospace Plane (NASP), are being screened for proper security classification and are not included in the list.

The official class definitions and a listing of the technologies cited by AFSC include:

• **Revolutionary** ("order of magnitude," or factors of two to five, improvements in military capability) and **Pervasive** (extending across large numbers of military uses) **Technologies:**

Artificial Intelligence (AI) (especially Expert Systems).

Hypersonic Technologies (including supersonic combustion).

High-Performance Turbine Engine (HPTE).

Advanced Materials (ordered polymers, molecular composites, etc.).

AEROSPACE WORLD

Adaptive Systems (including self-cohering antenna arrays, supermaneuverability, control of nonlinear systems, etc.).

Phased Integrated Laser Optics Technology (PILOT).

Solid-State Analog Devices (superconducting, Acoustical Charge Transport [ACT], and integrated optics).

Signal and Data Processing (fast algorithms, parallel processing, distributed processing, and optical processing).

Man/Machine Performance Enhancement (including cognitive processes, virtual cockpit, and human factors).

Millimeter Wave Integrated Circuits (MMIC).

• **Integrating Technologies** (large-scale integration across laboratories):

Weapon/Aircraft/Crew Interface.

Survivable Penetration and Attack (including defense suppression, multiple kills per pass, and high-accuracy long-range targeting).

Large Space Structures (including man in space and unmanned platforms).

Advanced Fighter Technology Integration (AFTI/F-16, STOL test-bed, and ATF).

Advanced Missile Integration Technologies.

• **Chronic Problem Areas** (areas of additional conscious efforts):

Combat Identification.

Brilliant Weapons.

Generic Cockpit.

Electronic Combat.

Software.

Low-Cost Access to Space.

Battle Information Management.

Reliability, Maintainability, and Logistics.

During the past twenty-five years, more than 56,000 US and NATO pilots have been trained in the Northrop T-38 Talon. The T-38 was the world's first supersonic trainer, and it is the only trainer in use today that can travel faster than sound. The T-38 fleet will be getting new wings that should allow it to fly for another twenty-five years.

★ It may be hard to believe, but when the first Northrop T-38A Talon was accepted by Air Training Command at Randolph AFB, Tex., in March 1961, John F. Kennedy was President, and the first pilot class trained in the aircraft went on to fly F-100 Super Sabres and F-105 Thunderchiefs.

In the twenty-five years since its acceptance, the T-38 fleet has accumulated more than 9,000,000 flight hours, or the equivalent of one pilot flying one aircraft twenty-four hours a day for roughly 1,025 years. The Talon has trained more than 56,000 US and NATO pilots during its career. In addition to training, the plane is also used to perform chase and proficiency missions for NASA and to provide dissimilar air combat training exercises for the US Navy. In its AT-38 variant, it gives Air Force pilots lead-in training in air-to-air and air-to-ground combat tactics.

The T-38 holds a couple of "firsts." It was the world's first supersonic trainer (and it is the only faster-than-sound trainer in use today), and it was the first US supersonic aircraft to complete its flight-test program (2,000 flights) without a major accident. The plane set four time-to-climb records and, with Jacqueline Cochran at the controls, set eight women's flying records.

Every one of the 1,187 T-38s built was delivered on time and on budget. Northrop is currently manufacturing new wings for the Talon that should allow the aircraft to fly for another twenty-five years.

March also marked the fifth anniversary of the operational debut of the McDonnell Douglas KC-10A Extender tanker/cargo aircraft.

In just half a decade, the forty-one KC-10 aircraft have flown more than 70,000 hours, and they have made more than 93,000 tanker contacts with receiver aircraft. Two of the longest fighter deployments in history—7,700 miles from California to Australia and 8,100 miles from Okinawa to

AIR FORCE

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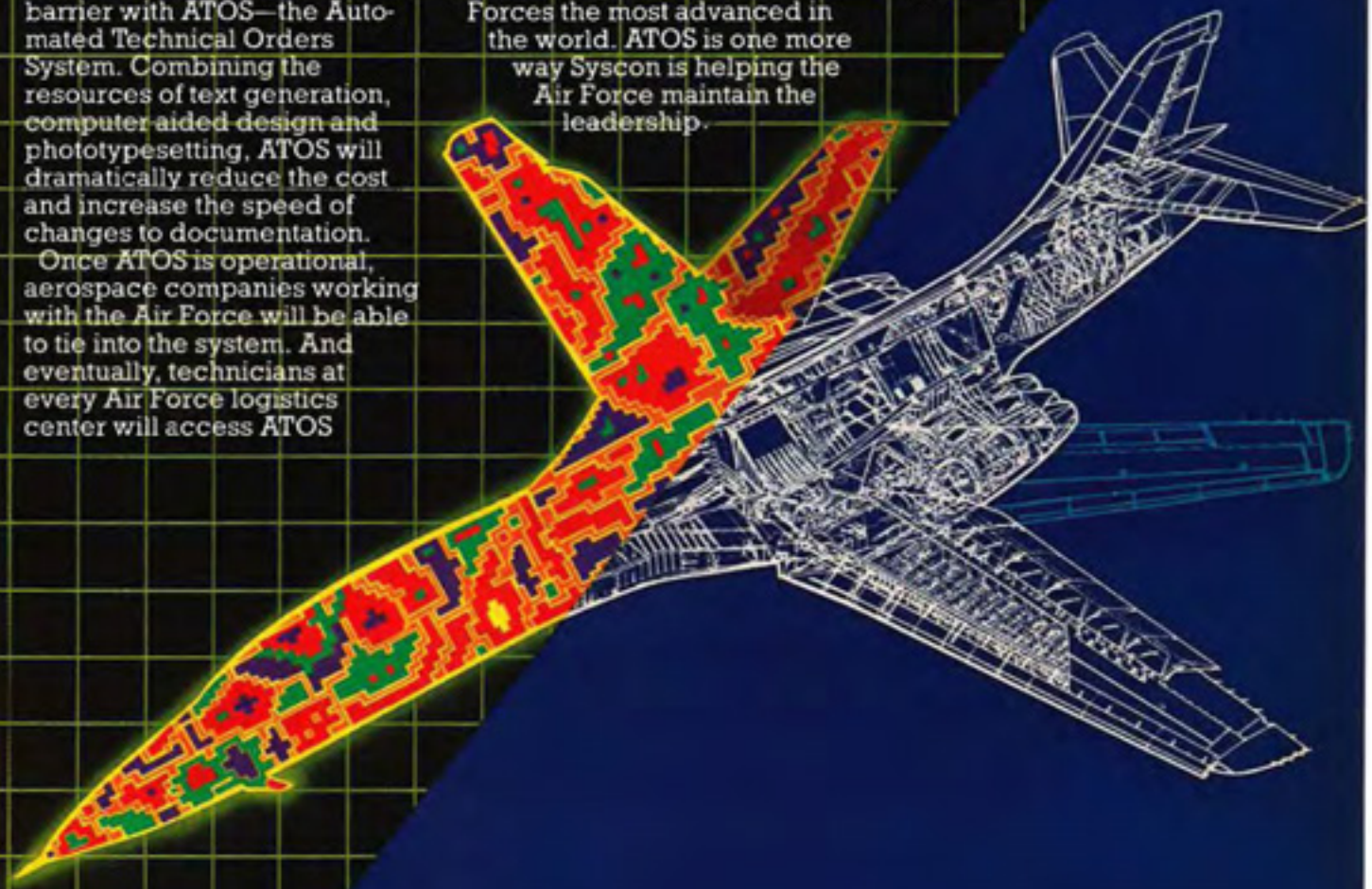

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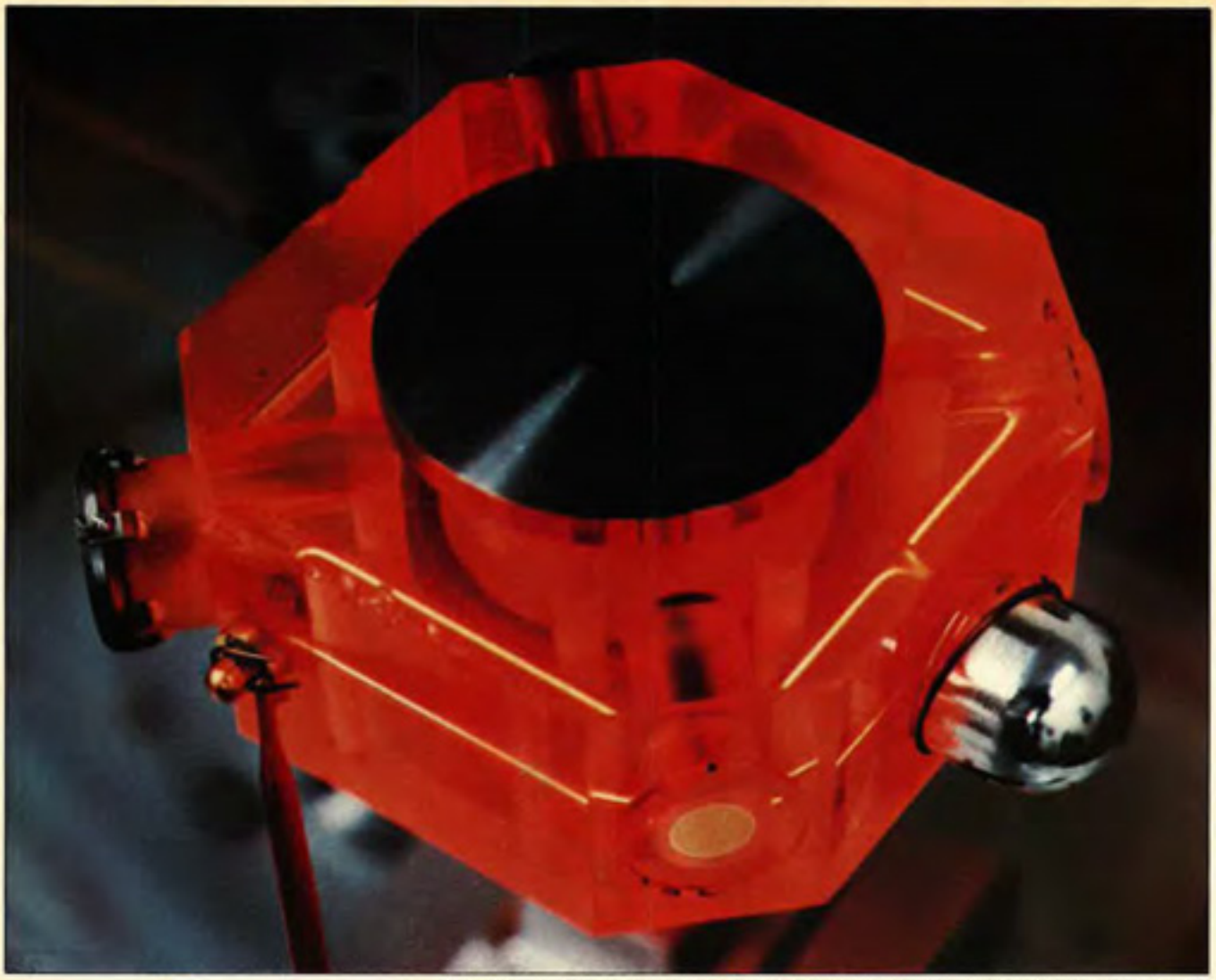

Compared to any triangle, Litton's square "ring" laser produces measurably less backscatter, a definite benefit.

USAF selects Litton for Standard RLG INU, world's first military RLG production program.

C-130 and RF-4C aircraft to receive first units, with HH-60A and EF/F-111 soon after.

The United States Air Force has selected Litton's Guidance and Control Systems Division, long a world leader in inertial navigation, to produce the LN-93 Standard RLG Inertial Navigation Unit. Litton's LN-93 was the first RLG system to successfully complete all tests at the Central Inertial Guidance Test Facility, Holloman Air Force Base, New Mexico, and will be the Form-Fit Function alternative to the AN/ASN-141, currently manufactured by Litton for the F-16, A-10, FB-111, and other Air Force and Army aircraft. Initially, the Standard RLG INU will be employed in the C-130 Self-Contained Navigation System and the RF-4C, and later in the HH-60A and EF/F-111. A variant of the LN-93 will be purchased for the F-15; the two configurations will share over 90% commonality.

The LN-93 Standard Ring Laser Gyro INU is Litton's most recent system to employ Ring Laser Gyros in strapdown configuration. As there are no moving parts, these gyros will have significantly better reliability than earlier-design spinning-wheel gyros. The LN-93 system employs the same 28cm pathlength Ring Laser Gyro and much of the same electronics as both the Litton commercial LTN-90 Inertial Reference System, and LN-92 RLG INS, currently under development for the U.S. Navy CAINS II. The high reliability guaranteed by Litton will allow the Air Force to employ a two-level maintenance approach, eliminating the need for test equipment at base shops.

LN-93 Standard RLG INU, a full step ahead.

Litton Guidance & Control Systems

AEROSPACE WORLD

Florida—were flown with the aid of KC-10s.

KC-10s are assigned to Barksdale AFB, La., March AFB, Calif., and Seymour Johnson AFB, N. C. Current plans call for a total of sixty Extenders in the inventory. The last aircraft will be delivered late next year.

★ Many people exchange heart-shaped boxes of candy for Valentine's Day. Richard Reinhardt, however, exchanged a defective heart for a healthier one last February 14—courtesy of the 509th Bombardment Wing at Pease AFB, N. H.

On February 13, a donor heart was found for Mr. Reinhardt, forty-six, a patient in the Hartford (N. H.) Hospital, but, unfortunately, the organ was in Oklahoma City, Okla., 1,415 miles away.

Four hours or less between the time the heart is removed from the donor and transplanted in the recipient is considered the optimal time to reduce the danger of the organ being rejected. Time was the critical factor, and no commercial or medical aircraft were available to transport the heart to Hartford in the required span, so the 509th was called in to make the delivery.

An FB-111A and a KC-135 tanker left Pease in the early evening and flew to Tinker AFB, Okla. A backup FB-111 was dispatched an hour later. The heart arrived early in the morning of February 14. Because the cockpit is the only pressurized area of the FB-111, the container carrying the organ was secured in the lap of radar navigator Capt. Steven J. Bruger. By 3:00 a.m., Capt. David R. Lefforge, the aircraft commander, had the plane headed back to Connecticut at just under 700 miles an hour.

The plane landed at Bradley ANGB, Conn., approximately two hours later. A helicopter took the heart to Hartford, where it was then implanted in Mr. Reinhardt. Total time elapsed from removal to transplant—three hours, fifty-nine minutes.

Mr. Reinhardt was joined by the FB-111A crew and a representative of the KC-135 crew in a press conference held at Hartford Hospital in late March. By March 22, Mr. Reinhardt was back home. He will return to his job as a part-time letter carrier in a few months.

Like the T-38, the McDonnell Douglas KC-10 Extender also celebrated an anniversary in March. Since 1981, the KC-10 fleet has accumulated more than 70,000 hours of flight time, and the tankers have made more than 93,000 contacts with receiver aircraft.

The day before he left the hospital with his new heart, Richard Reinhardt (lower right) and several of the members of the 509th Bombardment Wing at Pease AFB, N. H., spoke at a press conference. With Mr. Reinhardt are Capt. Robert J. Keneally (lower left), Emergency Actions Controller who took the original call from the hospital, and Capts. Steven J. Bruger and David R. Lefforge (standing, left and right), the FB-111A crew that delivered the heart.

★ According to the preliminary results of a DoD survey of 20,000 military personnel worldwide, drug and alcohol abuse in the services has shown its second major decline since the original poll was taken in 1980.

The results show that the percentage of individuals who had used drugs in the thirty days prior to the survey was down to nine percent in 1985, as compared with twenty-seven percent in 1980. Nonmedical use of drugs in the last year was reported by thirteen percent of personnel, and eleven percent said they had used marijuana in the previous twelve months. Loss of productivity as a result of drug use in the previous year was claimed by three percent of the sample.

The poll results also indicated that twelve percent of personnel were heavy drinkers, defined as those who consume five or more alcoholic drinks at one time at least once a week. Twenty-seven percent of those

polled in 1985 reported loss of productivity in the last twelve months because of alcohol use. This figure compares with thirty-four percent in 1982.

As a sidelight, drug use as a DoD average was higher in grades E-1 through E-3 (twenty-two percent), while forty-three percent in each group of grades from O-1 through O-10 (O-1–O-2, O-3, O-4–O-10) considered themselves "moderate" drinkers.

★ The US Navy's aerial demonstration team, the Blue Angels, will have a new look next year, as the unit will transition to the McDonnell Douglas F/A-18 Hornet aircraft at the end of the 1986 show season. The Hornets will replace the team's current twenty-year-old A-4F Skyhawks, which will then be used for undergraduate pilot and fleet adversary training.

The Blue Angels will receive ten aircraft—eight single-seat F/A-18As and a pair of tandem-seat TF/A-18As. These aircraft will be older production planes and are not carrier-suitable. The only modifications to the F/A-18s will be the addition of a smoke-generation system and a strengthened seat harness.

In the event of a national emergency, the aircraft would be assigned to fleet replacement squadrons and would be used during initial phases of F/A-18 pilot training. By making the switch, the Navy will gain seven aviators and approximately eighty maintenance personnel who are current in the fleet's front-line multirole aircraft and who could augment combat squadrons in time of crisis.

AEROSPACE WORLD

The F/A-18 will be the third consecutive McDonnell Douglas-built aircraft flown by the Blue Angels. The team flew F-4J Phantom IIs from 1969 through 1973 and has flown A-4Fs since 1974. The Hornet will also be the first twin-tailed airplane that either the Blue Angels or the Air Force's Thunderbirds has flown as a regular show aircraft. The Blue Angels did, however, fly a pair of twin-tailed Vought F7U Cutlasses as solo aircraft for two shows in 1952.

In related news, the US Army Parachute Team, the Golden Knights, has recently completed training in that team's new Fokker F27 turboprop transports and began their show season in late March. The two F27 aircraft, which have not been given a military designation, are being leased for the Knights and feature two large aft paratroop doors. The disposition of the team's C-7 Caribou aircraft had not been determined at this writing.

This is an artist's concept of the new crash/rescue vehicle being developed for the Air Force by Bell Aerospace Textron, Inc., and ASD's Flight Dynamics Laboratory at Wright-Patterson AFB, Ohio. The new truck will combine air cushion technology and conventional-wheel drive.

★ Bell Aerospace Textron, Inc., along with Aeronautical Systems Division's Flight Dynamics Laboratory at Wright-Patterson AFB, Ohio, is working on the design of a new crash/rescue vehicle that will combine air cushion technology and conventional-wheel drive and steering to "float" over difficult terrain.

Sixty-five percent of military aircraft accidents happen away from hard-surfaced runways, taxiways, and roads. This new vehicle will allow ease of movement over rough, uneven terrain or ice and snow. In combat situations, the crash truck will be able to traverse bomb craters and debris. The air cushion will lift the truck from the ground, but the wheels will remain in contact with the surface for steering and movement.

Approximately the size of the current P-19 fire truck, the new vehicle will be thirty-eight feet long, seven-

The US Army Parachute Team, the Golden Knights, recently completed training in the unit's new Fokker F27 turboprop transports. The new aircraft feature two large aft paratroop doors.

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AEROSPACE WORLD

teen feet wide, and a little over eight feet tall. The truck will be small enough to be airlifted by a C-130.

The new crash truck will feature a fifty-foot rescue boom, capacity for at least 1,000 pounds of water and/or foaming agents, and a protected compartment for three litter patients, an attendant, and the related emergency medical equipment. The new truck will weigh roughly 25,000 pounds and will operate with a single diesel engine.

A scale model, weighing about 600 pounds, will be tested later this year on the Flight Dynamic Laboratory's "whirling arm machine" to determine the truck's stability as it moves over obstacles and to measure its reaction to acceleration and other forces. The development effort will take from four to five years. The entire program is being managed by the Air Force Engineering and Services Center at Tyndall AFB, Fla.

★ Engineers, designers, and other officials from the defense industry are getting a little extra exposure to operational reality through a unique Air Force program called Blue Two.

During each Blue Two visit, which typically involves thirty to forty people and lasts for a week, the engineers are shown operations at SAC, MAC, TAC, and AFLC bases. Despite the fact that the Air Force only provides the tour—the companies pay lodging and transportation costs for their representatives—demand for space on the visits has been heavy.

The highlight of these visits for the engineers is the opportunity to get out of the office environment and to talk with the maintenance men and women on the line and to get their hands dirty by actually practicing on the equipment they may have designed. On a recent winter visit to the 5th Bomb Wing at Minot AFB, N. D., engineers learned what it is like to work on aircraft in cold weather while wearing chemical warfare gear.

While no major maintenance procedure changes have yet emerged from these visits, several minor procedural modifications, including the attachment of safety wires to several parts of F-15s, have resulted from earlier Blue Two visits.

The Blue Two program is managed by the Air Force's Coordinating Office for Logistics Research (AFCOLR).

★ Gen. Duane H. Cassidy, Commander in Chief of Military Airlift Command, recently appeared before the Senate Armed Services Committee's Subcommittee on Sea Power and Force Projection to describe his long-term recommended force mix of cargo aircraft for the active and active/Reserve Associate Units and the organic Air Reserve Forces (ARF).

According to General Cassidy's testimony, the ARF, by Fiscal Year 2000, will operate forty-four C-5As (up from eight aircraft in FY '86) and eighty C-141Bs (up from four in FY '86). Forty-eight of the Air Force's newest projected airlifter, the C-17, are expected to be flown by ARF crews by the turn of the century.

The recommended aircraft distribution for the active forces is seventy C-5s (fifty B and twenty A models), 100 C-141s, and 132 C-17s.

The proposed force mix calls for the number of C-130 aircraft to be reduced gradually by the year 2000. The active force will be flying 190 of the venerable C-130s, while the ARF will still have 152 aircraft on its roster. By the end of the 1990s, the design of the C-130 will be nearly fifty years old.

"We believe our Total Force plan will provide us a force fully capable of executing national strategy," General Cassidy noted.

★ The Boeing Military Airplane Co. has received a $44.5 million contract for five Common Strategic Rotary Launchers (CSRLs) and associated support equipment for use on B-52H bombers. These first five launchers constitute the first of five lots that will eventually total 104 CSRLs. The contract also includes an option to produce conversion kits for adapting the launchers to the B-1B when the B-52s are eventually phased out of service.

The CSRL can accommodate existing and projected nuclear weapons, cruise missiles, and AGM-69 Short-Range Attack Missiles (SRAM). This launcher will allow for internal carriage of eight cruise missiles in the B-52s, which will give the aging bombers a total capacity of twenty AGM-86 cruise missiles.

The launcher will be installed by AFLC's San Antonio Air Logistics Center at Kelly AFB, Tex., and the first modified aircraft is expected to be delivered in 1988. All B-52 modifications and CSRL installations should be completed by 1993.

Bases to receive the improved B-52s include Carswell AFB, Tex., Fairchild AFB, Wash., K. I. Sawyer AFB, Mich., and Minot AFB, N. D.

★ Ten months have passed since the "new" GI Bill was passed. In a candid assessment, Air Force officials recently rated its success as a "B+."

While service managers believe the Bill is a good tool for attracting high-quality recruits, it "must not be viewed as a panacea." Other incentives, such as bonuses, are seen as the key recruiting and retention aids. Under the new GI Bill, members must contribute a nonrefundable $100 per month. After six years, they get back

Hughes Aircraft Co. technician David Dominguez conducts a test on the guidance electronics assembly that is the "brain" of the Navy's Trident I missile. Hughes recently delivered the last of the Trident I assemblies to the Navy. Since 1978, these assemblies have performed flawlessly in fifty test launches.

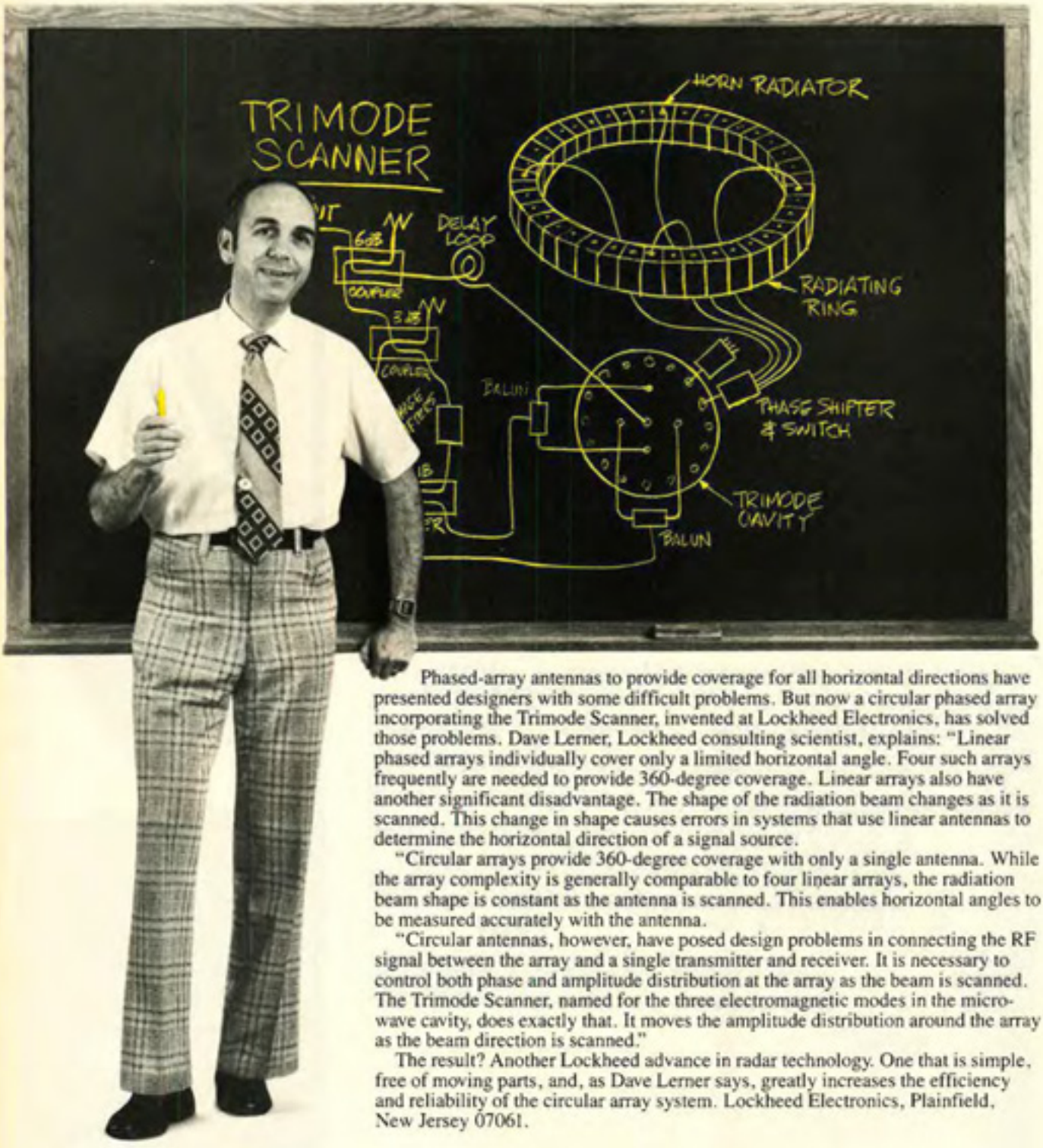
$300 a month for thirty-six months.

The Recruiting Service says that education-minded recruits seem to like the Bill, which went into effect last July 1. In a poll of new recruits, Army trainees found the program most to their liking, with sixty-nine percent signing up for the benefits. The Marines signed up fifty-one percent of their accessions in the program, and Air Force and Navy basic trainees joined up at a rate of thirty-eight and twenty-nine percent, respectively.

So far, the Air Force has not indicated any plans to add "kickers" to the

MSgt. Michael L. Smith (left), flight engineer, Lt. Col. William A. Jordan (center), aircraft commander, and Lt. Col. Joseph Lindsay, copilot, constituted the first all-black crew to fly the C-5A. This Dover AFB, Del., crew flew a routine airlift mission to Europe to commemorate Black History Month.

Dave Lerner on a new approach to omnidirectional coverage.



Phased-array antennas to provide coverage for all horizontal directions have presented designers with some difficult problems. But now a circular phased array incorporating the Trimode Scanner, invented at Lockheed Electronics, has solved those problems. Dave Lerner, Lockheed consulting scientist, explains: "Linear phased arrays individually cover only a limited horizontal angle. Four such arrays frequently are needed to provide 360-degree coverage. Linear arrays also have another significant disadvantage. The shape of the radiation beam changes as it is scanned. This change in shape causes errors in systems that use linear antennas to determine the horizontal direction of a signal source.

"Circular arrays provide 360-degree coverage with only a single antenna. While the array complexity is generally comparable to four linear arrays, the radiation beam shape is constant as the antenna is scanned. This enables horizontal angles to be measured accurately with the antenna.

"Circular antennas, however, have posed design problems in connecting the RF signal between the array and a single transmitter and receiver. It is necessary to control both phase and amplitude distribution at the array as the beam is scanned. The Trimode Scanner, named for the three electromagnetic modes in the microwave cavity, does exactly that. It moves the amplitude distribution around the array as the beam direction is scanned."

The result? Another Lockheed advance in radar technology. One that is simple, free of moving parts, and, as Dave Lerner says, greatly increases the efficiency and reliability of the circular array system. Lockheed Electronics, Plainfield, New Jersey 07061.

Lockheed Electronics **Innovation**
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Bill. Authority has been granted to offer some additional educational funding for special service—the Army, for example, offers "kickers" to those signing up in Combat Arms.

Another key element of the Bill is the opportunity for certain Guard and Reserve enlistees to receive benefits also.

★ The National Aeronautic Association has announced that Cessna President and CEO Russell W. Meyer, the Cessna Aircraft Co., and that company's line of Citation business jets have been selected as the winner of the prestigious Collier Trophy for 1985.

The Citation family of aircraft has achieved an unparalleled passenger safety record in the fourteen years since the plane was introduced. There have been only four Citation accidents involving passenger fatalities in more than 3,500,000 hours flown since 1972. No fatalities have been recorded in the 750,000 hours flown by the 1,400 Citations worldwide over the last two years. The Citation fleet logs more than 2,000 hours per day, or the equivalent of thirty-three trips around the world.

The Collier Trophy has been presented annually since 1911 for the greatest achievement in aeronautics or astronautics in America demonstrated by actual use in the previous year.

AEROSPACE WORLD

At Nellis AFB, Nev., enlisted personnel have taken over the important job of visually checking aircraft before they take off or land. Here A1C Robert Harrison (left), A1C Kevin Fanning (center), and A1C Ronald Davis keep an eye on runway operations.

The trophy will be presented to Mr. Meyer and Cessna at a dinner in May.

★ The average fighter pilot is now flying more sorties per month, and, as a result, some traditional pilot jobs on the ground—such as visually checking aircraft before takeoff or landing—are being taken over by enlisted personnel. This change to enlisted observers was directed by Tactical Air Command headquarters last fall.

Called ROMs, or Runway Operations Monitors, these enlisted personnel operate from a runway monitoring station, or a "mobile" as it is called. Using binoculars, they check departing aircraft for anomalies, and they give incoming aircraft the once-over to make sure that their landing gear is down. If something is amiss, the ROMs can fire flares or call on the radio to alert the pilot.

At Nellis AFB, Nev., one of the busiest fighter bases in the world with nearly 350,000 takeoffs and landings a year, the ROMs have already taken over this vital function. For now, both the 57th Fighter Weapons Wing and the 474th Tactical Fighter Wing are training the ROMs, but eventually the ROM training will be taken over by squadron operations personnel.

Sgt. Todd Trabue, a new ROM at Nellis, recorded one of the first "saves" recently when he alerted a pilot who was about to take off with a safing pin still installed on one of the weapons racks.

SENIOR STAFF CHANGES

PROMOTIONS: To be **Brigadier General:** Col. Chalmers R. **Carr,** Jr.

RETIREMENTS: B/G Michael H. **Alexander;** B/G Albert C. **Guidotti;** B/G Mary A. **Marsh;** B/G Gerald W. **Parker;** B/G Robert B. **Plowden,** Jr.; B/G Albert L. **Pruden;** B/G William B. **Webb;** B/G David H. **Williams,** Jr.

CHANGES: Col. (B/G selectee) James S. Allen, from Dir., Joint and Nat'l Security Council Matters, DCS/P&O, Hq. USAF, Washington, D. C., to Dep. Dir., Regional Plans and Policy, and Dir., GLCM Planning Group, DCS/P&O, Hq. USAF, Washington, D. C., replacing B/G Burton R. Moore . . . **Col. (B/G selectee) Chalmers R. Carr, Jr.,** from Cmdr., Goodfellow TTC, ATC, Goodfellow AFB, Tex., to Dir. of Inspection, Hq. AFISC, Norton AFB, Calif., replacing B/G Albert L. Logan . . . **Col. (B/G selectee) Gerald A. Daniel,** from Cmdr., 4th TFW, TAC, Seymour Johnson AFB, N. C., to Spec. Ass't to the Cmdr., 9th AF, TAC, Shaw AFB, S. C. . . . **M/G Robert F. Durkin,** from Dep. Dir. of Plans, DCS/P&O, Hq. USAF, Washington, D. C., to Dep. Dir., Foreign Intel., DIA, Washington, D. C.

Col. (B/G selectee) Floyd E. Hargrove, from Cmdr., 314th TAW, MAC, Little Rock AFB, Ark., to Vice Cmdr., 23d AF, Hq. MAC, Scott AFB, Ill. . . . **Col. (B/G selectee) Richard E. Hawley,** from Cmdr., 18th TFW, PACAF, Kadena AB, Okinawa, Japan, to Spec. Ass't to the Cmdr., 313th AD, PACAF, Kadena AB, Okinawa, Japan . . . **B/G (M/G selectee) Wayne O. Jefferson, Jr.,** from Dep. Dir., C^3 Connectivity and Eval., C^3 Systems Directorate, OJCS, Washington, D. C., to Ass't Dir., C^3 Div., Int'l Mil. Staff, NATO, Brussels, Belgium . . . **B/G Albert L. Logan,** from Dir. of Inspection, Hq. AFISC, Norton AFB, Calif., to Dep. Dir. of Plans, DCS/P&O, Hq. USAF, Washington, D. C., replacing M/G Robert F. Durkin.

Col. (B/G selectee) Charles F. Luigs, from Cmdr., 3d TFW, PACAF, Clark AB, Philippines, to Cmdr., 13th AF, PACAF, Clark AB, Philippines, replacing M/G Gordon E. Williams . . . **B/G Burton R. Moore,** from Dep. Dir., Regional Plans and Policy, and Dir., GLCM Planning Group, DCS/P&O, Hq. USAF, Washington, D. C., to Dep. Dir. of Ops., DCS/P&O, Hq. USAF, Washington, D. C., replacing retired B/G Robert B. Plowden, Jr. . . . **B/G Donald A. Rigg,** from Cmdr., US Forces Azores, and Cmdr., 1605th MASW, MAC, Lajes Field, Azores, to Dir., Aerospace Safety, Hq. AFISC, Norton AFB, Calif., replacing retired B/G Albert L. Pruden . . . **Col. (B/G selectee) Paul L. Roberson,** from DCS/Personnel, Hq. ATC, Randolph AFB, Tex., to Cmdr., Goodfellow TTC, ATC, Goodfellow AFB, Tex., replacing Col. (B/G selectee) Chalmers R. Carr, Jr. . . . **M/G Gordon E. Williams,** from Cmdr., 13th AF, PACAF, Clark AB, Philippines, to Spec. Ass't to the CINC, PACAF, Clark AB, Philippines. ■

AEROSPACE WORLD

★ **NEWS NOTES**—Then-Air Force Secretary Russell A. Rourke announced in late February that the **planned buy of 365 fighter engines** for FY '87 will be a fifty-six/forty-four percent split between the General Electric F110 engine and the P&W F100-220. This third yearly increment of the Alternate Fighter Engine (AFE) contract announced in February 1984 will provide the Air Force with savings of approximately $25 million more than was forecast in 1985. The 205 GE engines will be used in the F-16, while the 160 P&W engines will be used in both F-16s and F-15s.

The Lance P. Sijan Leadership Award is given to those officers and enlisted men at wing level or below who demonstrate most clearly the highest qualities of leadership in their duties and in the conduct of their lives. The 1985 winners are Capt. Robert Hughes, Brig. Gen. Henry Viccellio, Jr., MSgt. Richard Helton, and SSgt. Joseph Miller. With the winners is USAF Chief of Staff Gen. Charles A. Gabriel (center).

Air Force **Col. (Brig. Gen. selectee) Kenneth E. Staten** has been appointed as the program manager for the National Aerospace Plane (NASP) project at Wright-Patterson AFB, Ohio. The NASP office, which will manage the technology and design programs leading to a prototype, will be staffed by Air Force, Navy, and NASA personnel. A native of Mulvane, Kan., Colonel Staten previously commanded the 6510th Test Wing at the Air Force Flight Test Center and, before that assignment, the USAF Test Pilot School, both of which are located at Edwards AFB, Calif. Colonel Staten is a 1961 graduate of the Air Force Academy.

Maj. Gen. Thomas K. Turnage, USA (Ret.), was confirmed by the Senate on March 21 as Administrator of the Veterans Administration. General Turnage was previously the Director of Selective Service. He has seen service on active duty as well as with the Army Guard and Reserve. ■

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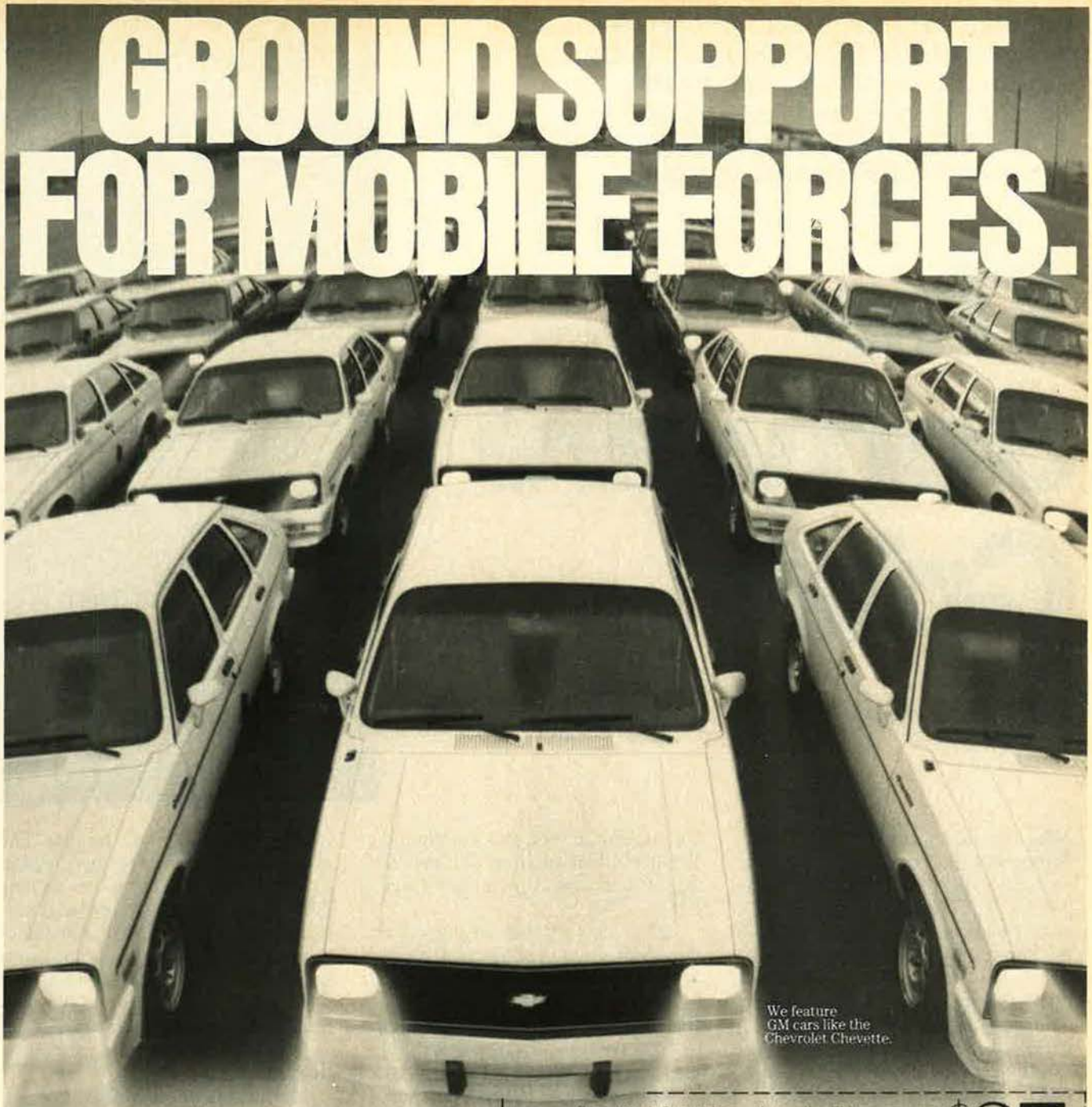
GROUND SUPPORT FOR MOBILE FORCES.



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Software will soon account for ten percent of the USAF budget. There are problems of cost and quality, but the biggest problem is that demand for software exceeds supply by a dangerous margin.

The Software Crisis

BY JAMES W. CANAN
SENIOR EDITOR

COMPUTER software is the brainpower of modern US military systems. The systems have come to live by it. There is increasing concern, however, that they may go into decline for the future lack of it.

Virtually all major military systems—aircraft, missiles, satellites, ships, tanks, torpedoes, and command control communications and intelligence (C^3I) networks—now embody programmable digital electronics.

More and more, the performance of such systems is dictated by the computer programs in their signal processors and data processors that tell them what to do and how to do it.

Modifying the computer software is now the main means of upgrading the systems to keep them on top of the threats.

"Software has become a highly important force multiplier, even though this is difficult to express in terms of bombs on targets," says Col. Kenneth Nidifer, director of mission-critical computer programs for Air Force Systems Command's Deputy Chief of Staff for Product Assurance and Acquisition Logistics.

"The very security of our nation depends on software," Colonel Nidifer declares.

Software and National Security

That security is now being threatened by a full-blown software crisis.

Software costs have skyrocketed so high that they dominate the costs of military electronics and are headed for runaway proportions.

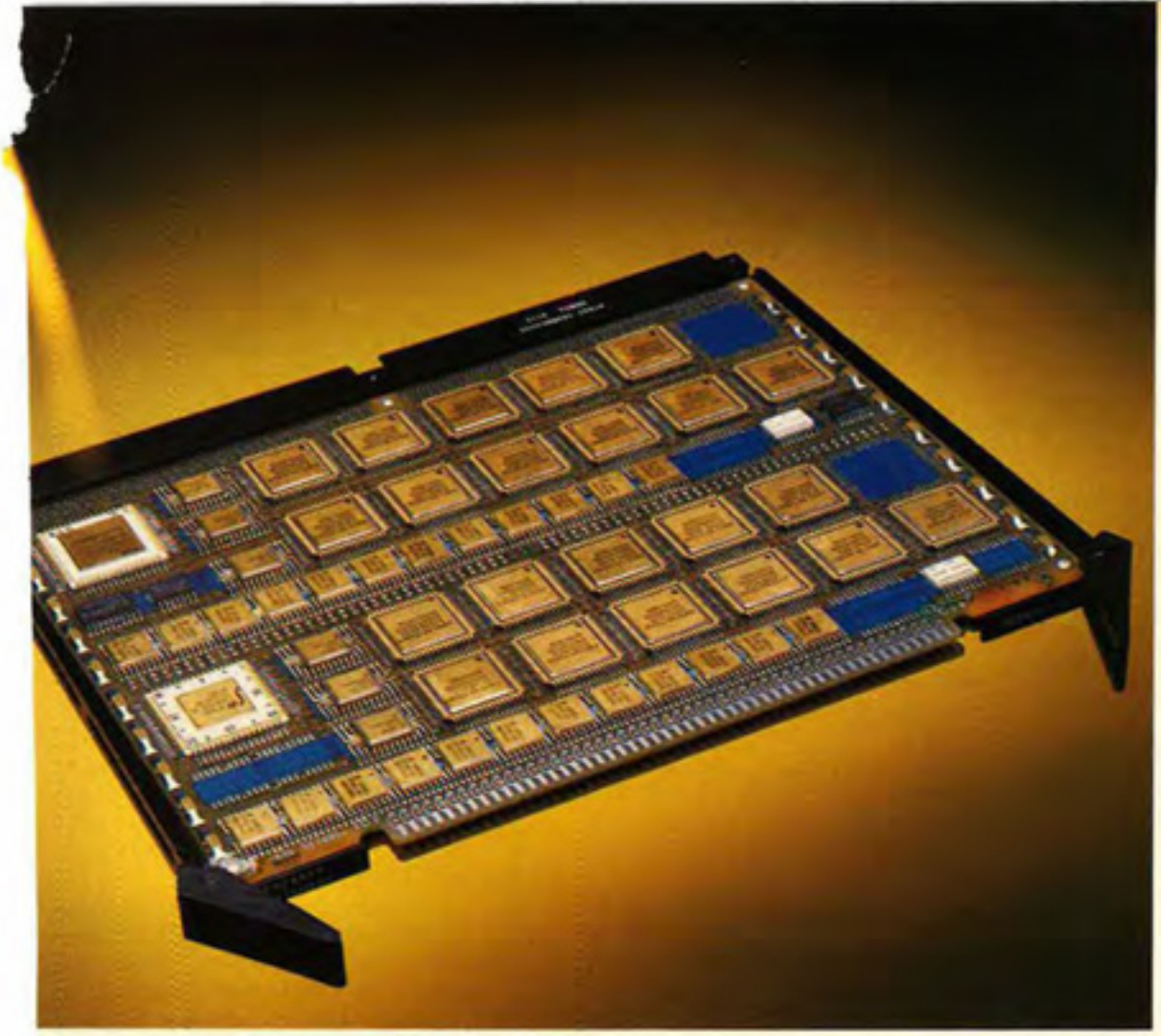
The Department of Defense spends $10 billion a year on software and anticipates the need to triple such spending by 1990. At $3 billion a year, software spending accounts for five percent of the total Air Force budget, and it is expected to eat up ten percent of the budget by 1990.

The demand for software and for software professionals, which is to say engineers, managers, and programmers, far outstrips supplies and is becoming more intense and more worrisome by the minute. The military is currently developing as much new software as the 100,000,000 lines of code that it now has in use. The national shortfall of some 80,000 civilian and military software professionals is expected to swell to 1,000,000 by 1990, and only a few US universities offer advanced degrees in software engineering.

Military systems software is becoming ever more complex. For example, the B-1A bomber of ten years ago embodied 500,000 lines of software code, fewer than half of the 1,200,000 lines of code in today's B-1B.

It has often taken the military services as long as nineteen years to get software into systems from the time of its conception. The heightening demand for increasingly complex software threatens to protract this excruciating process even more.

Software quality is spotty. "Debugging" error-ridden software is a major headache and highly expensive



Shown here as if isolated from the aircraft carrying it, a fire-control combination of digital computer hardware and software—seen as an aura surrounding a Westinghouse "common module board"—launches a missile that swoops toward a ground target. This exemplifies USAF's increasing dependence on software. (Photo by Paul Kennedy)

once the programs are introduced into systems in full-scale development.

Catching errors in programs prior to such introduction is now extremely difficult, however, because the military has had a hard time in setting standards for software design and development, in measuring whether or not contractors meet software specifications, and, thus, in catching "bugs" in the very beginning, when correcting them is relatively painless and inexpensive.

By and large, military decision-makers are not aware of the software crisis and, in consequence, of the urgent need to resolve it. The main reason for this is that they do not yet grasp software's make-or-break role in modern military systems.

Project Bold Stroke

Correcting this condition in the Air Force is the first order of business for USAF's Project Bold Stroke, a "software management action plan" for coping with all elements of the software crisis.

In implementing Bold Stroke late last year, USAF Vice Chief of Staff Gen. John L. Piotrowski served notice on all Air Force commanders that "this [software] issue is of critical importance."

Unless USAF comes to grips with it, wrote General Piotrowski, "we run the risk of blunting our critical edge in computer-based technology through inept exploitation as well as [through] squandering scarce computer resources as the result of ill-informed leadership and direction."

Symptoms of the software crisis are already showing up in the operational arena.

For example, the Air Force and the Navy had to postpone making some much-coveted changes for the better in their respective F-16 and F/A-18 fighters when the software that they had counted on for such changes—as in radars—was not ready on schedule.

Such symptoms are also surfacing in discussions of plans for future military systems.

The Strategic Defense Initiative (SDI) program is probably the most highly publicized example of this. SDI's critics claim that the current problems and state of the art in the software world bode badly for the successful development and deployment of the highly complex, ultrareliable software that will be required by the battle-management and C^3 segments of the planned strategic defense system.

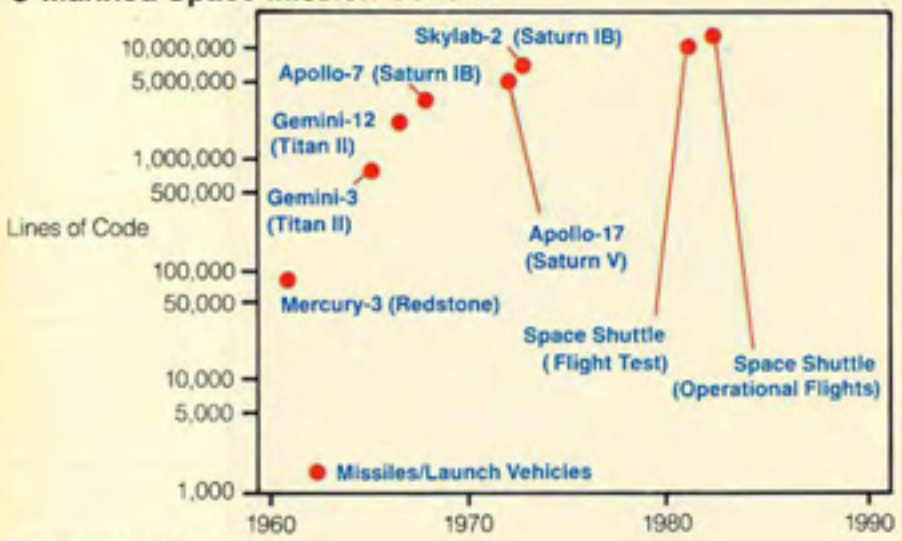
SDI officials claim in turn that the critics are borrowing trouble where none need exist.

Early this year, the Eastport Study Group, a panel of computer science specialists appointed by the Strategic Defense Initiative Organization (SDIO) to study the SDI computer situation, reported that SDI computer hardware and software technologies are available or will come within reach over the next several years.

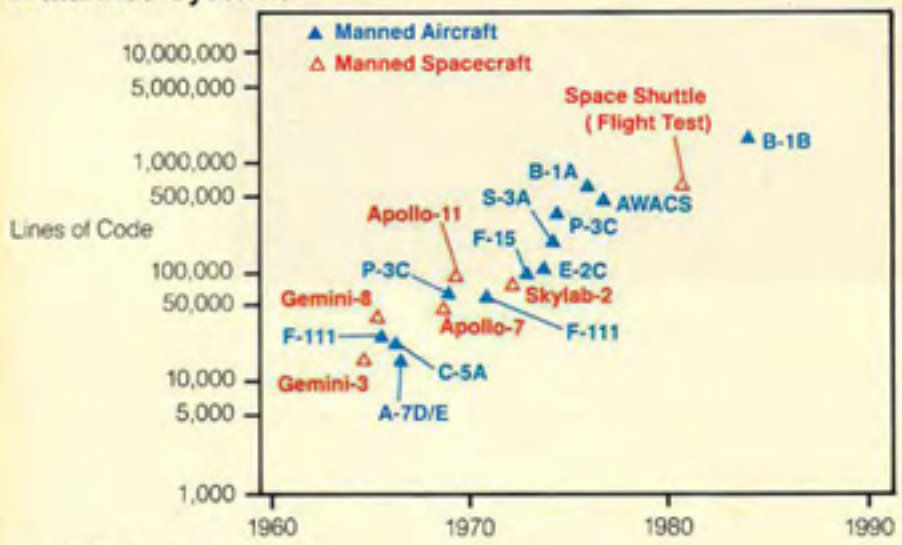
The panel also acknowledged, however, that the rigors to be expected in developing, testing, simulating, fine-tuning, and evolving the

The Climbing Need for Software

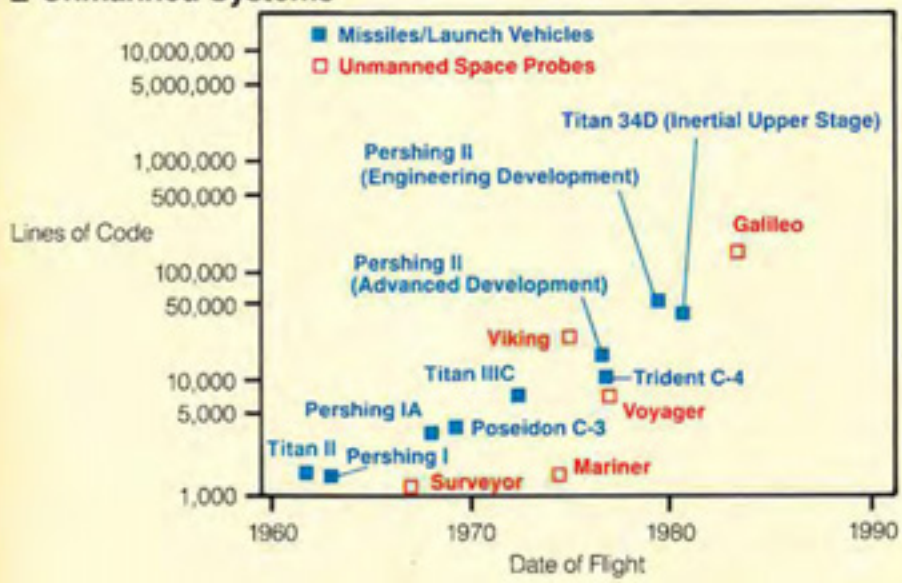
● **Manned Space Mission Control**



▲ **Manned Systems**



■ **Unmanned Systems**



software for SDI battle management and C³ systems will make those systems "the paramount strategic defense problem."

Any "closed-loop" system in which the human element is lacking or is rarely present, such as SDI, demands an awful lot of its computer software. The more a system is automated, the more reliable its software must be.

Scramble for Programmers

The software crisis is by no means peculiar to the military. It also grips the civilian sector, where efforts to solve it are in some ways making matters worse for the defense establishment.

This is especially true when it comes to recruiting software talent.

Because of their dire need for software engineers and managers, banks and industries, for example, are paying top dollar for them and are luring military officers and DoD civilians from the already thin ranks of those with solid software managerial experience.

As a result, the Air Force now depends almost exclusively on captains and lieutenants to work its worsening software problems.

By and large, these junior officers are quite good at what they do. They lack clout when it comes to competing for resources, however, and—as part of that—convincing their seniors of just how bad the military software situation has become.

Project Bold Stroke, with its emphasis on making senior commanders aware of the situation, should be a big help in this regard.

The commercial sector's voracity for software and for software professionals is starkly illustrated by the fact that General Motors Corp. alone uses as much software and spends almost as much money on it as does the entire US defense establishment. GM reportedly spent $7 billion to $9 billion last year on automating its plants. Ninety percent of its expenditure went for software and for software people.

Dr. John H. Manley, a former Air Force officer who is the director of DoD's Software Engineering Institute (SEI) at Carnegie-Mellon University, says that "the commercial sector is offering double or triple the salaries of our [military] software professionals to hire them away.

"We can't compete with that," Dr. Manley asserts, "so we're going to have to rely on the commercial world to build the software for us. This raises the questions of how DoD manages that and of who minds the store for DoD. And this is why DoD set up the STARS [Software Technology for Adaptable, Reliable Systems] program and why it created SEI—to get control of the software crisis."

That crisis has been building for years. Jointly and separately, the military services and the Office of the Secretary of Defense have studied software problems off and on ever since programmable digital electronics began entering combat systems in the 1970s.

One OSD report in 1982 concluded that "the military power of the United States is inextricably tied to the programmable digital computer." It drew the corollary conclusion that software problems "can make our future military systems fail in ways that could be disastrous for our national security."

The Software Initiative Program

That report spawned DoD's three-pronged Software Initiative Program to develop reliable, cost-effective software for mission-critical computers. It consists of SEI, the STARS project, and DoD's adoption of a standard military programming language called Ada.

SEI is set up to investigate the entire software engineering scene in the US, to foster new software engineering talent and new software technologies, and, perhaps most importantly, to expedite the transition of software technologies into practice.

The office of the Deputy Under Secretary of Defense for Research and Advanced Technology oversees the DoD Software Initiative Program. For it, the Air Force administers SEI out of AFSC's Electronic Systems Division at Hanscom AFB, Mass.

AFSC headquarters at Andrews AFB, Md., also plays a major, eclectic role in the Software Initiative Program through its Mission Critical Computer Resources Division. The division, which reports to AFSC's DCS for Science and Technology, is headed by Maj. Duane Johnson. Capt. Greg Juday and Capt. Gregg Swietek are its computer system staff officers most intimately involved with software and advanced-computing projects on a workaday basis.

Both captains make persuasive cases that USAF must give much more financial and managerial attention to solving the software crisis and that it must stop doing "business as usual" in designing, developing, and acquiring software.

The facts are on their side. The Air Force is in hock to software.

For example, the core avionics of today's fighter aircraft embody about 200,000 machine instructions. The next generation of such aircraft—defined generically, not as any particular aircraft—will need 1,000,000 such instructions in their core avionics. Those future aircraft will also require about 250,000 machine instructions just for the signal processors that will be mated with their sensors.

It costs $85 million to develop the software for an F-16D. It costs another $250 million to maintain that software—rectifying its errors, keeping it in shape, updating it—over its anticipated operational lifetime.

The Pacing Technology

Software has become the pacing technology in advanced fighters, just as it has in most other weapon systems and information systems.

AFSC's Colonel Nidifer, in his Bold Stroke briefings of USAF commanders and other personnel, makes a point of this as follows:

- Through most of the Vietnam War, Air Force F-4s contained no digital computers and no software.
- Each F-16A that went operational in 1981 had seven computer systems with fifty digital processors and 135,000 lines of code.
- This year's F-16D has fifteen computer systems with 300 digital processors and 236,000 lines of code.
- Moreover, the magnitude of the software inside an aircraft may represent only a fraction of that aircraft's total software requirement. The "on-the-ground" software of the automated systems used to develop the aircraft's on-board operational software contains many more lines of instructions than does the software that it develops.

All this is hard for AFSC's software missionaries to get across, especially to those who did not grow up with digital electronics and computer programs and who still size up combat aircraft in terms of their sizes, shapes, speeds, and other obvious characteristics.

As AFSC's Captain Juday puts it, "When you see an F-16 fly by, you don't say, '*Look at that software.*' And yet, to a great extent, that's what you're seeing."

If software costs and requirements for USAF's newest fighters are already chilling, they may be downright bloodcurdling for future fighters and other sophisticated combat aircraft.

AFSC estimates that the software of each future fighter, as envisioned in generic terms, will cost $450 million to develop and a whopping $1.3 billion in life-cycle maintenance, defined as "ownership cost."

Such costs look to be prohibitive. USAF will have no choice but to pay them, however, if it wants its aircraft to do what it now believes they will need to be able to do—unless, of course, it can cut those costs.

Increasing software productivity will be the key to such cutting. As an Air Force report sums up the situation:

"The single most important factor in fully utilizing the advanced electronic capability in aircraft systems is going to be the production of the software required to implement the desired capability.

"In order to reduce the cost of the software, major productivity improvements are required. . . .

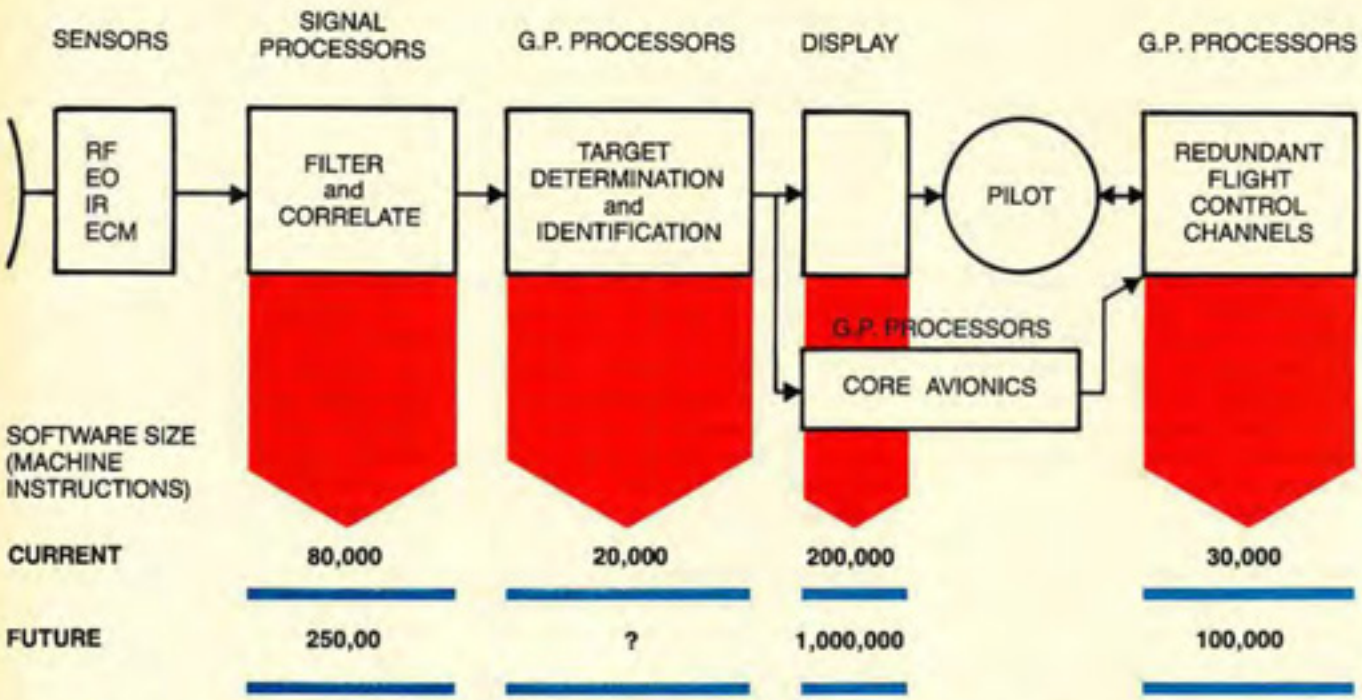
"It is also obvious that this requirement is not unique to airborne systems."

The Essentiality of Software

USAF simply cannot turn away from software. Dr. Thomas E. Cooper, Assistant Secretary of the Air Force for Research, Development, and Logistics, made this clear in calling, last year, for a "bold stroke" at the software crisis. So did USAF Chief of Staff Gen. Charles A. Gabriel and former Secretary of the Air Force Verne Orr in a subsequent joint memorandum for all USAF major commands and separate operating agencies.

They wrote: "Our newest weap-

Avionics Software Is Headed Up



ons and information systems—the B-1B, Peacekeeper, SACDIN [Strategic Air Command Digital Network], and the Phase IV Standard Base Supply System—depend upon sophisticated software. In a very real sense, our ability to deliver and support this software in a timely and cost-effective manner provides the Air Force its most significant technological edge over our potential adversaries."

Among other new systems that provide USAF's technological edge are the Advanced Medium-Range Air-to-Air Missile (AMRAAM) and the Low-Altitude Navigation and Targeting Infrared for Night (LANTIRN) system. Both rely on sophisticated computer programs for guidance and targeting. LANTIRN's development required 6,000 lines of software code.

Software Is the Key

All "smart" weapons derive their IQs from their software. It is crucial to precision-guided munitions (PGMs), to the increasing automation of combat aircraft with fully integrated avionics, and to the emergence of battle-management systems and others featuring artificial intelligence (AI).

USAF's new F-15E dual-role fighter is nearly as "software-intensive" as the B-1B bomber. When Air Force officials remark on the F-15E's capacity for "growth," they mean its capacity for software embellishments that will make it more capable to meet changing threats.

It is easier and less costly to modify software than it is to modify hardware. USAF's experience in its F-111 program is an example.

The Air Force upgraded the avionics of its F-111A/E aircraft by altering their analog (hard-wired) computers. It also upgraded the avionics of its F-111D/F aircraft, introducing the same new capabilities, by altering the software in their digital computers.

The hardware changes cost fifty times as much as the software changes and took three times as long to make.

According to a DoD report, software changes that improved the accuracy of USAF's 550 deployed Minuteman III ICBMs cost "only $4 million, a fraction of what the corresponding physical modification might have cost."

The report continued: "The cost and time required to *design* a software change is comparable to the cost and time to design a hardware change, since both are human-intensive, intellectual tasks of comparable complexity.

"But the cost and time needed to *implement* these changes favor software by orders of magnitude, particularly when the change is replicated in many systems."

Before systems software can lend itself to such modification, however, it must be designed to system specifications in the first place, its errors must be discovered and eradicated, and it must be introduced into the systems on schedule and up to speed.

The People Problem

Getting all this done is largely a people problem. It has to do not only with the shortage of software personnel but also with the individualism and the lack of discipline that are rampant—necessarily so, given the freehand nature of the software workplace—in the programming world.

Creating sophisticated software is still much more an art than a science, and the all-too-few premier programmers reflect this in the way they do their jobs.

For example, three such programmers may take three different, innovative approaches to writing a program to satisfy a military requirement. Only the programmer whose program is adopted really knows exactly what is in it and,

thus, how to debug it without a lot of expensive—and maybe fatal—trial and error.

Such dependence on individual creativity, which could have dire results if, for example, the top programmer for a vital piece of software becomes incapacitated, is not the fault of the programmers themselves.

They lack the automated tools and automated "support" environment—meaning good software and computers for writing good "applications" software—that they need for greater efficiency and discipline of their "methodology."

As defined by AFSC's Captain Swietek, a software environment is a "collection of tools organized to support a specific function, such as the development of software for an avionics or a C^3 application." Among such tools are program-language compilers and debuggers.

"Methodology" is nothing more than the way the programmers use their tools and their environment to get their software written and into use and the way the software managers use them to keep the programming on track and to predict its costs.

AFSC's programs in software technology and in advanced computer technology are aimed, in large measure, at just such automated improvements in the software production process.

DoD's STARS program is also concentrating on this.

Citing USAF's B-1B and E-3A systems and the Navy's Aegis shipboard fire-control system as prime cases in point, the 1982 DoD report on the military software situation described the development and support of software for major military systems as "one of the most complex human endeavors, often requiring hundreds of people for five or more years at costs exceeding $100 million."

This makes a salient point that USAF is addressing.

"Software is extremely labor-intensive," says Captain Swietek, "so if we could cut by a factor of four the time it takes to produce software, we could cut its cost by about the same proportion. We could make a big dent in the problem."

One-tenth of the money that USAF expects to spend on software in the current fiscal year would buy twenty-six more F-16Ds.

Sufficient Resources?

Air Force officials point out that the US, which prides itself on its computer technology, slights the software arena in its per capita allocation of resources in terms of percentages of the Gross National Product.

By USAF's calculations, workers in agriculture are supported at the level of $75,000 per person, those in industry at $45,000, and those in the software field at only $10,000.

A rough analogy can be drawn with respect to military software's slice of total military resources.

Software productivity is hard to measure, because software, unlike hardware, is not visibly a production item. This also deters software contractors from investing their own funds up front to improve the productivity of software for military systems.

In hardware production, contractors are usually willing to make such investments, because they stand to recoup much or all of them from DoD in contracts pegged to productivity incentives and because they can write off some of such investments as well.

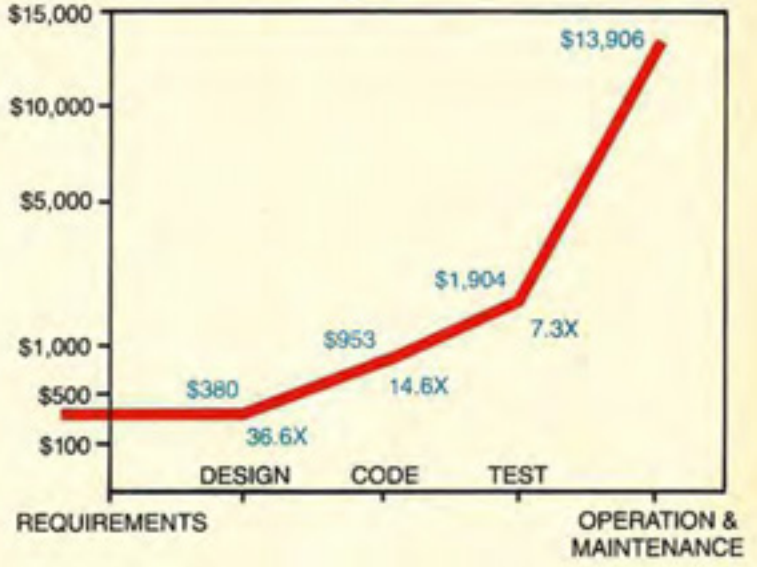
In software, however, there is no "production" phase as such and, thus, no possibility of returns on investment. This means no incentive for the contractors to invest in modern software-producing tools or, if they have them, to use them for defense software work.

Contractors' proprietary claims on the software that they produce for DoD or that DoD would like to acquire from them also get in the way. Under current law, DoD has not only the rights to the software that contractors produce for it but also the rights to the tools that they use in producing the software.

"What we find," Joseph Batz, deputy director of USDR&E's Computer Software and Systems Directorate, explains "is that contractors are not willing to use the most advanced tools in their possession because they don't want DoD to come after those tools. In order to foster the use of the most advanced existing tools and the further development of such tools, we're going to have to overcome that problem."

One move being considered is to permit contractors to keep some rights to their tools as an incentive

The High Cost of Late Fixes



This graph shows how sharply the cost of "debugging" computer programs escalates as they pass from the design stage into the operational stage. As depicted here, it is 36.6 times more cost-effective to rid software of errors during its design than during its operation. This is why USAF is concentrating on setting clearer standards for software design and on means of measuring whether such standards are met early on.

to improving them and maybe even to marketing the use of them, under licensing arrangements, to their competitors. To encourage them, DoD may even let the contractors charge it royalties for its use of such tools.

Such considerations are emerging in the STARS program, which is only now picking up steam. That program is also working the major problem of software reusability.

The services have been in the habit of starting from scratch in developing software for each new system. Through experience, however, they now know that portions of software in one missile, for example, can be transferred to another, newer one, thus cutting its costs and expediting its development.

Computer Babel

A big difficulty with doing this lies in the wide divergences of program languages used across, and even within, the military services. Many systems use "machine assembly languages" that are especially and laboriously devised just for the particular computers of each.

This is a major reason why DoD's adoption of the Ada standard programming language is so important.

Having studied ten different missile systems in all three services, DoD has begun building a library of what it calls "Ada packages" or CAMP (for Common Ada Missile Parts) of software to perform functions that it found to be common to the software of all the systems.

AFSC's Armament Division at Eglin AFB, Fla., is now taking this software-commonality process much farther. It is building a prototype missile digital avionics software package in Ada and with some artificial intelligence characteristics.

Ada is earmarked for incorporation in more than 100 military systems. The changeover will take time, however, because the services' systems already have millions of lines of code written in other languages.

Even so, Ada's implications for increasing the productivity of military software development through standardization—and for the cut-rate reusability of such software—are profound.

"Each individual piece of software that gets reused becomes better and more reliable," explains DoD's Mr. Batz. "If we could reuse thirty percent of our software, just think of the savings we could make."

Much of the STARS program, in which software reusability ranks high as a goal, also deals with getting software technology into practice. Such software technology transition is mainly the responsibility of DoD's Software Engineering Institute, however, and is expected to take up about two-thirds of all SEI activity.

First off, SEI is identifying emerging software technologies, assessing those currently available for military use, and promoting the development and the eventual use of those that promise big advances in software reliability and integrity.

In a joint report last January, USAF's Dr. Cooper and Lt. Gen. Bernard P. Randolph, Deputy Chief of Staff for Research, Development, and Acquisition, called attention to SEI's pivotal role.

"It will be increasingly important," they wrote, "to develop advanced software technologies that are user-friendly and are robust enough for all applications. Use of the Ada language and efforts of the Software Engineering Institute will provide the software technology for future weapon systems."

"Robust" has become a byword in USAF software circles.

"We must make computers tougher components of battlefield systems," declares AFSC's Captain Swietek. "They must be fault-tolerant; they can't just quit. We can't afford to have computer programs that crash if you type in a wrong number. We need programs that degrade gracefully."

There are too few such programs now. Military software reliability and integrity are too often constrained by the outdated technologies that SEI has set out to cull.

Fostering Home-Grown Talent

SEI is also on the hunt for software talent for the military and for the means of nurturing such talent in the nation's colleges and universities.

Operating in a state-of-the-art software environment at Carnegie-Mellon, SEI is now affiliated with several other academic institutions as well and is beckoning to prospective industrial affiliates.

Captain Juday, who is AFSC's program element monitor for SEI, says that SEI aspires to "bringing the ablest minds and the most effective technology to bear" on improving the quality of operational software.

Through SEI, Captain Juday declares, "We want to establish software engineering as a profession, form a national center for software engineering technology information, and lead the development of a progressive software engineering technology base."

SEI's Dr. Manley emphasizes that SEI itself "does not give software engineering courses."

"We're concentrating at the leverage point by creating software professors and graduate students," he asserts. "We are in business to educate the educators and to train the trainers."

The whole idea is to increase the US military software technology lead. First, however, it must be kept from narrowing.

A major problem in this regard is that US graduate schools in engineering and scientific disciplines in, or related to, the computer field are heavily populated by students from foreign nations. In many cases, such students make up more than half of the classroom complements.

They also tend to have an advantage over their usually monolingual American counterparts in that they can speak and read several languages and thus can glean more extensively from international writings in their field.

Compounding this problem of foreign competition is the increasing excellence and drive of several nations, notably Japan, England, and France, in the computer technology arena.

In Japan, for example, the software productivity norm is 3,500 lines of code per man/month. In the US, it is 183 lines of code.

The same thing could happen to the US software industry that happened to the US steel industry and to others. Unless its productivity goes up and its costs come down, it could slip badly or even be lost, with grave consequences for future US military capability. ■

Which major features distinguish the PC-9 from a good jet trainer?

Naturally it's not the Cockpit Layout with its Single Power Control Lever, Advanced Avionics and Comprehensive Instrumentation. These features are very jet-like.

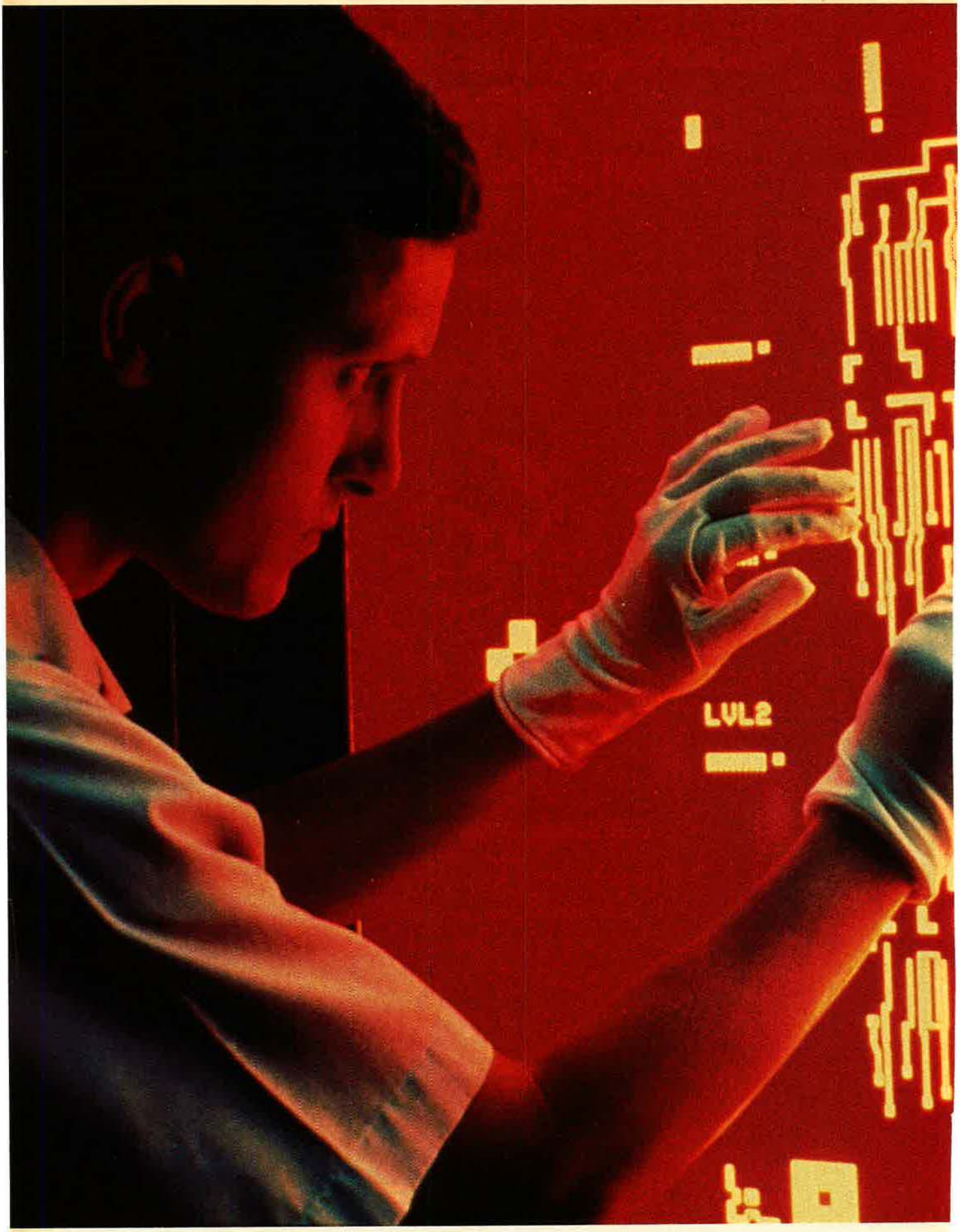
Neither is it the Performance, Maneuverability, Climb Rate or «Feel». These too are very jet-like.

Nor is it the Martin Baker Ejection System, the Hydraulics or the Sleek Aerodynamic Profile. All of these features make the PC-9 remarkably jet-like.

What distinguishes the PC-9 is the propeller of course, and the low costs.

PILATUS

Information: Pilatus Aircraft Limited, CH-6370 Stans, Switzerland, Tel.: 041 - 63 61 11, Telex: 866 202, Telefax: 041 - 61 33 51


LVL2

This Air Force electrical engineer is working on the design of an integrated circuit in one of the labs at Wright-Patterson AFB, Ohio. Research and development of technologies such as this, followed by full utilization, gives the US a significant force multiplier.

To counter intensive Soviet development gains, the Pentagon seeks a substantial increase in RDT&E—with forty-one percent of the funds going to the Air Force.

R&D for Leveraged Technologies

BY EDGAR ULSAMER
SENIOR EDITOR (POLICY & TECHNOLOGY)

IN ORDER to counter the "intense and pervasive" Soviet military development effort that, on average, has been growing at an annual rate of four percent over the past three decades, the FY '87 budget request seeks modest but critically important boosts in the Pentagon's research, development, test, and evaluation (RDT&E) account. On a DoD-wide basis, this proposed increase would take RDT&E funding from $35.5 billion this year to $42 billion in FY '87. The corresponding figures for the Air Force are $13.8 billion and $17.3 billion, respectively. This means that the Air Force would account for about forty-one percent of all military RDT&E spending next year.

The Technology Base and Advanced Technical Development accounts, the primary seedbed areas of the RDT&E effort, are earmarked for healthy growth—up in the aggregate by about $2.5 billion, or some thirty-two percent, over the current level. In contrast with the proposed modest growth in the research and development sector, procurement for DoD is slightly below the FY '86 level, even though Air Force procurement funding is slated to remain essentially level.

The foundation of the Pentagon's research and development effort continues to be the Science and Technology (S&T) program. As Under Secretary of Defense for Research and Engineering Donald A. Hicks put it in his annual report to Congress, maintaining the technological edge over potential adversaries—the principal objective of the S&T program—"is becoming increasingly difficult as the Soviets field higher-quality equipment for their forces." It follows that "we must ensure not only that our military technological base is viable but also that our national technology infrastructure is second to none." The FY '87 S&T program, therefore, is focused primarily—and selectively—on "highly leveraged technologies," meaning high-payoff approaches that can

serve as force multipliers to offset Soviet quantitative leads.

But as Assistant Secretary of the Air Force for Research, Development, and Logistics Thomas Cooper and Lt. Gen. Bernard P. Randolph, USAF's Deputy Chief of Staff for Research, Development, and Acquisition, cautioned in their joint report to Congress, "Identification of revolutionary technologies is not enough. We must also have the resource flexibility to pursue those areas that will significantly impact our future weapon systems."

S&T Areas of Prime Concern

Among the high-payoff areas stressed by the FY '87 research and development roadmap, advanced microelectronics rank prominently, especially gallium arsenide (GaAs) technology and very-high-speed integrated circuits (VHSIC). In the case of the latter, Secretary Hicks promised Congress that stepped-up efforts in this field would increase this country's lead in integrated-circuit technology. Thousands of sample VHSIC chips of the 1.25-micrometer variety are available for weapon systems insertion, while "a number of brassboards that provide signal-processing capabilities at the leading edge of technology are operational."

At the same time, the Defense Department is testing a second generation of VHSIC devices with a 0.5-micrometer minimum feature size that promises to produce "another fifty to hundredfold increase in signal-processing capability." Beyond the two-phased VHSIC technology project, DoD and the Air Force initiated a new program that centers on monolithic gallium arsenide integrated-circuit technology and is expected to score major improvements in sensor electronics. The primary emphasis of this program is on analog functions for microwave and millimeter-wave military applications. Called the Microwave/Millimeter Wave Monolithic Integrated Circuits (MIMICs) program, this highly promising advanced-technology effort is meant to lead relatively rapidly to operational hardware that will enhance the performance of aircraft, missiles, and a range of surveillance and other military systems. VHSIC, GaAs, and MIMIC are expected to find pervasive application in future Air Force and other US weapon systems.

Another advanced technology program stressed within DoD's FY '87 R&D roadmap is the Defense Advanced Research Projects Agency's strategic computing project *(see "The Next Computer Generation," p. 86, June '85 issue).* This umbrella effort encompasses R&D in artificial intelligence, multiprocessor system architecture, and optical and microelectronic devices, with the objective of developing "intelligent" systems that can graft broad new capabilities onto existing and future weapon systems and act as force multipliers. The high-payoff potential of these supercomputers is about to be demonstrated on such test-beds as autonomous, unmanned, land vehicles, airplane "pilot associates," and battle management projects. Dr. Hicks predicted that second-generation systems employing this technology, "with suitable sensors, will be able to help humans reach reliable conclusions in intelligence assimilation, target discrimination, target assignment, and other difficult tasks faster and more accurately than with present conventional computing systems."

In a related effort, the Air Force is focusing major attention in its new R&D program on artificial intelligence, with the expectation that this technology "can be applied to great advantage in aiding decision-makers in future fast-paced combat scenarios." As Secretary Cooper and General Randolph reported to Congress, "Artificial intelligence will enable us to automate some functions now accomplished manually in command and control systems, such as targeting and mission planning." Concomitantly, "The commander's job will be made easier through the analytical power and speed of artificial intelligence systems he can use to aid force employment [or] disposition decisions in complex battle scenarios."

Advanced Aircraft Programs and Technologies

Next year, work in the field of advanced aerodynamics will concentrate on the integration of flight controls with propulsion controls featuring thrust-vectoring/thrust-reversing exhaust nozzles for short takeoff and landing (STOL) and increased maneuver performance. The initial test-bed is a specially modified F-15 that will probably be able to take off and land within 1,500 feet of runway. First flight of this modified F-15 is scheduled to occur within the next budget year. If this technology pans out as expected, it will probably be incorporated into the Air Force's next air-superiority fighter, the Advanced Tactical Fighter (ATF), and retrofitted to upgrade existing fighter aircraft. Other R&D efforts in the field of advanced aerodynamics that the Air Force plans to continue or initiate in FY '87 involve voice interactive systems, terrain-following/terrain-avoidance systems, forward-sweptwings, aeroelastically tailored wings, and advanced composites.

Cooperative, interservice aircraft development took a major step forward with a unique memorandum of understanding (MOU) executed by the Secretaries of the Air Force and the Navy with the assistance of DoD's Under Secretary for Research and Engineering. Announced in March of this year, this accord is devoted to "cross-service utilization of the USAF Advanced Tactical Fighter [ATF] and the Navy Advanced Tactical Aircraft [ATA]." The stakes in this cooperative arrangement are formidable. The Navy, according to Secretary John Lehman, plans to make a variant of the ATF its next-generation air-superiority fighter—after the F-14D—for the 1990s and beyond. He suggested that "more than 450" aircraft of this type might be acquired by the Navy.

Secretary of the Air Force Russell A. Rourke told the same Pentagon press conference that the Air Force plans to buy 750 ATFs at a current dollar cost of $35 million per aircraft. He pegged the program's RDT&E cost at about $9.9 billion. So far, the Air Force has eschewed forecasts about how many ATA variants it might buy and has resisted pressures by Secretary Lehman to declare the Navy aircraft a categoric replacement for the F-15E and the F-111. In the MOU, the Air Force agreed, however, to examine "thoroughly" the ATA's suitability as a "potential close air support/interdiction aircraft." But—as Secretary Hicks, the acknowledged catalyst behind the accord, emphasized—ATA should not be seen as an "A-10 successor."

The terms of the MOU provide for the assignment of

Air Force personnel to the Navy's ATA Program Office and for Navy representatives to work at the Air Force's ATF SPO. The function of the representatives from the "other" service is to "identify, at the earliest possible point in the development process, design and system changes that would need to be made on each aircraft to minimize engineering, testing, and funding to develop variants in order to make them suitable for the other service's mission requirements."

USAF's Chief of Staff and the Chief of Naval Operations were requested to assign the required experts to the two project offices within thirty days from the signing of the MOU, with the expectation that "preliminary results will be forthcoming within six months, leading to firm recommendations for decision." These recommendations, in turn, are expected to lead to tangible joint or interdependent arrangements. The MOU is to remain in effect until the end of FY '90, unless terminated or extended by agreement of the signatories.

Not a Repeat of TFX

The two service Secretaries, as well as Dr. Hicks, took pains to point out that the MOU in no way parallels the ill-conceived and ill-starred TFX program of the 1960s that sought to combine divergent Air Force and Navy requirements in one aircraft. Nevertheless, there is evidence of Air Force concern over penalizing the ATF design by incorporating basic features that would ease its transition to a carrier-based air-superiority fighter. While Secretary Lehman averred that the Navy did not expect the Air Force's ATFs to "carry around the extra weight" associated with beefed-up landing gear and other features required for carrier operation, he nevertheless suggested that allowances should be made by the Air Force to "facilitate" conversion of the basic design to special naval requirements.

He specifically suggested that the ATF's airframe include a center, load-carrying, I-beam member. Secretary Lehman explained that the absence of such an I-beam would make the aircraft's conversion to a carrier-compatible configuration "much more expensive." Dr. Hicks predicted that if the two services were able to adapt each other's aircraft to their own requirements, about seventy-five percent of the total development costs could be saved in each instance.

Both the ATA and the ATF are to incorporate stealth technologies in a major way, but as Dr. Hicks told AIR FORCE Magazine, present plans don't envision that one aircraft will be "stealthier" than the other. For reasons that he did not specify, Secretary Lehman said the ATA program would continue to be handled as a classified, or "black," project. He hinted, however, that the unit cost of the ATA "would not exceed that of the ATF" and confirmed that "we are about two years along" on the ATA program. In spite of this early lead on the Air Force's ATF program, Secretary Lehman predicted that the two aircraft would reach IOC (initial operational capability) at roughly the same time, in the "mid-1990s."

The two service Secretaries said that what drives the MOU is the fact that "current and future budget realities and the large RDT&E investment projected for the development of [both ATA and ATF] make it certain that both will be the subject of intense scrutiny and debate." Therefore, the MOU argues, it is "imperative that both the Navy and the Air Force thoroughly examine potential cross-service applications of the two aircraft to fill possible future requirements and as a means of amortizing development expenses over a larger number of aircraft, rather than developing totally new aircraft." The MOU, in effect, builds on a far less ambitious, more restrictive agreement by the two services—particularly between AFSC's Aeronautical Systems Division and the Naval Air Systems Command—that has been in effect about one year and that promotes interdependent ATF/ATA technology development at the subsystem level.

Secretary Lehman, who came across as extremely bullish on the new accord with the Air Force, termed the MOU "a whole new step in joint development [that is being taken] at the takeoff of the two programs." He praised the accord as a "serious statement of intent for the Navy to take the Air Force-developed [ATF] as its next generation air-to-air fighter and adapt it to carrier use." The Air Force, similarly, is making a "very major decision" through its statement of intent to take the Navy-developed air-to-ground aircraft and adapt it as the follow-on to the F-111 interdiction, air-to-ground fighter. The Navy, he stressed, is "quite excited about this. [Nothing like this] has ever been tried before."

The "Conventional Initiatives" Package

The FY '87 R&D program's *pièce de résistance* in the field of conventional warfare is a combination of developmental programs that, according to Dr. Hicks, "will allow us to both see and strike the enemy throughout the depth of the battlefield." The importance of the new "Conventional Initiatives" package that is meant to provide these capabilities was underscored by the US European Command's CINC, Gen. Bernard W. Rogers, before the Senate Armed Services Committee: "The significant determinant of the success of Allied Command Europe's conventional defense will be how well we can engage the enemy's follow-on forces and reduce to a manageable ratio the number of his forces we must engage at our general defensive positions."

It is imperative, General Rogers told the Senate panel, that the US "continue to take the lead among its allies in providing surveillance/target-acquisition platforms, joint/combined tactical fusion capabilities, C^3 capabilities, and essential weapon systems so that we can apply the [Follow-on Forces Attack, or FOFA, concept of second-echelon interdiction] in an appropriate and adequate manner. Thus, I urge your support for programs such as the combat targeting center, JSTARS, TR-1 with ASARS, F-16, JTF (LOCE), several important C^3 initiatives, ATACMs, and a number of the services' black programs that will support FOFA."

Dr. Hicks, elaborating, said the Conventional Initiatives package includes "advanced long-range sensor systems such as Joint Surveillance and Target Attack Radar System [JSTARS], Precision Location Strike System [PLSS], and Advanced Synthetic Aperture Radar System [ASARS] that will provide real-time intelligence information to the theater commanders to prevent surprise and, in the event of an enemy attack, provide targeting information on enemy forces so that they can be engaged long before they reach the front."

The long-range strike part of the Conventional Initiatives package, he went on to say, "includes both surface-

launched and air-launched missile systems, such as the Air Force/Army Joint Tactical Cruise Missile System [JTACMS] and the Army's Tactical Missile System [ATACMS], that can be used to both destroy enemy forces behind his lines and mass fire laterally along the front." The Pentagon's top technologist suggested that a relatively small number of such long-range systems is capable of massing large amounts of firepower along the NATO front.

In extension of these conventional initiatives, the Air Force is stepping up cooperative development programs with several NATO partners, according to Dr. Cooper and General Randolph. In their joint report to Congress, they called attention to three joint feasibility studies: "They are the Long-Range Standoff Missile [LRSOM], the Short-Range Antiradition Missile [SRARM], and the Low-Cost Powered Dispenser [LOCPOD]." Their report pointed out that "while we have no commitment to go beyond the feasibility study phase, we intend to proceed into a full-scale cooperative development program if the results of the study prove feasible."

Further, "we anticipate that Air Force-NATO cooperative programs will increase over the next few years. The Nunn Amendment [named after Sen. Sam Nunn of Georgia that sets aside an annual total of $250 million for joint R&D programs with NATO] to the FY '86 Authorization Act . . . gave us [the] much-needed means to increase our cooperative involvement. As a result of that legislation, we will initiate cooperative projects . . . for a series of modular air-launched standoff weapons."

Emerging Technologies Initiative

The new R&D budget continues to stress the C^3 elements of coalition warfare as part of the so-called Emerging Technologies initiative involving both the US and several European NATO countries. Included is the Joint Tactical Fusion Program, along with its interim precursor, NATO's Battlefield Information Collection and Exploitation System. The purpose of these systems is to bolster coalition warfare capabilities through the sharing of tactical intelligence.

Avionics integration is getting major emphasis under the new R&D roadmap, both in terms of cooperative arrangements among the services and with allied forces. Prominent here are two projects that will have NATO-wide application—the integrated electronic warfare system (INEWS) and the integrated communications, navigation, and identification avionics (ICNIA) system.

The need for these interrelated systems stems from the fact that, as Secretary Cooper and General Randolph told Congress, "since World War II, new electronic systems have been added piecemeal to our combat aircraft—as individual, stand-alone avionics systems. With the increasing reliance on more sophisticated and complex avionics systems to assist the pilot in accomplishing his mission, the costs of developing and integrating individual systems into aircraft—one at a time—has become prohibitive." INEWS and ICNIA are meant to bring order and integration to the avionics field. These systems will be made up of hardware and software modules that can be put together in various combinations to tailor the operational capabilities to the mission of various aircraft types. INEWS has completed concept definition and is in initial source selection. The Air Force, as the lead agency of both programs, will pick the two most promising approaches from among the five concepts developed by individual contractor teams. The two winning concepts are to enter the program's demonstration/validation phase in May of this year.

The ICNIA program has passed the critical design review milestone, and the contractors are now in the midst of constructing hardware and coding software for the competing designs. Delivery of the first advanced development model ICNIA systems is scheduled for December 1987. INEWS is to be incorporated initially into both the ATA and ATF. ICNIA will also be used by these two aircraft types, but in addition is under consideration for the F-15, F-16, F-14D, F/A-18, and the US Army's LHX helicopter.

The Impact of the *Challenger* Loss

The tragic loss of a Space Shuttle on January 28 has had major impact on the Pentagon's space-related R&D program. Air Force Under Secretary Edward C. Aldridge, Jr., and NASA Acting Administrator William R. Graham recently told Congress that until at least 1995, a combination of "adequately sized Shuttle and complementary expendable launch vehicle [CELV] fleets" is imperative. The acting head of NASA stressed that the loss of *Challenger* has driven home the lesson that "clearly, we cannot rely on one system for maintaining the assured access to space the nation requires."

Explaining that at least a one-year hiatus in Shuttle operations was likely, Dr. Graham said the loss of one orbiter—out of a fleet of four—means that over the next few years NASA will be able to accommodate only sixteen to eighteen Shuttle flights per year, compared to the originally planned total of twenty-four. Secretary Aldridge, warning that the Shuttle's standdown might well extend beyond NASA's planning "baseline" of one year, told Congress that in case of a two-year hiatus, "DoD would have serious problems, with twenty-one high-priority payloads waiting on the launchpad for launch opportunity."

He added that in case of such a prolonged standdown, more than thirty-five Shuttle missions would have to be canceled: "Unfortunately, there is no alternative to alleviate the DoD launch requirements over the next two years." He explained that only two of the remaining orbiters, *Discovery* and *Atlantis*, "are capable of flying the heavier DoD missions."

The solution to the problem, Secretary Aldridge suggested, is to remove a limited number of DoD payloads from the Space Shuttle manifest "to help NASA maintain a viable civil, foreign, and commercial launch capacity and yet fully meet DoD launch demands." But this imposes the need to "increase the number and launch rate for CELVs beyond our current plan of ten vehicles launching at a rate of two per year." Further, such an offloading from the Shuttle presupposes the use of Titan II expendable launch vehicles beyond the thirteen launches scheduled at this time and continued launch of other existing expendable launch vehicles, such as Titan 34D and Atlas. Additional expendable launch vehicles could be built within two years, whereas a replacement orbiter could not be obtained in less than three or four years, Secretary Aldridge told Congress. ■

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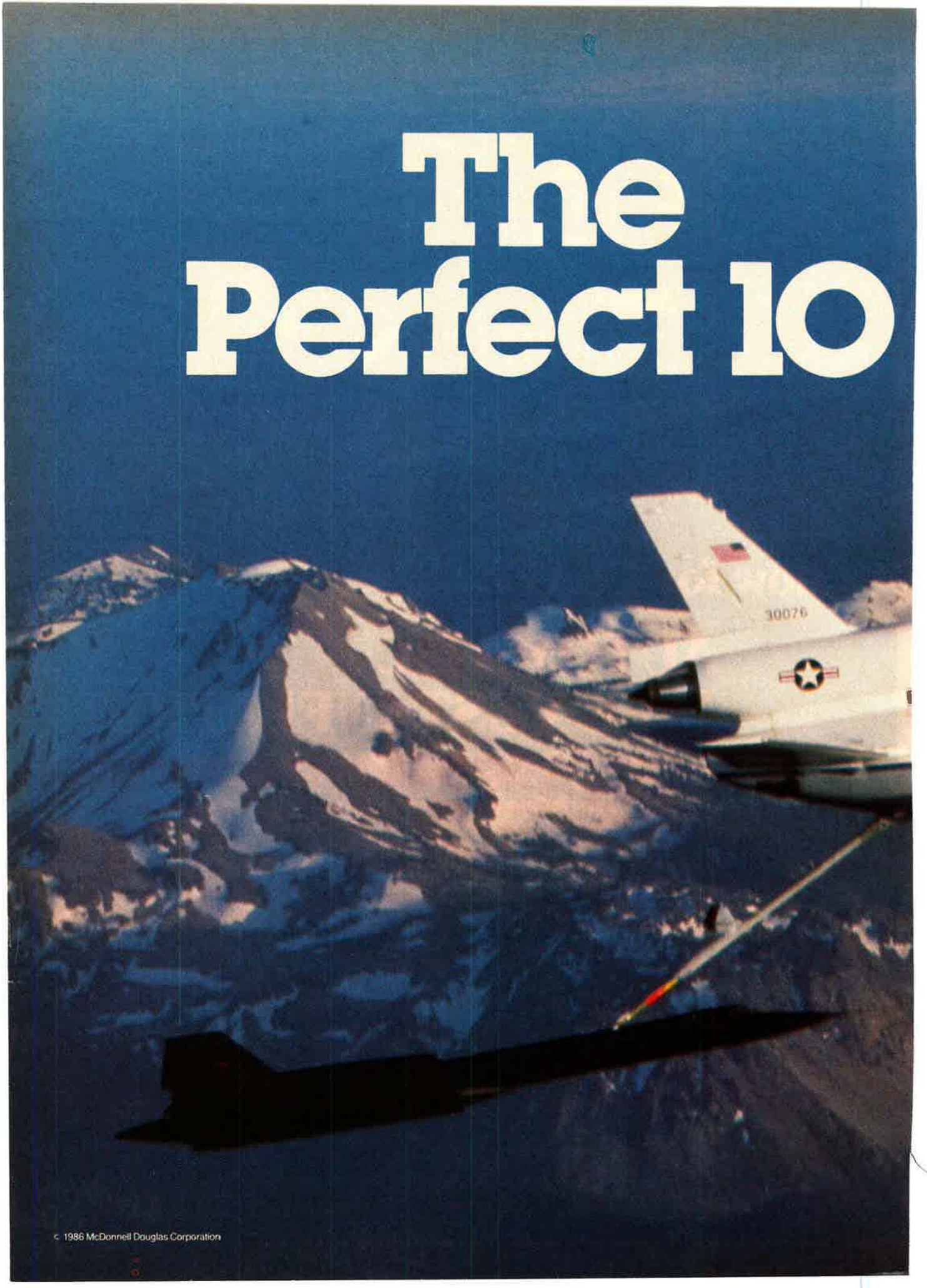

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Israel's First Line of D

The Israeli Air Force exudes self-confidence. That's where the really big money goes, and it gets first pick of the recruits.

BY GEN. T. R. MILTON, USAF (RET.)
CONTRIBUTING EDITOR

If Adolf Hitler had been stopped early in his tracks, there might not be a Zionist nation at the far end of the Mediterranean. The dream of a Jewish return to Palestine was an ancient one, but the Nazi atrocities provided the real impetus for what has become Israel. In 1917, the Balfour Declaration proclaiming Britain's support for the creation of a Jewish homeland in Palestine had given legitimacy to the dream, and a British League of Nations mandate for Palestine after World War I encouraged it. The result was a minor trickle of Jewish immigrants to Palestine until the ascendancy of Hitler. When his monstrous policies became clear, there was a great increase in the number of emigrants from Germany to Palestine as well as to the United States, a fact of enormous significance to the future of the Jewish homeland.

After World War II, when the full extent of Nazi atrocities became known, a wave of emigrants left Europe for Palestine. During the immediate postwar years, the British tried to limit this influx, an effort that resulted in violence and British charges of terrorism against the Jewish underground movement. The survivors of that underground are deeply involved in Israeli affairs today, tough old men not inclined to compromise on anything that could conceivably threaten their land.

In 1948, following a United Na-

Much like the defenders of Masada (background), who held the Romans at bay for about two years around 70 A.D., the pilots of the Israeli Air Force stand ready to protect their homeland. This F-16 is one of nearly seventy F-16As flown by the IAF.

tions partition of Palestine into Arab and Jewish zones, the state of Israel was proclaimed, with Jerusalem—a holy place for Christians, Jews, and Moslems alike—declared neutral and under UN control. This proclamation of the state of Israel was the signal for war between Israel and its neighbors, a conflict that went on sporadically for about a year and a half. A UN-arranged armistice brought several years of uneasy peace, marked by border violence.

When the British and French launched their poorly conceived invasion of the Suez Canal region, the Israelis joined in with an attack against the Egyptian Sinai and the Gaza Strip. The United States, which had been kept in the dark, opposed the entire action. That opposition was a major factor in the Suez failure. In due course, the Israelis also withdrew and turned over their Sinai and Gaza acquisitions to UN peacekeepers. In 1967, Egypt's Nasser moved 80,000 troops into the Sinai, displaced the UN, and closed the Red Sea to Israeli shipping.

These actions promptly led to the Six-Day War. When a UN armistice ended hostilities, the Israelis had driven to the banks of the Suez, controlled the Golan Heights, and had seized all of Palestine west of the Jordan River, including Jerusalem. Israeli gun positions looked across the Suez Canal at Ismailia, a key

control point, and served as an unpleasant and occasionally violent reminder to sunbathers at the Suez Canal Club of how that war had turned out.

In 1973, Egypt made one more try. Taking advantage of relaxed Israeli vigilance during its observance of Yom Kippur, Egypt attacked through the Sinai, and Syria on Israel's northern border. To paraphrase the Duke of Wellington after Waterloo, the Yom Kippur War was a near-run thing, but Israel, thanks to an heroic resupply effort by the United States, recovered and drove into Egypt. This time, the United States and the Soviet Union pulled back their respective clients, and the war ended with a cease-fire. It also ended Egypt's tie to the USSR and, apparently, any further desire to fight Islam's wars against the militant Jewish state.

Camp David and all the euphoria surrounding that event seems a long time ago—Anwar Sadat murdered, Menachem Begin a recluse, and Jimmy Carter back in Georgia. Egyptian President Hosni Mubarak has distanced his government from the Camp David accords, in spirit if not in actual renunciation. These days, the relations between Israel and Egypt are correct but decidedly cool.

The Continuing Conflict

A factor in that coolness is Israel's continuing war with the Arab world at large. Egypt may be quiescent and Jordan desirous of some sort of agreement, but the Israelis have other scores to settle from time to time.

Syria has been thoroughly rearmed by the Soviet Union since the Israeli shellacking in 1982 when the final air combat score was Israel 84, Syria 1—and that lone Syrian tally by a surface-to-air missile. The deployment of SA-5s into Lebanon's Bekaa Valley is a worry. Although we can assume that the Russians maintain control over these long-range missiles, the memory of KAL 007 comes to mind. In any case, Israeli intelligence considers them a serious threat to airspace over much of the country, another way of saying the SA-5s are on the target list.

A slight bit of reassurance that these rockets will remain on the ground comes from Syrian forbearance over the Golan Heights. Syrian President Hafez Assad, in the judgment of the Israelis, is honoring an unwritten agreement with then-Secretary of State Henry Kissinger not to attack the Golan Heights in return for other considerations. Recently, Syria has moved a substantial number of troops opposite the Golan for some purpose, but it has thus far, since the Yom Kippur War, been a peaceful Israeli vantage point. That is more than can be said for the boundary between Lebanon and Israel.

Beirut, a decade ago the financial center of the Mideast and a mecca for tourists, has been all but destroyed. A probably unanticipated result of Israel's invasion of Lebanon has been the movement of many business firms to Amman and the consequent boost to Jordan's economy. Now and then, in the ancient eye-for-an-eye tradition, the Israeli Air Force asserts itself in Lebanon against the Palestine Liberation Organization (PLO). A few houses in Sidon were leveled in January, after the Israelis had confirmed to their satisfaction that these were PLO quarters. Reconnaissance over Lebanon, either by RF-4s or drones, takes place regularly. And should the Syrians challenge these flights, the result is air combat with, so far, the usual lopsided score.

A small nation of 3,300,000 surrounded by unfriendly if not downright hostile neighbors in immensely superior numbers has to be on its toes. The universal military service of Jewish citizens is the basic foundation of Israel's war readiness. There are ways to beat the draft, but it is not easy, nor do many seem to be so inclined. Arabs—and there are about 700,000 who are Israeli citizens and more than a million on the occupied West Bank who are Jordanian nationals—are not, except for the Druze, subject to conscription. Although the government does allow for select volunteers, the Arab population is essentially excluded from the defense of Israel. A grand total of forty was enlisted last year. That leaves it up to the faithful in this religious country, and they accept the charge with apparent equanimity.

After the initial three-year period of conscription, which generally comes at age eighteen, most conscripts return to civilian life, but remain in the reserve. Reservists do one month of active duty a year, along with instant recall when the alarm goes off, until they are fifty-five. Thus, one finds a restaurant owner driving a truck, a typesetter clearly pleased at wearing his major's uniform, and a psychologist flying C-130 transports. Based on past results, the system works.

Air Force Is First

An efficient army is essential to Israeli security, while the small but highly skilled navy does the job of protecting the coast. But the first line of defense, the unquestioned elite, is the Israeli Air Force. That is where the really big money goes, and that is the service to which the pick of the nation's eighteen-year-olds are assigned.

Each year, Israel's air force gets first crack at the 20,000 or so high school graduates. After a rigid screening, some 2,000 are chosen. Of these, a few hundred go to pilot training, and, following a two-year course near the ancient town of Beersheba, some 200 graduate. The top forty of these graduates will end up in fighters, beginning with the A-4, Kfir, or F-4. After two years or more in these aircraft, the best go on to the F-15 or F-16, in which they receive a further eight months of training. A typical wingman in an F-16 squadron, then, has more than five years' experience as a military pilot and can look forward to another four years before he is qualified to lead. Training in these first-line fighters is almost exclusively geared to air combat.

The loss of the Sinai bases and of the almost unlimited maneuver room offered by the Sinai desert following Camp David was a blow to the Israeli Air Force, but it is still able to manage well enough. The United States built two new bases in the Israeli part of the desert, the Negev, as compensation for those lost in the Sinai handover to Egypt. Ramon, the one I visited, is probably its best. It is also an isolated community plunked down in the middle of a desert wilderness, in the midst of a rocky landscape much like that of the Mojave desert near Fort Irwin, the Army's National Training Center.

Aside from the nomadic Bedouins who graze their sheep through the landscape, there is little sign of human life around Ramon, but the base itself is a model for anyone's air force with an occasional war to fight. The base was designed from scratch, with efficiency and survivability in mind. Hardened aircraft shelters are equipped with electric winch and cable devices that latch on to F-16s and tow them into the shelters. Taxi distances are minimal, munitions are packaged, and the communication net is designed to cut down on travel. Supply is automated, even to the robot in the warehouse that fetches the part. Ramon is, in short, a base where the wish list has come true. It represents, obviously, a lot of US money, but that was the deal we made.

Looking down the road, the Israelis worry about penetration speeds. During the Yom Kippur War, they discovered that anything moving slower than 450 knots through enemy ground fire was going to take more than its share of hits. They have calculated 540 knots as the minimum safe penetration speed for the 1990s. In order to achieve that speed, there has to be a minimum amount of external stores.

IAI and the Lavi

That, at least, is the rationale behind the Lavi and its ability to survive in the next decade. Cynics say that the survivability of Israel Aircraft Industries (IAI) also figured heavily in the rationale, but whatever the reason, the Lavi project is under way, with the first of six prototypes well along. First flight is scheduled toward the end of this year, with production to follow at the rate of twenty-four airplanes at $500 million a year.

Like its IAI ancestor, the Kfir, the Lavi has a deltawing and a canard that is, in this case, movable. The nose section and air scoop look very much like those of the F-16. Fuel is pumped into every conceivable nook and cranny, in line with the philosophy of minimizing external stores.

From the outset, pilots have been worked into the design loop in a way that only Israel, with its tight little bureaucracy, could have managed. Israel Aircraft Industries is a government company under the Minister of Defense. In the Israeli reserve system, pilots with civilian jobs fly in the regular fighter squadrons. IAI simply selected twenty of their employees with F-15 and F-16 reserve assignments to work as advisors on the Lavi project. It is a direct and practical contribution.

The problem, or at least a major one with this airplane, has to do with money. It is United States money, and thus far, the Lavi has gone through about $1 billion of it. In an unusual gesture of ambivalence toward the Lavi project, the latest US input of $300 million was given to Israel as grant aid, with no strings attached. If the Israelis want to spend it on the Lavi, it is their business.

Well, not entirely. Israel Aircraft Industries has signed on more than 150 American companies as subcontractors to participate in avionics and airframe development. Beyond that, Pratt & Whitney has come up with a new engine for this Israeli airplane, the PW1120. Shorter by twenty-seven inches and lighter than the F100 engine from which it sprang, the PW1120 is scheduled to deliver 20,000 pounds of thrust. Since this new engine has no present US market, the Lavi's future and that of the PW1120 would appear to be closely linked.

IAI, however, being an inventive outfit, has begun to explore an interesting new use for the PW1120 in connection with a modernization scheme for the F-4. If an internal

The IAF uses the Israel Aircraft Industries Kfir as an interceptor and for ground attack. The US Navy uses a number of Kfirs for adversary training.

With considerable justification, the Israeli Air Force exudes self-confidence. Its pilots have the unique experience of being the only people who have flown our first-line fighters in combat. This has given them a, shall we say, certain assertiveness. They are happy with the F-15 and F-16, although there are things about these birds they believe could be better. Israeli pilots, for instance, don't like the reclining seat in the F-16, a feature designed to give a greater tolerance for Gs. The Israelis think that a pilot must sit erect if he is to see everything that goes on, and so they sit erect, even if it means no back support. They pull, it might be noted, a lot of Gs in their MiG encounters.

The first of six prototypes of the IAI Lavi is scheduled to fly later this year. The Lavi is slated to be Israel's front-line fighter for the 1990s.

extension to the air scoop is added to compensate for the shorter length of the PW1120 and minor adjustments are made to the aft section of the engine nacelles, then the PW1120 will fit very nicely into the Phantom. With two of these, you have a Phantom with 40,000 pounds of thrust. Then, as long as you are at it, why not modernize the avionics? And so, says IAI, for $10 million you can turn your old Phantom into an F/A-18.

IAI's Remarkable RPVs

A subsidiary of IAI, Mazlat, is in the business of making highly intelligent RPVs—remotely piloted vehicles. This company makes a drone called the Pioneer, a descendant of the successful Scout. It is a remarkable little flying machine powered by a twenty-six-horsepower German engine. Takeoff is made either conventionally, after a short run, or by a catapult launcher. Once on its way, Pioneer sends back clear television pictures—real-time reconnaissance—while it also takes photos. Integral software sets its flight profile, but ground control can reprogram Pioneer in flight to cover up to ten new targets. The US Navy, after a competitive test in the Mojave desert, has ordered three complete Pioneer sets, probably with the Sixth Fleet in mind. Pioneer might just be the way to locate Colonel Qaddafi's tent.

Israel Aircraft Industries makes boats, an executive jet sold in the United States as the Westwind, and some sophisticated munitions. IAI does heavy maintenance on all Israeli Air Force aircraft, with the exception of the F-15 and F-16. These go to IAF depots, a duplication of effort explainable by Israel's need for redundancy against war damage. The company also furnishes twenty-four Kfir F-21A Aggressor aircraft to the US Navy and maintains them. Denied KC-135s by the US, IAI built its own boom system and installed it on a 707. The boom operator uses television and electronic controls, a system IAI considers superior to anything we have.

All this activity is important to the viability of Israel Aircraft Industries, but it is secondary to the Lavi program. With the Kfir line finished and the Westwind in a tough competitive market, the Lavi is IAI's only hope for a major production line.

But while the official Israeli position is solidly behind the Lavi, there are some negative views. A major concern of some Israelis is that the Lavi will prove so expensive that the Israeli Air Force will fall below survivable numbers in order to pay for it. A lively export program would offset Lavi costs, but there are a number of reasons why foreign sale of the Lavi is not a likely prospect—maybe components, but not the airplane. Meanwhile, work is well under way on the six prototypes. Whether Israel goes ahead with this project or once more relies on American aircraft is still open to question.

Solid Peace Not Likely

A lot of things have yet to be decided regarding the future of this lonely little country. So long as the Arab nations continue to be disunited, Israel has proven more than able to handle them militarily. The most formidable Islamic country, Egypt, has withdrawn from the Jihad, or Holy War, although a repeat of that remarkable day when an Egyptian president arrived in Israel to address the Knesset seems, at this point, highly unlikely.

Since Sadat's murder, relations between Egypt and Israel have deteriorated badly—the dispute over Taba is more than a friendly quarrel, and Israeli tempers are still inflamed over the killing of seven Israeli vacationers at Ras Burka, on the Red Sea, by an apparently crazed Egyptian sentry. The Egyp-

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tians tried and sentenced the soldier, but there is a strong feeling in Israel that the incident was viewed too casually in Cairo.

Ezer Weizman, the former Israeli Air Force Chief and Defense Minister, is a man of considerable charm. A native of Israel, Weizman knows Arabs better, he feels, than his colleagues in the Knesset, many of whom came from Poland, Germany, and other countries remote from the Mideast. In an effort to lessen the impasse and growing tension, Weizman flew to Cairo in January to confer with President Mubarak, one former air force chief and fighter pilot to another. The visit evidently failed to move Mubarak toward a meeting with Israeli Prime Minister Shimon Peres, although Mr. Weizman gave a more optimistic account of the talks than did Israel's hard-line politicians and news media. They were merciless in their condemnation of the visit and, in their view, its humiliating result.

Under an agreement between Mr. Peres and Yitzhak Shamir, made at the time they formed their coalition government, Shamir's turn to be prime minister will come this fall. Peres is considered more favorably disposed toward concessions on the West Bank occupied territories than is Shamir, who has a reputation for intractability. Those who lean toward negotiations with the Arab states in the hope of easing tensions would like something to get under way during the few months that Peres has left. There is not much substance to support those hopes. King Hussein, acting as peace broker with the encouragement of the United States, has failed to come up with a formula to which the various parties—Israel, the PLO, and Egypt—can agree. In any case, Syria remains both a client of the Soviet Union and Israel's sworn enemy. A solid peace agreement with the Islamic nations does not seem to figure heavily in Israeli calculations for the future.

The one basic and all-important factor in that future is continued US support. Israel does not, as we know, take that support for granted. The Israeli lobby, along with the devotion of American Jewry to Israel's cause, keeps it at a high level. Beyond that, it is in the United States's own interest to see to Israel's strength. Aside from the fact that Israel is providing priceless operational evaluation of US weaponry against real-life aggressor forces, a strong Israeli ally adds considerably to United States credibility in the eastern Mediterranean. Israel, for all its fractious and sometimes regrettable behavior, is our only certain ally in the Mideast.

Egypt and Israel are the largest beneficiaries of US aid. That they do not like one another is unfortunate, but the fact that they are both US clients makes a large-scale Mideast war improbable, especially while Iraq and Iran are preoccupied with their own private slaughter.

Immigration Turns to Emigration

Dependence on US aid is explainable in large part by its defense needs, but Israel's economy is lagging, although the triple-digit inflation of a few years ago is down to twenty percent—high, but relatively manageable. The trouble lies in inadequate employment opportunities for large numbers of engineers and other professionals. Emigration, mostly to the United States, is beginning to equal immigration, bad news for a country that counts on attracting the world's Jews. A particular disappointment has been the reluctance of Soviet Jews to emigrate to Israel, where passports await them. Instead, the majority have gone to the US or Europe.

That is why, or at least one big reason why, the Lavi is so important in Israeli plans. The question is whether or not the United States, faced with its own deficit problems, will be willing to commit more than $500 million a year for a Lavi production run of fifteen years. Even if the money is simply part of the total aid package, can Israel itself afford to spend it in that way?

Whether it can afford to or not, the future holds no promise of a diminished threat—not at least, say the Israelis, until Arab oil runs out and, with it, the capacity to buy modern weaponry. Against that uncertain day, Israel must face up to a continued state of war readiness—conscription and service to the brink of old age. A state that demands this from its citizenry cannot be the usual sort of relaxed democracy. Israel, for all its democratic freedoms, is not.

It is a religious state, one in which Judaic laws impinge directly and sometimes heavily on the lives of ordinary citizens. The rabbis have a distinct voice in the way the country is run, although their influence appears to be principally in the wide range of activities subject to religious law.

A troublesome exception is Rabbi Meir Kahane, late of Brooklyn. Kahane leads a splinter party that has managed a small voice in the Knesset and a large capacity for disruptive behavior. An exponent of violence, Kahane would expel all Arabs from Israel.

Even though he is not taken seriously by many and is, in fact, widely considered a menace, Kahane does focus attention on Israel's basic insecurity. Including the territory occupied after the 1967 war, the country's average breadth is about fifty miles, east to west. Without the occupied territories, the east-to-west average would be scarcely ten miles.

More than 1,000,000 Palestinian Arabs live on the occupied West Bank. That figure will naturally increase as time goes by. Those Arabs, together with the 700,000 already incorporated in the Israeli state, have the potential, as Israeli citizens, of destroying the Jewish character of Israel. At the same time, giving up the West Bank to a Palestinian state is a notion that the Israelis find unthinkable.

Mideast peace talks are undoubtedly useful exercises. If nothing else, they take people's minds off war. But how to settle Israeli/Arab discord on any lasting basis seems beyond the ken of ordinary human comprehension. ■

Gen. T. R. Milton, USAF (Ret.), is a longtime Contributing Editor to this magazine. His forty-year military career included combat service with Eighth Air Force in World War II, participation in the Berlin Airlift, command of Thirteenth Air Force in the Philippines, service as Air Force Inspector General and USAF Comptroller, and duty as the US Representative to the NATO Military Committee. He retired from active duty in 1974 and makes his home in Colorado Springs, Colo.

At a time of deficit reductions, several areas need concentrated attention.

Five Challenges

BY THE HON. RUSSELL A. ROURKE
SECRETARY OF THE AIR FORCE

Without question, today's United States Air Force is strong. It is proud, professional, and ready, due in large part to the buildup of the past five years. In several important areas, we have succeeded in both setting and accomplishing our goals. Let's review our record.

Russell A. Rourke ponders an issue at the Pentagon. He writes here that "without question, our greatest strength as a military service is the quality of our people . . . their motivation and dedication." This article was written before Mr. Rourke's resignation April 7 for personal reasons.

Without question, our greatest strength as a military service is the quality of our people. We have made a very successful effort over the past years to recruit, train, and retain high-quality people and to keep their morale high. For example, in our enlisted ranks, fully 98.5 percent are high school graduates, and forty-one percent have the equivalent of a year or more of college. And we currently have more than 30,000 already signed up in the job bank, ready to come in this year. In the officer corps, forty-four percent have graduate degrees, and among new general officers over the past two years, eighty-five percent have advanced degrees. Moreover, well over half of our first-termers re-enlist.

But beyond their high quality, the things that most impress me about our people since coming on board as Secretary are their motivation and dedication. During my recent visits to SAC, TAC, and MAC, I have flown missions with them, watched them respond to often difficult and always challenging jobs, and observed their skills. I have had the chance to talk with airmen, lieutenants, captains, and generals. In sum, I am reassured by their high spirit, enthusiasm, and dedication.

To keep our good people, we are continuing our efforts to improve their quality of life. We have steadily expanded opportunities for women, and last year, seventeen percent of our recruits in the enlisted ranks were

women. We have more than 400 women pilots and navigators, either actually flying or in training. Last year, the Air Force opened up the security police specialist ranks to women, providing about 38,000 security police positions Air Force-wide, and we have now trained ninety-six for this career field. Two years ago, we put women in the front and back on crews of AWACS, and it was only recently that an all-women crew took a C-141 across the Atlantic. All but five percent of Air Force jobs are currently open to women. Only those excluded by law are closed.

We, along with the other services, have worked hard with Congress for improvements in the quality of life. Although we are short 25,000 units of family housing at some fifty installations, Congress approved 1,800 new units for this year at six locations, and we have requested 523 units for next year. We've built new commissaries, base exchanges, gyms, and other support facilities. We've increased the amount of time our people are spending in one place, and there is a substantial increase in voluntary requests for extension of assignments, both in the continental United States and overseas.

Finally, we have pursued a number of initiatives to upgrade and structure vital components of our team—Air National Guard, Air Force Reserve, and Air Force civilians—as part of a "Total Force" policy. I'm proud of our people. They are the best of any air force in the world.

Modernization and Reform

The Air Force has an outstanding record in modernizing and improving its forces, both strategic and conventional. Success stories in our B-1 and Peacekeeper development, acquisition, and deployment, together with improved capabilities demonstrated by our fighter and airlift forces, have done much to ensure deterrence. And this is really what our improvement programs are all about—not to get stronger than our opposition by outspending them, not to rattle sabers, but to deter our potential enemies from the fatal miscalculations that could bring on a catastrophe for us all.

We have instituted a number of reforms in the way we do business that are producing excellent results. For example, the dollar level of contracts we awarded competitively has almost doubled. The percentage of contracts we compete is up from sixty-eight percent in 1981 to more than eighty-two percent through August 1985. Our percentage of dollars spent noncompetitively is down from 18.6 percent in 1981 to less than thirteen percent.

As a result of Multiyear Procurement Contracts, we estimate savings of more than $3 billion from FY '82 through FY '89 in such systems as the F-16, B-1B, KC-10, various satellites, and spares acquisition for B-1B and F-16 aircraft. Spare-parts price-challenge programs, such as Zero Overpricing and Pacer Price, have resulted in identification of items for which we have paid too much.

A landmark acquisition reform took place early last year when the Air Force instituted the R&M 2000 action plan. In the past nine months, the Air Force has taken extraordinary measures to ensure that the commitment to reliability and maintainability (R&M) within the service is permanent. Reliability and maintainability are now the *number-one concern* in the source selection for our weapon systems.

In sum, the Air Force has made many improvements and great progress over the past four and one-half years through programs and initiatives I enthusiastically endorse and intend to continue emphasizing as Secretary. We have a great force, but we can make it better. Let me highlight what I consider our most important challenges.

Areas for Attention

The *threat* continues to grow. From 1977 through 1983, the Soviets acquired 1,500 ICBMs, 1,300 SLBMs, 250 bombers, and 5,000 fighters while we, over the same period, added less than ten percent of their number of new ICBMs, one-third their number of new SLBMs, no strategic bombers at all, and only sixty percent of their fighter production. Soviet efforts to develop advanced systems continue at the same pace and cover the full range of technologically advanced weaponry they need to modernize all their forces.

- To meet this threat, we must first restore public and congressional confidence in our management of defense resources. Acquisition reforms already begun—and which I will continue to strengthen—will help. We must reaffirm and reemphasize, both with Congress and with the public, the end result of our procurement program—increased combat readiness and operational capabilities to meet the *threat*.
- Second, we must be smarter and more precise in how we define weapons requirements and what we need to meet the threat. In the face of challenges abroad, we are faced here at home with the possibility of declining defense growth. Pressures for reduced deficits and balanced budgets will, no doubt, take their toll on our defense programs. We could find ourselves caught in the squeeze of lower budget levels and increasing costs to operate and maintain the systems we have been buying over the past five years. That could mean the threat of less funding for modernization programs at the very time we need most to continue them.
- Third, we must continue to maintain high morale among our people. It makes little sense to spend millions training pilots, missile launch officers, or radar technicians just to have them leave the service because we've failed to spend a few hundred thousand dollars on quality-of-life improvements in housing or support facilities or because we're slow to recognize and accommodate career irritants, which might be resolved with a little more attention and interest. In this regard, we must continually emphasize the value of pay, compensation, and retirement programs to the maintenance of a high-quality force.
- Fourth, we must institutionalize the steps required to meet the emerging threat of terrorism and low-intensity warfare. Our capability will be crucial in future conflicts, since low-intensity warfare is the most likely form. We must also acknowledge terrorism as a form of warfare and take steps to counter it, such as increase our security and intelligence capabilities.
- Finally, we must continue to maintain our strong Air Force space program. The Air Force budget contains almost seventy percent of the Total Obligational Authority for all DoD space activities in FY '86. We have the experience and the expertise to serve our nation well in space.

We must all realize that in this year and for the foreseeable future, defense spending, programs, benefits, and organization will fall under increased scrutiny. In many instances, we will be required to do more with less and to intensify our efforts so that the gains of the past half-decade are not allowed to evaporate.

As we go into this era of deficit reductions, let us keep in mind the words of Abraham Lincoln: "The defense and preservation of our nation under adverse circumstances require the utmost in dedication and resolve." I have no doubt that those of us in the Air Force will meet these new challenges, for meeting and succeeding at new challenges is, after all, the very proud tradition and heritage of the United States Air Force. ■

Good budgets have built a stronger defense. It will be difficult to preserve that with the fiscal austerity that lies ahead.

The Going Gets Tougher

BY GEN. CHARLES A. GABRIEL, USAF
CHIEF OF STAFF, UNITED STATES AIR FORCE

In September of 1982, I wrote my first article for AIR FORCE Magazine as Chief of Staff. The Air Force was celebrating its thirty-fifth birthday that year. From a modest beginning in 1947, we have developed into a powerful and effective force. We were fortunate, because we had the heritage of earlier air pioneers to guide us. Their daring, dedication, and innovation served us well as we laid our foundations. We also listened to people like the famous scientist, Theodore von Kármán. Von Kármán once said, "The men in charge of the future Air Force should always remember . . . that a constant inquisitive attitude toward science and a ceaseless and swift adaptation to new developments can maintain the security of this nation through world air supremacy." We've certainly followed his advice and have built an Air Force that is, without a doubt, the best in the world.

Air Force Chief of Staff Gen. Charles A. Gabriel enjoys himself among the fighters. In his final article for this magazine, General Gabriel writes that "today's Air Force is stronger than ever" and that the years ahead "will be even more challenging" than those gone by.

This will be my last article for the magazine as Chief. This year the Air Force is thirty-nine—growing older and getting better. In my 1982 article, I said that people are the key to whatever improvements we make. In the last four years, Air Force people have shown time and again that this is true. They can handle any situation with class—whether it's putting bombs inside a circle the size of a manhole cover, as in the recent Gunsmoke '85 competition, saving the life of a new baby by transporting a medical team in bad weather, or turning in the best flying safety record in Air Force history—1.49 accidents per 100,000 flying hours in 1985. I'm impressed by the caliber of the entire Air Force family—military and civilian.

We need to keep our quality people and must continue working hard to be sure they get the pay and benefits they deserve. We received one of the largest pay raises in our history in 1982. Since then, our yearly pay raises have kept pace with inflation. However, there is still a wide gap between military and private-sector wages, so we will continue to pursue more equitable pay. We've picked up additional benefits, including larger PCS reimbursements, higher per diem, and space-available dental care for dependents. Right now, we're working on a dental insurance plan for spouses and children of active-duty members, which we plan to have available by early 1987. Quality-of-life improvements for our people will always be a major goal.

Progress in Force Modernization

Our efforts to modernize both our strategic and tactical forces also illustrate the good things that are happening. First, our strategic modernization efforts have achieved considerable success. Our first new bomber in thirty years, the B-1B, was delivered to Strategic Air Command in June 1985. Adding 100 B-1Bs to the inventory will greatly enhance our manned penetra-

tion capability in the near term, while the Advanced Technology Bomber (ATB)—the second part of our two-bomber program—will be the penetrator of the future. It will allow us to operate well into the next century against the most sophisticated air defenses the Soviets can put up against us. Plans are for the ATB to be operational in the early 1990s. Finally, air-launched cruise missiles (ALCMs) became operational in December 1982, and today we have five B-52 squadrons fitted with these missiles. This combined force of B-1Bs, ATBs, and B-52s equipped with ALCMs will help to ensure that deterrence is strong well into the future.

In the area of ICBM modernization, we've made good progress as well. Our decision to deploy 100 Peacekeeper missiles, based on Scowcroft Commission recommendations, has been slowed by congressional action; we are presently capped at fifty missiles. But we are still committed to full deployment of 100 Peacekeepers. The system is vital to our deterrent posture because it puts Soviet hard targets at risk. The second part of our ICBM modernization effort, the small ICBM, is running smoothly. SICBM is in research and development and is expected to be operational in the early 1990s.

To tie together all the parts of the Strategic Modernization Program, we are developing a Strategic Forces Roadmap. The roadmap will include alternatives for a more survivable basing mode for a second fifty Peacekeeper missiles, a thorough look at variations in missiles and basing modes for the small ICBM, and an examination of future strategic bomber force structure needs. Our goal is to ensure a maximum triad capability that at the same time is consistent with reduced levels of strategic arms and with eventual transition to a strategy based on strategic defense, if research proves that this is the best way to go.

Reaching for Forty Wings

Modernization and expansion of our tactical forces is also well under way. The Tactical Fighter Roadmap is our guide in procuring the right mix and numbers of aircraft. In the last four years, we've taken delivery of more than 850 fighter and attack airplanes. We're planning to reach forty wing-equivalents by FY '91 while maintaining an acceptable average aircraft age. In addition, our FY '86 budget request included funds for the first eight F-15Es, the Dual-Role Fighter. This airplane will give us badly needed long-range surface attack capability and be able to meet the air-to-air threat.

Three important tactical programs deserve special mention—AMRAAM (Advanced Medium-Range Air-to-Air Missile), LANTIRN (Low-Altitude Navigation and Targeting Infrared for Night system), and the Advanced Tactical Fighter (ATF). AMRAAM, which is in full-scale development, will greatly increase our capability in the air-to-air role. LANTIRN will be employed on the F-15E and F-16C/D and will allow us to conduct low-altitude operations at night and in adverse weather. The first navigation pod is planned for delivery in April 1987. The targeting pod is now in IOT&E, with a planned delivery date of April 1988. Finally, to ensure air superiority over a Soviet threat that gets tougher every year, we're continuing development of the ATF.

Good things are also happening with our projection forces. By the end of this decade, we'll nearly double the airlift capability we had in 1980. The increase will result from additional spares and aircraft (C-5B, KC-10, and Civil Reserve Air Fleet [CRAF] Enhancement). In December 1982, we awarded a contract for fifty C-5Bs. The first aircraft was delivered last December, and deliveries will be completed in FY '89. Our buy of sixty KC-10s is fully funded and will be completed in FY '87. And the CRAF Enhancement program, in which we are modifying nineteen civilian Boeing 747 passenger planes to be able to carry cargo, is nearly complete.

But the C-17 is the key to our future force projection capability. For the first time, we'll have the ability to deliver outsize Army equipment directly to where it's needed—at austere airfields near the front. Furthermore, the C-17 is the affordable solution. It will provide the capability of reaching our 66,000,000 ton-mile-per-day goal at a savings of about $16 billion over thirty years and will require about 15,000 fewer people than the next best option.

Emphasis on Joint Approaches

Another good thing happening in the Air Force is increased emphasis on joint cooperation. Army Chief of Staff Gen. John Wickham and I kicked off this effort in May 1984 when we signed a Memorandum of Agreement on the Joint Force Development Process. Starting with thirty-one initiatives, the process has expanded to include four more. As of this date, fourteen initiatives have been implemented, four are closed, and seventeen are ongoing. The Navy has also come on board and is now actively involved in five initiatives. They have representatives in the Joint Assessment and Initiative Office—the focal point for the Joint Force Development Process—and staff officer exchanges between the services have become standard procedure.

These initiatives have helped us eliminate duplication and fill voids. Substantial cost savings have resulted as well. For example, a near-term cost avoidance of $600 million was achieved by restructuring the JSTARS program with the Army. By working together, we reduced two platforms and two radar systems to a single platform (the C-18) and a single radar system.

Cooperation among the services has extended to our efforts in space. A significant milestone was the establishment last September of the Unified Space Command, which will ensure the coordination of all space assets in support of national objectives and in concert with other military forces.

I think we'll see more and more emphasis on working, training, and planning together. The Air Force will continue to push these efforts among all the services as the best way to achieve the most affordable and effective combined combat capability.

Good budgets have allowed us to build a much stronger defense—a more confident posture for deterrence. But fiscal austerity seems to be the name of the game—at least for the next several years. We have already cut about forty programs and stretched many others to meet lower-than-expected budget targets. I don't expect the ghost of the 1970s—a time when we couldn't do our job adequately because of limited funds—to return, but keeping up momentum is going to be much tougher. But as President John Kennedy once said, "There is no discount price on defense. The free world must be prepared at all times to face the perils of . . . war." We live in a dangerous world, and the challenges we face are growing, not fading away. I don't think this point will be forgotten by the American people.

Today's Air Force is stronger than ever. The last four years have been good ones, and it has been a privilege for me to be a part of them. The people in the Air Force today are the best I've seen, and working with and for them has been the most rewarding part of my thirty-six-year military career. You can bet that the years ahead will be even more challenging than those behind us. But I believe as the Air Force grows older, we'll discover that "the best is yet to be." ■

In the age of technology, the NCO must be far more than a technician. And the NCO of the future will shoulder even more of a leadership role.

The Heart of the F

BY CMSGT. SAM E. PARISH, USAF
CHIEF MASTER SERGEANT OF THE AIR FORCE

I've been a part of our Air Force for almost thirty-two of its nearly thirty-nine years, and, upon retirement, I'd like to share some thoughts about the past, the present, and the future.

Chief Master Sergeant of the Air Force and Mrs. Sam E. Parish. CMSAF Parish has praise and sound advice for USAF career enlisted personnel and NCOs who, he writes, "play a tremendously important role and . . . do it in a dedicated and disciplined manner." He describes NCOs as the "heart and lungs" of today's Air Force.

Throughout our short history, NCOs have been referred to as various parts of the human anatomy. Not all of these analogies have been favorable, but the one expression most commonly heard is that "the NCO is the backbone of the Air Force." It has generally been meant to carry a favorable connotation. I don't like it, though, and I believe it has outlived its usefulness. I like to think of our airmen and NCOs as proud professionals—the heart and lungs of our Air Force, for without us, our mission would never get accomplished. We play a tremendously important role, and we do it in a dedicated and disciplined manner.

It hasn't always been this way. When our Air Force was established, many career enlisted personnel were looked on as "lifers," society misfits, people who produced for a day's pay—and the pay wasn't that great. In the beginning, we had a relatively simple Air Force—piston-driven aircraft, virtually no computer capability, and the age of missiles yet to be realized.

With advancements in technology in the 1950s, we could not afford to have individuals who looked forward to the proverbial "three hots and a flop." We needed NCOs who were highly specialized and who could supervise airmen trained in the more complex machinery of the day. To meet this requirement, we introduced the grades of senior and chief master sergeant and started to educate our NCOs in management, leadership, and supervision—their NCO responsibilities. Professional military education was born—the greatest step taken for enlisted personnel, in my estimation, in our short history as a separate service.

The 1960s were the great age of specialization, and the word "technician" was prevalent in our vocabulary. We centralized many things and encouraged our people to become technical experts and specialists. Management replaced leadership, and supervision became a byproduct of a specialist's duties. Technology continued to advance. Missiles were operational. Pro-pay was in. Promotions loosened up. WAPS was implemented and TOPCAP was born.

Our rank structure changed: airmen third, second, and first class became airmen, airmen first class, and sergeants. Sergeants (E-4s) were recognized as NCOs. And our first Chief Master Sergeant of the Air Force was appointed.

The Slump of the Seventies

The late 1960s and early 1970s were a very trying period, both in our society and for our Air Force. Individuality dominated to the extent that "I" overrode "we"; we were faced with a permissiveness that almost destroyed many of our time-honored traditions. But the low point of the '70s came in 1979—the only year in our short history when we did not meet our recruiting objectives. Our mid-career NCOs were leaving our Air Force in great numbers.

The 1980s started with some much needed improvements in benefits, entitlements, and philosophy. The NCO technician concept was out; decentralization was back in; management was replaced by leadership; and NCOs were again expected to supervise and guide.

Today, we have the best Air Force we've ever had. Top to bottom, we have the most people-oriented leadership ever. Along with this we also have what makes me so proud and what I've seen in my travels—the most educated, dedicated, and disciplined enlisted force that I have served with in my thirty-two years of Air Force life. You're damn good! You do your job with a dedication and enthusiasm the likes of which I don't believe has been seen in a military department in the history of our nation. It makes me very proud to be able to represent you.

Direct leadership in day-to-day activities of today's Air Force—as well as the foundation for the future—is in the hands of our NCOs. Are we fulfilling these responsibilities? In many cases, I would answer with a resounding "yes." In other areas, though, I believe there's room for improvement.

We still have too many NCOs who are concerned only with their technical jobs and the people under their direct supervision. We need to work on this. We must set the example we expect from *all* contemporaries—not just those we rate. We must increase our involvement in as many unit and base activities as possible—get out and be visible, know where our people eat, sleep, work, and play. We must increase our involvement in the everyday, nontechnical activities that affect our subordinates. We must communicate with each other and ensure free-flowing communication up and down the chain. We must also recognize our people for doing good jobs and counsel those not doing the job properly.

Leaders of Tomorrow

Enlisted personnel of the future will be very technically qualified, dedicated, and disciplined—able to take on virtually any job in a career field, even some presently held by officers. You who will lead in that force of the future can't be concerned with reinstitution of the traditional NCO authority and roles—the kind I saw when I first started. You'll have to go beyond that.

You'll have to step forward and take charge. You'll have to work hard, lead, manage, and supervise. In most cases, you'll lose the security of being one of the masses. You can't be afraid to tell the boss the truth, and you can't pass the buck. You'll have to give of yourself wholly and inspire by example, actions, integrity, and self-discipline.

As an NCO, develop a trust in your people by showing a genuine interest in their well-being. Be professional in your dealings with your superiors and subordinates alike. Appreciate the accomplishments of your people. Assign them meaningful jobs and only accept an honest effort for these jobs. The future of our Air Force and our enlisted corps rests in your hands, and believe me, we can't succeed without you being a success.

My wife, Inge, and I have been blessed to serve during a great time in our history, and we'll leave with very mixed emotions—extremely proud to have been able to be a part of our Air Force, but saddened that we're leaving when the future may look bleak in many areas. It's truly been an honor for us.

Keep up your positive attitude, dedication, and enthusiasm. Give my successor the same support you've given Inge and me, and we'll continue to have the best enlisted force any nation could ever hope to have. ■

Air Force Communications Command

Air Force Communications Command provides operational commanders and the National Command Authorities with the information systems and air traffic services needed in peace or war. AFCC centrally manages Air Force standard information systems, incorporates a "dual-hat" organizational structure to respond rapidly to MAJCOM requirements, performs day-to-day operational support, and carries out long-range information systems planning. As the central manager for communications-electronics, data automation, and air traffic services, AFCC's responsibility is to engineer, acquire, install, operate, maintain, and perform "system-level" management of Air Force information systems.

The most critical of these responsibilities is to look at the Air Force's information systems and air traffic services on an Air Force-wide "systems" basis. With the rapid advances of telephonic, computer, and video technology, AFCC's charge is to take individual systems requirements that support specific missions and to make them more efficient with standard, general-purpose systems that can expand, evolve, and interoperate with the standardization and capacity that is necessary.

AFCC provides the "reins of command" to the Air Force, conducting its support mission with 745 units at 444 locations. The work force comprises more than 8,000 civilians, 58,000 active-duty military, and more than 15,000 Air Force Reserve and Air National Guard members who would be gained in wartime by AFCC. Centralized management and decentralized execution to obtain maximum use of limited resources have been keys to AFCC's success in meeting the rapidly changing requirements of the Air Force.

The command also acts as the key DoD interface with various federal agencies, such as the Defense Communications Agency, the Federal Aviation Administration, and the Federal Communications Commission.

Today, there are basically four "gates" to Air Force bases: the "main" gate for entry by automobile, the "air" gate for entry by air, the "voice" gate for entry by telephone, and the "data" gate for entry by message and data. AFCC manages three of those four Air Force "gates."

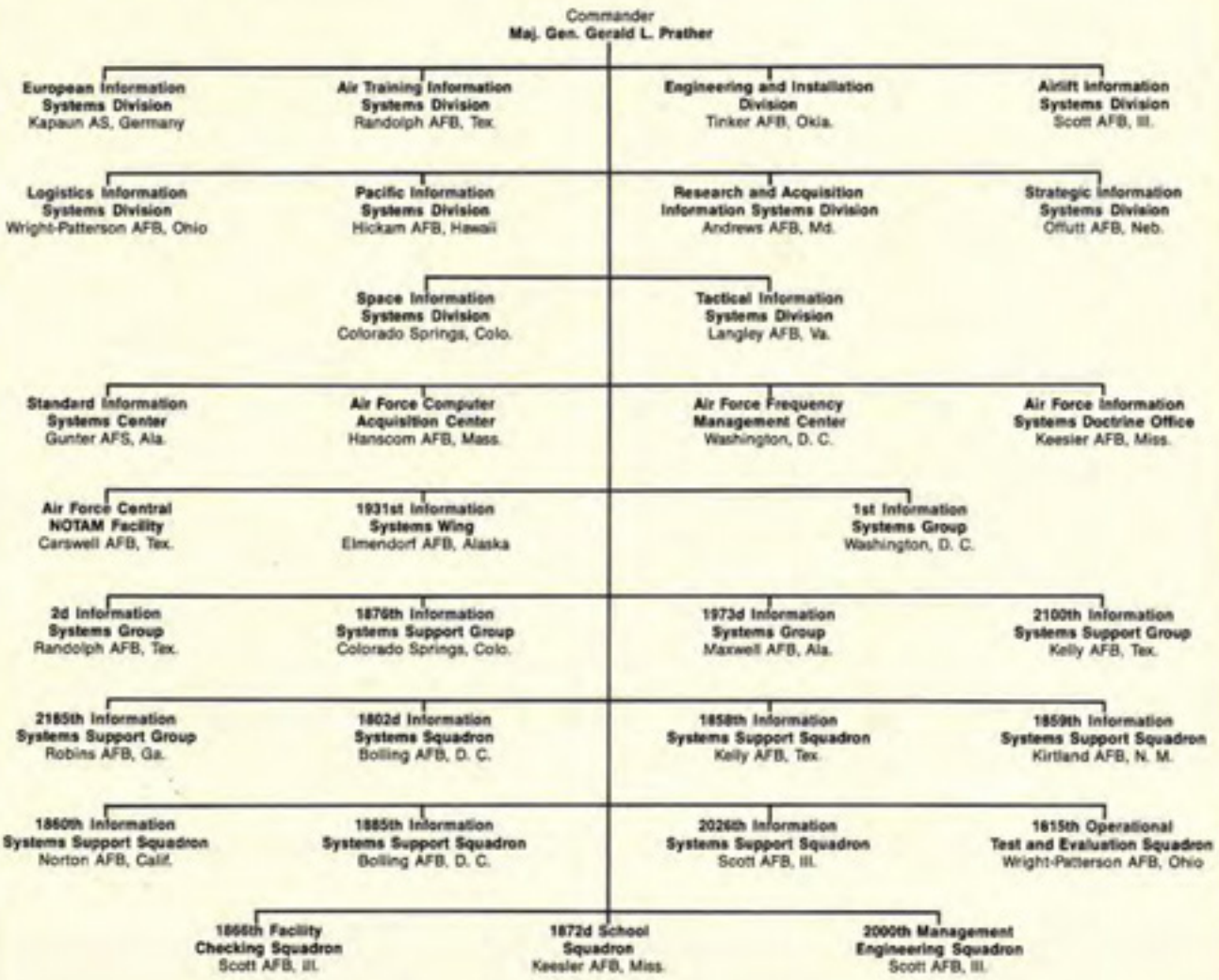
At the "air" gate, AFCC air traffic controllers oversee the largest military air traffic system in the free world. AFCC has deployable air traffic control assets that can respond in a matter of hours to meet "bare-base" combat requirements. Last year, AFCC controllers handled more than 13,000,000 aircraft operations, of which nearly twenty percent was civilian air traffic. Working with the FAA and allied and international agencies, AFCC air traffic controllers integrate the worldwide movement of aircraft.

AFCC also manages the installation, operation, and maintenance of navigational aids, instrument landing systems, VORs and TACANs, RAPCONs, and control towers. Working closely with the FAA during peacetime and solely responsible for the technical performance of navaids and TRACALs during wartime, AFCC's aircraft travel around the world to ensure

Two members of AFCC's Engineering and Installation Division, wearing chemical warfare suits, practice wartime restoration of communication capabilities for USAF information systems.

AIR FORCE COMMUNICATIONS COMMAND

Headquarters, Scott AFB, Ill.



that quality service and safety are maintained. AFCC operates six facility checking aircraft (four C-140s and two T-39s). Replacement aircraft have been identified, and procurement activities are now under way.

At the telephone "gate," AFCC is upgrading base-level systems throughout the Air Force by installing modern, advanced, computer-assisted digital telephone exchanges that reduce manpower and improve service. This modernization program will affect eighty major Air Force installations.

Merger of the once separate disciplines of telecommunications and data automation is nearly complete for the Air Force, and increased efficiency will be one result of the modernized, state-of-the-art "data" gate. Collocation of telecommunications centers and data-processing facilities in unified information-processing facilities will provide "one-stop" service for many base-level facilities. And as AFCC's extensive base-level computer modernization program nears completion, data-processing services for supply, maintenance, pay, and accounting will improve.

AFCC's Computer Acquisition Center (AFCAC) and its Standard Information Systems Center (SISC) are responsible for the acquisition of computers for the Air Force as well as the production and configuration control of the software that drives the Air Force's standard information systems.

During FY '85, AFCAC saved the Air Force nearly $80 million by acquiring computers through competitive bidding. For example, in procuring microcomputers for the Air Force, this AFCC organization managed the purchase of nearly 50,000 small computers through a single contract. It is currently negotiating follow-on purchases and other related projects. At the same time, SISC manages the production of computer software for Air Force functional areas that include weather, supply, finance, security police, and command and control. It is responsible for nearly 20,000,000 lines of computer code for more than 750 different systems.

Long-range planning, design, and technical considerations are important to the success of the many upgrade projects for Air Force information systems. For example, new electronic systems being installed at Air Force bases require high-quality transmission media—cables, fiber-optic wiring, etc.—to operate at peak efficiency. Most Air Force bases have aged metallic and copper cables that

can't adequately support highly sophisticated computer and telephone systems. AFCC is leading the way in a program to upgrade base-level capabilities systems through the Base Information Data Distribution System (BIDDS). BIDDS will be the cornerstone of the Air Force's twenty-first century information systems capabilities.

Before any of these capabilities are used, they must first be engineered and then installed. AFCC's Engineering and Installation Division (EID) at Tinker AFB, Okla., manages the standardized installation of Air Force information systems. During 1985, EID's eleven subordinate units plus the Air National Guard units it controls installed air traffic control, data automation, and information systems equipment worth $103 million.

Supporting such vital projects as the Consolidated Space Operations Center, the Peacekeeper, and the Vandenberg Space Shuttle Complex, Engineering and Installation units laid more than 2,200,000 miles of cable, including cabling boasting some of the most advanced fiber-optic concepts yet explored.

AFCC is also pioneering the application of local area networks (LANs). A large network at the United States Air Force Academy will connect more than 4,000 small computers in one example of the many LAN projects in progress.

Engineering and Installation units also have a combat role to provide emergency installation and repair of damaged or destroyed information systems. Active and reserve teams representing the entire engineering and installation community converge at Tinker AFB, Okla., in an annual competition to test their combat restoral skills. In 1985, members of the 1827th Engineering and Installation Squadron, Kelly AFB, Tex., took the coveted trophy.

For contingency and combat operations, AFCC's five combat information systems groups (CISG) have tactical mobile units to provide commanders with information systems that can connect them directly into the worldwide Defense Communications System. During 1985, elements of AFCC's CISGs deployed in support of such exercises as Gallant Eagle, Bright Star, and Team Spirit as well as for real-world contingencies. This year, teams will meet for the first time in a "Combat Eyes" competition at Tinker AFB.

AFCC has several ongoing initiatives better to meet the needs of operational commanders. The "A-Team," along with the Hammer Combat team, helps MAJCOM commanders solve their information systems problems. The "A-Team" has been involved with correcting secure voice and electromagnetic pulse (EMP) problems for CINCPACAF and Space Command.

Hammer Combat has acquired commercially available "off-the-shelf" equipment to meet operational requirements and solve problems quickly. Working in concert, the "A-Team" and Hammer Combat have increased mission effectiveness of several MAJCOM commanders.

Another team, Hammer Ace, can provide immediate secure voice and message capability from anywhere in the world. For example, secure voice capability was required during a recent aircraft accident in Central America. Within hours, the team was on-site, hooked up to a satellite and providing secure "comm."

A recent internal restructuring of AFCC headquarters has totally integrated the command's many functions, aligning them more closely with functions in other Air Force major commands.

AFCC's role in the formulation of an information systems architecture for the next century will continue to revolve around its ability to respond rapidly and efficiently to the needs of the operational commanders. Air Force Communications Command is ready. ■

Air Force Logistics Command

Air Force Logistics Command made significant contributions to the readiness of the Air Force in 1985 by centering its efforts on weapon system capability and procurement cost savings.

Increased readiness throughout the Air Force—the core of AFLC's mission—was reflected in a twelve percent increase in the Air Force's mission-capable rate for weapon systems and a twenty-two percent decrease in the number of weapon systems not mission-capable because of spare-parts shortages.

The command put great emphasis on timely execution of Air Force procurement programs, resulting in 1985 in having the highest rate of obligation of first-year funds in the history of AFLC.

Effective logistics support in 1985 contributed to the Air Force's safest flying year ever, with an all-time low number of logistics-related mishaps for the year. According to AFLC Commander Gen. Earl T. O'Loughlin, the support of Air Force weapon systems is the command's first consideration. AFLC must stay in tune with customer needs, identify critical logistics elements, and provide balanced support with available resources, General O'Loughlin has said.

Numerous programs support AFLC's campaign to increase readiness. The emerging Depot Support Concept will establish, early in the acquisition process, AFLC requirements for weapon systems so that the reliability of each system can be ensured. AFLC is also expanding the Turbine Engine Monitoring System, which provides improved computerized capability so that maintenance personnel can determine the status of the TF34 engine. There are many other examples.

AFLC took major steps to further develop its automatic data-processing programs used to order and track spare parts and other inventory.

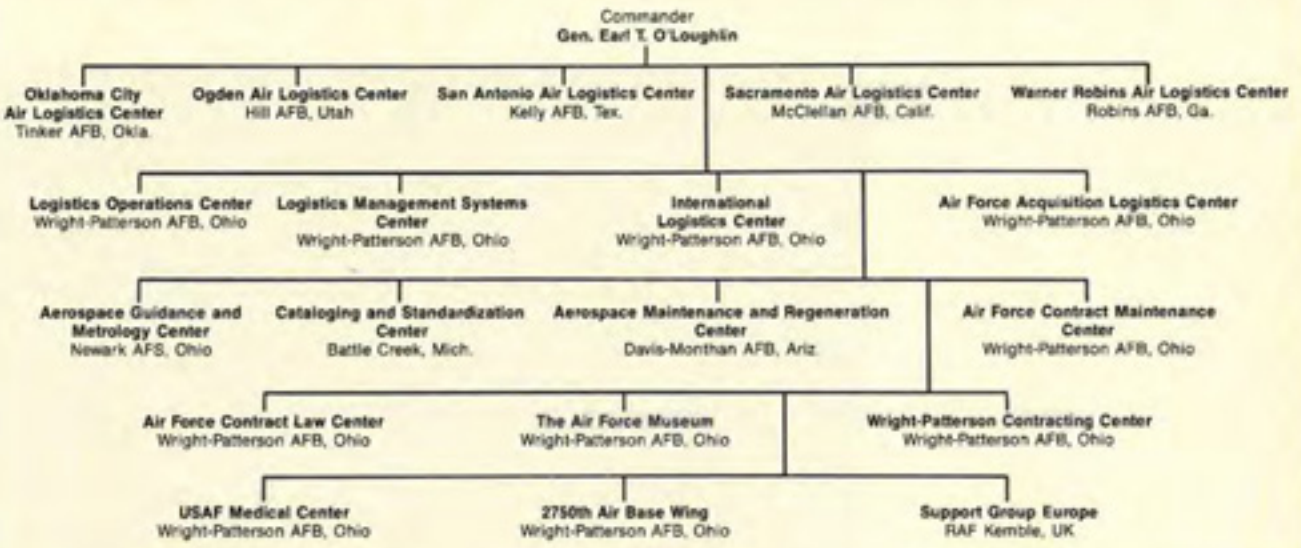
Contracts were awarded for the upgrade of the Stock Control and Distribution System, which supports inventory control and the distribution of assets. Each of two contractors will design and operate a prototype system. One will be selected in 1986 for further development under an eight-year contract.

Likewise, a contract was awarded early in 1985 to further develop the Requirements Data Bank System, which aids in the determination of spare parts and repair needs. New mainframe computers and terminals for the RDB system will be installed at Hq. AFLC and the five Air Logistics Centers as part of the contract.

AFLC moved rapidly to implement the Air Force Reliability and Maintain-

AIR FORCE LOGISTICS COMMAND

Headquarters, Wright-Patterson AFB, Ohio



ability 2000 program. There are hundreds of projects working at the command's field units to carry out the R&M 2000 goal: to increase warfighting capability and survivability and at the same time decrease manpower, support requirements, and costs. Strong command emphasis has been placed on the program.

The command, which is staffed by more than 90,000 civilians and nearly 12,000 military members, used increased competition, consolidation of purchases, the award of multiyear contracts, and other innovative practices to reduce the cost of replenishment spares. The payoff was a cost avoidance of more than $443 million in FY '85.

Installation of the bar code wholesale receiving system at San Antonio ALC in Texas not only completed the project for all five AFLC centers but also marked the Defense Department's first system implementation under LOGMARS—the Logistics Application of Marking and Reading Symbols. The system keeps track of the receipt and distribution of AFLC material using a method similar to the Universal Product Code used in grocery stores. The system has improved customer support and improved accuracy in posting debits and other inventory functions.

Warner Robins ALC at Robins AFB, Ga., was assigned responsibility for two major AFLC organizations: Support Group Europe (formerly Support Center Europe) at RAF Kemble and the European Distribution System, a hub-and-spoke system that uses eighteen C-23A aircraft to distribute engines and spare parts for US Air Forces in Europe.

In the coming year, General O'Loughlin intends to make "logistics" a synonym for "excellence."

"We must continue to reinforce the key elements of excellence—quality, productivity, and accountability," he said. "We need to depend less on getting more money and do more with the funding we get."

All told in 1985, command personnel performed depot maintenance on more than 1,300 aircraft and nearly 3,500 engines. They also completed nearly 650,000 contracting actions. The command managed a financial program of almost $51 billion and supervised $101.7 billion in capital assets, allowing AFLC to move effectively toward its goal of providing a high level of combat readiness for the Air Force. ■

At the Warner Robins Air Logistics Center at Robins AFB, Ga., mechanic John Bellflower attaches a sling to the wing of an F-15 for installation on the aircraft. AFLC operates five such centers for maintenance of all major operational systems.

Air Force Systems Command

The primary mission of Air Force Systems Command (AFSC) is to advance aerospace technology, apply it to operational aerospace systems development and improvement, and acquire qualitatively superior, cost-effective, and logistically supported aerospace systems.

AFSC also supports the major space responsibilities of the Department of Defense, including research, development, test, and engineering of satellites, boosters, space probes, and associated systems. In addition, the command supports NASA projects and programs arising under basic agreements between DoD and NASA.

The command designs, constructs, tests, and purchases weapons and equipment and initial spare parts for Air Force operational and support commands. Primary emphasis is given to aeronautical, space, electronic, missile, and armament systems.

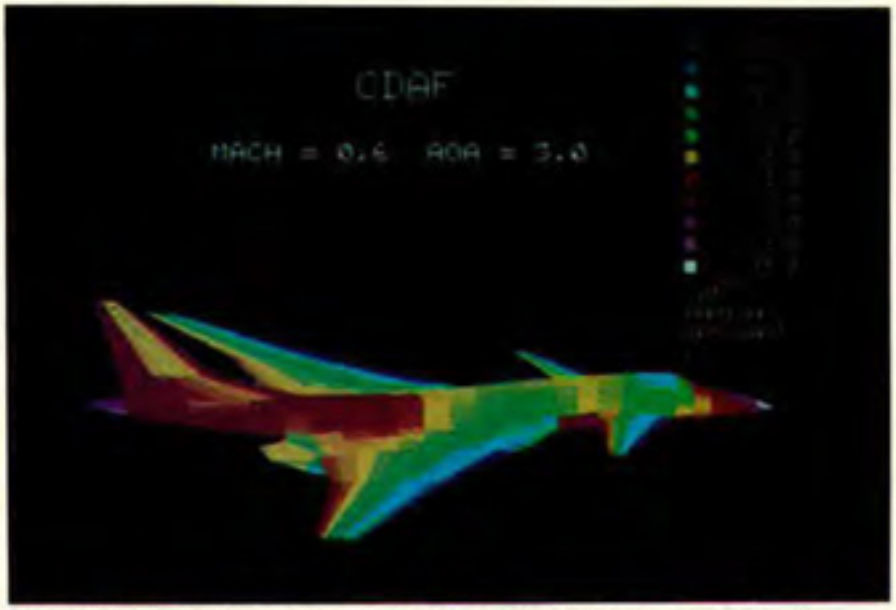
The command has approximately 28,600 military and 30,400 civilians. The nature of its research, development, test, and acquisition mission makes AFSC the Air Force's major employer of scientists and engineers.

Systems Command will manage approximately $37.7 billion in FY '86. Of this amount, $22.8 billion goes for procurement of aircraft ($15 billion), missiles ($5.4 billion), and other equipment ($2.4 billion). In addition, $9.7 billion goes for research, development, test, and evaluation (RDT&E), $1.9 billion for operations and maintenance, and $200 million for military construction. The remaining $3.1 billion includes foreign military sales ($1 billion), reimbursables ($1 billion), and military pay ($1.1 billion).

AFSC administers thirty-four percent of the total Air Force budget, although comprising only 6.6 percent of Air Force people. The command—through the Air Force Contract Management Division—currently administers more than 24,000 active contracts valued at approximately $141 billion.

The following research, development, and systems acquisition milestones are among the most significant accomplishments recorded by AFSC during the past year:

• Aeronautical Systems Division launched full-scale development of the C-17 to meet long-term inter- and intratheater airlift needs. ASD also is acquiring fifty C-5Bs to meet near-term airlift needs.



Computers are playing a more and more important role in the work of Air Force Systems Command. This is an example of computer-aided design, a process that allows engineers to develop and test models and modifications much faster than the conventional method of having to draw each new design by hand.

• Strategic force improvement continues on schedule for the B-1B, with several operational aircraft delivered to SAC at Dyess AFB, Tex.

• The Air Force's new Aeropropulsion Systems Test Facility (ASTF) at the Arnold Engineering Development Center in Tennessee achieved initial operational capability in September. The ASTF will be used to test the complex propulsion systems being proposed and designed for advanced military aircraft.

• The Aerospace Medical Division's Harry G. Armstrong Aerospace Medical Research Laboratory at Wright-Patterson AFB, Ohio, completed a prototype helmet that superimposes flight data on a pilot's field of vision. The helmet, known as the Visually Coupled Airborne Systems Simulator, uses a TV picture tube one inch in diameter and optics that relay images from the tube to the pilot's eye in order to give the flyer a three-dimensional view over an area of 120 degrees. VCASS allows the pilot to monitor all of the aircraft's systems without looking away from terrain or targets.

• In September, a division of the 6595th Aerospace Test Group at Vandenberg AFB, Calif., made a successful first intercept of an object in space with the air-launched antisatellite (ASAT) weapon system. An F-15 launched the two-stage ASAT missile at an experimental satellite about 350 miles over the Pacific.

• The Air Force Weapons Laboratory provided an Improved High-Altitude Radiation Detection System to other commands in 1985. The system will alert command authorities to high-altitude nuclear bursts affecting communications.

• The Air Force Space Technology Center initiated programs in such diverse areas as infrared sensors, cryocoolers, and space computing. The Center's largest program, the Sagittar Experiment, supports the Strategic Defense Initiative. Sagittar contracts totaling nearly $53 million will develop the technologies needed to build space-based hypervelocity launchers for ballistic missile defense.

• The first use of the Space Shuttle for the Strategic Defense Initiative organization was successful in June when engineers used a four-watt laser beam to track the orbiter *Discovery* as it flew about 200 nautical miles above the Air Force Maui Optical Station in Hawaii.

• The first full-scale-development,

guided-missile launch of the Advanced Medium-Range Air-to-Air Missile (AMRAAM, or AIM-120A) was successful at Eglin AFB, Fla., in May 1985.

• Armament Division's work on a new version of a 2,000-pound bomb culminated in 1985 when a bomb penetrated and destroyed a target buried inside a granite mountain.

• In 1985, the Ballistic Missile Office at Norton AFB, Calif., continued its flight-test program for the Peacekeeper missile by successfully launching four flight-test missiles from Vandenberg AFB, Calif. Included in those firings were the first two flights of a Peacekeeper from a modified Minuteman silo. All previous test launches had been from an above-ground test pad.

• The first airborne test of an unconventional aircraft wing that can be reshaped in flight for optimum aerodynamic efficiency has been carried out at Edwards AFB. The concept, called the Mission Adaptive Wing, features a built-in system that can change the leading- and trailing-edge curvatures of the modified F-111 while in flight. This concept promises improved maneuverability, fuel efficiency, handling qualities, payload, and range capabilities.

• The Electronic Systems Division, Hanscom AFB, Mass., began full-scale development of the Joint Surveillance Target Attack Radar System (JSTARS). Built around a ground-watching radar in a C-18 (Boeing 707) aircraft, this Air Force/Army system promises to revolutionize ground warfare by providing real-time battlefield surveillance and attack management on a scale never before possible. JSTARS includes both airborne and ground segments with weapon-targeting capabilities. ■

AIR FORCE SYSTEMS COMMAND

Headquarters, Andrews AFB, Md.

Air Training Command

From its headquarters at Randolph AFB near San Antonio, Tex., Air Training Command recruits, trains, and educates the Air Force's most vital resource—its people. ATC "shows the way" by applying new cost-effective technology and advanced training concepts, providing the Air Force with the qualified professionals needed to meet the challenges of our high-tech future.

It's called the "The First Command"—and rightly so. Virtually all enlisted members and nearly ninety percent of the Air Force's new officers receive their first Air Force experience through ATC. At the Basic Military Training School and the USAF Officer Training School at Lackland AFB, Tex., and at 152 Air Force Reserve Officer Training Corps units at colleges and universities throughout the country, ATC instills professionalism, pride, and discipline in the newest Air Force members and gives them an understanding of the Air Force mission.

More than 66,000 basic trainees passed through Lackland AFB's Basic Military Training Center—the "Gateway to the Air Force"—in FY '85. Close to ninety-five percent of these new airmen also received follow-on technical training from ATC. The command also introduced nearly 6,500 new officers to the Air Force. AFROTC detachments serving 775 colleges and universities commissioned 3,265 line officers and forty-seven doctors, lawyers, and nurses last year. The command's other commissioning program, OTS, produced 3,158 new second lieutenants in FY '85, including 850 Air Force prior-service members entering the officer corps. *(For Air Force Recruiting Service results, see the accompanying box.)*

But ATC goes beyond the basics in introducing "new blues" to their Air Force careers. The command's thirteen major installations host six technical training centers, six undergraduate pilot training wings, one pilot instructor training wing, and one basic and advanced navigator training wing. ATC also operates from three survival training locations and a network of field training units at ninety-six locations worldwide. This career training is crucial to the Air Force's ability to meet its mission and touches nearly every Air Force member. ATC trained more than 330,000 officers and airmen in FY '85 alone.

The ATC "schoolhouse"—the largest education and training system in the free world—offers 4,200 courses in 350 different career specialties. There are introductory, refresher, and advanced courses for officers and enlisted members, all geared toward providing a skilled, dedicated force.

Toward that end, the Community College of the Air Force was founded in 1972 to provide enlisted members with an opportunity for job-related postsecondary education in every Air Force career field. CCAF is unique in that it is the only institution of higher education within the Department of Defense awarding degrees only to enlisted members. It's an accredited college system with 250,000 registered students and has granted more than 42,000 associate of applied science degrees.

ATC's training and education opportunities have built an impressive fighting force, both on the ground and in the air. In FY '85, the command pinned wings on 1,664 active-duty pilots, including forty-five women, and 750 active-duty navigators, including twenty-three women. ATC also supported the Total Force concept by training 164 Air Force Reserve and Air National Guard pilots and eighty-seven navigators as well as forty-seven pilots and eighty-nine navigators from allied nations.

ATC works closely with other services to meet joint training needs. For example, Air Force helicopter pilots are trained in association with the US Army at Fort Rucker, Ala. The 323d Flying Training Wing at Mather AFB, Calif., produced 186 Navy and Marine Corps navigators in FY '85. The command also trains allied pilots. In FY '85, the 80th Flying Training Wing at Sheppard AFB, Tex., trained 112 US pilots and 121 from allied European nations through the Euro-NATO Joint Jet Pilot Training (ENJJPT) program. Approximately 243 pilots will be involved in this year's program.

ATC helps the Air Force get the most out of its people, but the command is also seeking ways to get the most from its own resources. ATC has several programs in place that support the Air Force's Reliability and Maintainability 2000 plan, including the Pacer Classic modifications to improve and extend the service life of the T-38 supersonic jet trainer. The T-38 is already twenty-five years old, and ATC projects that it will still be around in the twenty-first century. The modified T-38 will be easier to maintain and more dependable in its new configuration. Improved maintenance and supply procedures in ATC provide a better work atmosphere for its maintenance people. All this should help the command uphold its unequaled safety record while meeting its training mission with fewer support personnel.

The saying that "you never get a second chance to make a first impression" is taken seriously at ATC, where the Air Force's first encounter with new recruits shapes the careers that will determine the success or failure of our mission. ATC instills the pride, professional competence, and dedication to duty that have forged today's high-quality force and will allow USAF to take charge of the future. ■

Recruiting: Getting Better and Better

The United States Air Force Recruiting Service ended FY '85 with the best recruiting year ever. Recruiters exceeded recruiting goals in a traditionally tough area, physician recruitment.

In 1985, recruiters brought in more than 65,000 people with no previous military service. Of these, more than ninety-eight percent are high school graduates. And almost forty-five percent scored in the top two mental categories. The Air Force particularly needs qualified people to fill enlisted specialties requiring technical aptitude.

Recruiters also placed in critically manned specialties more than 2,000 people with prior military service.

Recruiters brought in more than 3,000 college graduates to fill rated and support requirements. Additionally, medical recruiting teams recruited more than 1,500 physicians, dentists, nurses, and other health professionals. They provide top-quality medical care to a growing number of active-duty, retired, and dependent members.

Air Force recruiters will seek about 71,000 volunteers in all programs to meet the challenges of FY '86.

With headquarters at Randolph AFB, Tex., the Recruiting Service commander also functions as Air Training Command's Deputy Chief of Staff for Recruiting.

Recruiting Service is composed of a headquarters staff, five recruiting groups, and thirty-five recruiting squadrons. Some 1,300 recruiting offices are located throughout the United States, Puerto Rico, Guam, and at some areas in Europe and the Pacific with large American populations.

About 500 new recruiters are needed each year to help meet Air Force personnel requirements. Career noncommissioned officers interested in learning more about this challenging duty should call CMSgt. Don J. Haygood, Recruit-the-Recruiter Team chief, at AUTOVON 487-2812.

Aircrew members prepare a Northrop T-38 Talon for launch at Laughlin AFB, Tex. Over the last quarter century, almost every pilot in the Air Force received his or her advanced training in this supersonic aircraft. (USAF photo by TSgt. Bill Thompson, Airman Magazine)

AIR TRAINING COMMAND

Headquarters, Randolph AFB, Tex.

Commander
Gen. Andrew P. Iosue

Technical Training Center
Lowry AFB, Colo.

3400th Technical Training Wing
3320th Correction and Rehabilitation Squadron

Technical Training Center
Chanute AFB, Ill.

3330th Technical Training Wing

Technical Training Center
Keesler AFB, Miss.

3300th Technical Training Wing

Technical Training Center
Goodfellow AFB, Tex.

3480th Technical Training Wing

Community College of the Air Force*
Maxwell AFB, Ala.

Air Force Reserve Officer Training Corps*
Maxwell AFB, Ala.

Foreign Military Training Affairs Group
Randolph AFB, Tex.

Officer Training School, USAF
Lackland AFB, Tex.

San Antonio Contracting Center

San Antonio Real Property Maintenance Agency

Technical Training Center
Sheppard AFB, Tex.

3700th Technical Training Wing
3785th Field Training Wing
USAF School of Health Care Sciences

Air Force Military Training Center
Lackland AFB, Tex.

Basic Military Training School, USAF
3250th Technical Training Wing
Defense Language Institute English Language Center**

USAF Recruiting Service
Randolph AFB, Tex.

Recruiting Groups

3501st—Hanscom AFB, Mass.
3503d—Robins AFB, Ga.
3504th—Lackland AFB, Tex.
3505th—Chanute AFB, Ill.
3506th—Mather AFB, Calif.

ATC Specialized Direct Reporting Units

3303d Contracting Squadron
Randolph AFB, Tex.
3304th School Squadron (ATC NCO Academy)
Lackland AFB, Tex.
3305th School Squadron
Randolph AFB, Tex.
3306th Test and Evaluation Squadron*
Edwards AFB, Calif.
3307th Test and Evaluation Squadron
Randolph AFB, Tex.
3314th Management Engineering Squadron
Randolph AFB, Tex.
3507th Airman Classification Squadron
Lackland AFB, Tex.
3588th Flying Training Squadron
Fort Rucker, Ala.
USAF Occupational Measurement Center
Randolph AFB, Tex.
3308th Technical Training Squadron (Advisory)
Randolph AFB, Tex.
3309th Training Readiness Squadron
Randolph AFB, Tex.
USAF Instrument Flight Center
Randolph AFB, Tex.

Undergraduate Pilot Training

14th Flying Training Wing
Columbus AFB, Miss.

47th Flying Training Wing
Laughlin AFB, Tex.

64th Flying Training Wing
Reese AFB, Tex.

71st Flying Training Wing
Vance AFB, Okla.

80th Flying Training Wing
Sheppard AFB, Tex.

82d Flying Training Wing
Williams AFB, Ariz.

Navigator Training
323d Flying Training Wing
Mather AFB, Calif.

Pilot Instructor Training
12th Flying Training Wing
Randolph AFB, Tex.

3636th Combat Crew Training Wing* (Survival)
Eielson AFB, Alaska*

3612th Combat Crew Training Squadron*
(Fairchild AFB, Wash.)
3613th Combat Crew Training Squadron*
(Homestead AFB, Fla.)
3614th Combat Crew Training Squadron*
(Fairchild AFB, Wash.)

*Tenant unit
**DoD Executive Agent

Air University

Air University (AU), headquartered at Maxwell AFB, Ala., provides professional military education (PME) and degree-granting and professional continuing education (PCE) for officers, NCOs, and civilians.

Most of AU's PME schools are located at Maxwell AFB. These include Air War College (AWC) for senior officers, Air Command and Staff College for mid-career officers, and Squadron Officer School (SOS) for company-grade officers. The Air Force Senior Noncommissioned Officer Academy, the highest level of NCO PME, is located at nearby Gunter AFS.

Other major AU organizations include the Leadership and Management Development Center (LMDC), the Center for Aerospace Doctrine, Research, and Education (CADRE), the Educational Development Center (EDC), the Air University Library, and Headquarters Civil Air Patrol-USAF (all at Maxwell); the Extension Course Institute (ECI) and the Air Force Logistics Management Center at Gunter AFS; and the Air Force Institute of Technology (AFIT), located at Wright-Patterson AFB, Ohio.

The 3800th Air Base Wing is the host unit, and its primary mission is to operate and maintain Maxwell AFB and Gunter AFS by providing total logistical support and base services to Air University and other tenant organizations. Specific responsibility for supporting tenant units at Gunter rests with the 3800th Air Base Squadron.

Nearly 2,800 military and 1,700 civilian personnel are permanently assigned to AU. More than 11,792 military and civilians completed resident AU classes last year. Thousands more completed courses through nonresident seminar and correspondence programs.

AWC initiated major programs to enhance the Air Force's warfighting capability by emphasizing the unique skills, perspectives, knowledge, and analytical thinking required of senior officers. These programs are: faculty enhancement with emphasis on recruiting, training, education, evaluation, and image; addition of seven faculty advisory chairs for select major command representatives; procurement of computer educational aids to facilitate curriculum development and student learning; and a restructured Command and Leadership course. AWC also conducted an extensive associate program worldwide, with more than 9,100 senior officers and DoD civilians enrolled.

The seven-member AU Air Force National Security Briefing Team completed its third successful year of increasing public awareness of key national security issues. The team has now presented 800 briefings in forty-three states.

Designated the clearinghouse for Air Force wargaming applications, the Air Force Wargaming Center (AFWC) was completed in January 1986. The AFWC, a directorate of CADRE, will operate a computer-assisted wargaming system now in development and called the Command Readiness Exercise System (CRES). CRES will support extensive exercises and scenarios using notional or real-world data to teach wartime decision-making and to explore new concepts and strategies. AFWC will begin supporting Air Force PME courses in the summer of 1986, joint wargaming with other services' PME institutions by the summer of 1987, and operational wargaming for senior commanders and staffs in 1989.

Also a part of CADRE, the Combined Air Warfare Course increased its coverage of areas other than Europe better to prepare its graduates for joint or combined service in all theaters. Additionally, the organization expanded its course offerings with the newly developed Contingency/Wartime Planners Course.

CADRE's Airpower Research Institute expanded its research efforts. In 1985, the institute hosted seventeen visiting research scholars from fourteen different commands. The institute's permanent staff also played a major role in the development of several Air Force doctrinal publications.

ACSC hosted its second annual Latin American Symposium. Fifty military officers, career diplomats, and private citizens from fifteen countries attended. The ACSC Associate Programs introduced a new curriculum and student data management system better to serve student needs and prepare for the introduction of computer-directed instruction.

SOS highlighted 1985 with a faculty reunion and a "Leadership Symposium" celebrating thirty-five years of education excellence. The communicative skills program was revised to stress staff writing and briefing concepts. SOS is also working with AFWC to install computer terminals in each classroom for force employment exercises.

To improve professional military education for senior NCOs, the USAF Senior NCO Academy completed a $1.6 million building addition and renovation project. This project consolidates staff, faculty, and students in one facility for the first time.

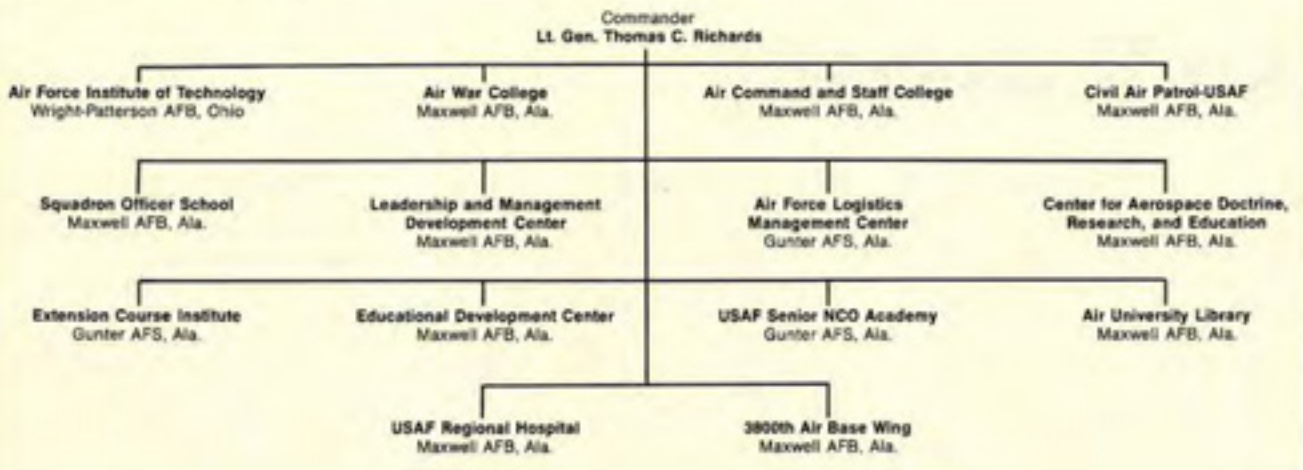
Professional development courses were provided by LMDC through six professional continuing education schools that offer forty-three courses in specialized areas. Courses in such career fields as comptroller, judge advocate, chaplain, personnel, aircraft maintenance, resource management, and systems information graduated more than 3,500 students. Wing and base commanders attended courses on commander's responsibilities. LMDC also provided management consultant services to commanders and conducted a wide variety of research efforts.

EDC continued to manage three diverse functions. Academic Instructor School prepared students to teach by using a competency-based education program, while the International Officer School prepared international students for instruction at AU PME schools. Air University Television operated an Air Force special-mission color teleproduction facility and cable network in direct support of AU schools.

AFIT offers advanced education, conducts basic and applied research, and provides expertise to develop, manage, and operate Air Force and DoD defense systems. Nearly 21,000 Air Force, DoD, and international stu-

AIR UNIVERSITY

Headquarters, Maxwell AFB, Ala.



dents took part in AFIT programs in FY '85. Through AFIT's Civilian Institutions program, nearly 5,000 Air Force members attended more than 300 institutions worldwide. The School of Systems and Logistics leads the Air Force and other services in areas of combat logistics, contract administration, and weapon system acquisition. Through their School of Engineering, nearly 2,500 students received education in the newest civil engineering techniques and management skills. The School of Engineering is the eleventh largest engineering school in America, based on master's degrees awarded yearly. Work in this school includes basic research in fields ranging from image processing and robotics to artificial intelligence.

Future AFIT plans call for development of software management courses, an information resource management master's degree, and a new science and research building. Expansion of laboratory facilities for strategic computing and allocation of resources for reliability and maintainability will ensure AFIT's educational leadership into the next century.

The year 1985 was also one of success for other AU activities. The *Air University Review*, the professional journal of the Air Force, won a first-place Blue Pencil Award. Published bimonthly in English and quarterly in Spanish and Portuguese, its English circulation is 30,000.

The stunning new AU Library interior, completed in 1985, was one of five "Honor Award" recipients among the fifteen "best in the Air Force" design projects in the Ninth Annual Air Force Design Awards Program. The largest and most comprehensive military library in the free world, AUL has begun implementation of an ambitious automation program. When completed, the $600,000 system will support up to 100 terminals capable of accessing the facility's impressive research collections from anywhere in AU.

Also active under the AU umbrella is Hq. CAP-USAF, the Air Force organization that advises and assists Civil Air Patrol in its primary missions of emergency services, aerospace education, and a cadet program for youth. Some 205 active-duty military and civilian personnel are assigned to CAP-USAF throughout the US and Puerto Rico in support of the Civil Air Patrol. In recognition of outstanding search and rescue performance, the Civil Air Patrol received the Military Airlift Command Distinguished Citizen Award for 1985. ■

Alaskan Air Command

Alaska, with its 586,000 square miles, 3,000,000 lakes, and more than 33,000 miles of coastline, is not always a land of ice and snow. Yet the harsh Arctic environment and the war against cold are factors the men and women of Alaskan Air Command must contend with in fulfilling the command's motto of providing "Top Cover for America."

AAC is charged with providing, training, and equipping tactical air forces to preserve the national sovereignty of United States lands, waters, and airspace.

Responsibility for AAC's vast area of operations lies with the 813 officers, 6,578 enlisted people, and 1,430 civilian employees of the command.

Alaska's military significance and strategic location have been recognized for many years. At no other place on the globe are the US and USSR closer together. The two land masses are separated by only forty-four nautical miles at the Bering Strait.

Alaska lies across the Great Circle routes connecting the Orient with Europe and North America, making it an ideal location for deployment or refueling of aircraft flying polar routes.

The AAC commander also serves as commander, Alaskan North American Aerospace Defense Command Region. As the senior military officer in Alaska, he is the coordinating authority for all joint military administrative and logistical matters in Alaska and is the military point of contact for the state.

In the event of natural disaster, emergency, or when directed by the Joint Chiefs of Staff, the AAC commander becomes the commander, Joint Task Force-Alaska (JTF-AK).

In addition to numerous command post exercises, the JTF-AK concept of operations is field-tested every other year during Brim Frost, a major joint Arctic training exercise.

AAC people are assigned to three main bases and two forward operating bases. The main bases are Elmendorf AFB, adjacent to Anchorage; Eielson AFB, twenty-six miles southeast of Fairbanks; and Shemya AFB, near the tip of the Aleutian Islands chain. Galena and King Salmon Airports are forward operating bases that host alert F-15 Eagle aircraft from Elmendorf.

AAC, which celebrated its fortieth anniversary in December 1985, is headquartered at Elmendorf, home also of the 11th Tactical Control Group, 21st Tactical Fighter Wing, and 21st Combat Support Group. Assigned to the 21st TFW are the 43d Tactical Fighter Squadron, flying F-15 Eagles, and the 5021st Tactical Operations Squadron, flying T-33 Shooting Stars.

Aircraft as well as equipment and personnel from the 21st TFW deployed to Team Spirit '85 (Korea), Cope North '85 (Japan), and Combat Archer (Tyndall AFB). Additionally, wing assets participated in six NORAD exercises and hosted Air National Guard and Air Force Reserve forces during 1985.

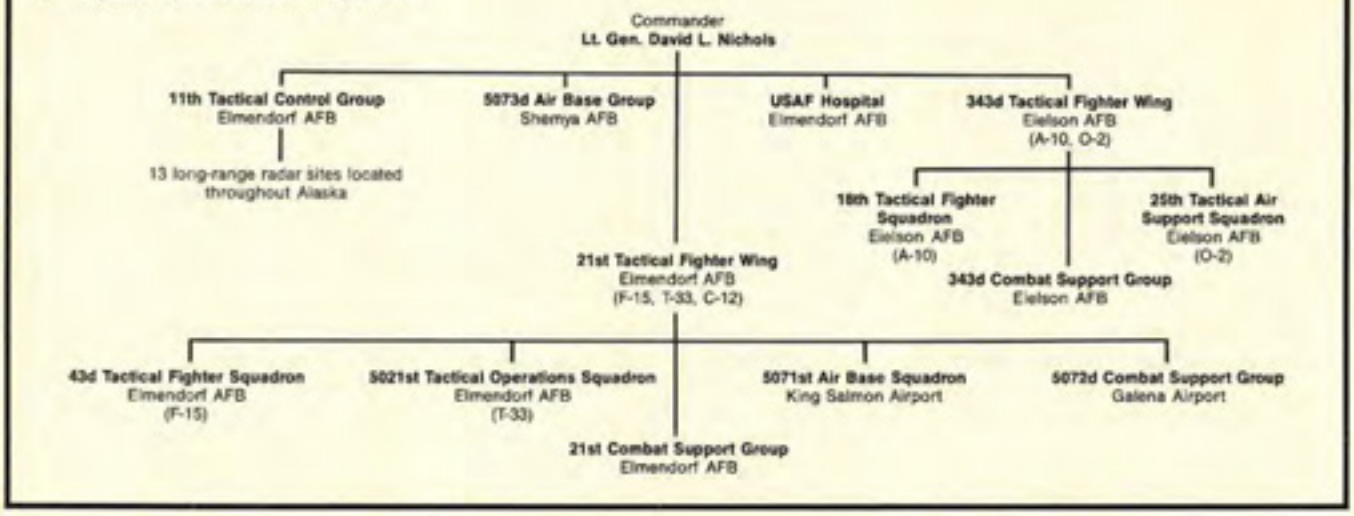
Fighters from the 21st TFW intercepted more than thirty Soviet aircraft near Alaskan airspace during 1985. Of particular interest were the 21st TFW's intercepts of Soviet Bear H bombers. These intercepts marked the first time Soviet Bear Hs had been intercepted by United States aircraft off the coast of Alaska.

Eielson AFB, named in honor of Carl Ben Eielson, a famed Arctic pioneer, Alaskan aviator, and 1985 inductee into the National Aviation and Aerospace Hall of Fame, is headquarters for the 343d Tactical Fighter Wing and 343d Combat Support Group. The wing's 18th Tactical Fighter Squadron operates the command's A-10 Thunderbolt II close air support aircraft, while the 25th Tactical Air Support Squadron flies O-2A forward air control aircraft.

Aircraft, equipment, and personnel from the 343d TFW deployed to Gunsmoke '85, Opportune Journey (Hawaii), and Air Warrior (California) during 1985. The 25th TASS deployment of six O-2s to Air Warrior marked the longest deployment in the squadron's history. The 343d CES Prime BEEF personnel deployed as part of the AAC Prime BEEF Team for the first

ALASKAN AIR COMMAND

Headquarters, Elmendorf AFB, Alaska



time outside the United States (to Korea) in support of Team Spirit '85. Additionally, 1985 saw the activation of the 343d Services and the 5055th Range Squadrons at Eielson AFB.

Continuing efforts to upgrade facilities at Eielson AFB saw the Cool Home construction start of 300 new enlisted housing units, refurbishment of the base dining facility, renovation of the NCO Open Mess dining room, renovation of the base gymnasium, use of new ground equipment and Temporary Lodging Facilities, beginning of the Base Exchange mini-mall project, and beginning of construction for a new aircraft maintenance hangar and a consolidated medical/dental clinic.

The 11th TCG is responsible for the 3d Air Support Operations Center, the Region Operations Control Center (ROCC), and the command's thirteen long-range radar sites. Modernization and innovation characterized the 11th during 1982–85. This modernization of the thirty-year-old Alaskan Air Defense System was marked by radar system conversion and continued integration of the Joint Surveillance System (JSS) into the 11th TCG's ROCC.

In the new JSS system, data from the 11th TCG's thirteen radar sites is received via satellite and displayed on consoles at the ROCC. From the ROCC, F-15 fighters are directed by radios that are remoted via satellite to locations anywhere in Alaska.

The radar system modernization, called Seek Igloo, includes conversion to new solid-state, minimally attended radars, or MARs, and new facility construction at the remote sites. The thirteen long-range radar sites located along the western periphery and interior of the state are now maintained and operated by contractor personnel, saving the Air Force about $108 million annually compared to costs in the mid-1970s. Also, 1,500 blue-suit remote assignments have been totally eliminated as a result of these successful programs.

Under the Seek Igloo program in 1985, the last five Seek Igloo radars were accepted at Tatalina, Cold Bay, Cape Lisburne, Cape Romanzof, and King Salmon. The combination of the JSS and Seek Igloo upgrade programs will save the Air Force more than $1 billion over the next twenty years.

To provide backup for current single-thread satellite communications, AAC has successfully employed Meteor Burst communications technology. In addition to providing radar data from remote long-range radar sites, Meteor Burst communications can also be used to direct fighter intercepts.

AAC operates the Elmendorf Rescue Coordination Center (RCC). The RCC coordinates search-and-rescue efforts involving aircraft and people from all military services and many federal, state, local, and civil volunteer agencies. During 1985, the RCC coordinated emergency assistance for 158 military and civilian persons in distress and was credited with saving fifty-five lives. Since its inception in October 1961, the RCC has recorded more than 3,000 saves and assisted more than 11,000 people. ■

Protecting America's northern flank is the job of the Alaskan Air Command. Here an F-15 from the 21st Tactical Fighter Wing intercepts a Soviet Bear H over Alaska's northern coast.

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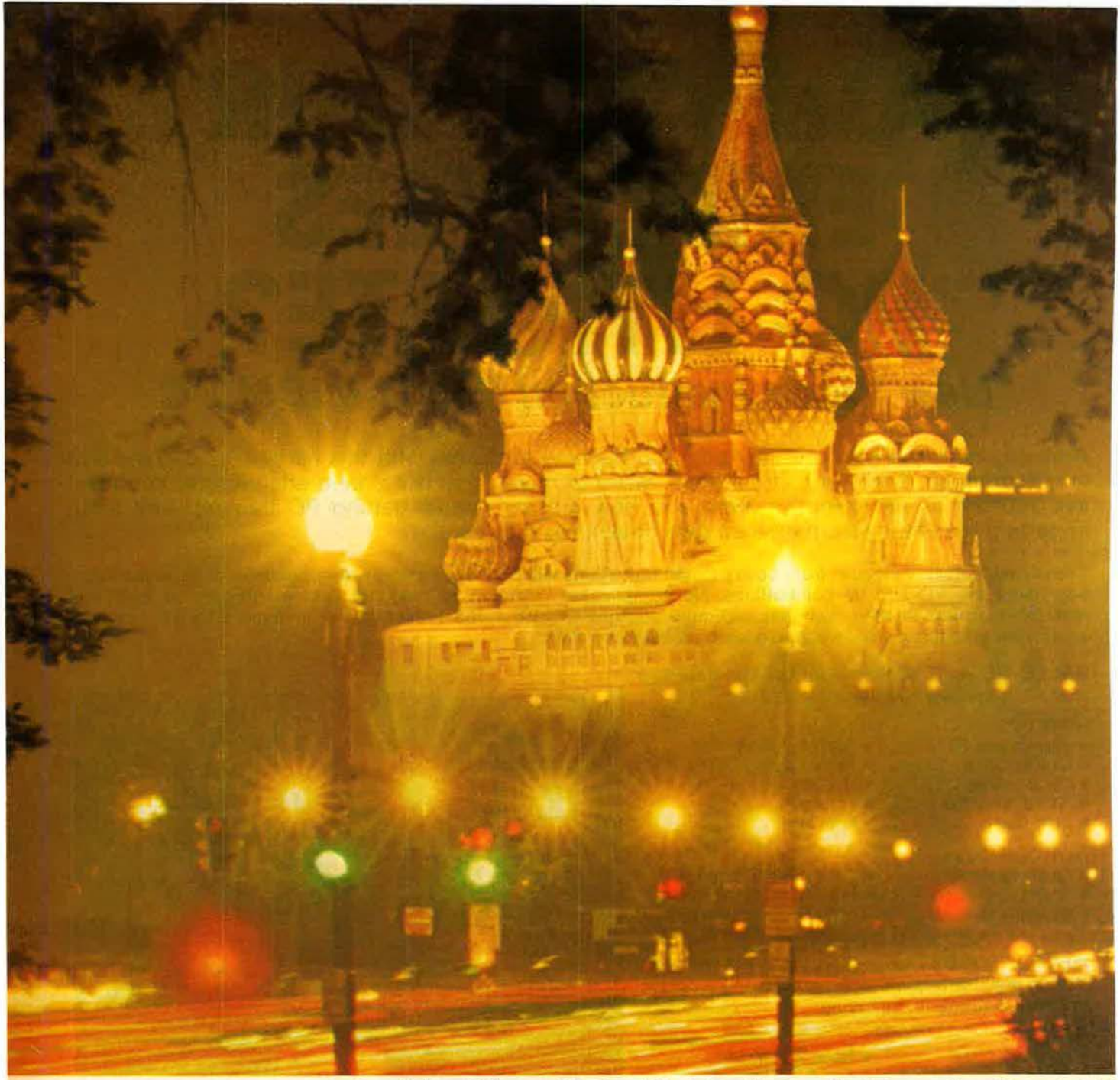

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Electronic Security Command

The Electronic Security Command (ESC), with headquarters at Kelly AFB, Tex., is commanded by Maj. Gen. Paul H. Martin. The 13,250-member command plays a vital role in developing ways to exploit, analyze, jam, confuse, or destroy opposing command control and communications systems. At the same time, it ensures that Air Force communications are protected from enemy exploitation. The command provides all-source intelligence, electronic combat (EC), operations and communications security (OPSEC and COMSEC), and communications support. These specialized services are provided to the US Air Force and unified and specified commands for exercises, contingencies, and real-world events.

The command plays an important role in developing US Air Force electronic warfare (EW) and command control and communications countermeasures (C^3CM) capabilities, techniques, and systems. By providing C^3CM training to operational support elements during exercises, ESC helps prepare the Air Force team for combat operations in a hostile electromagnetic environment. To help the tactical commander satisfy his C^3CM requirements, ESC develops, maintains, updates, and disseminates the Air Force C^3CM support data base. The command also advises combat commanders of their electronic combat options.

ESC is also the USAF executive agent and lead command for operations security administrative support, technical services, and assistance to Air Force OPSEC planning. The OPSEC program enhances mission effectiveness by contributing to the overall security for all Air Force operations. To assist US Air Force commanders in evaluating their OPSEC posture, ESC COMSEC surveillance units monitor Air Force radio and telephone communications to determine whether information of intelligence value is being exposed to enemy exploitation. They report their

ELECTRONIC SECURITY COMMAND

Headquarters, Kelly AFB, Tex.

Commander
Maj. Gen. Paul H. Martin

Hq. 6940th Electronic Security Wing
Fort George G. Meade, Md.

6933d Electronic Security Squadron
Howard AFB, Panama

6941st Electronic Security Squadron
Fort George G. Meade, Md.

6942d Electronic Security Squadron
Fort George G. Meade, Md.

6943d Electronic Security Squadron
Fort George G. Meade, Md.

6944th Electronic Security Squadron
Fort George G. Meade, Md.

6945th Electronic Security Squadron
Fort George G. Meade, Md.

6947th Electronic Security Squadron
Homestead AFB, Fla.

6994th Electronic Security Squadron
Fort George G. Meade, Md.

Hq. 6960th Electronic Security Wing
San Antonio, Tex.

6906th Electronic Security Squadron

6923d Support Squadron

6948th Electronic Security Squadron

6960th Security Police Squadron

6964th Computer Services Squadron

6993d Electronic Security Squadron

Hq. Electronic Security Alaska
Elmendorf AFB, Alaska

6981st Electronic Security Squadron
Elmendorf AFB, Alaska

6985th Electronic Security Squadron
Eielson AFB, Alaska

Hq. Electronic Security Strategic
Offutt AFB, Neb.

6949th Electronic Security Squadron
Offutt AFB, Neb.

Hq. Electronic Security Europe
Ramstein AB, Germany

Hq. 6910th Electronic Security Wing
Lindsey AS, Germany

6913th Electronic Security Squadron
Augsburg, Germany

6918th Electronic Security Squadron
Sembach AB, Germany

6911th Electronic Security Squadron
Hahn AB, Germany

6952d Electronic Security Squadron
RAF Alconbury, UK

Hq. 6912th Electronic Security Group
Tempelhof Airport, Berlin

6915th Electronic Security Squadron
Bad Aibling, Germany

6916th Electronic Security Squadron
Hellenikon AB, Greece

Hq. 6917th Electronic Security Group
San Vito AS, Italy

6931st Electronic Security Squadron
Iraklion AS, Crete, Greece

Hq. 6950th Electronic Security Group
RAF Chicksands, UK

6968th Electronic Security Squadron
RAF Mildenhall, UK

Hq. Electronic Security Pacific
Hickam AFB, Hawaii

Hq. 6903d Electronic Security Group
Osan AB, Korea

Hq. 6920th Electronic Security Group
Misawa AB, Japan

6922d Electronic Security Squadron
Clark AB, Philippines

6924th Electronic Security Squadron
Wheeler AFB, Hawaii

Hq. 6990th Electronic Security Group
Kadena AB, Japan

DIRECT REPORTING UNITS

Hq. Electronic Security Tactical
Langley AFB, Va.

Det. 1
Eglin AFB, Fla.

Det. 2
Davis-Monthan AFB, Ariz.

Det. 3
Nellis AFB, Nev.

Hq. Air Force Electronic Warfare Center
San Antonio, Tex.

Hq. Air Force Cryptologic Support Center
San Antonio, Tex.

Electronic Security Combat Operations Staff
San Antonio, Tex.

6962d Management Engineering Flight
San Antonio, Tex.

findings to US Air Force commanders, who can take corrective actions to minimize the damage from such intelligence leaks.

ESC is made up of two centers, three wings, six groups, twenty-nine squadrons, numerous operating detachments and locations, and five major command liaison staffs at locations around the world. Additional support is provided by mobile units and US Air Force Reserve mobilization augmentees. Ninety percent of ESC's people are enlisted, and the command has the highest percentage of women specialists in the Air Force.

Closely supporting efforts of ESC field units and other commands are the Air Force Electronic Warfare Center (AFEWC) and the Air Force Cryptologic Support Center (AFCSC).

Both, although subordinate to the command, are also primary managers of Air Force-wide programs. AFEWC is a primary source of EC analysis and advice for the Air Force. Its members use high-speed computers to provide senior battle commanders with analytical reports on major exercises and on EC systems effectiveness worldwide. The data they provide assists strategic and tactical commanders in making electronic combat decisions. They also perform analyses to support the planning, development, test, and use of the latest electronic combat equipment.

The Air Force Cryptologic Support Center is responsible for the Air Force's Information Systems Security (ISS) program, comprising communications security (COMSEC), emanations security (TEMPEST), and computer security (COMPUSEC). AFCSC also provides engineering and logistics support for ESC operational mission activities. The Center logistically manages and accounts for cryptographic devices, codes, call signs, and documents that protect Air Force information systems, provides analytical and engineering services to Air Force activities worldwide, performs depot maintenance on Air Force cryptologic equipment and systems, and develops and distributes ISS multimedia educational materials to all Air Force MAJCOMs and SOAs.

The command provides support to the Joint Electronic Warfare Center, which is collocated with Headquarters ESC. ESC's commander, General Martin, is the JEWC's director.

The command's mobile units deploy to support major exercises, such as Team Spirit, Bright Star, Cold Fire, Red Flag, Central Enterprise, Brim Frost, Green Flag, and many others. During these exercises, ESC provides a hostile electronic warfare environment that US forces might encounter in actual combat, including electronic disruption techniques through the use of mobile and self-contained jamming and deception vans.

Support to tactical and strategic commanders is given by ESC officers stationed at the headquarters of Strategic Air Command, Tactical Air Command, Air Force Space Command, United States Air Forces in Europe, Alaskan Air Command, and Pacific Air Forces and by several mobile units. These staff officers are integrated into the commands they support and assist them in their daily operations and planning.

Command units around the world are linked to the headquarters through the facilities of the twenty-four-hour alert center at Kelly AFB. This nerve center provides immediate guidance to its worldwide units.

Electronic Security Command activities have reaped great benefits for the United States by strengthening US defense. The success of ESC's mission continues to be dependent on the excellence of its people worldwide. ■

Military Airlift Command

From headquarters at Scott AFB, Ill., Military Airlift Command (MAC), a specified command of the Department of Defense and a major command of the Air Force, directs more than 94,000 active-duty military and civilians as well as almost 1,000 aircraft at more than 325 locations in twenty-six countries. MAC-gained ANG and AFRES assets comprise 63,000 people and some 400 aircraft.

MAC operates thirteen bases in the United States and controls US facilities at Lajes in Portugal's Azores and at Rhein-Main AB, West Germany. The command is the "backbone of deterrence" for US fighting forces. MAC's major missions include deployment, employment, resupply, and redeployment of combat forces and their support equipment.

The command, which serves as the single manager for DoD airlift, moved more than 499,000 tons of cargo and some 2,323,000 passengers in 1985.

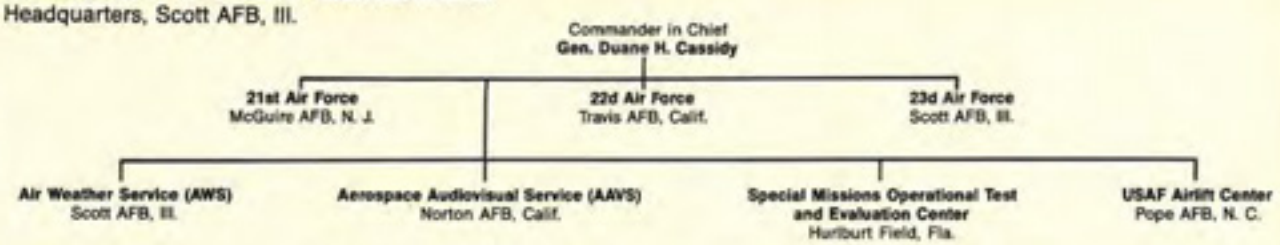
MAC's active-duty airlift forces constitute about half of the capability available to the command under full mobilization. When mobilized, the Air Reserve Forces (ANG and AFRES) provide approximately sixty percent of tactical airlift capability. Reserve Associate units provide half of the aircrews and forty percent of the maintenance personnel for the C-141 and C-5 strategic airlift aircraft. Additionally, they provide thirty percent of the aeromedical airlift crews and twenty percent of the maintenance personnel for the C-9 aeromedical airlift aircraft. Additional airlift is also available through the Civil Reserve Air Fleet (CRAF) program to meet contingency and wartime requirements.

CRAF is a significant part of MAC's total airlift capability. The partnership between the civil aviation industry and Department of Defense began more than three decades ago to meet airlift requirements for contingencies and wartime. CRAF currently consists of twenty-eight commercial carriers providing 366 cargo and passenger aircraft. Should CRAF be activated, these aircraft represent approximately half the airlift available to DoD during times of crisis.

In a related effort to secure additional airlift capability, the Air Force awarded a contract to Pan American World Airways to modify Boeing 747 passenger aircraft with cargo features. The modification adds a cargo door and reinforced floor to existing passenger aircraft. The first aircraft entered the Boeing Wichita facility on February 1, 1985, and was completed the following June. The fourth aircraft is now in modification. After modification, the planes will fly in a passenger configuration until needed by MAC. Twelve aircraft are presently on contract, and the Air Force has options for seven more. The average cost for each of the nineteen aircraft for retrofit and twelve years of increased operating cost is $26.7 million in Fiscal Year 1983 dollars. The addition of these nineteen aircraft will add another 2,900,000 ton-miles per day to our airlift capability.

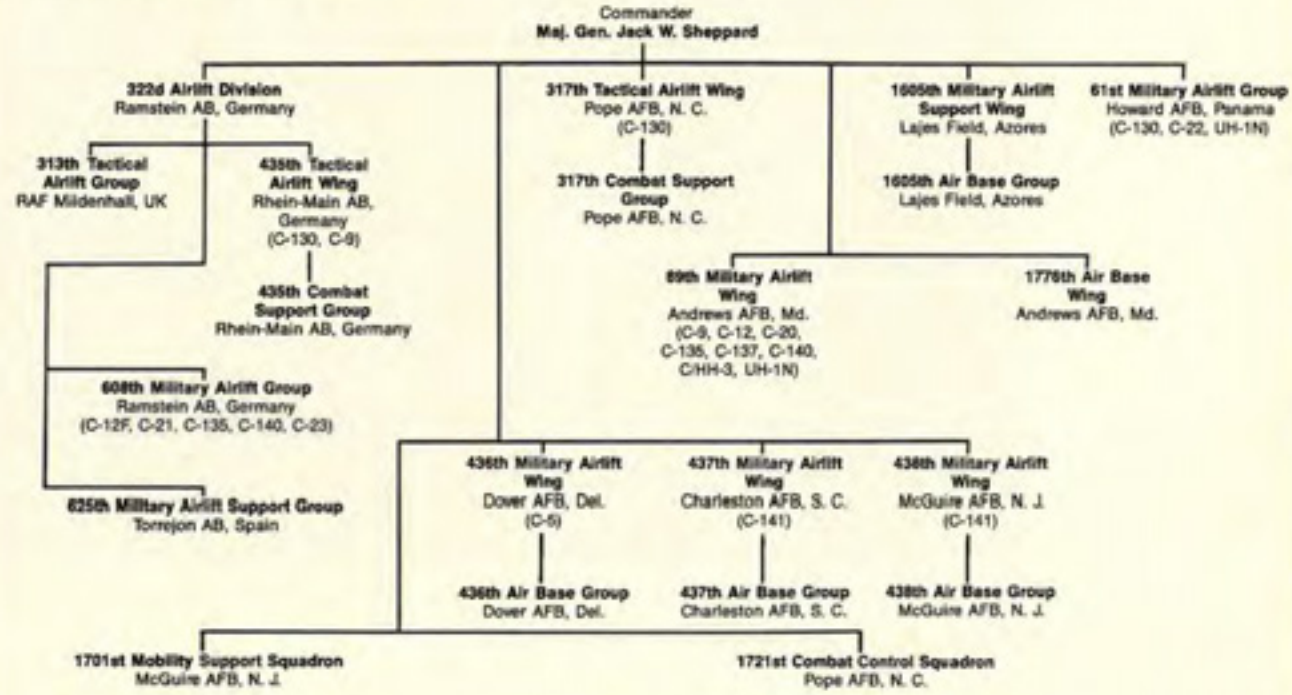
MILITARY AIRLIFT COMMAND

Headquarters, Scott AFB, Ill.



TWENTY-FIRST AIR FORCE (MAC)

Headquarters, McGuire AFB, N. J.



Several other initiatives are also under way to enhance the posture of airlift forces. MAC placed three C-20A (Gulfstream III) aircraft into service to support the special airlift mission of the 89th MAW, Andrews AFB, Md.

MAC's C-5 Galaxy fleet continued the wing modification started in 1983. Lockheed had delivered forty-eight modified aircraft to the command as of December 14, 1985, and plans to complete all C-5s by mid-1987. The modifications strengthen the wings of the C-5 fleet and will provide 30,000 flying hours of aircraft service life after modification. This program not only increases airlift capability but extends the life of the C-5 well into the twenty-first century.

To increase near-term airlift, the Air Force began acquisition of fifty C-5B aircraft for MAC and forty-four more KC-10 aircraft for SAC. MAC received delivery of the first C-5B aircraft in January 1986.

Responding to Air Force's plan to transfer additional strategic airlift assets to the Air Reserve Forces (ARF), MAC began transferring C-5As to the Air Force Reserve and the Air National Guard in July 1985. The 433d Military Airlift Wing at Kelly AFB, Tex., is the lead unit for the Reserve, and the 105th Military Airlift Group at Stewart ANGB, N. Y., is the first for the Guard. Ultimately, MAC plans to transfer forty-four C-5s and eighty C-141Bs to the ARF.

The Air Force received approval in February 1985 from the Defense Systems Acquisition Review Council for full-scale engineering and development of the C-17 aircraft. The C-17 will increase MAC's long-range airlift capability, provide an outsize intratheater airlift capability, and serve as a replacement for aging C-141 aircraft and the capability lost as MAC retires its older, less maintainable C-130s. McDonnell Douglas Aircraft Co. will deliver the first C-17 aircraft in 1990.

In addition to its airlift mission, which is managed by the Twenty-first Air Force, McGuire AFB, N. J., and Twenty-second Air Force, Travis AFB, Calif., MAC is responsible for a number of other demanding missions.

Twenty-third Air Force is MAC's only numbered Air Force with worldwide responsibility. From Scott AFB, it commands all Air Force special operations forces (SOF), combat rescue and recovery forces, and weather reconnaissance aircraft. Twenty-third Air Force also commands CONUS

aeromedical evacuation and operational support airlift forces and helicopter security support for SAC missile sites; supports air sampling, drone recovery, and the Space Shuttle; and is responsible for coordinating federal search and rescue activities in the CONUS. ANG and AFRES forces significantly augment its diverse mission.

Special operations include unconventional warfare, collective security, counterterrorist operations, psychological operations, and civil affairs measures. SOF units fly MC-130 and AC-130 fixed-wing aircraft and UH-1N and HH-53 helicopters. In 1987, the Special Operations Forces (SOF) will begin receiving ten rescue H-53s modified to the HH-53H Pave Low II "enhanced configuration." In 1988, the first seven of twenty-one new MC-130H aircraft will arrive to augment the current MC-130E force. These improvements will considerably enhance the SOF operational capability and deployment flexibility. Additionally, AFRES operates AC-130A and CH-3 SOF aircraft, and the ANG flies EC-130s.

Combat rescue units of the Twenty-third Air Force operate the HH-1H, UH-1N, UH-60A, CH/HH-3E, and HH-53B/C helicopters and the HC-130 fixed-wing aircraft to recover downed crew members in peace and war.

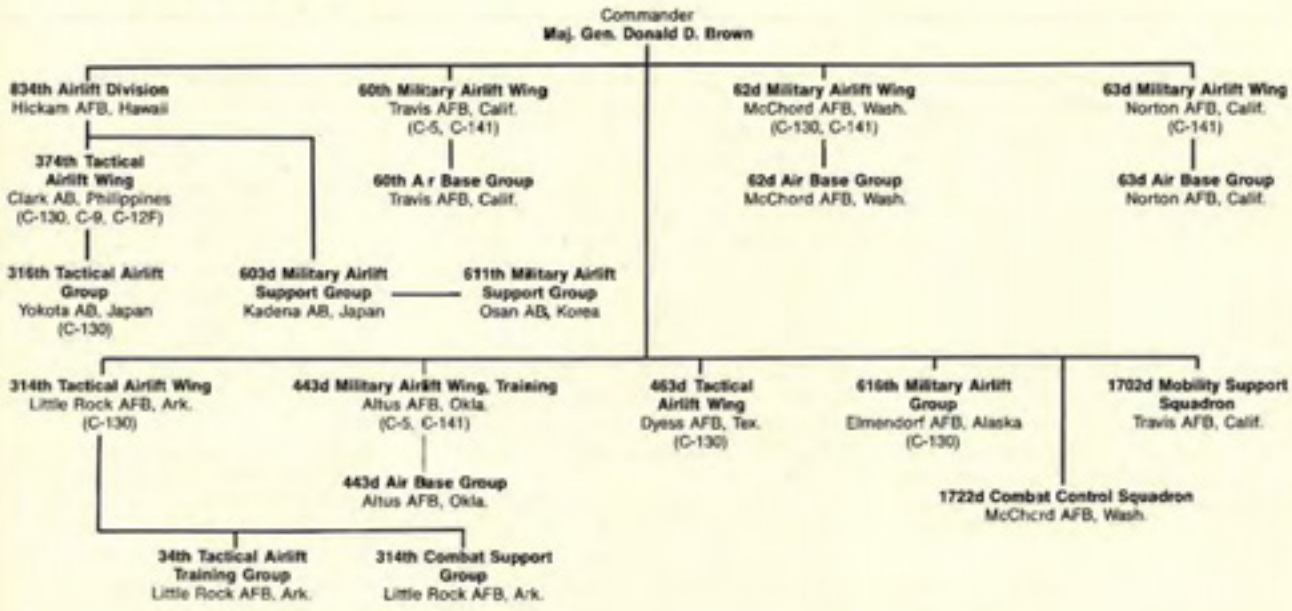
Twenty-third Air Force and AFRES weather reconnaissance units fly the WC-130 and WC-135 aircraft, providing the aerial platforms needed by MAC's Air Weather Service people to perform their mission.

Aerospace Rescue and Recovery Service, an element of Twenty-third Air Force, is the executive management agency for search and rescue (SAR) within the forty-eight continental United States. ARRS operates the Air Force Rescue Coordination Center (AFRCC) at Scott AFB to provide humanitarian assistance by coordi-

One of MAC's many missions is aeromedical airlift. Here a C-9A Nightingale hospital aircraft taxis by a UH-1 Huey helicopter at a recent Reforger exercise.

TWENTY-SECOND AIR FORCE (MAC)

Headquarters, Travis AFB, Calif.



Airlift of troops and equipment to the front lines of a battlefield is MAC's most vital function. These infantrymen are queueing up to board a C-141 during a recent winter exercise. C-141s, along with C-130s, also provide jump platforms for paratroopers.

nating all inland SAR using USAF Rescue, Civil Air Patrol, and other military and federal assets. The AFRCC works closely with state and local agencies and solicits services of police and sheriff departments as well as the US Coast Guard. Rescue forces saved more than 21,000 lives during the past thirty-nine years.

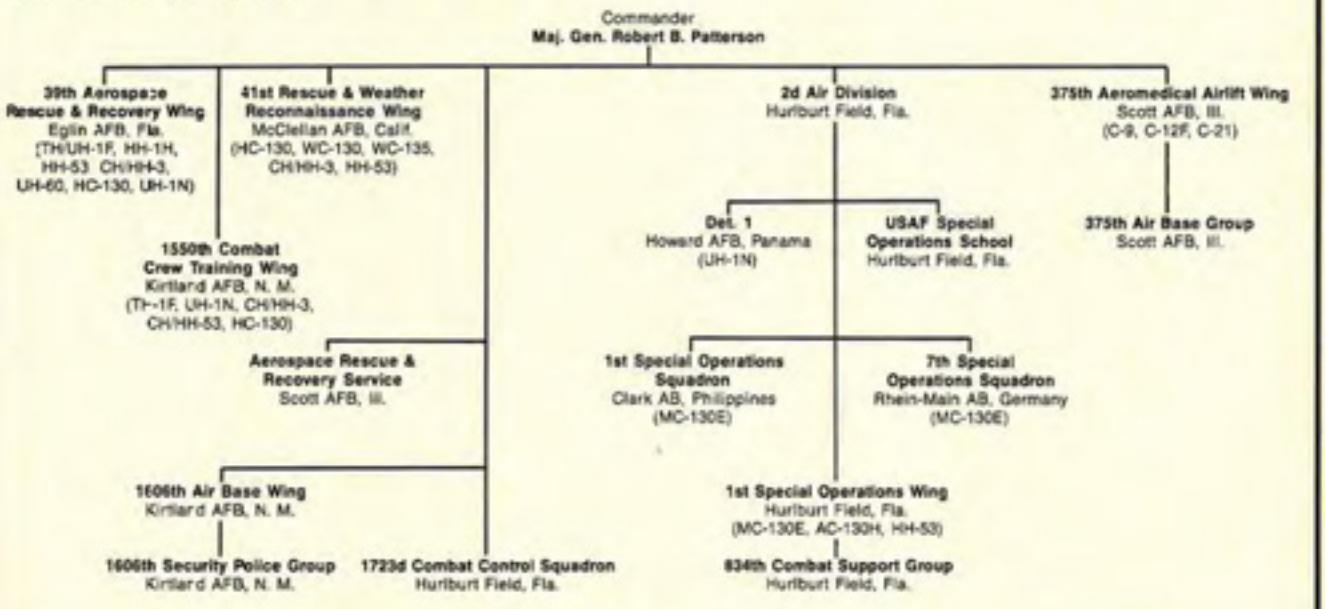
ARRS also operates the US Mission Control Center for the Search and Rescue Satellite-Aided Tracking system. The United States joined several other nations in using low-orbit satellites to "listen" for distress signals from aircraft and ships. SARSAT began as an experiment in 1982 and is now an operational program that greatly assists in locating emergency transmitter signals coming from various points on the globe. Worldwide, SARSAT information helped save more than 340 lives.

Aeromedical airlift is another vital MAC mission. The C-9 Nightingale "air ambulances" of the Twenty-third Air Force's 375th Aeromedical Airlift Wing tie into the MAC airlift system to move thousands of patients to medical facilities all over the world. In Fiscal Year 1985, MAC aircrews and 375th AAW nurses and medical technicians provided aeromedical evacuation for more than 18,700 airmen, 13,000 sailors, 8,000 soldiers, 17,700 dependents of active-duty military members, 21,000 retired personnel and their dependents, and 1,000 others (civilians, foreign nationals, etc.). In all, MAC transported 80,620 patients—a 1.8 percent increase over 1984—on a total of 4,416 C-5, C-9, C-130, C-141, C-21, and C-12F aeromedical evacuation missions.

The 375th AAW also manages the operational support airlift fleet, which, in 1984, carried more than 77,000 passengers on time-sensitive government missions. During 1985, MAC replaced the last of its CT-39 fleet with C-21 and C-12F aircraft. The

TWENTY-THIRD AIR FORCE (MAC)

Headquarters, Scott AFB, Ill.



phaseout of the CT-39 was completed in December 1985.

The newly developed European Distribution System will operate eighteen C-23 aircraft from Zweibrücken AB, Germany, to provide dedicated airlift of critical spare parts for Air Force weapon systems in Europe.

Another airlift unit, the 89th Military Airlift Wing, uses a variety of aircraft to provide airlift for the President, other US government officials, and foreign dignitaries. The Air Force is proceeding with plans to replace existing Presidential aircraft and intends to award a contract soon.

The Air Weather Service (AWS), a technical service of MAC with headquarters at Scott AFB, provides staff and operational weather support to active, Guard, and Reserve Air Force and Army units, unified and specified commands, and other agencies as directed. AWS has more than 4,800 military and civilian personnel serving in more than 270 worldwide locations.

Weather support includes various combinations of scientific, technical, and advisory activities to acquire, produce, and supply information on the past, present, and future state of space, atmospheric, oceanographic, and terrestrial surroundings for use in military planning and decision-making.

During contingencies and wartime, weather support is a vital part of the decision process in the use of air and ground forces. Peacetime weather support is essential for protection of military personnel and national resources from severe weather, for safe and efficient air and ground operations, for realistic and productive training exercises, and for research and development of effective weapon systems.

With Twenty-third Air Force and AFRES WC-130 aircraft, AWS provides critical tropical storm surveillance by means of aerial weather reconnaissance. AWS also uses a series of satellite and ground-based facilities to observe, forecast, and provide information on hazards resulting from solar activity. The space program needs this information to ensure the safety of man's activities in space as well as to measure and predict the effect of solar activity on surveillance and warning systems, satellite tracking systems, and communications.

MAC's other technical service—the Aerospace Audiovisual Service (AAVS) headquartered at Norton AFB, Calif.—is the Air Force's single management agency for audiovisual documentation of combat, operational, and humanitarian activities. AAVS operates six squadrons and fifty-eight detachments and operating locations around the world. In addition, AAVS produces video, motion picture, and still photographic training products, provides optical instrumentation and technical documentation of Air Force space, missile, and other weapon systems, and manages base audiovisual service centers and regional audiovisual libraries.

"No matter if we're at war or in peace, there's a MAC mission at hand. To perform our mission, we must have increased, modern airlift capability. The C-17 is the next step in allowing us to meet the challenges that lie ahead. The C-17 is very important to our national defense. It has very good guarantees, it is very low risk, and it will take us well into the next century," says Gen. Duane H. Cassidy, MAC Commander in Chief.

The worldwide MAC mission is an integral part of our nation's defense posture. Because of its ability to project American muscle anywhere in the world on short notice, MAC is known as the "Backbone of Deterrence." ■

Pacific Air Forces

Pacific Air Forces (PACAF) is the principal air arm of the US Pacific Command. Commanded by Gen. Robert W. Bazley, PACAF is responsible for maintaining security and defending US interests in an area extending from the west coast of the US to the east coast of Africa and from the Arctic to the Antarctic—more than half the earth's surface and home for 2,000,000,000 people living under more than three dozen flags.

Although many of these countries are of particular interest and importance, PACAF has adopted a regional perspective rather than focusing on a single area. Theater-wide and even worldwide roles are considered, with special recognition of the growing Soviet threat in the Pacific.

To meet this threat, PACAF has put together programs that maintain its forces on the forward edge of readiness. PACAF's concentration on total capability has guaranteed a balanced program of improved readiness, sustainability, force structure, and modernization. As the first half of this decade ends, PACAF is better equipped and more ready than ever to meet its mission requirements—to plan, conduct, and coordinate offensive and defensive combat air operations in the Pacific and Asian theaters.

At the tip of the PACAF spear on the northern end of Honshu—Japan's main island—is the 432d Tactical Fighter Wing and its newly activated 13th Tactical Fighter Squadron at Misawa AB, Japan. The F-16s there are the first US fighters stationed on Honshu in fifteen years. These aircraft, along with the more than 6,900 US Air Force personnel and dependents assigned to Misawa, significantly enhance US defense capabilities in the region.

The F-16s now stationed at Misawa have become an integral part of the nearly 300 aircraft that make up the PACAF tactical air team, which includes F-15s, F-4s, A-10s, RF-4s, F-5s, and OV-10s. In addition, aircraft of other commands, such as MAC's C-12s, C-21s, C-130s, and HH-3s, SAC's B-52s and KC-135s, and TAC's EC-135s and E-3s, provide needed support.

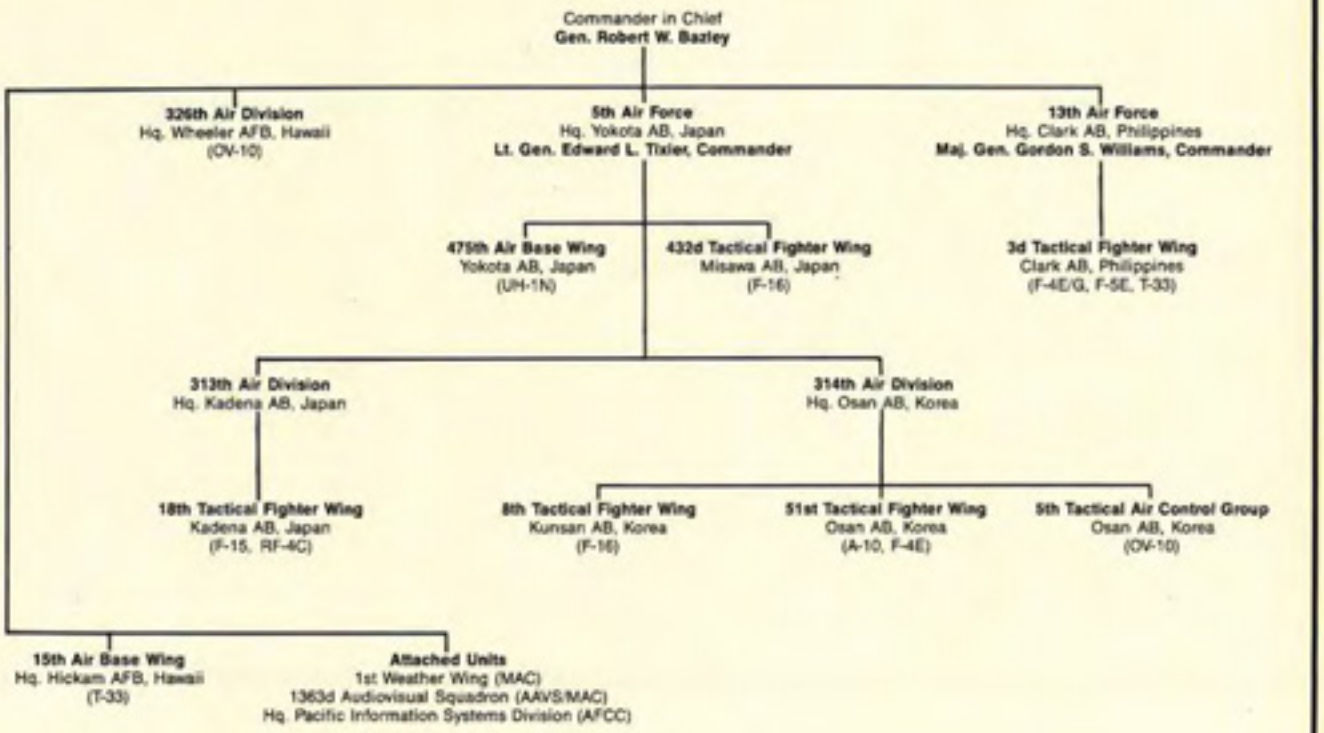
Highlighting PACAF's readiness was the command's record-setting year of flight safety—for the first time in its history, PACAF flew the entire calendar year without a Class A mishap. This is a major accomplishment for both the command and the Air Force and one that demonstrates that care and professionalism are the order of every day in PACAF.

PACAF's intensive training and evaluation programs were key ingredients in achieving these results. Last year, PACAF units flew in more than fifty exercises. Ninety-eight percent were conducted with other US services. Sixty-three percent were conducted with the military forces of regional allies. Such exercises as Team Spirit, Cope Thunder, and Cope North highlighted the 1985 schedule.

Team Spirit is the free world's largest joint combined field training exercise. Held annually in the Republic of Korea, it demonstrates PACAF's ability to augment in-place

PACIFIC AIR FORCES

Headquarters, Hickam AFB, Hawaii



forces rapidly and to integrate combat operations with other US and Republic of Korea forces.

Cope Thunder, held seven times a year in the Republic of the Philippines, gives aircrews and support personnel realistic tactical air warfare training with other services and other countries. Dissimilar air combat tactics and electronic combat training are vital elements in these exercises. Air-to-air, air-to-ground, and ground-to-air scenarios test the skills of all exercise participants.

Cope North, held four times a year with the Japan Air Self-Defense Force, is primarily an air defense exercise. In 1985, the Japan Maritime Self-Defense Force also began participating in Cope North—a first for the exercise and the JMSDF. Not only has

PACAF has more ground to defend than any other command—the entire Pacific area from Hawaii to Korea. This pilot is preparing his OA-37 Dragonfly for flight at last fall's Team Spirit exercise.

the training been valuable, but the exercises have also served to further cement relations between the US and Japan.

Equipment and trained aircrews alone do not guarantee success—support also plays a major role. In terms of aircraft generation, the 3d Aircraft Generation Squadron at Clark AB in the Philippines won the General Lew Allen trophy for excellence in direct sortie production. On another front, to compensate for the long supply lines needed to keep its units fully operational, PACAF greatly increased its supply munitions and fuel storage capacities. In addition, existing storage facilities were "hardened" in order to enhance their survivability.

Also playing an important part in survivability is the increase in training and money being spent to provide PACAF security police with the skills and equipment they need to provide effective base defense against both air and ground threats. In 1985, more than 1,000 security policemen received special training, and $3.5 million of combat equipment has been provided.

In addition to improving command logistics capabilities and survivability, PACAF began and completed major initiatives that have improved the quality of life for command personnel. Kadena AB, Okinawa, Japan, was selected as one of four bases in DoD to receive the Commander in Chief's Installation Excellence Award. Sponsored by the President, this award gives special recognition for quality-of-life improvements as well as increased productivity and efficiency of management in support of the mission.

Command construction projects in 1985 included new dormitories, housing units, commissaries, medical and dental facilities, a dining hall, and a postal services center. Improvements were made in base exchanges and recreation facilities.

PACAF also improved the quality of life in areas other than facilities. Equipment was updated, and work centers were modernized. Family support centers were added for a total of five. Additionally, PACAF chaplains introduced a new "family fortification" program called TIME—Training in Marriage Enrichment.

An indication of the success of these and other morale-enhancement programs is the PACAF pilot retention rate for FY '85. At eighty-six percent, it surpassed the Air Force-wide figure by a significant margin.

Also reflecting positive strides in quality-of-life initiatives was the Morale, Welfare and Recreation division of the 15th Air Base Wing at Hickam AFB, Hawaii. The division received the 1985 Gen. Curtis E. LeMay MWR award for giving superior support to the people of the 15th ABW and the more than fifty tenant units it serves.

As the second half of this decade begins, the men and women of PACAF continue to achieve heightened levels of readiness. Their tireless efforts and personal sacrifice have made PACAF a highly efficient and effective fighting force—a prime component of US Pacific Command and a major air command of the United States Air Force. ■

Space Command

Air Force Space Command was formed in September 1982 to manage the operational space activities of the Air Force. The command's motto, "Guardians of the High Frontier," reflects the sense of purpose with which the military has traditionally protected our nation.

The Space Command mission is to manage and operate assigned space assets, centralize planning, consolidate requirements, provide operational advocacy, and ensure a close interface between research and development activities and operational users of Air Force space programs. Space Command is also one of the major commands responsible for the aerospace defense mission, managing and operating assigned assets in support of the North American Aerospace Defense Command (NORAD), a binational command consisting of US and Canadian forces.

The Air Force Space Command is also a component of the newly formed US Space Command and provides resources for this unified command, operating space systems and space surveillance and missile warning sensors. In addition, the command is the manager of the Attack Warning/Attack Assessment System. This is a network of surveillance and early warning sensors, command posts, and interconnecting communications circuits that provides the information used in determining whether or not North America is threatened by an attack.

That critical attack warning by the Commander in Chief of NORAD is the cornerstone of deterrence. Thus, in carrying out its major day-to-day management operations, the Air Force Space Command plays a key part in the strategic defense role of deterrence.

The Commander of Air Force Space Command also serves as the Commander in Chief of NORAD (CINCNORAD) and as Commander in Chief of USSPACECOM (USCINCSPACE). The Vice Commander of Air Force Space Command also serves as the Vice Commander in Chief of NORAD.

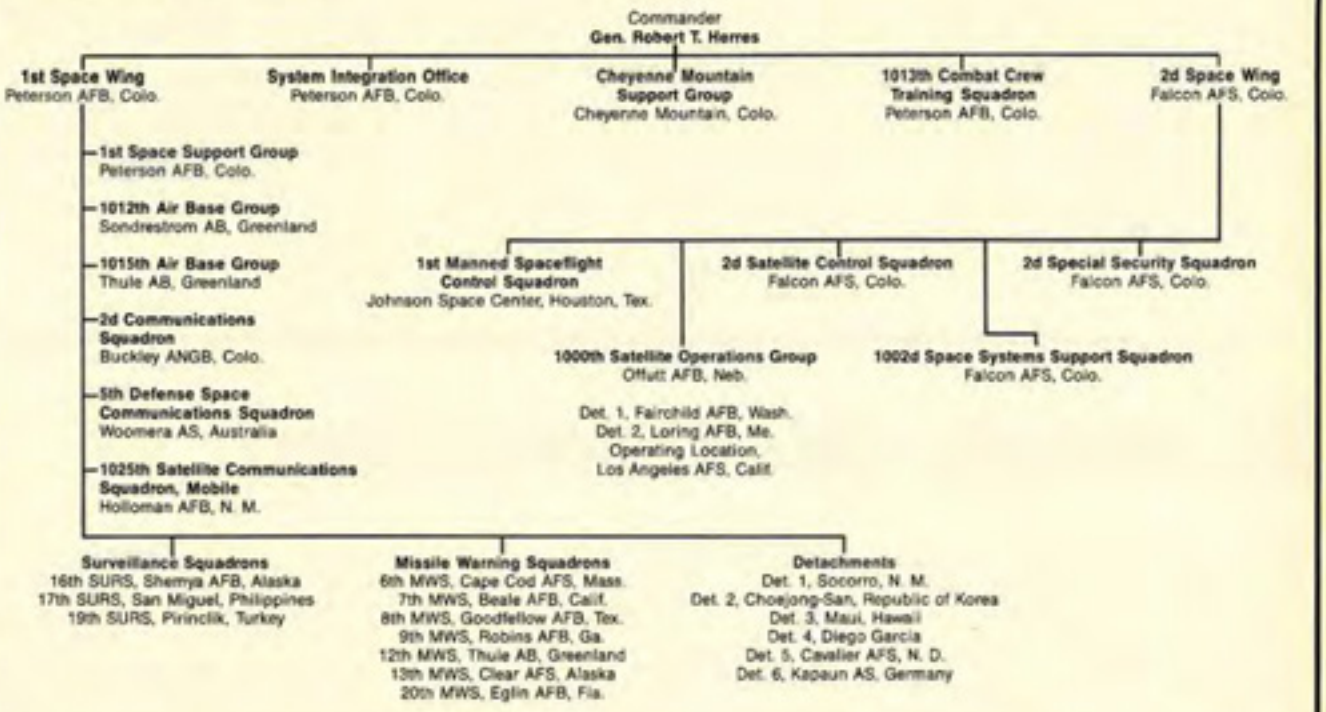
There are approximately 6,500 Air Force military and civilian personnel and about 4,200 contractor personnel worldwide assigned to Air Force Space Command. The command has three bases: Peterson AFB, Colo., and Thule and Sondrestrom ABs in Greenland. It also has four Air Force stations: Clear AFS, Alaska, Cavalier AFS, N. D., Falcon AFS, Colo., and Cape Cod AFS, Mass.

On September 23, 1985, the United States Space Command (USSPACECOM) was activated at Peterson AFB, Colo., with Gen. Robert T. Herres, USAF, as its first Commander in Chief. Integrating elements of the four services, USSPACECOM provides an integrated command structure for space operations. Air Force Space Command is the Air Force component of USSPACECOM and will play a large role in developing the capabilities needed to manage and protect our critical space assets.

• The 1st Space Wing at Peterson AFB manages operational satellite systems and the worldwide ground-based sensor network. These sensors continuously monitor strategic ballistic missile and space-launch sites and provide more than 25,000 space observations a day. The wing tracks roughly 5,800 objects in space and furnishes space intelligence to the Space Surveillance Center in the Cheyenne Mountain Complex. The 1st Space Wing is responsible for the operational readiness of all assigned

AIR FORCE SPACE COMMAND

Headquarters, Peterson AFB, Colo.



assets, including administrative, training, and standardization and evaluation functions.

• The 2d Space Wing, activated on July 8, 1985, is charged with managing and operating assigned space systems. Its Consolidated Space Operations Center (CSOC) at the new Falcon AFS, nine miles east of Peterson AFB, will have two primary missions: controlling operational spacecraft and planning, managing, and controlling DoD Space Shuttle flights. By 1986, CSOC will have more than 1,385 personnel, more than half of whom will be active-duty Air Force personnel. Total manning is programmed to increase to about 3,500 by 1990, with 1,780 blue-suiters.

The mission of the CSOC Satellite Operations Complex is to control DoD satellite systems through a worldwide tracking network. It is supported in this by the Satellite Test Center at Sunnyvale, Calif. The CSOC Shuttle Operations and Planning Complex (SOPC) will allow full exploitation of unique Shuttle capabilities at security levels consistent with DoD mission objectives. Thus, CSOC will give Air Force Space Command the capability to provide centralized command and control over DoD satellite and Shuttle operations, including the ground-based Air Force Satellite Control Network. This will allow Air Force Space Command to be responsive to the real-time operational requirements of the DoD unified and specified command structure. Space Shuttle operations are now scheduled for the early 1990s.

• The Space Information Systems Division is one of nine Air Force Communications Command intermediate headquarters and exists specifically to meet the mission requirements of Air Force Space Command, US Space Command, and NORAD. The division includes 2,500 people serving in seventeen units and eighteen locations throughout the world. These members operate and maintain information systems for space surveillance and missile warning, supporting twenty-three worldwide sensor sites. They also operate and maintain selected data-processing equipment to support the Cheyenne Mountain Complex. The commander of the Space Information Systems Division also serves as the Deputy Assistant to the DCS for Systems Integration, Logistics, and Support on the Air Force Space Command staff.

• The 4th Weather Wing, a Military Airlift Command unit, manages the twenty-two worldwide solar observatories and weather detachments that provide a full range of weather services to Air Force Space Command.

• Two operational satellite systems—the Satellite Early Warning System and the Defense Meteorological Satellite Program, along with associated ground control and tracking networks—are assigned to Space Command. The command also will operate and manage two satellite systems currently under development—the DoD navigational satellite system called the Global Positioning System (GPS), and Milstar, the next-generation strategic and tactical military satellite communications system.

Air Force Space Command operates twenty-three worldwide space surveillance and missile warning units, which include both radar and optical sensors. During 1984, ground was broken for two new radar sites, Pave Paws southeast at Robins AFB, Ga., and Pave Paws southwest at Goodfellow AFB, Tex. These two new sites will incorporate the latest phased-array radar technology to provide significantly improved detection and tracking capability for submarine-launched ballistic missiles. Additionally, the Ballistic Missile Early Warning System (BMEWS) radar at Thule AB will be upgraded with the latest phased-array technology in early 1987.

• The 1013th Combat Crew Training Squadron (CCTS) was activated

on December 13, 1985, at Peterson AFB. The squadron will centralize, manage, and control all space operations crew qualification training within Air Force Space Command. Crew members graduating from the 1013th CCTS will report "mission capable" to their operational units. This will replace initial on-site training and ensure that crew members are ready for their jobs at remote sites, thus increasing manpower utilization.

Initially the squadron will consist of from 900 to 1,000 members and forty instructors. When it is fully operational, the 1013th will be responsible for all initial Air Force Space Command crew qualification training. The number of students will increase to 1,500 in 1989, when the squadron will have a staff of approximately 200 instructors and training support personnel.

Today, Air Force Space Command is facing increasing challenges and opportunities. Despite the fact that the command was formed a little over three and a half years ago, its growth and contribution to our national defense have been dramatic. As the importance of space-based assets tinues to increase, Air Force S Command will play a large role in suring our national security an maintaining the peace through the deterrence provided by our warning systems.

In supporting the strategic aerospace defense mission, this Air Force command for space envisions tremendous opportunities as well as challenges.

The men and women of Air Force Space Command are truly the "Guardians of the High Frontier." ■

Strategic Air Command

This year, Strategic Air Command reaches a number of significant milestones in a proud and distinguished history. The fortieth anniversary of the command is also the twenty-fifth consecutive year that "Looking Glass," the SAC Airborne Command Post, has helped guard America's freedom. Additionally, the world's most sophisticated reconnaissance aircraft, the SR-71, notched its twentieth year of service in January. Just as 1985 saw a long-awaited step with the introduction of the B-1B into the SAC inventory, this year will see another first as the Peacekeeper ICBM strengthens the nuclear triad.

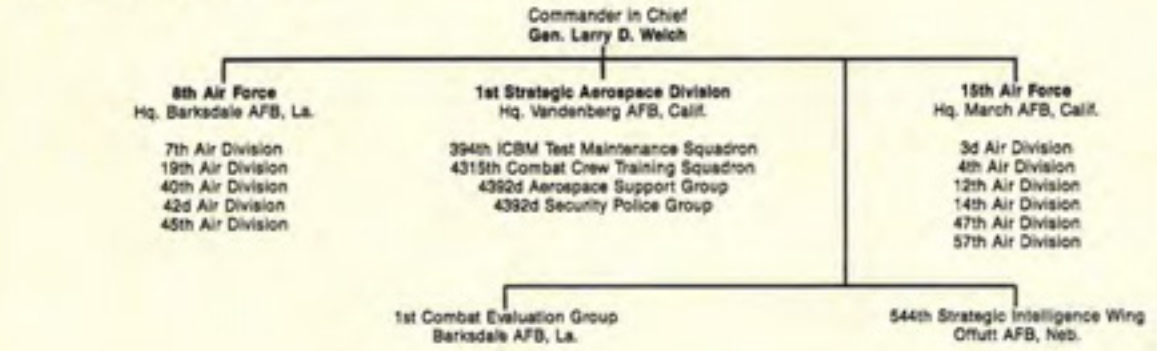
The composition and capability of SAC forces have changed dramatically since the command's inception, but even though weapon systems and tactics have evolved over the years, the deterrent mission of Strategic Air Command remains unchanged.

From the beginning, the command's overriding responsibility has been to provide and operate the forces necessary to ensure an effective and credible deterrent to nuclear war. Concurrently, the global responsiveness and flexibility of these strategic assets have made significant contributions to conventional capabilities as well. In addition to providing two legs of the nation's strategic strike force, SAC is also responsible for the airborne command and control of our forces, worldwide air refueling support, and strategic reconnaissance. SAC also provides a long-range conventional capabil-

The first operational B-1B bomber was delivered in mid-1985, and Dyess AFB, Tex., is now well along toward receiving its full complement of the new aircraft. The B-1B is SAC's first new bomber in nearly twenty years. (Photo by SMSgt. Jesse Grice, USAF)

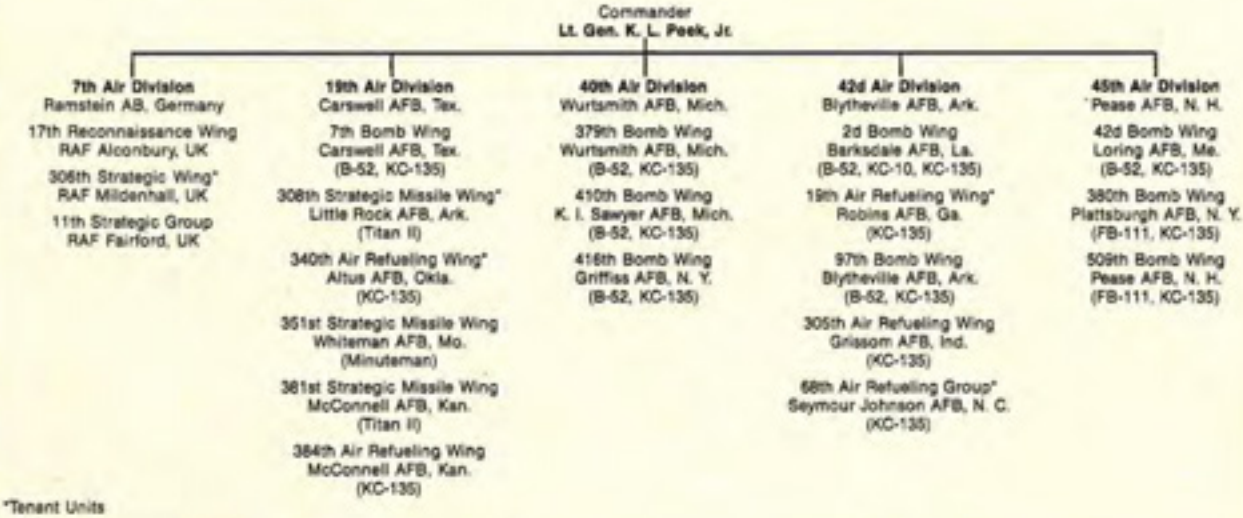
STRATEGIC AIR COMMAND

Headquarters, Offutt AFB, Neb.



EIGHTH AIR FORCE (SAC)

Headquarters, Barksdale AFB, La.



*Tenant Units

ity to support theater commanders throughout the world.

The ability to maintain an effective deterrent today is predicated on the readiness of currently deployed forces. Strategic Air Command's ability to carry out its mission has improved significantly, but for those improvements to continue in the future, the collective programs that represent tomorrow's deterrence must remain on track and on schedule.

People are the number-one priority in SAC. Although the need for modern, capable equipment is apparent, the most essential ingredient is the highly skilled and dedicated team of more than 116,000 officers, enlisted members, and civilians as well as 16,000 members of the SAC-gained reserve forces who make "peace their profession." Serving at more than 100 diverse locations throughout the United States and overseas, SAC professionals are the key to keeping highly sophisticated hardware ready and capable of supporting our national political objectives. In the final analysis, the most significant advantage a military force may have over a potential adversary is the quality and professionalism of its people.

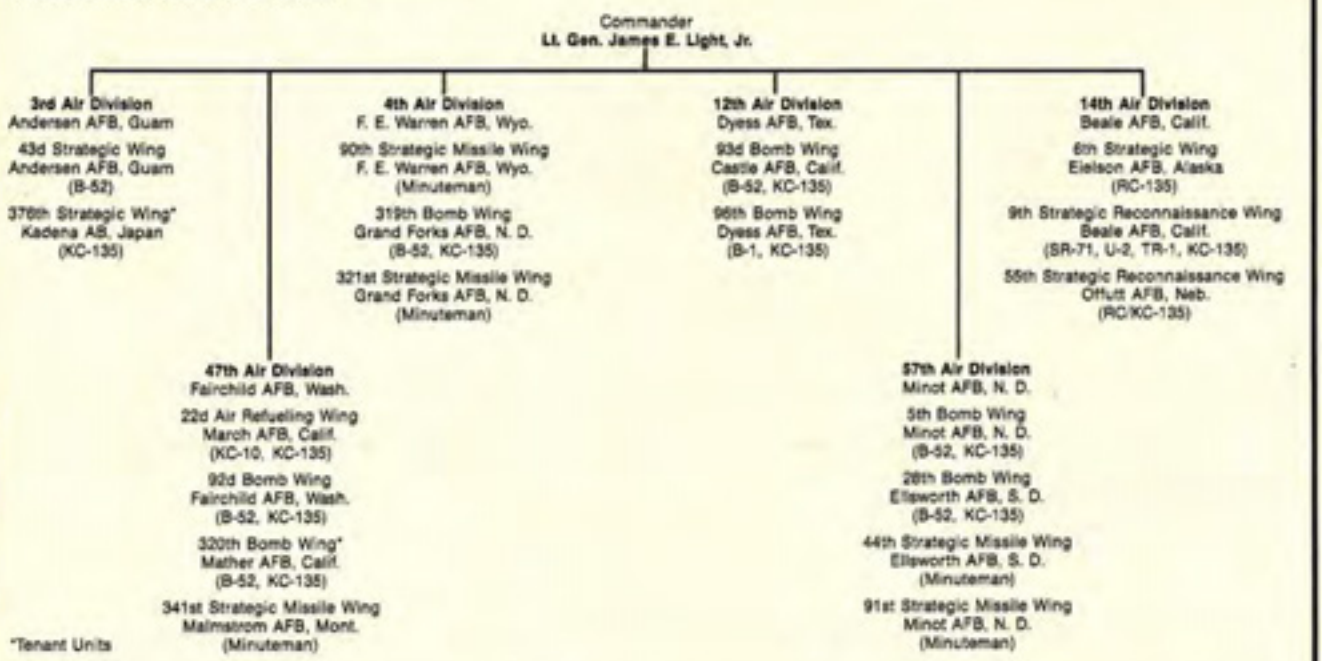
The comprehensive modernization of current SAC forces assures the continued integrity of the nation's strategic triad and underwrites future deterrent capabilities. The nucleus of the strike force consists of approximately 260 B-52G and H Stratofortresses, sixty supersonic FB-111s, and 1,000 Minuteman (450 Minuteman II and 550 Minuteman III) ICBMs. A handful of the older Titan II missiles, which are scheduled to be phased out in 1987, completes SAC's nuclear arsenal.

Supporting these primary systems are some 615 KC-135 Stratotankers, of which 128 are assigned to thirteen Air National Guard and three Air Force Reserve units. Each system is receiving a significant upgrade as part of President Reagan's ongoing strategic modernization program.

Equipping the B-52 with state-of-the-art avionics is part of a comprehensive modernization package that includes a cruise-missile role for some B-52s. Others have achieved full operational status with the Harpoon antiship missile. FB-111 combat reliability and maintainability is getting a boost as selected components in the bombing and navigation systems benefit from an avionics modernization program (AMP). AFLC is sched-

FIFTEENTH AIR FORCE (SAC)

Headquarters, March AFB, Calif.



uled to provide the first AMP-modified FB-111 to SAC in December of this year.

The Minuteman system is being rehabilitated under the Rivet Mile program, a joint AFLC and SAC project to extend the useful life of Minuteman launch-control centers and launch facilities. Further guaranteeing Minuteman's usefulness is ARSIP, the Accuracy, Reliability, Supportability Improvement Program, which improves the missile's warfighting capability.

The KC-135 fleet is being improved by a series of modifications to extend the useful lifetime and increase mission capability. Reengining programs to replace the J57 with CFM56 and JT3D engines are the most dramatic examples of the KC-135 modernization effort.

There is a limit, however, to how much existing forces can be improved. To continue an effective deterrent into the twenty-first century, SAC is acquiring a new generation of equipment reflecting the technological strides of the 1980s.

The B-1B, which remains on schedule and within projected cost, will achieve initial operational capability at Dyess AFB, Tex., in September. Deliveries to the second base, Ellsworth AFB, S. D., are scheduled to begin in January 1987.

September will witness the arrival of the long-awaited Peacekeeper missile at F. E. Warren AFB, Wyo. The first fifty of the new ten-warhead ICBMs are scheduled for emplacement in modified Minuteman silos in Wyoming, with initial operational capability by December of this year.

The capability of the KC-10 Extender is, in effect, a force multiplier, bringing important new capacity and versatility to tanker operations. Expansion of the KC-10 Associate Program to a third operational unit increases SAC's return on investment in a most productive strategic mobility asset.

Key to the successful employment of any weapon system is effective command and control. SAC relies on a family of communications satellite and terrestrial networks to assure the survival and employment of SAC assets. Additionally, work is progressing on a new SAC Command Center that will feature state-of-the-art communications and automated data-processing capabilities.

For the longer term, SAC is planning ahead with initiatives that include the Advanced Technology Bomber (ATB) and the small ICBM.

The ATB, popularly known as the "Stealth" bomber, promises to maintain the flexibility inherent in the bomber leg of the triad. The new small ICBM represents advanced missile technology, with mobility a prime enhancement. Still in the developmental stages, the small ICBM will help ensure that the strategic triad remains diverse and effective for the long term.

Though bombers, tankers, and missiles represent the sword of deterrence, the strategic eyes and ears of deterrence are also a SAC responsibility. A broad mix of reconnaissance platforms provides critical information to decision-makers who range from operational theater commanders to the National Command Authorities. These important reconnaissance roles are carried out by units operating SR-71s, U-2s, and TR-1s as well as RC-135s, EC-135s, and the National Emergency Airborne Command Post, the E-4B. Force modernization is being applied in this area, too, with improvements scheduled for the SR-71, U-2, and RC-135.

Operation of the KC-10 Extender is hard evidence that Air Force Reserve units are full partners in SAC's global mission. The third KC-10 associate squadron was formed last year at Seymour Johnson AFB, N. C., and now joins similar units at March AFB, Calif., and Barksdale AFB, La. Essential contributions to national defense are made by the thirteen ANG and the three Air Force Reserve KC-135 units that maintain crews and aircraft on round-the-clock alert in support of the Single Integrated Operational Plan.

As the command celebrates the fortieth anniversary year, the men and women whose creed is "Peace Is Our Profession" reflect on a proud history as they forge the foundations for an exciting future. ■

EF-111A RAVEN.
ITS PRESENCE ALONE IS A POWERFUL DETERRENT.

The EF-111A is the U.S. Air Force's newest dedicated tactical jamming aircraft. And nothing in the air can match its extensive capabilities.

Developed by the USAF and Grumman, the EF-111A can detect, identify and disrupt the electronic air defenses of enemy armor and strike forces. In support of our own air-to-ground operations, the EF-111A can operate miles from enemy territory as a standoff jammer, or fly along with our strike forces and nullify hostile radar deep behind the lines.

Against simulated Central European air defenses—the densest in the world—the EF-111A has demonstrated its ability to counter radars.

For the USAF, the EF-111A is an imposing weapon that multiplies the effectiveness of defending forces many times over and provides an increased deterrent to aggression.

The EF-111A: It's not looking for trouble, but it knows how to stop it. Grumman Aerospace Corp., Bethpage, N.Y. 11714.

Invisible

Night Visible

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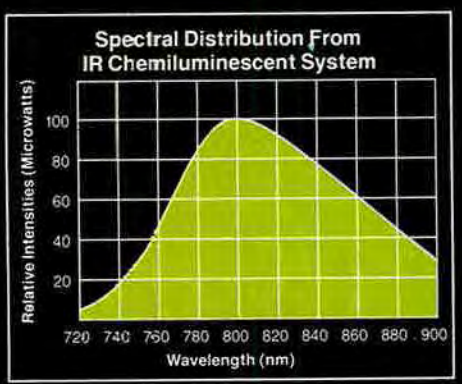

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CYANAMID

IR-8

Tactical Air Command

The mission of Tactical Air Command (TAC) is to organize, train, equip, and maintain combat-ready forces capable of rapid deployment and employment and to ensure that strategic air defense forces are ready to meet the challenges of peacetime air sovereignty and wartime air defense.

TAC's emphasis on realistic training for operational, maintenance, munitions, and support personnel is the key to its many successes. Units mobilize and deploy to both Stateside and overseas locations on a continuing basis, and they practice daily those combat skills necessary to destroy enemy air and ground forces.

TAC's active force consists of more than 112,000 people and almost 2,400 aircraft. When mobilized, 71,000 members of the Air National Guard and Air Force Reserve, along with their 1,600 aircraft, are assigned to TAC.

TAC provides the Air Force component of the US Readiness Command, US Central Command, US Atlantic Command, and US Southern Command. The TAC Commander is triple-hatted as TAC/CC, CINCAFRED, and CINCAFLANT. TAC's Ninth Air Force Commander doubles as COMUSCENTAF, and the Southern Air Division Commander at Howard AFB, Panama, is responsible for the air component tasks of US Southern Command.

As AFRED, TAC performs tactical fighter, reconnaissance, command and control, and electronic combat operations during worldwide contingencies. In support of USCENTCOM, TAC provides combat-ready units for operations in Southwest Asia. When activated as Air Forces Atlantic under the Unified Atlantic Command, TAC conducts air operations within the LANTCOM area, which includes the North Atlantic and Caribbean. And in support of the joint US Southern Command in Latin America, TAC provides air defense and tactical support for the region as required.

TAC's forces are organized under three numbered air forces and four direct reporting units.

- First Air Force (formerly ADTAC), headquartered at Langley AFB, Va., comprises four air divisions that conduct peacetime command and control of interceptor squadrons and surveillance radars for the strategic air defense of North America. First Air Force also provides air defense forces to Air Forces Iceland (AFI), located at Keflavik Naval Station, operates and supports the Distant Early Warning (DEW) System, and oversees the USAF Air Defense Weapons Center (USAFADWC) at Tyndall AFB, Fla. USAFADWC trains aircrews and weapons controllers, develops air defense doctrine, tactics, and procedures, and manages all CONUS USAF drone aerial target operations.
- Ninth Air Force at Shaw AFB, S. C., has ten wings performing tactical fighter operations and training as well as reconnaissance and the tactical air control mission. The Commander of Ninth Air Force, when serving as COMUSCENTAF, commands all US Air Force forces made available to the Air Force component of US Central Command, which has responsibility for Southwest Asia and the Persian Gulf area.
- Twelfth Air Force at Bergstrom

TACTICAL AIR COMMAND

Headquarters, Langley AFB, Va.

Commander
Gen. Robert D. Russ

1st Air Force
Hq. Langley AFB, Va.
4 air divisions
USAF Air Defense Weapons Center
Air Forces Iceland
1 air defense squadron (DEW Line)

9th Air Force
Hq. Shaw AFB, S. C.
8 tactical fighter wings
1 tactical training wing
1 tactical air control wing

12th Air Force
Hq. Bergstrom AFB, Tex.
4 air divisions
6 tactical fighter wings
5 tactical training wings
1 tactical reconnaissance wing
1 tactical air control wing

USAF Southern Air Division
Hq. Howard AFB, Panama

24th Composite Wing
Hq. Howard AFB, Panama
(O-2, OA-37)

Inter-American Air Forces Academy
Albrook AFS, Panama

28th Air Division
Hq. Tinker AFB, Okla.

552d Airborne Warning & Control Wing
Tinker AFB, Okla.
(E-3)

961st Airborne Warning & Control Squadron
Kadena AB, Japan
(E-3)

960th Airborne Warning & Control Squadron
Keflavik NS, Iceland
(E-3)

41st Electronic Combat Squadron
Davis-Monthan AFB, Ariz.
(EC-130)

8th Tactical Deployment Control Squadron
Tinker AFB, Okla.

7th Airborne Command & Control Squadron
Keesler AFB, Miss.
(EC-130)

USAF Tactical Fighter Weapons Center
Hq. Nellis AFB, Nev.
(F-15, F-16, F-111, A-10, F-5, UH-1)

57th Fighter Weapons Wing
Nellis AFB, Nev.
(USAF Fighter Weapons School)
(4440th Tactical Fighter Training Group)
(Red Flag)
USAF Air Demonstration Squadron
(Thunderbirds)

554th Operations Support Wing
Nellis AFB, Nev.
(554th Range Group)

USAF Tactical Air Warfare Center
Hq. Eglin AFB, Fla.
(RF-4, F-4, F-15, F-16, A-10, EF-111, GLCM)

4441st Tactical Training Group
(Blue Flag)
Eglin AFB, Fla.

4442d Tactical Control Group
Eglin AFB, Fla.
(USAF Air-Ground Operations School)
Hurlburt Field, Fla.

While the pilots accomplish the missions, it is ground crew members of TAC—or any other command—who keep the pilots and their aircraft flying. Here, SrA. David Clair polishes the canopy of an F-16.

FIRST AIR FORCE (TAC)

Headquarters, Langley AFB, Va.

Commander
Maj. Gen. Buford D. Lary

- **23d Air Division**
  Hq. Tyndall AFB, Fla.
  (F-15, T-33, F-4C, F-106)
- **24th Air Division**
  Hq. Griffiss AFB, N. Y.
  (F-4C/D, F-106, T-33)
- **25th Air Division**
  Hq. McChord AFB, Wash.
  (F-15, F-4C/D, F-106, T-33)
- **26th Air Division**
  Hq. March AFB, Calif.
  (T-33, F-4D)
- **4700th Air Defense Squadron**
  Peterson AFB, Colo.
  (DEW Line)
- **USAF Air Defense Weapons Center**
  Hq. Tyndall AFB, Fla.
- **Air Forces Iceland**
  Kefavik NS, Iceland
  (F-15)
- **325th Tactical Training Wing**
  Tyndall AFB, Fla.
  (F-15, T-33)
- **475th Weapons Evaluation Group**
  Tyndall AFB, Fla.
  (QF-100, YQF-100D, BQM-34A/B, MQM-107B)

NINTH AIR FORCE (TAC)

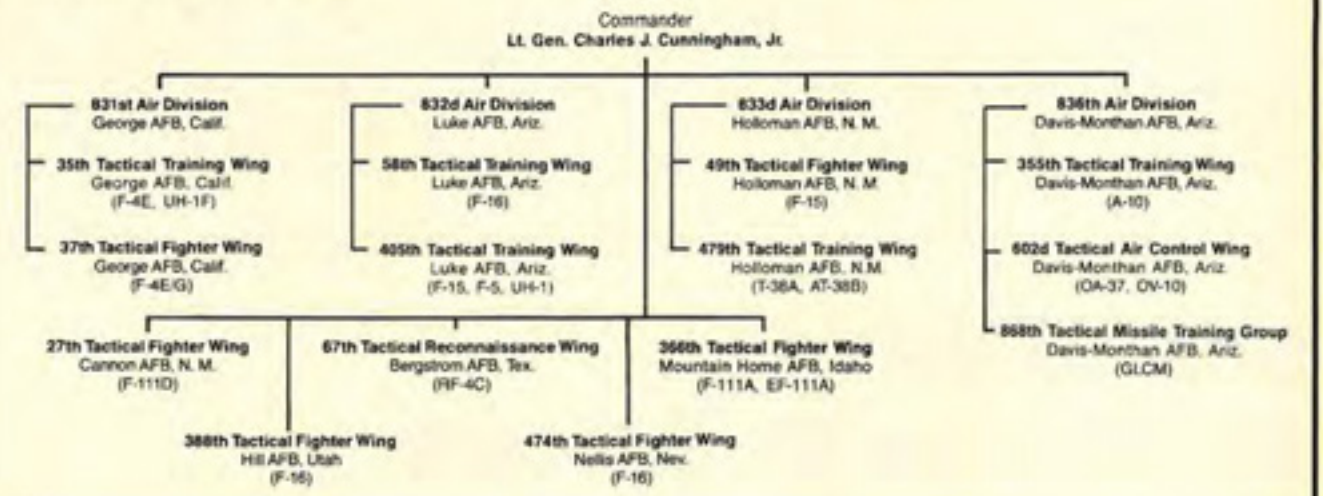
Headquarters, Shaw AFB, S. C.

Commander
Lt. Gen. William L. Kirk

- **1st Tactical Fighter Wing**
  Langley AFB, Va.
  (F-15, EC-135, UH-1)
- **4th Tactical Fighter Wing**
  Seymour Johnson AFB, N. C.
  (F-4E)
- **23d Tactical Fighter Wing**
  England AFB, La.
  (A-10)
- **31st Tactical Fighter Wing**
  Homestead AFB, Fla.
  (F-4D, F-16)
- **33d Tactical Fighter Wing**
  Eglin AFB, Fla.
  (F-15)
- **56th Tactical Training Wing**
  MacDill AFB, Fla.
  (F-16, UH-1)
- **347th Tactical Fighter Wing**
  Moody AFB, Ga.
  (F-4E)
- **354th Tactical Fighter Wing**
  Myrtle Beach AFB, S. C.
  (A-10)
- **363d Tactical Fighter Wing**
  Shaw AFB, S. C.
  (F-16, RF-4C)
- **507th Tactical Air Control Wing**
  Shaw AFB, S. C.
  (OV-10, O-2, CH-3)

TWELFTH AIR FORCE (TAC)

Headquarters, Bergstrom AFB, Tex.



AFB, Tex., has four air divisions and thirteen wings performing tactical fighter operations and training, reconnaissance, tactical air control, and a wide range of electronic combat tasks, including F-4G Wild Weasel and EF-111A Raven support jamming, plus one group responsible for ground-launched cruise missile training.

• The USAF Tactical Air Warfare Center (USAFTAWC), Eglin AFB, Fla., is a direct reporting unit responsible for all aspects of electronic combat activities and provides training and evaluation of command control and intelligence (C^2I) systems assets. USAFTAWC also conducts testing and evaluation of our latest air-to-air and air-to-ground tactical weapons, ground-launched cruise missiles, flight simulators, and reconnaissance systems.

• The USAF Tactical Fighter Weapons Center (USAFTFWC), Nellis AFB, Nev., conducts advanced schooling and testing in tactical air concepts, doctrine, weapons, and tactics. USAFTFWC also evaluates equipment and munitions designed for tactical fighter operations. The USAF Air Demonstration Squadron, the Thunderbirds, is a USAFTFWC unit. The Center is also responsible for all Red Flag activities and TAC's aggressor forces.

• The 28th Air Division, Tinker AFB, Okla., operates E-3 AWACS, EC-130E, EC-130H, and EC-135 aircraft. The division is comprised of a wing at Tinker AFB, Okla., and squadrons at Kadena AB, Japan, Keflavik NS, Iceland, Davis-Monthan AFB, Ariz., and Keesler AFB, Miss. The E-3 provides surveillance and warning, control of friendly fighters, and airborne battle management. The two versions of the C-130 provide for airborne battlefield command and control and jamming of enemy command control and communications networks. The EC-135s serve as flying command posts to assist overseas deployments of tactical fighter aircraft.

• The other direct reporting unit is TAC's USAF Southern Air Division at Howard AFB, Panama, the air arm of the joint US Southern Command in Latin America. USAFSO is responsible for air defense of the Panama Canal, assists in training Latin American air forces, provides air support for combined training exercises with Latin American military forces, and carries out search-and-rescue activities in the region.

To maintain their high state of readiness, TAC personnel conduct training exercises and overseas deployments and participate in numerous joint exercises. During the last year, TAC and TAC-gained units conducted thirty-four overseas deployments to thirteen countries, including Korea, Germany, Turkey, the United Kingdom, and Norway.

TAC also continued its highly praised "Flag" programs to provide combat training under realistic conditions. Key Flag programs include the following:

• **Blue Flag** provides real-time command control and communications training for battle staff personnel in realistic NATO, Korean, and Southwest Asian scenarios.

• **Checkered Flag** provides unit preparation for operations from overseas bases. Under Checkered Flag, every TAC fighter squadron and tactical air control unit is specifically assigned an overseas deployment location. Aircrews and tactical air controllers study and practice all facets of operation from these locations. Units deploy regularly to their Checkered Flag bases for realistic on-scene training.

• **Red Flag** furnishes tactical fighter training in a very large, combined exercise and gives aircrews training against simulated enemy ground and air opposition. As many as 300 aircraft fly up to 4,500 sorties during each six-week exercise.

• **Green Flag** is an "electronic Red Flag" that focuses on coordinating and increasing the electronic combat (EC) capabilities of the tactical air forces. Under the direction of USAFTAWC, Green Flag personnel develop EC tactics and then provide the exercise scenarios in which to test and evaluate these tactics and electronic combat systems.

• **Copper Flag** is the air defense equivalent of Red Flag and is conducted at Tyndall AFB, Fla., to increase the readiness of strategic air defense forces. These exercises provide aircrews, weapons controllers, and command and control training against enemy tactics and capabilities in scenarios covering the full range of attack and defensive options.

Significant events in TAC over the past year were numerous: Air Defense TAC (ADTAC) became First Air Force on December 6, 1985. The 363d Tactical Fighter Wing at Shaw AFB, S. C., became the first wing to achieve initial operational capability in the F-16C and D model aircraft. Air Forces Iceland converted from the

F-4E to the F-15C. TAC aircrews delivered the first operational TV-guided GBU-15 modular glide bomb during Red Flag, and this weapon achieved initial operational capability at all beddown locations during FY '85. And the Thunderbirds flew sixty-two Stateside and five Latin American demonstrations before more than 15,000,000 spectators.

In addition, TAC's 1985 Class A mishap and fighter attack mishap rates were the lowest ever—2.1 per 100,000 flying hours.

Finally, during the past year, TAC once again received a number of prestigious awards. The 23d Tactical Fighter Wing at England AFB, La., won the Daedalian Maintenance Award. The Myrtle Beach commissary won the L. Mendel Rivers Best CONUS Commissary award. The TAC aircraft surge launch and recovery team, composed of pilots and air traffic controllers, won the Duckworth Award for significant improvements in instrument flight.

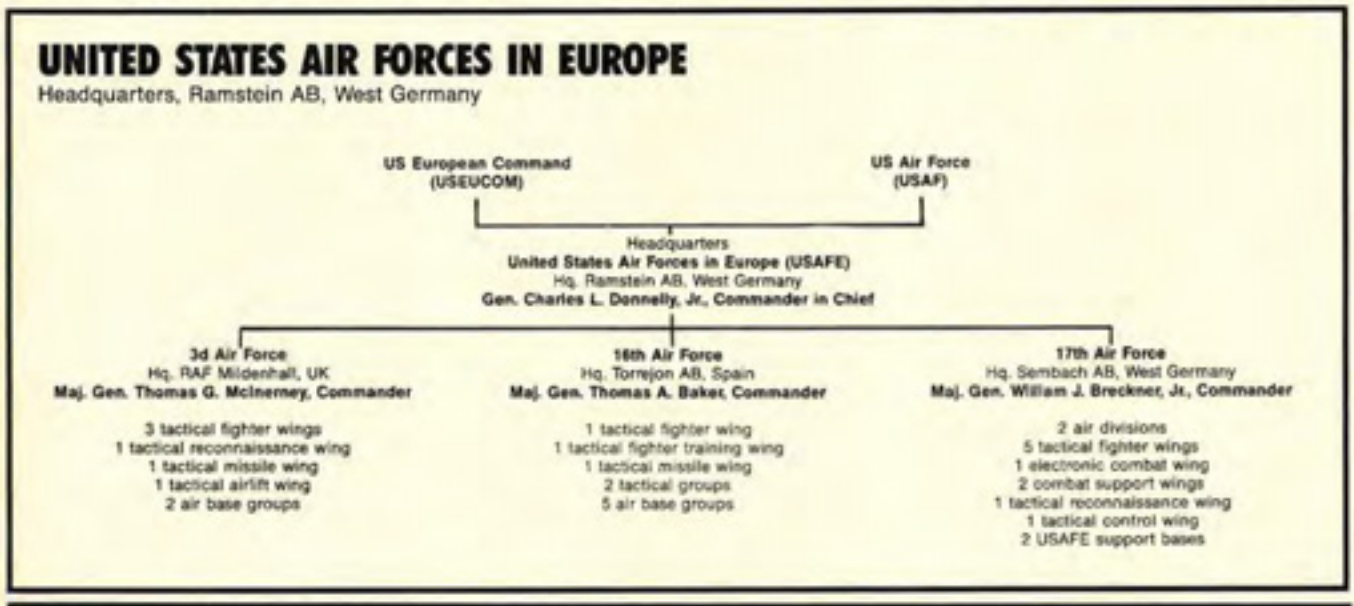
And the 318th Fighter Interceptor Squadron, which is based at McChord AFB, Wash., became the first TAC unit ever to win the Hughes Trophy as the best air defense squadron in the Air Force. ■

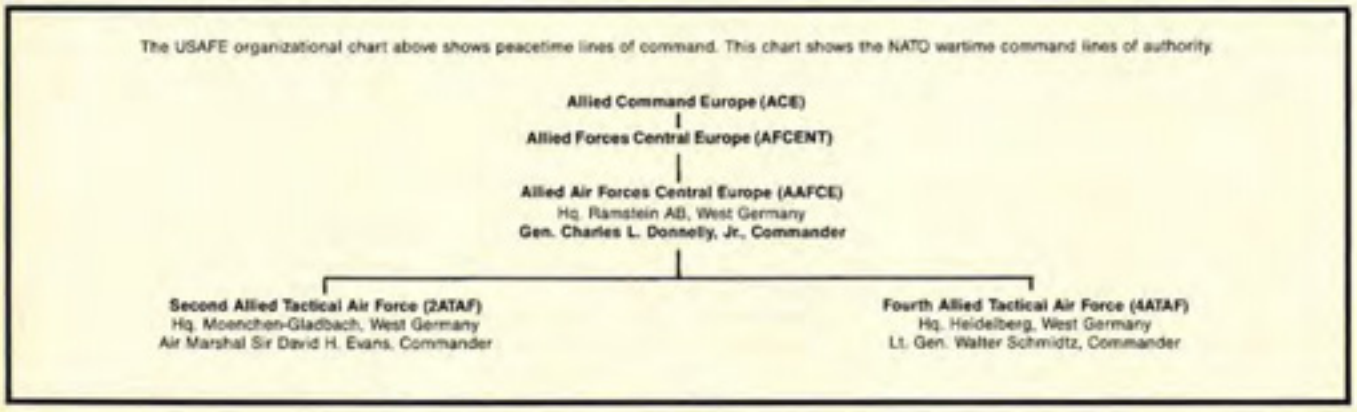
United States Air Forces in Europe

Today's United States Air Forces in Europe (USAFE) is a modern fighting force poised at the front lines of deterrence, with more than 62,000 military and 11,000 civilian men and women operating and maintaining some of the most sophisticated weaponry in the USAF inventory. These people, serving with more than 67,000 family members in seventeen European countries, are ready now to—first—prevent aggression from the Soviet Bloc, and—failing that—to defend Western Europe, along with our NATO allies, from an invasion by the Warsaw Pact.

USAFE is the air component of the US European Command. It is divided into three numbered air forces: Third Air Force in the United Kingdom, Seventeenth Air Force in the Central Region, and Sixteenth Air Force in the Southern/Mediterranean Regions.

USAFE's aircraft inventory repre-



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Nothing is more critical to effective command and control on the battlefield. Magnavox meets your need, with cost-effective, modular tactical ECCM communication systems. Offering you more capabilities than ever before.
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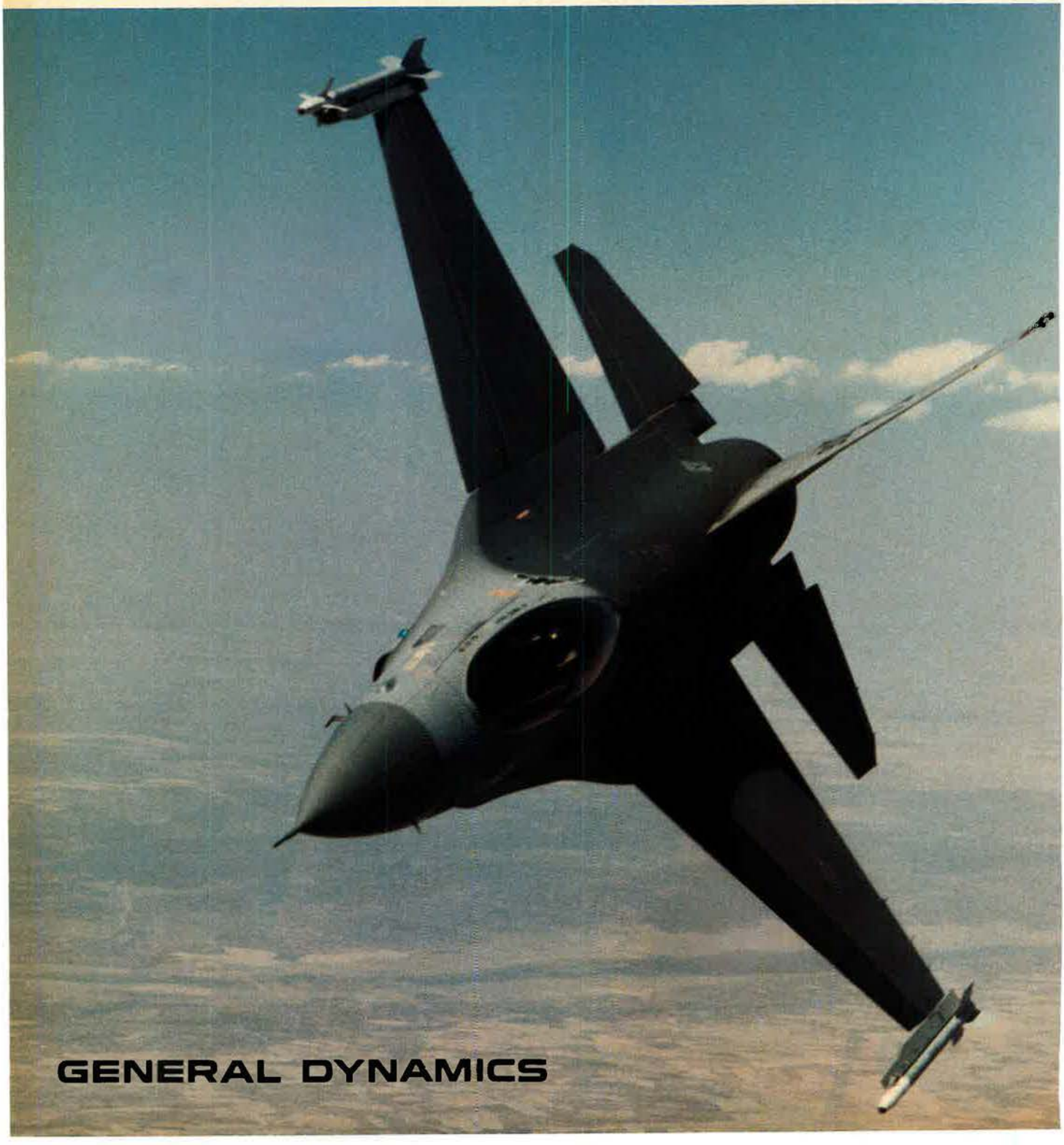
THE F-16 FIGHTING FALCON. UNSURPASSED PERFORMANCE.

The unmatched air-to-air and air-to-ground capabilities of the F-16 have been demonstrated in more than one million flight hours.



sents a state-of-the-art tactical air fighting force and includes the A-10 Thunderbolt II (largest wing in USAF), various models of the F-4 and RF-4 Phantom II, the F-15 Eagle, and the F-16 Fighting Falcon (with two wings converting to F-16C/Ds). In addition, USAFE operates the front-line F-111 and EF-111A Raven as well as the F-5E Tiger II for aggressor training.

Supporting USAFE are various systems based in Europe, but operated by other major commands, including the TR-1, SR-71, and KC-135. USAFE operates its own C-130 Hercules tactical airlifters and is supported by others from MAC. USAFE units also support many transient military and civil aircraft.

Additionally, USAFE hosts USAF's only operational wings of BGM-109G ground-launched cruise missiles. Four GLCM wings have been activated; three are currently operational. USAFE will activate the last two GLCM wings by 1988.

The command's philosophy was promulgated in 1985 during USAFE's fortieth year as a major air command: "Right People, Right Mission, Right Now!" USAFE's thousands of blue-suiters are ready today to carry out the command's missions effectively.

The command's future is one of continued improvements in mission capabilities. In the area of C³I, USAFE has implemented such force-enhancing initiatives as the Joint Tactical Fusion-Limited Operational Capability Europe system. JTF-LOCE rapidly combines, correlates, and displays multisource intelligence information in near real time to provide current assessments to US and NATO commanders at all levels, including commanders on the battlefield.

Another USAFE enhancement is the USAF/US Army computerized threat training facility—the Warrior Preparation Center (WPC). The WPC provides US and allied commanders an electronic battlefield on which combined ground and air tactics can be tested. Improving its readiness through increased availability of spare parts involves USAFE's use of eighteen MAC-owned C-23A Sherpas to move spare parts around the command. The C-23s, prepositioned assets, and a computerized logistics system make up the USAFE-unique European Distribution System.

Plans for weapon system enhancements are also under way and include preparations for such systems as ASRAAM, AMRAAM, and LANTIRN. A 1985 decision by West Germany paves the way for introduction of a common IFF system (the Mark XV) for employment throughout the air forces of NATO.

The Major Operating Units of USAFE

Unit	Location	Weapon Systems/Missions
	England	
10th Tactical Recon Wing	RAF Alconbury	RF-4, F-5; SAC TR-1
20th Tactical Fighter Wing	RAF Upper Heyford	F-111, EF-111
48th Tactical Fighter Wing	RAF Lakenheath	F-111
81st Tactical Fighter Wing	RAF Bentwaters/Woodbridge	A-10; MAC Rescue HC-130, HH-53
501st Tactical Missile Wing	RAF Greenham Common	BGM-109G GLCM
513th Tactical Airlift Wing	RAF Mildenhall	USAFE EC-135, MAC rotational C-130, SAC rotational KC-135, SAC SR-71
819th Civil Engineering Squadron	RAF Wethersfield	Support; civil engineer heavy repair squadron
7020th Air Base Group	RAF Fairford	SAC rotational KC-135
7274th Air Base Group	RAF Chicksands	Support; communications
	Spain	
401st Tactical Fighter Wing	Torrejon AB	F-16
406th Tactical Fighter Training Wing	Zaragoza AB	Tactical range support/weapons training detachments; SAC rotational KC-135
	Italy	
40th Tactical Group	Aviano AB	Rotational USAFE aircraft
487th Tactical Missile Wing	Comiso AS	BGM-109G GLCM
7275th Air Base Group	San Vito AS	Support; communications
	Turkey	
Hq. TUSLOG	Ankara AS	Logistics management
39th Tactical Group	Incirlik AB	Rotational USAFE aircraft
7217th Air Base Group	Ankara AS	Command and logistical management
7241st Air Base Group	Izmir AS	NATO unit support
	Greece	
7206th Air Base Group	Hellenikon AB	Support; communications
7276th Air Base Group	Iraklion AS, Crete	Support; communications
	The Netherlands	
32d Tactical Fighter Squadron	Camp New Amsterdam	F-15
	Belgium	
485th Tactical Missile Wing	Florennes AB	BGM-109G GLCM
	West Germany	
65th Air Division	Sembach AB	Electronic combat
316th Air Division	Ramstein AB	F-4 (converting to F-16)
26th Tactical Recon Wing	Zweibrücken AB	RF-4, C-23
36th Tactical Fighter Wing	Bitburg AB	F-15
50th Tactical Fighter Wing	Hahn AB	F-16
52d Tactical Fighter Wing	Spangdahlem AB	F-4E/G
66th Electronic Combat Wing	Sembach AB	Electronic combat
86th Tactical Fighter Wing	Ramstein AB	F-4 (converting to F-16)
377th Combat Support Wing	Ramstein AB	Support
601st Tactical Control Wing	Sembach AB	Command control communications
38th Tactical Missile Wing	Wueschem AS	BGM-109G GLCM
7100th Combat Support Wing	Lindsey AS	Support; command control communications; USAF Regional Medical Center-Wiesbaden
7350th Air Base Group	Tempelhof Central Airport, Berlin	Support; communications
600th Combat Support Squadron	Hessisch-Oldendorf AS	Communications

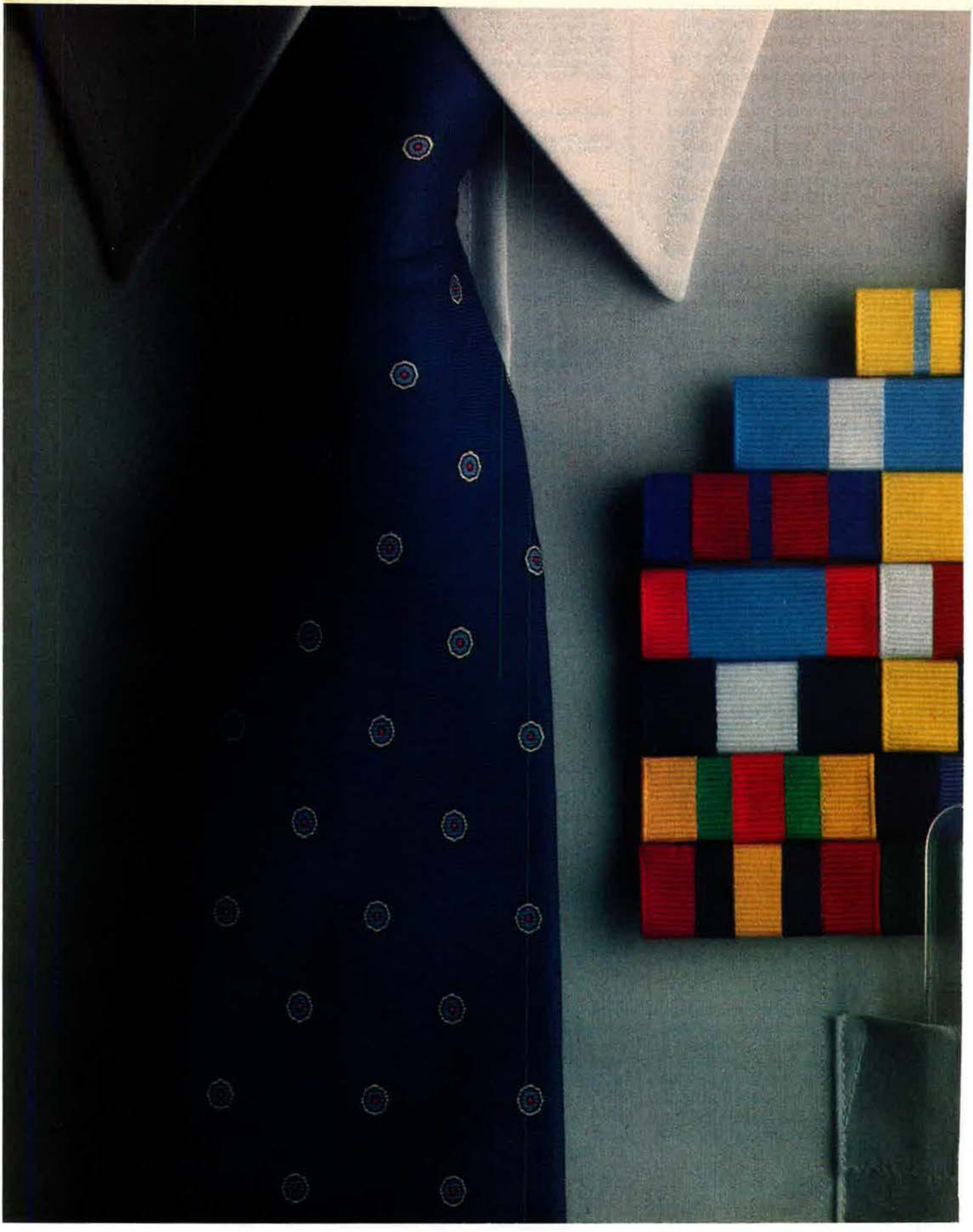
In terms of air base survivability, efforts are under way in the UK and West Germany for those nations to operate and maintain US-funded Rapier and Roland air defense missiles at USAFE bases. Also, through US and NATO funding efforts, USAFE is modernizing its chemical-warfare protection capabilities with improved gas masks, installation of survivable collective protection shelters, and increased chemical defensive training.

Some new systems already in place include French-made Durandal runway bombs, the GBU-15, AGM-88 HARM, and the Imaging Infrared Maverick. Further, USAFE now has theater repair capability for the AIM-9L.

USAFE's top priority today is people. Quality-of-life initiatives are under way throughout USAFE and include construction of more than 9,000 new homes to provide adequate quarters for all families by FY '90. Further, the command initiated twenty-seven construction and upgrade projects on MWR facilities in 1985 at a cost of $2.1 million.

The United States Air Forces in Europe has, for more than forty years, helped to maintain the peace and stability of Western Europe and the United States. Ready right now, USAFE will continue this proud tradition—through diligence and training—into tomorrow. ■

THE BOEIN



TF TEAM HAS ALREADY WON 325 BATTLES.

To date, Boeing has been awarded 325 contracts for advanced tactical fighter technology. Nearly fifty contracts are in progress right now.

Over the past ten years, Boeing has invested more than $120 million of independent research and development funds in advanced fighter technology.

It will take nothing short of an all-out commitment to build the ATF. That's why Boeing is hard at work on thermoplastics for a lighter, stronger, easier-to-maintain airframe. Built-in test equipment for on-board diagnosis. Modular avionics that reduce the number of connections by 90%. A sophisticated ejection seat that provides increased performance and eliminates 90% of all seat removal. And air-to-air combat simulations that will guarantee the most effective, maneuverable ATF design.

The goal: build the fighter of the future at today's cost. At the same time, reduce operating and maintenance costs by 60% compared to current fighters.

It can be done. And Boeing is the company that can do it. Because when it comes to our country's defense, winning isn't everything, it's the *only* thing.

BOEING

Air Force Accounting and Finance Center

The Air Force Accounting and Finance Center (AFAFC), located at Lowry AFB, Colo., is the focal point for Air Force financial operations for the worldwide network of 124 Air Force accounting and finance offices (AFOs).

The Center provides centralized pay service to all Air Force military members, including active duty, retired, Air National Guard, and Air Force Reserve. AFAFC also accounts for all money appropriated to the Air Force and reports to Congress and financial managers throughout the government on the use of these funds.

Through the Security Assistance Accounting Center, AFAFC informs the Pentagon and Congress on the financial status of the DoD Foreign Military Sales Program. The Center bills, collects, and accounts for all DoD foreign military sales.

In 1985, the Center's sixty-two officers, 142 enlisted, and 2,254 civilians paid more than 785,000 active, Guard, and Reserve personnel from combined appropriations totaling more than $13 billion. AFAFC personnel accounted for more than $125 billion, submitted more than 31,000 reports, and processed more than 14,000,000 disbursement and collection vouchers.

The Joint Uniform Military Pay System Data Collection System currently operates at 110 Air Force installations. This system has decreased the amount of time required for pay actions. Accounting and finance offices on the system report that their processing time has decreased from seven days to twenty-four hours. When fully implemented in 1986, 155 manpower spaces will be saved Air Force-wide.

The Electronic Case Control System (ECCS) is being developed so that accounting and finance offices can determine the status of a pay case at any time. Message traffic among AFOs, their agents, and the Center via ECCS should be faster than current communications centers and mail distribution centers.

Retired pay operations paid more than $6.4 billion to 531,336 Air Force retirees and 26,989 annuitants under the Survivor Benefit Plan (SBP). Air Force retirees enjoy customer service at 100 bases worldwide in addition to service over toll-free telephone lines from anywhere in the United States. The Retiree and Annuitant Pay System (RAPS) computer systems upgrade uses on-line processing to provide better and faster service to retired members and their families. The first phase, which handles annuity processing, is complete. The last phase will include retiree payroll. When the total system is operational, ninety-six additional administrative spaces, needed currently, will be avoided.

Recently, the Center was the first non-Treasury disbursing office to issue the new five-color paper check featuring the Statue of Liberty as a design theme. Soon all Air Force accounting and finance offices worldwide will issue the colorful checks, which are difficult to alter or counterfeit. Most Air Force people didn't notice the change to the new check because their funds are electronically deposited into their bank accounts through SURE-PAY, the direct deposit program. Some ninety-one percent of active-duty and eighty percent of retired members used SURE-PAY last year.

A team of accounting and automation specialists is designing a centralized pay system for all Air Force civilians. The current system, which operates at 100 locations throughout the Air Force, is complex and labor-intensive. Under the centralized method, civilians will be paid from AFAFC. This new system will operate more efficiently and provide better service. The modernization is being implemented in two phases. Phase one will help bases in the near term with high payoff changes. The second phase will centralize the pay system by 1990.

Air Force travelers have noticed many changes in the way travel payments and advances are made. The Flat Rate Per Diem Test, implemented throughout the Air Force last year, was recently extended. Under the continuation of the test, travelers are paid on the basis of the locality rate for the area where the duty is performed rather than for actual expenses. Receipts are no longer required for lodging or meals, and no statement of actual expense needs to be filed with the travel voucher. A new automated way of processing travel vouchers under flat rate per diem became operational last year, significantly reducing the time required for computation.

Two other programs to improve service to TDY travelers are being tested this year. Accounting and finance offices at twelve bases are issuing Citicorp travelers checks for travel advances. This not only saves the government money by decreasing the amount of cash required in the AFO but also helps the traveler by providing a safe way to transport funds at no expense to the member. So far, the test results are encouraging.

Recently, seven organizations issued Citicorp Diners Club charge cards to traveling employees. This test limits the amount of travel advances, but provides a charge card to use for official travel expenses, including transportation. When fully implemented by all federal agencies, the charge card and travelers check programs are expected to save taxpayers about $200 million a year in administrative and interest charges. At the same time, TDY travelers are protected against loss of cash and are provided check-cashing privileges.

Last year, the Air Force Comptroller asked the Center to expand the Accounting and Finance Office of the Future program to include productivity improvement for base-level comptroller offices. This year, five bases are testing the new Comptroller Office of the Future system. The automation effort, which will help comptrollers keep up with the challenges of the future, should be implemented in 1988.

The Center recently implemented the Air Force Stock Fund Accounting and Reporting System, which tracks $6.5 billion worth of material. Batch tape systems were replaced by on-line interactive programs using the latest data-base technology.

The Center's Directorate of Resource Management is designing a new office information system to meet specific needs of the user. The Office Information System (OIS) and Local Area Network (LAN) provide the

latest innovations to rid the employee of the tedious manual methods of handling paperwork. The LAN will connect this electronic marvel to other offices within DoD through the Defense Data Network and the Comptroller Office Automated Network. These programs won productivity funding for AFAFC in FY '86.

While continually looking for ways to improve efficiency, productivity, and service to Air Force people, AFAFC takes pride in providing today's Air Force with the best in modern financial management. ■

Air Force Audit Agency

The Air Force Audit Agency (AFAA), headquartered at Norton AFB, Calif., provides all levels of Air Force management with independent, objective, and constructive evaluations of the effectiveness and efficiency with which managerial responsibilities (financial, operational, and support) are carried out.

J. H. Stolarow, the Auditor General of the Air Force, reports to the Secretary of the Air Force and has direct access to the Chief of Staff. The Assistant Secretary of the Air Force for Financial Management provides technical guidance and supervision on audit policy and management matters. This enables AFAA to assess independently the activities and functions it audits. Brig. Gen. Basil H. Pflumm, the Deputy Auditor General, is stationed at the Pentagon and acts for the Auditor General at the Air Staff and Secretariat.

The AFAA headquarters is comprised of two staff directorates, Operations and Resource Management. Line elements include:

- The Acquisition and Logistics Systems Directorate located at Wright-Patterson AFB, Ohio, which directs the development and management of audits relating to weapon system acquisitions and depot- and installation-level logistic support.
- The Forces and Support Management Directorate at Norton AFB, Calif., which directs the development and management of audits relating to Air Force-wide management of personnel and support services, information technology, comptroller and nonappropriated fund activities, forces management, communications, intelligence, and transportation.
- The Field Activities Directorate, also at Norton AFB, manages installation-level audit work at area audit offices located on most major Air Force installations worldwide. Supervision of area offices is exercised through four geographic regional offices located at Andrews AFB, Md. (Eastern), Offutt AFB, Neb. (Central), McClellan AFB, Calif. (Western), and Ramstein AB, West Germany (European). There is also an AFAA representative assigned to each major command headquarters.

The Agency has two basic procedures for reporting audit results to Air Force management:

- Reports of audit containing the overall results of centrally directed multisite audit efforts, which are addressed to top major command and air staff management levels.
- Reports of audit containing results of installation-level audits, which are addressed to local commanders.

The Audit Agency employs more than 1,000 people and has a civilian/military ratio of three to one. Ninety-seven percent of the auditors have at least one college degree, and forty-three percent have graduate degrees. Also, thirty-eight percent are certified public accountants, certified internal auditors, and/or certified information system auditors. ■

Air Force Commissary Service

The Air Force Commissary Service, with headquarters at Kelly AFB, Tex., handled more than $2.2 billion in sales at 139 resale stores and 113 troop support locations around the world last year.

Troop support is AFCOMS's primary mission in peacetime and wartime. This separate operating agency ensures that food and rations are available wherever and whenever needed for troops, whether it's on the battlefield or in dining facilities.

AFCOMS's most visible mission is the day-to-day operation of commissary stores at Air Force installations in the US and abroad. AFCOMS's stores average $8.8 million in sales every day, making them the fourteenth largest food retailing group in the US.

Air Force commissaries sell goods at cost, plus a five percent surcharge required by law to pay for equipment, supplies, and other expenses. The commissary benefit is a form of nonpay compensation, and patrons save an average of twenty-five percent by shopping in the commissary.

Four major theme sales throughout the year and special promotional offers added millions of dollars in additional savings for Air Force commissary patrons. Smart shoppers stretched their food dollars even farther by redeeming 84,700,000 cents-off coupons for another $26.8 million in extra savings.

Recent surveys show that the commissary benefit is the second most important nonpay compensation for Air Force people. It ranks just behind medical benefits as the reason why second-term airmen and above remain with the Air Force.

A major goal of AFCOMS's 11,000 civilian and military employees is to provide excellent commissary service to authorized shoppers.

AFCOMS introduced several initiatives in 1985 to improve service. These included:

- Expanding operating hours at many locations and opening a number of stores on Sunday. Full patron service is provided on Sundays at locations where crowded conditions require it. Other stores combined their

operating schedules with nearby Air Force commissaries so that patrons can enjoy shopping seven days a week.

• Restructuring the mandatory sales program to provide both CONUS-wide and regional promotions. These programs can now be tailored to respond more closely to regional shopping trends and local preferences.

• Adding fresh fish markets at many commissaries. AFCOMS plans to expand the availability of fresh seafood to as many commissaries as possible. A wide selection of fish, shrimp, and live lobsters is already available at several stores.

• Opening several in-store bakeries to provide fresh-baked products for commissary patrons. These bakeries turn out fully prepared baked goods, such as pastries and doughnuts, as well as prepared frozen products. Most stores already have delicatessens that offer a wide selection of meats and cheeses.

• Installing scanning checkout and data-processing equipment in nineteen stores. More than 100 additional systems will be installed in the next two years, improving customer throughput and increasing checkout accuracy. The new checkout system will also allow shoppers to pinpoint exactly where their food dollars have gone by issuing detailed receipts and will enable managers to track their item movement and stock positions automatically, thereby reducing out-of-stocks. More than $40 million will be spent to install this equipment, which is similar to that seen in commercial stores.

• Cutting energy costs. All of AFCOMS's new stores are designed to consume at least forty-five percent less energy per square foot than a store built in 1975. Active design practices, such as heat reclamation and high-efficiency lighting systems, continue to provide significant energy savings.

• Obligating $97 million in FY '85 for the largest-ever single-year construction program. Twenty-one new stores—overseas and CONUS—are now under construction. Fifteen of these are scheduled to open in 1986. By 1990, AFCOMS will have replaced ninety-seven of its 146 stores with modern facilities at a construction cost of more than half a billion dollars. Money for the construction comes from the five percent surcharge added at the end of patrons' grocery bills.

• Reorganizing their fifteen Stateside complexes into eight regions, yielding 170 manpower authorizations that were redistributed to the commissaries. The added manpower at store level has improved store operations and enhanced patron service.

• Adopting the Model Installation Program at ten commissaries. This Defense Department program will allow one store from each of AFCOMS's eight CONUS and two overseas regions to waive AFCOMS's requirements after coordinating the change with the region commander or director. With the goal of making Air Force commissaries a better place to live and work, this program will enable commissary officers to eliminate unnecessary routine irritants and encourages individuals to identify problem areas and to suggest solutions.

AFCOMS continues to strive for excellence and to look for new and better ways to serve its patrons. ■

Air Force Engineering and Services Center

The Air Force Engineering and Services Center (AFESC), with headquarters at Tyndall AFB, Fla., has a dual role. The first is recommending and developing programs and technical policies in support of the Air Force Director of Engineering and Services; the other is assisting all commands and installations in solving civil-engineering and services problems through consultant services, hands-on assistance, and the development of new products and procedures.

More than 600 highly qualified, carefully selected professionals provide engineering and services guidance and assistance worldwide in the areas of readiness, fire protection, facility energy, environmental planning, billeting, food services, mortuary services, and the overall operation and maintenance of Air Force installations. The Center also includes the Engineering and Services Laboratory, which is devoted to civil-engineering and environmental research, development, test, and evaluation.

By providing expertise with its headquarters staff and traveling teams, the Center helps solve the problems of today as well as plans for the engineering and services needs of the future.

The AFESC Commander reports directly to the Director of Engineering and Services at Air Force Headquarters in Washington, D. C.

In 1985, Hq. AFESC and its traveling teams:

• Pioneered the consolidation of Base Recovery After Attack Training (BRAAT) for all essential CONUS-based civil-engineering and services teams. This consolidation addressed disaster preparedness and explosive ordnance disposal training and the establishment of a curriculum development function at AFESC that is charged with coordinating theater training requirements, programs taught by technical training centers, as well as those taught by other Department of Defense activities.

• Began delivery of the new, highly mobile, four-wheel-drive, air-transportable P-19 aircraft crash and structural fire-fighting truck, which replaces the aging P-4 fire truck. One fire fighter can put the P-19 into air transport configuration in less than fifteen minutes. The new vehicle carries 1,000 gallons of water, 130 gallons of foam agent, and 500 pounds of Halon 1211 fire-fighting agent.

• Tested, validated, and fielded a new nondestructive system to determine the load-carrying capability of airfield pavements without having to close down flying operations for as much as seventy-two hours, as in the past.

• Saved $20 million in energy costs by helping the Air Force become 2.2 percent more energy efficient, including one $600,000 cost-avoidance savings at the Air Force Academy. To date, AFESC has helped the Air Force save approximately $45.8 million in energy cost avoidance.

• Completed an in-depth review of twenty-one base civil-engineering operations functions by using Project Innovative Management Achieves Greater Effectiveness (IMAGE). This resulted in a new basis of issue (BOI) for general-purpose vehicles, a new family housing reporting system (being tested for one year), the establishment of a program to replace and

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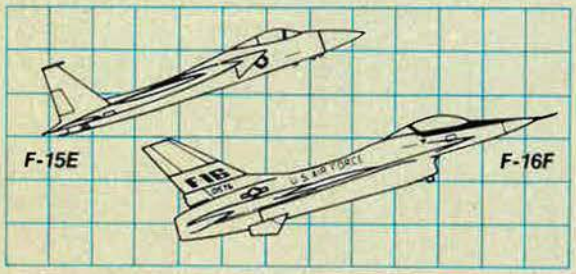

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update fifty-eight percent of all Air Force snow-removal equipment, and a restructuring of the training of civil-engineering equipment operators to increase wartime readiness.

• Conducted rapid runway repair (RRR) tests under realistic wartime conditions during the Air Base Survivability Exercise Salty Demo at Spangdahlem AB, Germany, culminating more than four years of preparation. Data gathered from this exercise will be crucial in the Air Force's decisions on procedures for base operations and recovery after attack for years to come.

• Developed and tested a new waste-treatment system for Air Force electroplating activities at Tinker AFB, Okla., that reduced costs by eighty percent and the volume of hazardous sludge waste by sixty percent. For this one base, the system cost $20,000 for full-scale installation and saved enough money in one week to pay for itself. This new technology could save more than $2 million Air Force-wide.

• Developed and implemented a new automated Air Force Construction Pricing Guide for calculating construction costs, thus eliminating the old, manual system that was tedious, prone to error, and wasted many man-hours in checking and rechecking cost estimates.

• Established procedures making the Air Force the only service to provide expert staff members (from AFESC Mortuary Affairs) to visit any family member of deceased Air Force people to answer questions and fully explain identification methods, especially for remains returned from SEA.

• Installed ten base-level Work Information Management Systems (WIMS) in civil-engineering squadrons and introduced the first prototype Services Information Management System (SIMS) at Davis-Monthan AFB, Ariz. In a unique and successful approach to these computerized total information management systems, AFESC individually designed and fitted each system to the specific user's needs rather than modified an organization or its procedures to fit the characteristics of the computer equipment.

• Completed Phase 1 of the Air Force Installation Restoration Program, the first step in a four-phase process designed to identify past hazardous-waste disposal sites that may pose a threat to human health or the environment. Exhaustive research at 165 installations resulted in the identification of more than 1,700 possible locations. Phases 2, 3, and 4 (determining if hazardous wastes are actually present, followed by actual clean-up and remedial procedures) have already begun at many of the sites.

• Held the first Air Force-wide Bird Aircraft Strike Hazard (BASH) workshop, involving 150 flying safety, civil-engineering, and airfield management personnel representing seventy Air Force bases, fourteen Naval installations, three Canadian bases, the National Aeronautics and Space Administration, and the Federal Aviation Agency. The workshop was organized, conducted, and hosted by AFESC's BASH team, the only team of its kind in the world.

• Continued a comprehensive program to enhance the quality of life for families making PCS moves by construction of new temporary lodging facilities (TLF). These TLFs embody improved design standards that will result in more living area in each TLF unit.

AFESC's prime mission continues to be the improvement of air base facilities to enhance the daily operation, readiness, and survivability of Air Force operational forces. ■

Air Force Inspection and Safety Center

The Air Force Inspection and Safety Center (AFISC), Norton AFB, Calif., provides the Secretary of the Air Force, the Chief of Staff, and major command and separate operating agency commanders an assessment of Air Force fighting capability and resource management effectiveness. Maj. Gen. Fred A. Haeffner commands AFISC and is also the Deputy Inspector General for Inspection and Safety, Hq. USAF.

AFISC has an authorized work force of 351 military and 138 civilian personnel who represent 111 Air Force specialties. It is divided into four directorates and two offices.

• **The Directorate of Inspection** determines operational readiness status within the major commands by monitoring their operational readiness inspection (ORI) reports and by conducting over-the-shoulder inspections with command inspector general teams during ORIs. The Directorate also evaluates the effectiveness and efficiency of USAF management systems through functional manage-

AFISC can take great pride in its role in helping the Air Force fly safer in 1985 than it ever had in history. Here, Maj. Michael J. Kaye, a project officer at AFISC, practices mishap investigation procedures at the Center's Crash Lab. (Photo by Bob King)

ment inspections (FMIs), system acquisition management inspections (SAMIs), and follow-up inspections.

• **The Directorate of Aerospace Safety** is the Air Force manager for flight, ground, missile, explosives, and systems safety programs. The Directorate provides guidance and monitors the implementation and effectiveness of mishap-prevention programs. This includes administering the investigation and reporting of mishaps to determine causative factors and positive corrective measures. Air Force safety programs continue paying large dividends. It was announced recently that the Air Force had won the National Safety Council's prestigious President's Safety and Health Award, Category I (large federal agencies). The 1985 aircraft mishap rate of 1.5 mishaps per 100,000 flying hours is the lowest in USAF history.

• **The Directorate of Nuclear Surety** manages the Air Force Nuclear Weapon Surety Program and ensures that the four DoD Nuclear Weapon System Safety Standards are met during all phases of design, operations, maintenance, modifications, and logistics movement. It accomplishes its worldwide missions through various program elements. These include the Nuclear Safety Inspection System, Accident/Incident/Deficiency Reporting System, Nuclear Weapon System Safety Rules, Nuclear Safety Certification Programs, Personnel Reliability Program, and the Two-Man Concept.

The Directorate also has nuclear surety responsibilities for terrestrial nuclear reactor systems and for review procedures for nuclear power systems and space or missile use of radioactive sources. It is located at Kirtland AFB, N. M., because this area is the "hub" of the nuclear community and offers the opportunity to coordinate nuclear-related matters with the Air Force Weapons Laboratory, Defense Nuclear Agency, Department of Energy, Sandia National Laboratories, and the nearby Los Alamos National Laboratory.

• **The Directorate of Medical Inspection** plans and conducts Air Force and Air Reserve Forces biennial Health Services Management Inspections (HSMIs) and special investigations to ensure effective management of health-care resources and the readiness of Air Force medical units. In addition to the 290 functional areas inspected in each medical facility, Special Interest Items (SIIs), as selected by the Air Force Surgeon General, are given increased emphasis.

• **The Office of Information Systems** provides the commander and his staff with automatic data processing and data systems support. It designs and develops all computer application software and operates a centrally located computer system to support all aspects of the AFISC mission. It also serves as USAF custodian and repository for flight records of rated individuals that date from the year 1911.

• **The Office of Management Support** manages manpower, personnel, budget, and plans and programs development for the Center and monitors major command and Air Force inspection schedules and activities. ■

Air Force Intelligence Service

The Air Force Intelligence Service (AFIS), comprising more than 2,200 active-duty, Reserve, and civilian personnel, is completing its thirteenth year as a separate operating agency. The AFIS mission is to provide accurate, timely, and reliable intelligence, trained intelligence personnel, and intelligence support resources to Hq. USAF and combatant commands during peacetime, wartime, and contingency situations.

Maj. Gen. Schuyler Bissell serves in a dual role as the Commander of AFIS and as the Assistant Chief of Staff, Intelligence, Hq. USAF. With its headquarters in Washington, D. C., and operational elements at more than forty locations in the CONUS and overseas, AFIS is involved in the full spectrum of intelligence activities. AFIS conducts intelligence collection operations, processes and disseminates intelligence information, and manages programs to provide the Air Force with the intelligence personnel and systems needed to identify and define the threat through the 1990s and beyond.

Air Force Intelligence Service directorates support US Air Force planning and combat operations, responding to changing Air Force intelligence requirements.

• Operational Intelligence Directorate ensures that the Secretary of the Air Force, the Chief of Staff, and other key Air Staff officers receive the timely and accurate intelligence necessary for indications and warning, contingency planning, and force deployment and employment. It also provides special intelligence research as required and experts on photo research and signals intelligence (SIGINT) analysis.

• Target Intelligence Directorate plans, coordinates, and exercises managerial control of Air Force target intelligence. Responsibilities include weaponeering, target analysis, force application, and mission planning; target materials; and mapping, charting, and geodesy (MC&G). The Directorate serves as the program monitor for Air Force support and MC&G to the Defense Mapping Agency.

• Security and Communications Management Directorate oversees worldwide Air Force Special Security Offices and ensures compliance with special intelligence and intelligence telecommunications security policies.

• Intelligence Data Management Directorate plans, coordinates, and exercises managerial control of worldwide Air Force intelligence data-handling systems.

• Attaché Affairs Directorate supports the Defense Attaché System and monitors all matters concerning Air Force participation in that program.

• Intelligence Reserve Forces Directorate manages the Air Force Intelligence Service's Intelligence Reserve program. Responsibilities include the recruitment, administration, readiness training, and operational utilization of intelligence mobilization augmentees in support of active-duty forces, peacetime requirements, and contingency mission requirements.

• Soviet Affairs Directorate conducts the Air Force's Soviet Awareness Program. Responsibilities include the *Soviet Military Thought* and *Studies in Communist Affairs* series, the *Soviet Press Selected Translations* periodical, the Soviet Military Power Week and Soviet Awareness Team, and the Soviet Military Literature Research facility.

• Joint Services Support Directorate provides centralized management

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and cohesive direction to all aspects of intelligence support for USAF Prisoner of War (POW) matters. The Directorate serves as the action office in the Department of Defense for Code of Conduct training, manages the peacetime Hostage Survival Program, and produces finished intelligence in support of combat survival.

• Special Studies Division provides all-source analysis, reporting, and intelligence production on foreign denial and deception activities.

• Air Force Special Activities Center provides centralized management of all the Air Force activities involved in the collection of information from human resources. Major subordinate units are located in Air Force European and Pacific commands.

The Air Force Intelligence Service participates in joint and Air Force training exercises each year to improve the readiness of active-duty and Air Force Reserve intelligence personnel. AFIS also sponsors a multinational exercise for DoD survival instructors, Exercise Ridge Runner.

In addition to these, AFIS demonstrated its readiness in the deployment of intelligence specialists to Grenada in support of Operation Urgent Fury. ■

Air Force Legal Services Center

Air Force Legal Services Center (AFLSC), with headquarters in Washington, D. C., provides Air Force-wide legal services in military justice, claims for and against the Air Force, tort litigation, general litigation, labor law, preventive law, and legal aid.

The Center handles Air Force patents, copyrights, and other property matters and is responsible for providing the trial officials for general or special courts-martial and for reviewing trial results. It also operates the automated legal research service center for DoD and other federal agencies through the Federal Legal Information Through Electronics (FLITE) system.

Maj. Gen. Robert W. Norris serves in a dual role as the Commander of AFLSC in addition to his duties as The Judge Advocate General of the Air Force. About 200 people are assigned to the Center staff legal offices in Washington, D. C., and about sixty who work with FLITE are assigned to Denver, Colo.

Several divisions of AFLSC administer or manage a variety of military justice functions.

The Court of Military Review reviews all courts-martial resulting in dismissal, confinement of one year or more, or dishonorable/bad conduct discharges. Decisions made by the Court of Military Review are appealable to the US Court of Military Appeals. The Court of Military Review is located in Washington, D. C.

The Military Justice Division reviews those records of trial by general courts-martial not required to be reviewed by the Court of Military Review. It advises The Judge Advocate General on petitions for new trial or for relief from conviction. This division prepares regulations, manuals, and policy letters relating to the preparation of responses to high-level inquiries concerning military justice matters. In addition, the division provides legal advice to members of the Air Staff on issues related to criminal activities and the military justice system.

The Defense Services Division provides defense services to Air Force members appearing before the Air Force Court of Military Review, the US Court of Military Appeals, and the US Supreme Court. This division also supervises 120 area defense counsel, nineteen circuit defense counsel, and seven chief circuit defense counsel, who provide defense services for Air Force personnel involved in special and general courts-martial and other adverse actions.

The Trial Judiciary Division oversees seven judiciary circuits and other subordinate districts throughout the world. The Chief Judge of each circuit is responsible for supervising the military judges and court administrators of the circuit. All Air Force judges are assigned to the Air Force Legal Services Center to ensure independence from local commanders.

The Government Trial and Appellate Counsel Division represents USAF before the Air Force Court of Military Review, the US Court of Military Appeals, and the US Supreme Court. This division also supervises the twenty-one full-time circuit trial counsel who prosecute most general and some special courts-martial.

The Special Assistant for Clemency and Rehabilitation Matters recommends appropriate clemency actions, including reduction in sentence, change in place of confinement, or substitution of administrative discharge for selected courts-martial convictions. The Assistant responds to all congressional, executive, and individual correspondence dealing with confinement, clemency, and post-trial matters.

The four remaining divisions of AFLSC handle a variety of civil law matters.

The Claims and Tort Litigation Staff performs both operational and management functions over claims and tort litigation arising from Air Force activities worldwide. It settles or recommends settlement of certain claims above the base-level authority and provides litigation support to the Department of Justice in defending Air Force suits, including aviation and medical malpractice cases.

The General Litigation Division protects Air Force interests in all domestic litigation except for copyright and patent cases and cases arising under the Federal Tort Claims Act. Its areas include information and privacy; personal torts; personnel matters (retirement and pay and allowance rights of Air Force military and civilian personnel, including individual or class discrimination); contracts (litigation brought by contractors for money damages, injunctions against award of contracts, government appeals of Armed Services Board of Contract Appeals decisions, bankruptcies, and collections of indebtedness to nonappropriated funds); general litigation (including environmental law litigation and actions under other federal and state laws, public utility rate litigation tax disputes, and civil rights litigation involving equal opportunity in off-base housing); and administrative labor law (provides attorney representation for management in unfair labor practices cases, discrimination complaints, Merit System Protection Board cases, labor arbitration, negotiability disputes, and other administrative labor law cases).

The Patents Division provides direction, control, and coordination of inventions, patents, copyrights, trademarks, trade secrets, and rights

in technical data matters for the Air Force.

The Preventive Law and Legal Aid Group supervises the worldwide Air Force preventive law and legal assistance program, through which installation legal offices assist Air Force members with their legal affairs. Each year, Air Force legal assistance offices help an average of 450,000 eligible clients in more than a million different personal civil matters. ■

Air Force Management Engineering Agency

The Air Force Management Engineering Agency (AFMEA) leads Air Force efforts to make the best use of scarce manpower resources.

The cornerstone of the AFMEA mission is the Functional Review Program. This program's prime objective is to develop the most efficient and effective organization with no decrease in readiness and also to develop manpower standards. To do this, AFMEA works with units and headquarters to apply the most progressive industrial engineering techniques available. The resulting manpower standards specify, by grade and skill, the correct number of people necessary to perform each unit's mission. The functional review process also enables AFMEA and commanders to assess wartime manpower needs and to develop models to help commanders determine what manpower will be required for wartime operations.

Other major responsibilities include the management of the Air Force officer/enlisted grade distribution; the operations and maintenance of the Logistics Composite Model (LCOM), a computer simulation to determine maintenance manpower requirements for different weapon systems; technical assistance to commands considering whether some jobs in the Air Force should be contracted; and the administration of major Air Force productivity enhancement programs. The productivity programs administered by AFMEA capitalize on technological advances and new ideas to increase productivity and free manpower for other priorities in the Air Force. They include the Air Force Suggestion Program and the Fast Payback Capital Investment Program (FASCAP). In FY '85, AFMEA directed the distribution of $8.7 million to help bases finance productivity improvements. Another $13.7 million, representing a percentage of savings realized, was awarded to Air Force members for their suggestions.

From its headquarters at Randolph AFB, Tex., AFMEA directs eleven subordinate units throughout the US and provides assistance and technical guidance to MAJCOM Command Management Engineering Teams (CMETs) at nearly every Air Force base in the world. The eleven units include eight Functional Management Engineering Teams (FMETs) responsible for using industrial engineering work measurement techniques to develop efficient organizations and standards in functional areas common to most locations throughout the Air Force. When possible, the FMETs are normally collocated with functional centers.

The FMETs are Comptroller Management Engineering Team at Lowry AFB, Colo. (AFCOMPMET); Engineering and Services Management Engineering Team at Tyndall AFB, Fla. (AFESMET); Intelligence Management Engineering Team at Offutt AFB, Neb. (AFINTELMET); Medical Management Engineering Team at Maxwell AFB, Ala. (AFMEDMET); Manpower and Personnel Management Engineering Team at Randolph AFB, Tex. (AFMPMET); Special Staff Management Engineering Team at Peterson AFB, Colo. (AFSSMET); Security Police Management Engineering Team at Kirtland AFB, N. M. (AFSPMET); and Logistics Management Engineering Team at Dover AFB, Del. (AFLOGMET).

The three other units are OL-A at the Pentagon in Washington, D. C., OL-B at Wright-Patterson AFB, Ohio, and the Air Force Wartime Manpower and Personnel Readiness Team (AFWMPRT) at Fort Ritchie, Md. AFWMPRT advises Hq. USAF on such matters as wartime manpower requirements, personnel availability, and training.

AFMEA has an authorized strength of ninety-four officers, 146 enlisted, and 110 civilians. ■

Air Force Military Personnel Center

The programs managed by the Air Force Military Personnel Center (AFMPC) affect nearly 600,000 Air Force men and women around the world. The Center's mission is people, and its personnel policies and programs affect the lives of Air Force people from their initial enlistment through their retirement.

The Center has undergone numerous changes during the past year, the first of which occurred on March 1, 1985, when the Air Force Management Engineering Agency, previously attached to AFMPC, became a separate operating agency. Another change resulted from a major study of the Center's functions. Study recommendations included major internal realignments that streamlined its operation and became effective on August 1, 1985. On August 30, 1985, AFMPC broke ground on a new computer operations wing to provide a centralized location for more advanced data-automation equipment; acquisition was completed on September 18, 1985.

The Center's name changed from Air Force Manpower and Personnel


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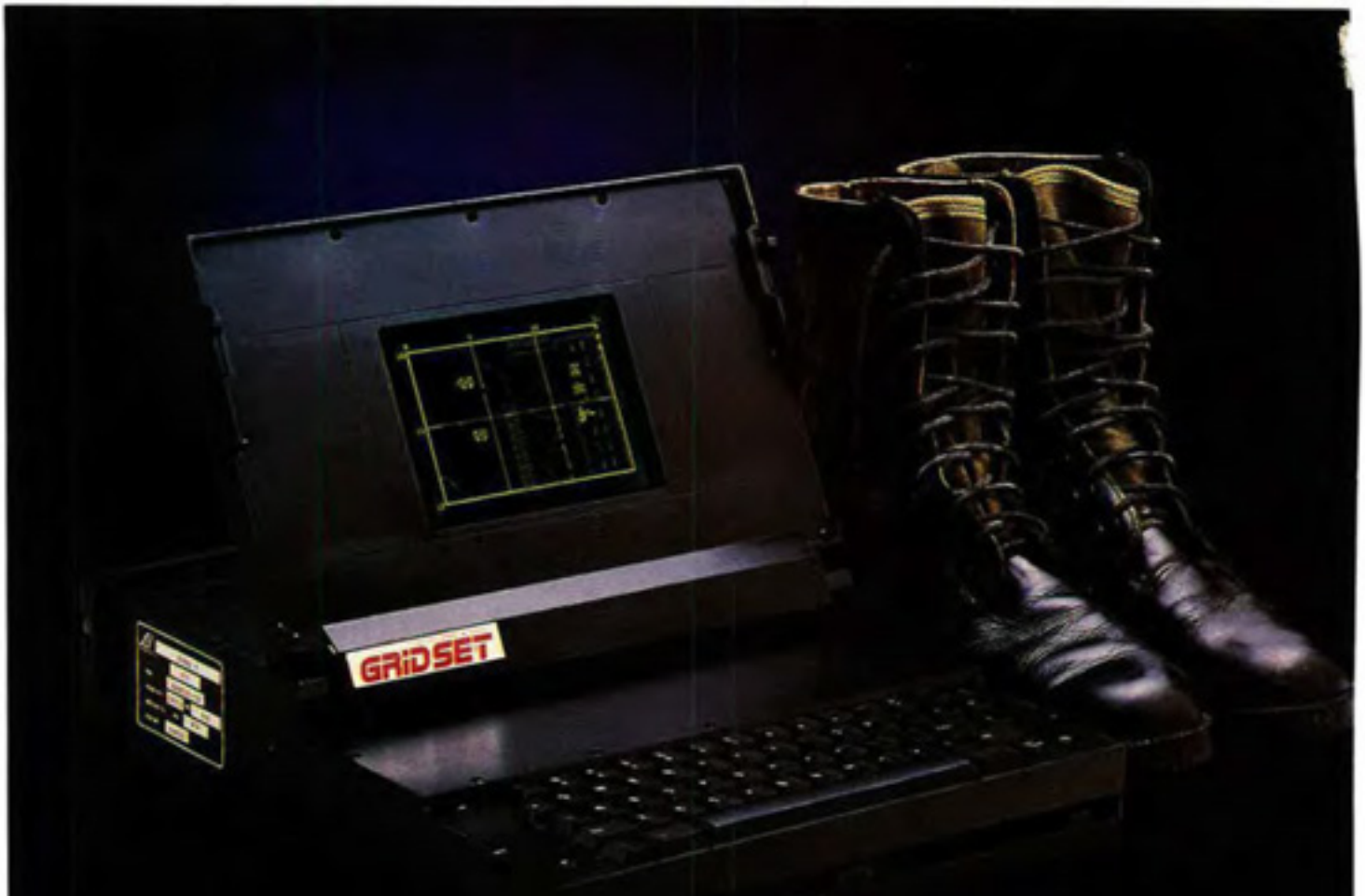

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Center to its present name on January 1, 1986, as part of a larger reorganization within the office of the Deputy Chief of Staff for Manpower and Personnel, Hq. USAF. This change moved the Directorate of Manpower and Organization to DCS for Programs and Resources, and the DCS for Manpower and Personnel was renamed DCS for Personnel. This change affected the Office of Civilian Personnel Operations, which was administratively attached to AFMPC. It became a direct reporting unit and was renamed the Air Force Civilian Personnel Management Center on January 1, 1986.

A separate operating agency located at Randolph AFB, Tex., AFMPC is commanded by Maj. Gen. J. B. Davis, who also serves as the Assistant Deputy Chief of Staff for Military Personnel, Hq. USAF.

AFMPC's most significant responsibility is to put the right people in the right skills at the right locations so that field commanders are able to accomplish their missions. To do this, the Center staff balances the need to accommodate individual preferences and career goals with the requirement to meet the personnel needs of field commanders. In FY '85, more than 246,000 airmen and nearly 49,000 officers were reassigned. Even before the initial assignment, AFMPC works closely with the Air Force Recruiting Service and Air Training Command to acquire, classify, and train the numbers and types of people the Air Force needs.

Last year, the Center hosted eighteen selection boards for promotion of officers up to the grade of colonel and for promotions to senior and chief master sergeant. In addition, boards were convened to select 635 officers for the Air Force Institute of Technology, 135 for Education With Industry, seventy-five officers for the Air Staff Training program, 715 officers and approximately 1,300 NCOs to attend professional military education courses in-residence, and 290 officers to attend special flying programs. Other boards at the Center identified individuals for special recognition, including the Twelve Outstanding Airmen of the Year.

In FY '85, more than 4,000 humanitarian requests were processed, of which approximately 2,000 were approved. In addition, more than 800 Children Have a Potential (CHAP) requests were processed, with almost 600 being approved. AFMPC also responded to more than 9,500 Presidential, congressional, Inspector General, and other high-level inquiries on a myriad of personnel matters.

AFMPC administers the Weighted Airman Promotion System (WAPS) and the Stripes for Exceptional Performers (STEP) programs. In FY '85, more than 44,000 enlisted members received promotions under WAPS, and 456 were selected by commanders for STEP promotions.

Quality of the force, awards and decorations, physical fitness, line-of-duty determinations, dress, and personal appearance fall within AFMPC's responsibility. The Center also handles all separations and retirements and is the focal point for retiree activities.

AFMPC is also the hub of all Air Force morale, welfare, and recreation activities, such as libraries, open messes, aero clubs, arts and crafts and recreation centers, child-care centers and preschools, golf courses, entertainment, sports, gymnasiums, bowling centers, and youth programs. The highlight of the year for MWR was the "Tops in Blue" entertainment group at the Super Bowl XIX halftime show for 1985.

Initiatives in the open mess area include reinstatement of slot machines in overseas locations and a concentrated effort to upgrade the ambience and quality of service to open messes through two programs—Culinary Upgrade Program and Tabletop Enhancement Program. CUP graduated 247 club management people, bringing the total to 601 graduates since 1981. Now in its third year, TEP training teams visited 151 bases and trained 3,919 employees. Open mess membership grew to its largest level since 1970, with 553,000 members, an increase of 21,000 since 1983.

AFMPC maintains data in its computers on nearly 1,750,000 active-duty, AFRES, ANG, and civilian personnel. Here, A1C Brian Logsdon removes one of the tape library's nearly 46,000 reels. (USAF photo by Jimmie R. Jilek)

Quality-force initiatives continued to influence reenlistment and retention activities in 1985. The Selective Reenlistment Program was expanded to apply to second-term and career airmen, allowing commanders to ensure that only the most highly qualified were allowed to reenlist. During FY '85, more than 10,000 people were retrained into new career fields through voluntary and selective retraining programs in order to achieve a better balance in career field manning.

To help keep quality people, many compensation and retention initiatives were conceived or supported by AFMPC reports, surveys, and field visits.

Ensuring the ability of the personnel activity to support commanders and mission tasking in wartime is a continuing concern. Programs and procedures are developed, tested, and refined by AFMPC through participation in such exercises as Team Spirit and Bright Star.

Another MWR initiative authorizes bases to establish family day-care programs. This program allows qualified people to care for children in their quarters, augmenting the child-care centers.

Programs to help those in need also are managed at AFMPC. Last year, Air Force members donated more than $6.4 million to help others through the Air Force Assistance Fund.

As part of the total effort to modernize Air Force programs to combat discrimination and drug and alcohol abuse, the Center convened an Equal

Opportunity and Treatment Workshop to train MAJCOM staffs to implement an upgraded mission support system. The system consists of state-of-the-art sociological methods and tools to give commanders a better understanding of the social dynamics in their units. By training Social Actions staffs worldwide to manage the Air Force Drug Testing Program, mission readiness was further enhanced. The Social Actions Program is being streamlined with microcomputers to reduce administration and provide more support to commanders.

The Office of the Surgeon is responsible for assuring full staffing of health professions officers. Presently, more than 1,700 physicians are being trained in active duty or deferred status to meet physician specialty requirements. The Surgeon's Office is also responsible for monitoring nonflying physical standards, and it reviewed 4,600 physical exams and 1,800 medical evaluation board reports in FY '85.

AFMPC is responsible for administering the Air Force Casualty Service Program. In addition to assisting families of active-duty casualties, the Center maintains contact with the families for the 941 unaccounted-for Air Force personnel in Southeast Asia.

The Colonels' Group is also part of AFMPC. In addition to assignment actions, they work executive development opportunities, maintain master selection folders, process nondisability retirements, and manage the senior service school program for all colonels and colonel-selectees.

The entire personnel network is linked together by a worldwide computer system, providing current information on personnel actions twenty-four hours a day. The system also includes newer, more powerful minicomputers at major commands and separate operating agencies as well as more than 600 remote terminals placed throughout the Air Force personnel community.

In addition, the implementation of the Advanced Personnel Data System-II project is more than halfway completed, but it is already providing office automation functions to base personnel activities and linking them to data stored on AFMPC mainframe computers.

The future direction of the Air Force personnel system is being shaped by a program called Personnel Concept III. PC-III is a funded, $150 million program that greatly enhances mission support through the use of advanced technologies that replace time-consuming, labor- and paper-intensive base-level processes with fast, efficient electronic processes. ■

Air Force Office of Medical Support

The Air Force Office of Medical Support (AFOMS) is a separate operating agency with headquarters at Brooks AFB, Tex. The AFOMS, formerly the Air Force Medical Service Center (AFMSC), was organized and became operational on July 1, 1985. The AFOMS Commander also serves on the staff of the Surgeon General, USAF, as the Director of Health Care Support.

The Air Force Office of Medical Support assists the Air Force Surgeon General in developing programs, policies, and practices relating to Air Force health care in peace and war. It acts for the Surgeon General to put policies and directives into effect. The office is organized into the Directorate of Health Care Support and the Professional Affairs and Quality Assurance Liaison Office.

The Directorate of Health Care Support develops plans, programs, and management guidance through its four divisions: Biometrics Division, Health Facilities Division, Medical Service Information Systems Division, and Medical Logistics Division. The Air Force Medical Logistics Office located at Fort Detrick, Md., is assigned to AFOMS.

The Biometrics Division creates and monitors reporting systems to collect biostatistical data on Medical Service functions, services, and operations, including patient administration, clinical records, outpatient records, and patient affairs activities located within all medical facilities.

The Medical Facilities Division serves as focal point for Air Staff management and coordination of all matters pertaining to medical facilities through the Military Construction Program, facilities maintenance and improvements, and medical facility design.

The Medical Service Information Systems Division monitors the development, acquisition, installation, and application of computer-based medical information handling and retrieval systems. This division is the single automated data processing manager for Medical Service operations and performs special procedural and cost benefit analyses.

The Medical Logistics Division develops plans and policies concerning medical equipment and materiel and their supply, biomedical equipment maintenance and repair, service contracts, and medical materiel support of Medical Service missions during wartime. The Air Force Medical Logistics Office, Fort Detrick, Md., is an operational element of the Medical Logistics Division. It functions as an operational control center for medical materiel in direct support of all base medical facilities, major commands, Air Force Reserve, Air National Guard, and various defense supply centers. It is the direct contact point with Defense Personnel Support Center and all USAF materiel activities. It is the single USAF manager of medical commodities and provides technical operational guidance and surveillance of base and major command medical materiel maintenance activities.

The Professional Affairs and Quality Assurance Liaison Office coordinates with the Directorate of Professional Affairs and Quality Assurance at Bolling AFB, D. C., on the activities of the Health Promotion Program, the Family Advocacy Program, and the USAF Radioisotope Committee. The Health Promotion Program conducts workshops, publishes and distributes health literature, and develops visual aids for health educators to use in promoting healthy lifestyles.

The Family Advocacy Program conducts workshops for medical and nonmedical personnel in the detection and treatment of spouse/child abuse, alcoholism, and the Children Have a Potential (CHAP) program. The USAF Radioisotope Committee is the Air Force's central point of contact with the United States Nuclear Regulatory Commission on all matters of licensing. This committee also coordinates all administration and regulatory aspects of licensing, possession, use, storage, handling, and disposal of all radioactive material in the Air Force.

AFOMS is directly involved on a daily basis with the Air Force Surgeon General, other Air Staff directorates, major commands, and other federal agencies. ■

Air Force Office of Security Police

The Air Force Office of Security Police (AFOSP), located at Kirtland AFB, N. M., is commanded by Brig. Gen. P. Neal Scheidel, who also serves as the Air Force Chief of Security Police and the Assistant Inspector General for Security Police. A staff of ninety-four is assigned to Kirtland AFB; an additional forty-five people are part of the Air Force Security Clearance Office, an operating location in Washington, D. C. Another twelve are assigned to the Inspector General's staff in the Pentagon.

AFOSP develops policies for security and law-enforcement programs and plans, directs, and supervises activities for a career field of more than 40,000 active-duty, Air Reserve Forces, DoD civilian, and contract civilian personnel. Activities include security of aerospace systems, maintenance of law and order, information security, management of security police personnel programs, vehicle traffic management, base defense, security police and combat-arms training, security education, prisoner rehabilitation and correction, as well as military working dog and security police systems and equipment programs.

AFOSP accomplishments during the past year include:

- Revision of security clearance policy for Air Force personnel. The new policy prescribes that clearances will be issued at the level of classified access required for a given position and that the level will be adjusted up or down as assignments change. The policy also permits temporary access up to the level of clearance eligibility to meet mission requirements. AFOSP has reduced the number of security clearances within the Air Force by more than ten percent, as directed by the Secretary of Defense. Recent espionage cases, including the Walker spy-ring case, have caused all services to take closer looks at information security. AFOSP has aggressively strengthened policies and procedures for protecting classified information.
- Integration of women into the security specialist career field, a specialty that was closed to women until 1985. AFOSP worked with the Air Force Recruiting Service in an effort to bring 250 women into the security specialty.
- An increase in the number of stand-alone microcomputers supporting the Security Police Automated System to more than 800 at 150 locations worldwide. In August, system developers at the Data Systems Design Office released software for Phase I of the SPAS program—the first Air Force standard software release based on microcomputers. SPAS will automate many security and law-enforcement management functions, with more than 3,000 systems being employed at 431 locations worldwide.
- Development with Army representatives of a joint operational concept for air base ground defense. The joint concept of operations, based on Initiatives 8 and 9, resulted from the 1984 Memorandum of Agreement on the Joint Force Development Process signed by the Chiefs of Staff of the Army and the Air Force. The concept emphasizes the Army's role in providing ground defense beyond the perimeter of an air base and in taking over the training of security police with an air base ground defense mission. Joint Service Agreements 8 and 9 will be implemented in phases.
- Evaluation of air base ground defense concepts and equipment during the active defense portion of Salty Demo, an air base survivability exercise held in Germany.
- Initiation of assessments of initial and qualification training for the entire security police career field, ranging from accession to retirement. The US Air Force Occupational Measurement Center was contracted to review the career field and provide a framework for developing a comprehensive training plan to a Security Police Training Planning Team. Security police is one of the first career fields to undertake such a review.
- Contributions to the development of security standards for the B-1 bomber, the Space Shuttle, the small mobile ICBM, strategic warning systems, nuclear resources, and the ground-launched cruise missile. Also, under AFOSP direction, the first GLCM security police units upgraded their firepower with new Mk 19 MOD 3 40-mm machine guns.
- Development of system security engineering standards that, for the first time, incorporate security requirements during the preliminary design of certain weapon systems. The program reduces security life-cycle costs.
- Sponsorship of the fifth annual worldwide Air Force Security Police competition, Peacekeeper Challenge. Seventeen teams representing Air Force major commands, Air National Guard, Air Force Reserve, and the Royal Air Force Regiment competed in eleven individual and team events. ■

Air Force Office of Special Investigations

The Air Force Office of Special Investigations (AFOSI) headquartered at Bolling AFB, D. C., has been the major investigative agency of the Air Force since August 1, 1948. AFOSI is commanded by Brig. Gen. Richard S. Beyea, Jr.

The mission objective of AFOSI is to provide investigative and counterintelligence services in areas having the most significant impact on Air Force resources and personnel.

In response to the national priority to eliminate fraud, waste, and abuse, AFOSI is actively pursuing fraud investigations as the command's number-one priority. The "typical" fraud investigation in 1985 dealt with a dollar value of $38,000, compared to $2,800 in 1982.

The command is fighting fraud through several different channels, such as by developing intelligence networks that target those high-dollar areas vulnerable to fraud.

Additionally, each AFOSI detachment provides the base populace with periodic briefings on fraud.

Seven Pros is an AFOSI initiative that has placed an agent versed in the

central weapon systems acquisition process at each of the Air Force Plant Representative Offices.

Finally, Fraud Survey Programs involve systematic approaches to uncover fraud and to identify potential fraud in various base activities.

Recent espionage and terrorist activities have riveted attention on the importance of counterintelligence (CI). Major AFOSI accomplishments in CI during 1985 include:

- Collecting and reporting to Air Force commanders worldwide some 11,000 items of information concerning hostile intelligence services and terrorist and related activities posing threats to USAF interests.
- Analyzing intelligence and security threats information and producing for Air Force commanders sixty-five Security Threat and Incident Summaries, fifteen CI Memoranda, 175 Threat Estimates, the AFOSI *Counterintelligence Digest*, ten CI Briefs, and two special reports.
- Providing 6,044 defensive awareness briefings to some 236,400 Air Force members.
- Conducting 189 CI investigations involving alleged or accomplished acts of espionage and other major security offenses.
- Providing some 1,850 antiterrorism (terrorist threat/personal security) briefings to more than 57,500 USAF people.
- Conducting 136 Protective Services Operations for key USAF, DoD, and other US government officials and foreign dignitaries.
- Providing AFOSI CI support to USAF elements involved with systems security, technology transfer, and operations security.
- Taking part in five major US military exercises, including Salty Demo, as well as deploying special agent personnel to provide "real-world" CI support in ten USAF deployments.

Criminal investigations continue to comprise the largest portion of the AFOSI work load. There has been a decrease in the number of criminal investigations, but an increase in man-hours expended on criminal investigations. The command has moved from simple investigations that can be handled by other investigators to more complex investigations in such areas as thefts involving large dollar amounts and contracting and procurement irregularities. Drug investigations account for the largest number of investigations.

AFOSI also provides specialized investigative techniques that include technical support, polygraph, forensic science, behavioral science, and computer crime assistance programs. In the polygraph area, AFOSI conducts more than 4,000 examinations annually, which represents a 200 percent increase since 1981. The significant increase is due to the use of the polygraph as a counterintelligence screening tool for persons requiring access to certain special programs.

AFOSI recruits, selects, and trains its own special agents. Selectees attend an eleven-week investigators' course at the US Air Force Special Investigations Academy, collocated with the headquarters. Some 240 agents are scheduled to be trained in 1986.

As a result of AFOSI fraud and criminal investigations, the Air Force recouped more than $26.9 million in recoveries and savings of assets in 1985, and, in addition, took in a total of $5.7 million in fines. ■

Air Force Operational Test and Evaluation Center

The Air Force Operational Test and Evaluation Center (AFOTEC) is a separate operating agency under Hq. USAF. It is the Air Force independent test agency responsible for testing, under operationally realistic conditions, new systems being developed for Air Force and multiservice use.

The commander of the Operational Test and Evaluation Center reports directly to the USAF Chief of Staff. Results from the Center's tests are used at all levels of the Air Force, the Department of Defense, and Congress in making program decisions leading to the production and fielding of systems. The Center's efforts focus on providing assessments of the operational effectiveness and suitability of the Air Force's future weapon systems and supporting equipment.

The Center tests equipment as diverse as the Low-Altitude Navigation and Targeting Infrared for Night (LANTIRN) system and the Navstar Global Positioning System (GPS). In addition to extensive operational tests now being conducted on such strategic systems as the B-1B and Peacekeeper

AFOTEC's focus is on providing assessments of the operational effectiveness of Air Force weapon systems. This F-16, loaded with six AIM-9 Sidewinder missiles, is being prepared for a flight at Edwards AFB, Calif. (Photo by Erik Simonsen)

missile, the Center is also conducting tests on the TRI-TAC multiservice communication system, airborne self-protection jammer, space transportation system (Space Shuttle), and antisatellite system. The Center recently completed testing of the Firebolt aerial target and the Low-Level Laser-Guided Bomb (LLLGB).

The Center has approximately 438 people assigned to the headquarters at Kirtland AFB, N. M., and an additional 175 at five detachments and two dozen test teams. The Center has detachments at Eglin AFB, Fla., Nellis AFB, Nev., Edwards AFB, Calif., Colorado Springs, Colo., and Kapaun AS, Germany.

The major commands supplement the test teams at the detachments and operating locations, bringing in an additional 2,400 people under the Center's operational control. These personnel represent the ultimate users of the system—the operators, the maintainers, as well as support and training specialists.

The Center's operational tests ensure that new equipment meets the users' requirements and that Air Force weapon systems can be operated effectively and supported under realistic operational conditions. ■

Air Force Service Information and News Center

Since June 1, 1978, the Air Force Service Information and News Center (AFSINC) has been helping Air Force leaders provide communication among Air Force people in addition to helping the Air Force and the Army communicate with the American public.

AFSINC's headquarters is at Kelly AFB, Tex. The Center also has three overseas broadcast squadrons and numerous operating locations and detachments worldwide. All of these make it possible for AFSINC to help commanders maintain a well-informed, ready, and motivated military force.

The Center is responsible to the Department of the Air Force through the Director of Public Affairs, Office of the Secretary of the Air Force. It is commanded by Col. Paul Heye and has five directorates: Internal Information, Army and Air Force Hometown News Service, Air Force Broadcasting Service, the Air Force Office of Youth Relations, and Administration and Resources.

• **The Directorate of Internal Information** produces printed and audiovisual materials to assist commanders in keeping Air Force military and civilian members and their families informed about Air Force, Department of Defense, and national policies, decisions, and activities. The Director of Internal Information is on the SAF/PA staff at the Pentagon; the Internal Information Production offices are part of the AFSINC complex at Kelly AFB.

Printed products include *Airman* magazine, the Air Force Policy Letter for Commanders, Air Force News Service for base newspapers, fact sheets on Air Force subjects, biographies of general officers, Aerospace Speeches, Family News, and the lithograph series.

Audiovisual products include "Air Force Now" films and the Air Force Radio News Service. The Directorate also monitors the "Commander's Call" program.

• **The Army and Air Force Hometown News Service** provided news of the activities and achievements of more than 400,000 soldiers and airmen to their hometown newspapers and broadcast outlets in 1985. About 15,000 news media received a record 1,750,000 releases on accomplishments of service members. Feature stories with photographs, as well as television and radio interviews, are also produced by the Army and Air Force teams in Hometown News.

• **The Air Force Broadcasting Service** (AFBS) manages the overseas operations of the Air Force's Armed Forces Radio and Television Service (AFRTS). AFRTS information and entertainment reaches DoD personnel and their families in Japan, Guam, the Philippines, Turkey, Greece, Spain, Norway, the Azores, Alaska, and Greenland through twenty radio and television stations "owned and operated" by AFBS. AFBS personnel also serve at stations operated by the Navy and Army in Germany, Italy, Iceland, Panama, Korea, Belgium, and the Netherlands.

• **The Air Force Office of Youth Relations** provides liaison between the Air Force and several national youth organizations. Offices are located at Kelly AFB and at six regional offices throughout the United States. Assistance in some form was provided to more than 4,500,000 youth during 1985.

• **The Directorate of Administration and Resources** manages AFSINC's worldwide resources, including personnel, manpower, logistics, and a multimillion-dollar budget. The Directorate provides administrative, information processing, reprographic, and distribution services for AFSINC headquarters and budget and personnel management support for all AFSINC units.

Reprographic and distribution services include producing the Center's information products through local base and commercial printing. These products are distributed worldwide. In addition, the Directorate provides budgetary and administrative support for Air Force regional public affairs offices in Chicago, Los Angeles, and New York City and for the Air Force Orientation Group in Dayton, Ohio.

As of December 1985, AFSINC was authorized 967 military and 202 civilian personnel. ■

Air Reserve Personnel Center

The Air Reserve Personnel Center (ARPC) located in Denver, Colo., has as its primary mission the peacetime support and mobilization readiness of more than 250,000 Air National Guard and Air Force Reserve men and women who collectively make up the Air Reserve Forces. Specifically, ARPC's mission has three separate but interrelated aspects: assist in mobilization of the Air Reserve Forces, provide personnel support of individ-

ual Guard and Reserve members, and maintenance of the master personnel records of all Guardsmen and Reservists not on active duty.

This mission has increased both in breadth and significance because of increasing emphasis on Total Force defense policy. Supporting this mission are 850 civilians and active-duty and reserve officers and airmen who provide numerous personnel services to Air Reserve Forces members not on extended active duty.

Representative of ARPC peacetime personnel support is the Project Awareness Program. Last year, some 17,000 members at forty-two Guard and Reserve units were briefed on participation point accounting, assignments, reserve retirements, officer promotions, and administration of the Reserve Component Survivor Benefit Plan. Another more specialized initiative—but one with far-reaching impact—was the establishment of the Reserve Officer Personnel Management Act (ROPMA) Task Force. Working directly with the Air Staff, it critically reviews this pending legislation affecting 45,000 reserve officers.

Promotions are important to all Air Reserve Forces members. Last year, the Center hosted sixteen selection boards, including those for the promotion of officers in the grade of captain through lieutenant colonel for the Guard and from captain through colonel for the Reserve. ARPC also provides assignment and career-planning assistance for these reservists at many points during their careers.

ARPC provides even broader services to Individual Mobilization Augmentee (IMA) reservists. Because IMAs train directly with the active force and thus have no reserve unit assignment, their base-level personnel support is provided directly by ARPC. The Consolidated Reserve Personnel Office serves nearly 13,000 IMAs, mostly by mail or telephone, and is the largest base-level personnel office in the Air Force.

Another special operation within ARPC is the Single Manager Program. It serves the special requirements of reserve medical, legal, and chaplain personnel.

Since timely personnel support and administration is absolutely critical during a time of national emergency, ARPC maintains more than a quarter of a million reservists' records. ARPC would identify and recall reserves and retired regulars, which could nearly double the size of the Air Force should full mobilization be directed.

This level of activity and other mission requirements make ARPC a busy place. More than 1,000,000 personnel transactions are completed annually using a variety of sophisticated data-management techniques and equipment.

Having completed a major computer and communications systems upgrade, ARPC now serves as the back-up for the Air Force Military Personnel Center in Texas. This, along with the growing demands on the Air Reserve Forces, drives Center initiatives to improve responsiveness and efficiency in its mission of reserve personnel administration.

It is a job and a mission that has spanned more than three decades, three recalls in support of national emergencies, and quantum leaps in the technology of personnel management. Each recall and mobilization exercise has provided invaluable lessons that enable ARPC to do the job better. That process continues. ■

Air Force Reserve

The Air Force Reserve in 1985 continued to modernize, improve its capabilities, and build experience while demonstrating the readiness of its people as full partners in today's Total Force.

"Many outstanding successes made 1985 a banner year for the Air Force Reserve [and for] our contribution to the active force and the Total Force," noted Maj. Gen. Sloan R. Gill, Chief of Air Force Reserve and AFRES Commander. "Several achievements guided us to a new peak of maturity, with dedicated, experienced people operating modern, state-of-the-art equipment."

In only its second year of operation with the F-16 Fighting Falcon, the Air Force Reserve's 419th Tactical Fighter Wing, Hill AFB, Utah, posted the top team bombing and gunnery scores in the Tactical Air Command-sponsored Gunsmoke '85 competition. The A-10 Thunderbolt II-equipped 442d TFW, Richards-Gebaur AFB, Mo., fielded the competition's best maintenance team, and a team from the 434th TFW, Grissom AFB, Ind., took top honors in the LOADEO (munitions-loading exercise).

Reservists also took first place in Volant Rodeo, the Military Airlift Command's annual airdrop competition at Pope AFB, N. C. The 94th Tactical Airlift Wing, Dobbins AFB, Ga., outperformed thirty-two US and foreign challengers with its C-130H aircraft. The 315th Military Airlift Wing, Charleston AFB, S. C., won the C-141 aircrew competition, and the 446th Military Airlift Wing, McChord AFB, Wash., took first place in the C-141 engine-running, cargo-offloading event and second in the C-141 maintenance category. The 459th TAW, Andrews AFB, Md., won first place in the C-130 short-field landing event.

In Strategic Air Command's annual bombing and navigation competition, the 452d Air Refueling Wing, March AFB, Calif., made it a clean sweep for AFRES when the wing team won the Saunders Trophy for the best overall performance by a KC-135 air refueling unit. The 452d also garnered a second trophy for celestial navigation, and its aircrews placed second and third for individual KC-135 crew honors.

Sharing the McDonnell Douglas Trophy for KC-10 competition honors were the 78th Air Refueling Squadron, Barksdale AFB, La., and its counterpart active-duty host, SAC's 2d Bombardment Wing. The 78th is a subordinate unit of the 452d, AFRES's largest flying wing.

"I can think of no greater compliment to pay a gaining command than to excel in the standards they've set," General Gill said. "Eighty percent of our personnel were trained and seasoned on active duty. We're proud of the opportunity to demonstrate our proficiency and the deterrent strength our victories represent," General Gill added.

"Once again, our reserve forces have proven that they are second to none and continue to make a vital contribution to our deterrent strength," said Gen. Charles A. Gabriel, Air Force Chief of Staff. "Results of 1985 competitions continue to prove that in the US Air Force, the Total Force is more than a policy—it's a way of life."

AFRES increased its airlift capabilities this year when the 433d MAW, Kelly AFB, Tex., became the first AFRES unit to be equipped with "AFRES-owned" C-5A transport aircraft. A

proposal announced for the 337th Tactical Airlift Squadron, Westover AFB, Mass., would redesignate it the 337th Military Airlift Squadron and see it convert from sixteen C-130s to eight C-5As in October 1987.

The year also saw activation of the 943d Tactical Airlift Group at March AFB, Calif., with eight C-130B aircraft from Kelly AFB, Tex. Another March unit, the 303d Aerospace Rescue and Recovery Squadron, was inactivated and its six HC-130Hs transferred to the newly formed 939th Aerospace Rescue and Recovery Group at Portland IAP, Ore. The 901st TAG at Peterson AFB, Colo., grew to sixteen unit-equipped aircraft after receiving Kelly's eight other C-130Bs and was redesignated the 302d Tactical Airlift Wing.

In conjunction with the activation of SAC's third KC-10 squadron, the 77th AREFS (Associate), Seymour Johnson AFB, N. C., was activated October 1. In addition, two C-130Hs were added to the fleet of the 700th TAS at Dobbins AFB, Ga., in July.

Further aircraft modernization is planned for other Reserve units over the next three years. This year, the 459th TAW at Andrews AFB, Md., will convert from eight C-130E aircraft to eight C-141Bs and assume a new strategic airlift mission. The wing will be the first AFRES unit equipped with C-141s. The C-130s from Andrews will be transferred to the 934th TAG at Minneapolis-St. Paul IAP, Minn. In 1987, the 302d Special Operations Squadron at Luke AFB, Ariz., will become a tactical fighter group, trading its six CH-3 helicopters for twenty-four F-16C and D model fighters.

Eight new civil-engineering units were activated October 1 and are expected to achieve combat-ready status within one year. They are the 925th CES, Kirtland AFB, N. M.; 923d CES, Davis-Monthan AFB, Ariz.; 930th CES, Grissom AFB, Ind.; 922d CES, Offutt AFB, Neb.; 933d CES, Griffiss AFB, N. Y.; 915th CES, Pope AFB, N. C.; 941st CES, Elmendorf AFB, Alaska; and the 912th CES, Chanute AFB, Ill.

"The citizen-airmen in our Air Force Reserve will continue their time-honored tradition of defending this country by working side by side with our active forces," emphasized General Gill. "This support is our daily mission, and we will continue that growth, modernizing our equipment in order to continue to meet the changing national defense needs."

AFRES strategic associate and tactical airlift units flew 135,359 flying hours in FY '85, augmenting MAC's global airlift mission. Nearly 248,865 tons of cargo and 522,672 people were air-dropped or airlanded during these operations.

Reserve Capt. Stephen D. Ishmael of the 419th Tactical Fighter Wing studies the day's mission briefing during his unit's deployment to Denmark last summer. The 419th TFW was the first Reserve unit to receive and deploy to Europe with the F-16. (USAF photo by TSgt. Patrick Nugent)

Associate C-9 aeromedical evacuation crews, with their MAC counterparts, logged 16,437 flying hours, airlifting more than 52,000 patients in the United States.

Supporting other MAC missions, the command's 815th Weather Reconnaissance Squadron—the "Storm Trackers"—at Keesler AFB, Miss., flew nearly 4,100 hours conducting weather surveillance, including the tracking of seven major hurricanes and three tropical storms. While tracking Hurricane Danny along the Louisiana shoreline in August, a WC-130 crew from the 815th provided urgent assistance in its first search and rescue mission for seven people aboard a disabled sailboat in the Gulf of Mexico. The unit located the craft, and its passengers were recovered. The Reserve's four aerospace rescue and recovery squadrons recorded sixty additional "saves."

Among other missions flown to control harmful insects, the spray branch of the 907th TAG, Rickenbacker ANGB, Ohio, was called into service to combat a grasshopper infestation in Idaho. Using their spray-equipped UC-123K aircraft, the Department of Defense's only fixed-wing aerial spray unit covered 735,000 acres during a thirty-day period in June and July.

In California, the 943d TAG assisted the US Forest Service in an effort to contain uncontrolled fires in the southern part of the state. Using modular airborne fire-fighting systems, two C-130s dropped 1,400,000 pounds of fire retardant while fighting the fires over a fifteen-day period.

Joining other international efforts, an Air Force Reserve C-5 crew from the 301st MAS (Associate), Travis AFB, Calif., was tasked by MAC to replace a routine training flight with an emergency airlift mission in support of earthquake-stricken Mexico City in September. The C-5 Galaxy and its fifteen-member crew flew from Travis to Norton AFB, Calif., where three helicopters, six trucks, and twenty-seven members of the US Forest Service were picked up and flown to the Mexican capital.

In still another humanitarian action, AFRES units on Volant Oak rotation to Howard AFB, Panama, were tasked by the US Southern Command to assist in relief efforts in the aftermath of a volcano eruption in Colombia. In the first nine days following the disaster, the Air Force Reserve deliv-

AIR FORCE RESERVE FLYING WINGS AND ASSIGNED UNITS

Air Force	Wing Hq.	Group	Squadron	Type Aircraft	Location	Gaining Command
Fourth Air Force (Hq. McClellan AFB, Calif.) Maj. Gen. James C. Wahleithner Commander			302d SOS	CH-3E	Luke AFB, Ariz.	MAC
		919th SOG	711th SOS	AC-130A	Eglin AFB, Fla. (Aux. 3)	MAC
	349th MAW (Assoc)		301st MAS (Assoc)	C-5A	Travis AFB, Calif.	MAC
			312th MAS (Assoc)	C-5A	Travis AFB, Calif.	MAC
			708th MAS (Assoc)	C-141B	Travis AFB, Calif.	MAC
			710th MAS (Assoc)	C-141B	Travis AFB, Calif.	MAC
	403d RWRW		815th WRS	WC-130H	Keesler AFB, Miss.	MAC
			301st ARRS	HC-130H/N, HH-3E	Homestead AFB, Fla.	MAC
			305th ARRS	HC-130H/N, HH-3E	Selfridge ANGB, Mich.	MAC
		939th ARRG	304th ARRS	UH-1N, UH-1H, HC-130H	Portland IAP, Ore.	MAC
	433d MAW		68th MAS	C-5A	Kelly AFB, Tex.	MAC
	302d TAW		731st TAS	C-130B	Peterson AFB, Colo.	MAC
		934th TAG	96th TAS	C-130A	Minneapolis-St. Paul IAP, Minn.*	MAC
		943d TAG	303d TAS	C-130B	March AFB, Calif.	MAC
	440th TAW		95th TAS	C-130A	Gen. Billy Mitchell Field, Wis.*	MAC
		927th TAG	63d TAS	C-130A	Selfridge ANGB, Mich.	MAC
		928th TAG	64th TAS	C-130A	O'Hare ARFF, Ill.*	MAC
	445th MAW (Assoc)		728th MAS (Assoc)	C-141B	Norton AFB, Calif.	MAC
			729th MAS (Assoc)	C-141B	Norton AFB, Calif.	MAC
			730th MAS (Assoc)	C-141B	Norton AFB, Calif.	MAC
	446th MAW (Assoc)		97th MAS (Assoc)	C-141B	McChord AFB, Wash.	MAC
			313th MAS (Assoc)	C-141B	McChord AFB, Wash.	MAC
Tenth Air Force (Hq. Bergstrom AFB, Tex.) Brig. Gen. Roger P. Scheer Commander	301st TFW		457th TFS	F-4D	Carswell AFB, Tex.	TAC
		924th TFG	704th TFS	F-4D	Bergstrom AFB, Tex.	TAC
	419th TFW		466th TFS	F-16A/B	Hill AFB, Utah	TAC
		507th TFG	465th TFS	F-4D	Tinker AFB, Okla.	TAC
	434th TFW		45th TFS	A-10A	Grissom AFB, Ind.	TAC
		917th TFG	46th TFTS	A-10A	Barksdale AFB, La.	TAC
			47th TFS	A-10A	Barksdale AFB, La.	TAC
	442d TFW		303d TFS	A-10A	Richards-Gebaur AFB, Mo.*	TAC
		926th TFG	706th TFS	A-10A	New Orleans NAS, La.	TAC
	452d AREFW (H)		336th AREFS (H)	KC-135	March AFB, Calif.	SAC
			77th AREFS (H) (Assoc)	KC-10	Seymour Johnson AFB, N. C.	SAC
			78th AREFS (H) (Assoc)	KC-10A	Barksdale AFB, La.	SAC
			79th AREFS (H) (Assoc)	KC-10A	March AFB, Calif.	SAC
		931st AREFG (H)	72d AREFS (H)	KC-135	Grissom AFB, Ind.	SAC
		940th AREFG (H)	314th AREFS (H)	KC-135	Mather AFB, Calif.	SAC
	482d TFW		93d TFS	F-4D	Homestead AFB, Fla.	TAC
		906th TFG	89th TFS	F-4D	Wright-Patterson AFB, Ohio	TAC
Fourteenth Air Force (Hq. Dobbins AFB, Ga.) Maj. Gen. Alan G. Sharp Commander		932d AAG (Assoc)	73d AAS (Assoc)	C-9A	Scott AFB, Ill.	MAC
	94th TAW		700th TAS	C-130H	Dobbins AFB, Ga.*	MAC
		907th TAG	356th TAS	C-130A, C-123K#	Rickenbacker ANGB, Ohio	MAC
		908th TAG	357th TAS	C-130E	Maxwell AFB, Ala.	MAC
	315th MAW (Assoc)		300th MAS (Assoc)	C-141B	Charleston AFB, S. C.	MAC
			701st MAS (Assoc)	C-141B	Charleston AFB, S. C.	MAC
			707th MAS (Assoc)	C-141B	Charleston AFB, S. C.	MAC
	439th TAW		337th TAS	C-130E	Westover AFB, Mass.*	MAC
		911th TAG	758th TAS	C-130A	Greater Pittsburgh IAP, Pa.*	MAC
		914th TAG	328th TAS	C-130A	Niagara Falls IAP, N. Y.*	MAC
	459th TAW		756th TAS	C-130E	Andrews AFB, Md.	MAC
		910th TAG	757th TAS	C-130B	Youngstown MAP, Ohio*	MAC
		913th TAG	327th TAS	C-130E	Willow Grove ARF, Pa.*	MAC
	512th MAW (Assoc)		326th MAS (Assoc)	C-5A	Dover AFB, Del.	MAC
			709th MAS (Assoc)	C-5A	Dover AFB, Del.	MAC
	514th MAW (Assoc)		335th MAS (Assoc)	C-141B	McGuire AFB, N. J.	MAC
			702d MAS (Assoc)	C-141B	McGuire AFB, N. J.	MAC
			732d MAS (Assoc)	C-141B	McGuire AFB, N. J.	MAC

AAG (Assoc)	Aeromedical Airlift Group (Assoc)	RWRW	Rescue and Weather Reconnaissance Wing	TAW	Tactical Airlift Wing
AAS (Assoc)	Aeromedical Airlift Squadron (Assoc)	AREFW	Air Refueling Wing	TFG	Tactical Fighter Group
ARF	Air Reserve Facility	AREFG	Air Refueling Group	TFS	Tactical Fighter Squadron
ARFF	Air Reserve Forces Facility	AREFS	Air Refueling Squadron	TFW	Tactical Fighter Wing
ARRG	Aerospace Rescue and Recovery Group	SOG	Special Operations Group	WRS	Weather Reconnaissance Squadron
ARRS	Aerospace Rescue and Recovery Squadron	SOS	Special Operations Squadron	#	AFRES retains 4 C-123K for spray mission
MAS (Assoc)	Military Airlift Squadron (Assoc)	TAG	Tactical Airlift Group	*	Indicates AFRES base
MAW (Assoc)	Military Airlift Wing (Associate)	TAS	Tactical Airlift Squadron		

ered more than 96,645 pounds of fuel to a US Army aviation battalion in Colombia so that it could continue to fly relief/support missions. Additionally, the C-130s from the 943d TAG, 302d TAW, and the 934th TAG flew in more than 106,000 pounds of tents, blankets, engine oil, and a replacement aircraft engine for the Army battalion.

AFRES KC-10 associate and KC-135 crews logged more than 8,000 missions during FY '85 in support of SAC's worldwide aerial refueling mission, supplying fuel to more than 9,000 airborne receivers.

More than 48,000 flying hours in FY '85 were recorded by AFRES fighter units taking part in various exercises and other training activities.

AFRES fighter units participated in thirty-six major exercises, such as Volant Partner, Solid Shield, Red Flag, Green Flag, and their Canadian equivalent Maple Flag. The units also participated in exercise Sentry Wolverine and Fightercomp '85, which pitted nine AFRES fighter units and gunnery teams in various scenarios, with the winners going to Gunsmoke.

Twelve F-16s from the 419th TFW, Hill AFB, Utah, flew nonstop to Skrydstrup, Denmark, to take part in Coronet Thud. The short-term tactical deployment brought together the 419th with elements of NATO in the exercise, which was part of a larger program called Checkered Flag that saw US-based tactical air units deploy to Europe, Alaska, and the Pacific to familiarize aircrews and support people with overseas bases, areas, and procedures.

Villafranca, Italy, was the site of another phase of Checkered Flag, which took twelve A-10s from the 434th TFW, Grissom AFB, Ind., to northern Italy for a two-week deployment.

Throughout the year, AFRES aerial port squadrons continued to augment the 611th Military Airlift Support Squadron, Osan AB, Republic of Korea, on a rotational basis.

Seventy-five thousand Reservists participated in exercises during the year, including C-130 missions to Alaska in support of Brim Frost, intratheater airlift in the Pacific as part of Team Spirit, and in support of Kindle Liberty '85 at Howard AFB, Panama. AFRES C-130 crews and support people at Howard continued to share with the Air National Guard the Volant Oak mission of providing tactical airlift support to the US Southern Command. In addition, the 452d's associate KC-10 tanker crews escorted two F/A-18 Hornet fighters across the Pacific to Australia and refueled the Thunderbirds on their visit to South America.

Ongoing support continued during the year for NASA's Space Shuttle program, with the 919th Special Operations Group, Duke Field, Fla., deploying its AC-130s to provide surveillance before each launch. The 301st ARRS, Homestead AFB, Fla., also served as part of the contingency force.

For the eighth year in a row, AFRES surpassed its fiscal year end-strength goal, attaining an end-strength of 75,214 Reservists. The largest increase since 1949 was the goal for the year, and recruiters surpassed it by 385. The goal for FY '86 is 77,400 people. This accelerated growth rate will continue through 1990, when AFRES is programmed to reach an end-strength of 86,000 people.

AFRES was the first command to receive the USAF Chief of Staff special achievement award for outstanding flying safety accomplishments for two straight years. "The award is based on high standards of flying safety and mission accomplishments—137,500 hours in eleven different aircraft, including some of the oldest and some of the newest in the Air Force's inventory," said Gen. Charles A. Gabriel, Air Force Chief of Staff.

Four AFRES units flying MAC C-5s, C-141s, and C-9s received MAC flying safety awards. The 446th MAW (Assoc), McChord AFB, Wash.; 445th MAW, Norton AFB, Calif.; 932d Aeromedical Airlift Group, Scott AFB, Ill.; and the 512th MAW, Dover AFB, Del., were cited for their flying safety accomplishments. The 446th also received the MAC Distinguished Flying Safety Award for 1984.

The Air Force Outstanding Unit Award was presented to seven AFRES units. The 10th CEF, Bergstrom AFB, Tex.; 403d CES, Keesler AFB, Miss.; 445th Avionics Maintenance Squadron, Norton AFB; 446th MAW; 459th TAW; 730th MAS, Norton AFB; and the 914th TAG, Niagara Falls IAP, N. Y., received the honors.

The 419th TFW received one of the Air Force Association's highest awards, the Citation of Honor, for excellence in all aspects of a major aircraft conversion. The unit converted from F-105s to F-16s in 1984.

An individual award went to Capt. John Bookas, 315th MAW, who flew the first C-141 into Beirut, Lebanon, to evacuate wounded Marines after terrorists bombed their headquarters in 1983. He was named the Reserve junior officer of the year.

"The unique blend of teamwork found only in the Reserve, the teamwork found between our Reservists, their families, and their civilian employers—Total Reserve Force Policy—can never get enough attention or gratitude from commanders," said General Gill. "A Reservist's family and employer make many sacrifices to help the Reservist keep serving our country.

"Short-notice orders, extended duty, and countless other hardships and inconveniences have been generously supported by the Reservist's family and employer. We cannot take those sacrifices for granted, and I deeply appreciate the support the Total Reserve Force gives us, time after time. That kind of unstinting commitment and support becomes a priceless part of the Reservist's experience."

Direct management of the Reserve's field units continued to be provided in 1985 by three numbered air force headquarters: Fourth Air Force, McClellan AFB, Calif., Tenth Air Force, Bergstrom AFB, Tex., and Fourteenth Air Force, Dobbins AFB, Ga., with Hq. Air Force Reserve at Robins AFB, Ga., providing overall unit-program management. ■

Air National Guard

This year, 1986, is special because it marks the 350th anniversary of the National Guard. For the past three and a half centuries, men and women have been serving their nation, their state, and their community as members of the Guard. It is this dual mission, both state and federal, that makes the Air National Guard unique among the Air Reserve Forces.

Air National Guard units in a nonmobilized status are commanded by the governors of the fifty states, the Commonwealth of Puerto Rico, the Territories of Guam and the Virgin Is-

THE AIR NATIONAL GUARD BY MAJOR COMMAND ASSIGNMENT

(As of January 1, 1986)

STRATEGIC AIR COMMAND

KC-135E Stratotanker

101st Air Refueling Wing	Bangor, Me.
126th Air Refueling Wing	Chicago, Ill.
141st Air Refueling Wing	Fairchild AFB, Wash.
171st Air Refueling Wing	Pittsburgh, Pa.
128th Air Refueling Group	Milwaukee, Wis.
134th Air Refueling Group	Knoxville, Tenn.
151st Air Refueling Group	Salt Lake City, Utah
157th Air Refueling Group	Pease AFB, N. H.
160th Air Refueling Group	Rickenbacker ANG Base, Ohio
161st Air Refueling Group	Phoenix, Ariz.
170th Air Refueling Group	McGuire AFB, N. J.
189th Air Refueling Group	Little Rock AFB, Ark.
190th Air Refueling Group	Topeka, Kan.

TACTICAL AIR COMMAND

A-7D/K Corsair II

121st Tactical Fighter Wing	Rickenbacker ANG Base, Ohio
127th Tactical Fighter Wing	Selfridge ANG Base, Mich.
132d Tactical Fighter Wing	Des Moines, Iowa
140th Tactical Fighter Wing	Buckley ANG Base, Colo.
112th Tactical Fighter Group	Pittsburgh, Pa.
114th Tactical Fighter Group	Sioux Falls, S. D.
138th Tactical Fighter Group	Tulsa, Okla.
150th Tactical Fighter Group	Kirtland AFB, N. M.
156th Tactical Fighter Group	San Juan, Puerto Rico
162d Tactical Fighter Group*	Tucson, Ariz.
178th Tactical Fighter Group	Springfield, Ohio
180th Tactical Fighter Group	Toledo, Ohio
185th Tactical Fighter Group	Sioux City, Iowa
192d Tactical Fighter Group	Richmond, Va.

F-16 Fighting Falcon

169th Tactical Fighter Group	McEntire ANG Base, S. C.
149th Tactical Fighter Group	Kelly AFB, Tex.

A-10 Thunderbolt II

128th Tactical Fighter Wing	Truax Field, Wis.
174th Tactical Fighter Wing	Syracuse, N. Y.
103d Tactical Fighter Group	Granby, Conn.
104th Tactical Fighter Group	Westfield, Mass.
175th Tactical Fighter Group	Baltimore, Md.

F-4C Phantom

122d Tactical Fighter Wing	Fort Wayne, Ind.
163d Tactical Fighter Group	March AFB, Calif.
181st Tactical Fighter Group	Terre Haute, Ind.
188th Tactical Fighter Group	Fort Smith, Ark.

F-4D Phantom

113th Tactical Fighter Wing	Andrews AFB, Md.
116th Tactical Fighter Wing	Dobbins AFB, Ga.
158th Tactical Fighter Group	Burlington, Vt.
183d Tactical Fighter Group	Springfield, Ill.
184th Tactical Fighter Group*	McConnell AFB, Kan.
187th Tactical Fighter Group	Montgomery, Ala.

F-4E Phantom

108th Tactical Fighter Wing	McGuire AFB, N. J.
131st Tactical Fighter Wing	St. Louis, Mo.

RF-4C Phantom

117th Tactical Reconnaissance Wing	Birmingham, Ala.
123d Tactical Reconnaissance Wing	Louisville, Ky.
124th Tactical Reconnaissance Group	Boise, Idaho
152d Tactical Reconnaissance Group	Reno, Nev.
155th Tactical Reconnaissance Group	Lincoln, Neb.
186th Tactical Reconnaissance Group	Meridian, Miss.

OA-37 Dragonfly

110th Tactical Air Support Group	Battle Creek ANG Base, Mich.
111th Tactical Air Support Group	Willow Grove ARF, Pa.
182d Tactical Air Support Group	Peoria, Ill.

F-15 Eagle

159th Tactical Fighter Group	New Orleans NAS, La.

AIR DEFENSE UNITS (TAC)

F-106A/B Delta Dart

102d Fighter Interceptor Wing	Otis ANG Base, Mass.
120th Fighter Interceptor Group	Great Falls, Mont.
125th Fighter Interceptor Group	Jacksonville, Fla.
177th Fighter Interceptor Group	Atlantic City, N. J.

F-4C Phantom

107th Fighter Interceptor Group	Niagara Falls, N. Y.
142d Fighter Interceptor Group	Portland, Ore.
114th Tactical Fighter Training Squadron*	Klamath Falls, Ore.
147th Fighter Interceptor Group	Ellington ANG Base, Tex.
191st Fighter Interceptor Group	Selfridge ANG Base, Mich.

F-4D Phantom

144th Fighter Interceptor Wing	Fresno, Calif.
119th Fighter Interceptor Group	Fargo, N. D.
148th Fighter Interceptor Group	Duluth, Minn.

MILITARY AIRLIFT COMMAND

C-130 Hercules

118th Tactical Airlift Wing	Nashville, Tenn.
133d Tactical Airlift Wing	Minneapolis/St. Paul, Minn.
136th Tactical Airlift Wing	Dallas, Tex.
137th Tactical Airlift Wing	Oklahoma City, Okla.
146th Tactical Airlift Wing	Van Nuys, Calif.
109th Tactical Airlift Group	Schenectady, N. Y.
130th Tactical Airlift Group	Charleston, W. Va.
135th Tactical Airlift Group	Baltimore, Md.
139th Tactical Airlift Group	St. Joseph, Mo.
143d Tactical Airlift Group	Quonset Point, R. I.
145th Tactical Airlift Group	Charlotte, N. C.
153d Tactical Airlift Group	Cheyenne, Wyo.
164th Tactical Airlift Group	Memphis, Tenn.
165th Tactical Airlift Group	Savannah, Ga.
166th Tactical Airlift Group	Wilmington, Del.
167th Tactical Airlift Group	Martinsburg, W. Va.
172d Tactical Airlift Group	Jackson, Miss.
176th Tactical Airlift Group	Anchorage, Alaska
179th Tactical Airlift Group	Mansfield, Ohio

HC-130 Hercules/HH-3 Jolly Green Giant

106th Aerospace Rescue & Recovery Group	Westhampton Beach, N. Y.
129th Aerospace Rescue & Recovery Group	Moffett NAS, Calif.

C-5A Galaxy

105th Military Airlift Group	Newburgh, N. Y.

EC-130E

193d Special Operations Group	Middletown, Pa.

PACIFIC AIR FORCES

F-4C Phantom

154th Composite Group	Hickam AFB, Hawaii

*Replacement Training Unit (RTU).

lands, and the Commanding General of the District of Columbia. All units in a state are responsible to the governor, who is represented in the state or territory chain of command by the Adjutant General.

Units may be called to federal service by the President to enforce federal authority, suppress insurrection, or repel invasion. They may also be ordered to active duty by Congress. During peacetime, all Air National Guard units are assigned to gaining Air Force commands. These commands provide advisory assistance and evaluate unit training, safety, and readiness programs.

The role of the Air National Guard today is more dynamic and challenging than it has ever been. Throughout the 1980s, the Air Guard has become an integral and vital part of the Total Force.

The importance of this role in the Total Force is evident in both operational and mission support areas. In both areas, the emphasis has been on modernization and growth and continues to remain on them.

Today, the Air National Guard is providing seventy-three percent of the Air Force's interceptor force, fifty-three percent of the reconnaissance force, twenty-four percent of the tactical air support, thirty-two percent of the tactical airlift, twenty-six percent of tactical fighters, seventeen percent of the air refueling tankers, and fourteen percent of the rescue and recovery capability of the total Air Force.

Basic to the Total Force is the principle of equipping first those units that will fight first—and in the Air National Guard, this is becoming a reality.

Last year, the Air National Guard began flying the world's finest air-superiority fighter, the F-15 Eagle. The second F-15 unit is scheduled for the Georgia ANG in FY '86. The 169th TFG in South Carolina is already operational with the F-16 Fighting Falcon, and the units at Kelly AFB, Tex. and Burlington, Vt., will convert this year. Three more units will convert to the F-16 in FY '87.

The ANG is not only receiving the newest aircraft but the biggest as well. Last year marked the return of the strategic airlift mission to the Air Guard when the 105th Military Airlift Group in New York began flying the C-5A Galaxy. The ANG's role in strategic airlift will increase when the Mississippi Air Guard converts from the C-130 Hercules to the C-141 StarLifter in 1986.

In addition to receiving new aircraft, the Air Guard is also modernizing its existing fleet.

The Air Guard's primary tactical fighter, the F-4 Phantom II, is undergoing modifications to increase its capability. All of the Air Guard's F-4D and F-4E squadrons will be modified to allow carriage of the AIM-9L and M missiles. A low-smoke modification is also scheduled for completion.

The ANG's A-7 fleet is also being modernized. Three of fourteen units will be equipped with a forward-looking infrared system that will enhance the night capability of this aircraft.

This year, the KC-135 reengining program will be completed. This upgrade, which replaces older J57 engines with reconditioned JT3D engines, greatly improves reliability of the ANG's KC-135 fleet. Environmentally, there is a sixty percent reduction in noise, a ninety percent reduction in smoke, and a twelve to fourteen percent increase in fuel efficiency.

On the airlift side, the ANG continues to receive new C-130H models to replace older aircraft. Six units are already flying this latest model, with two more units scheduled for conversion.

Like their flying counterparts, the Air National Guard mission support units contribute heavily to the Total Air Force.

There are at this time approximately 244 units heavily concentrated in the areas of base fixed communications and computers, combat information systems, weather, tactical control, engineering installation, civil engineering, medical support, and air base ground defense.

ANG combat information systems units provide sixty-five percent of the people and equipment used in Air Force combat communications and air traffic service roles.

The Air Guard plays a more important role in the Total Force than it ever has with its combination of modern equipment and experienced people. This Guardsman is donning booties prior to performing an engine compartment check of an A-7. The booties help eliminate the possibility of foreign object damage to the engine. (Photo by Bob Simons)

Air Guard tactical air control units represent sixty percent of Air Force ground tactical air control systems, and Guard engineering and installation units represent fifty-five percent of the total Air Force E&I capability.

Civil engineering and services is also a growing role in the Air National Guard. Recently established Prime RIBS teams contribute a substantial portion of the total Air Force wartime requirement for food service and base services personnel.

Air National Guard Prime BEEF units were reorganized late in FY '84 to meet the needs of the Air Force better, and they currently constitute approximately thirty percent of worldwide mobility engineering resources. Also, in FY '85, another Red Horse engineering squadron was activated with squadron headquarters at Camp Blanding, Fla., and a flight at Camp Pendleton, Va. This gives the Air National Guard two out of the total Air Force's seven Red Horse squadrons.

Readiness is the watchword for the 1980s. And the Guard's high state of readiness has been achieved through participation in realistic exercises and deployments at home and overseas.

Air National Guard C-130 Hercules aircraft provide more than six months of support annually to the US Southern Command. This JCS-directed deployment called Volant Oak positions six C-130s at Howard AFB, Panama, on a rotational basis. Also, the ANG A-7 units share a continuous rotational commitment, named Coronet Cove, in Panama.

One of the ANG's largest deployments in 1985 was Coronet Buffalo in the United Kingdom. Thirty-six A-7 units along with 950 personnel from South Dakota and Iowa had the opportunity to work side-by-side with British allies. This was the largest single deployment of fighters to England since World War II.

Around the clock, 365 days a year, ANG F-106 and F-4 air defense units perform a vital alert mission along the coasts of the United States. Units in Hawaii are responsible for the entire air defense of that state.

Starting this year, the Air Guard began an air defense alert mission at Ramstein AB, Germany. The mission began in April at the request of Hq. USAFE and will continue up to twelve months. The mission, named Creek Klaxon, will consist of eight F-4D fighters, aircrews, and maintenance and support personnel. The aircraft will deploy from Air Guard air defense units in Minnesota, North Dakota, and California. Aircrews, maintenance, and support personnel will come from these and other F-4 units.

The ANG mission support units also got a piece of the action.

Air Guard combat and fixed information systems and engineering installations units deployed more than 1,200 people to many exercises in Europe, Korea, and Honduras, and tactical air control units deployed to Norway, Italy, and Denmark.

ANG civil engineering sent Prime BEEF and Prime RIBS teams to Europe, Korea, and the Arctic Circle.

The medical units were also tasked to support such exercises as Reforger, Team Spirit, Bright Star, and Logex.

This realistic training paid off in 1985 annual competitions. During Volant Rodeo '85, the 167th Tactical Airlift Group from West Virginia represented the 133d Tactical Airlift Wing and won the best C-130 maintenance award.

In Photo Finish '85, a National Guard Bureau-sponsored competition, the 124th Tactical Reconnaissance Group from Idaho walked away with the honors as Best Overall TAC reconnaissance unit. This is the second time in a row that the 124th has won this award.

The ANG set another record in FY '85 with an all-time high of 109,400 members, meeting the programmed end-strength for the seventh straight year.

Emphasis is also being placed on professional military education to increase the quality of leadership in the Air National Guard. Air National Guard members receive professional military education at the I. G. Brown ANG Professional Military Education Center at McGhee Tyson Airport, near Knoxville, Tenn.

On July 1, 1985, The Educational Assistance Act of 1984—referred to as "The New GI Bill"—was implemented, entitling all qualifying members to tuition assistance for undergraduate study.

Modernization, deployments, training, and direct support to the Air Force on a day-to-day basis have made today's Air National Guard a proud, prepared, professional, and vital component of the Total Force. ■

Civilian Personnel Management Center

The Air Force Civilian Personnel Management Center (AFCPMC) was established as a Direct Reporting Unit (DRU) of the Air Force Director of Civilian Personnel on January 1, 1986. Although newly designated, AFCPMC has been in existence at Randolph AFB, Tex., since 1976 as a Named Activity entitled the Office of Civilian Personnel Operations.

The Center's mission is to serve as the Air Force Director's operational arm in the civilian personnel management arena. It is charged with directing, developing, managing, and evaluating a wide variety of government-legislated or regulated civilian personnel policies and programs. Its work affects more than 250,000 civilian employees, including foreign nationals, at Air Force installations worldwide.

The Center is organized into three divisions, and each plays an integral role in managing Air Force civilian workers.

The Integrated Systems Management Division is the Air Force focal point for civilian personnel data and information systems management. It provides training and consultation services about automated and integrated systems to the personnel community. In conjunction with field activities, the division develops a system approach for implementing civilian policies. It also keeps abreast of changing technology to improve those systems.

The Recruitment and Training Division is responsible for a variety of civilian recruitment programs geared to Air Force demand for skilled individuals in many technical or professional career fields. The staff also conducts quality-of-worklife studies and performs research in performance appraisal and selection improvements. Additionally, the division is responsible for developing and administering the Air Force-wide civilian education and training budget. It helps civilian personnel managers in finding the right school or course for employees' educational needs.

The Career Management Division helps identify civilian executive positions that need to be centrally managed for job referral and training. The goal is to satisfy Air Force needs by

providing a pool of career employees with strong skills in professional, technical, management, and administrative fields. Nine career programs are now in effect, including Comptroller, Engineering and Services; Historian; Logistics; Manpower and Personnel (which encompasses Education, Technical Training, and Morale, Welfare, and Recreation); Acquisition; Information Systems; Safety, Security, and Special Investigations; and Commissary. Civilians involved in the program can receive a combination of government, academic, and industry training. They have the opportunity to attend armed forces college programs and participate in courses in executive development and may be selected for Education With Industry assignments.

AFCPMC serves as a landmark organization for the DoD and federal government commitment to effective and efficient personnel life-cycle management of the Air Force's valued civilian resources. ■

Air Force District of Washington

The Air Force District of Washington (AFDW) is the Air Force's newest Direct Reporting Unit. It was formed October 1, 1985, to establish a single manager for the support of Air Force activities in the national capital region. Its headquarters is at Bolling AFB, D. C. Subordinate units, detachments, and operating locations of the AFDW are also at the Pentagon, Andrews AFB, Md., and Fort Meade, Md.

Brig. Gen. Edward N. Giddings is the AFDW's commander. As of December 31, 1985, the AFDW was authorized 1,116 military and 736 civilian personnel. Activation of the AFDW coincided with the activation of its two major subordinate units: the 1100th Air Base Group and the 1100th Resource Management Group.

The 1100th Air Base Group became the new host unit for Bolling AFB. It replaced the 1100th Air Base Wing and incorporates many of the wing's base-level support agencies typically found at base level. These support functions serve the numerous tenant organizations on Bolling AFB, such as the Air Force Office of Scientific Research, Hq. Air Force Office of Special Investigations, and the Defense Intelligence Agency. Among Bolling's Air Staff tenants are the Surgeon General, the Office of Air Force History, and the Chief of Chaplains.

The 1100th Resource Management Group (RMG) replaced the former 1947th Headquarters Support Group based at the Pentagon. The 1100th RMG took over all of this unit's responsibilities, plus several others that are resource-related. Its personnel activities include a command personnel division, civilian personnel, education office programs, and military personnel offices at Bolling AFB, Fort Meade, and the Pentagon. The directorate of personnel supports 11,000 active-duty members, 4,000 civilian Air Force employees, and 14,000 retired Air Force personnel in and around the nation's capital.

Another major branch of the 1100th RMG is plans and operations. This includes a diverse group of responsibilities, such as engineering services, audiovisual production, television services for the Air Staff, and management of more than 800 Pentagon parking spaces and 1,500,000 square feet of leased building space.

Comptroller and manpower services to AFDW are also part of the 1100th RMG.

Two regional offices are included in the 1100th RMG—the Washington Regional Accounting and Finance Center at Bolling AFB and the Washington Area Contracting Center at Andrews AFB. Both support a wide range of Air Force agencies in the Washington area.

The Air Force District of Washington is responsible for Air Force ceremonial events in the nation's capital. Appearing at many of these events are the Honor Guard and the United States Air Force Band, both based at Bolling AFB.

The Honor Guard is the Air Force's official representative at ceremonies in the Washington area. They serve at arrival and departure ceremonies at the White House, Pentagon, and Andrews AFB for visiting dignitaries. They participate in military funerals at Arlington National Cemetery as well as memorial ceremonies at the Tomb of the Unknown Soldier. The drill team is an elite component of the Honor Guard. The team performs its precision drills nationwide.

The 219-member Air Force Band has won international acclaim for its outstanding performances. Its six main components produce many different types of music for different events.

The Concert Band is the largest group, with sixty-five musicians.

The String Orchestra, also performing as the Strolling Strings, plays music from classical to pop. When combined with the winds from the concert band, they make up the Symphony Orchestra.

The Singing Sergeants is made up of thirty men and women who perform vocal music, including opera, traditional and contemporary choral works, folk songs, oratorio, Broadway, and jazz. Their emphasis is on American choral music.

Airmen of Note is the band's jazz ensemble.

Spectrum plays pop music of the 1950s, 1960s, and 1970s.

The ceremonial brass performs at many protocol events, such as the arrivals of heads of state. ■

Air Force Technical Applications Center

The Air Force Technical Applications Center (AFTAC), a Direct Reporting Unit, operates and maintains the US Atomic Energy Detection System (AEDS). The AEDS is a worldwide system with operations in more than thirty-five countries. AFTAC efforts involve comprehensive research and development programs designed to increase the understanding of the complex technical problems associated with the detection and identification of nuclear events in the atmosphere, underwater, underground, and in space.

The Center provides inputs to Department of Defense policies regarding nuclear arms-control issues and contributes to the nation's ability to monitor international agreements in these areas.

The concept of the AEDS originated in the minds of several senior government leaders, including Gen. Hoyt

S. Vandenberg and Adm. Lewis L. Strauss, after World War II when it became apparent that other nations would develop a nuclear-weapons capability and that it was in the best interest of the US to be aware of these developments. A committee of experts subsequently endorsed the concept of a detection system, and in 1947, Gen. Dwight D. Eisenhower directed the Army Air Forces "to detect atomic explosions anywhere in the world."

The mission remained with the Air Force when it became a separate service and proved its value when an AFTAC sensor aboard a B-29 flying between Alaska and Japan detected debris from the first Russian atomic test in September 1949. The detection was particularly noteworthy, considering that most experts had predicted that the first Russian atomic test would not occur until the mid-1950s.

During subsequent years, new detection systems were developed and older ones were improved. When the Limited Test-Ban Treaty was signed in 1963, the primary role of monitoring certain provisions of the treaty was assigned to AFTAC. The treaty prohibited the signatory states from testing nuclear weapons in the atmosphere, underwater, or in space. It also prohibited the venting of nuclear debris from underground tests across international boundaries.

To accomplish its mission, AFTAC has approximately 1,400 men and women assigned to operate and maintain the worldwide system. AFTAC Headquarters is located at Patrick AFB, Fla. Personnel assigned to the headquarters perform normal staff functions and provide for management, technical evaluation, and reporting of data.

Located at the headquarters, the Satellite Electromagnetic Pulse, Hydroacoustic, and Seismic Operations Centers receive data twenty-four hours a day. The three centers are responsible for the initial detection and identification of nuclear events occurring anywhere in the world.

To manage the AEDS properly, AFTAC has three major units plus a worldwide network of seventeen detachments, five operating locations, and more than sixty equipment locations. The three major subordinate units include the Technical Operations Division, McClellan AFB, Calif.; Pacific Technical Operations Area, Wheeler AFB, Hawaii; and European Technical Operations Area, Lindsey AS, Germany. The areas in Germany and Hawaii provide administrative, logistic, and other support to subordinate activities in their geographic areas of responsibility. The role of the Technical Operations Division in California is more complex. It supports a Central Laboratory and an air-sampling operation and also operates a logistics depot providing specialized support for the AEDS network.

AFTAC's people possess a wide range of technical expertise, and many hold advanced degrees in chemistry, physics, nuclear engineering, and electronics engineering. Complementing this impressive scientific capability is an experienced and talented operational force that is supported by skilled, handpicked technicians. ■

USAF Historical Research Center

The USAF Historical Research Center is the repository for Air Force historical documents. The Center collection, begun in Washington during World War II, moved in 1949 to Maxwell AFB, Ala. It consists today of nearly 50,000,000 pages devoted to the history of the service and constitutes the largest and most valuable organized collection of documents on US military aviation in the world.

In 1979, the Center became a Direct Reporting Unit of the Air Force, receiving technical direction and guidance from the Chief, Office of Air Force History. It is collocated with the Air University and provides research facilities for professional military education students, the faculty, and visiting scholars. More than eighty-five percent of the Center's pre-1955 holdings are declassified. Almost the entire collection is on 16-mm microfilm, with copies deposited at the National Archives and Record Service, Washington, D. C., and at the Office of Air Force History, Bolling AFB, D. C.

Center holdings consist largely of periodic unit histories prepared by the major commands, numbered air forces, and other subordinate organizations. These histories provide comprehensive coverage of Air Force activities beginning in 1942, when the President authorized the program. Extensive primary source material is attached to the histories, greatly enhancing their value.

Special collections complement the unit histories. Among them are historical monographs, end-of-tour reports, joint and combined command documents, aircraft record cards, and materials from the US Army, British Air Ministry, and the German Air Force. The Center also houses the personal papers of key retired Air Force leaders and a substantial collection of their oral history interviews. About 6,000 documents and collections of all types are accessioned annually.

In 1974, the Center adopted automated data processing as a finding aid and in 1980 began to enter abstracts of the documents into a computer. The Inferential Retrieval Index System, or IRIS, became operational in 1983 when the Center acquired an IBM 4341 computer. Plans call for the collection to become accessible in 1986 to the Air Force MAJCOM and field history program through remote terminals.

During 1985, the Center completed installation of shelving and the placement of all historical documents in Hollinger boxes. By replacing file cabinets with shelves and Hollinger boxes, the Center gained additional storage space, improved inventory and accountability, and reduced wear and tear on the document collection.

The Center is organized into four divisions.

- **Reference.** Maintains documents and microfilm and makes them available to users, answers inquiries about holdings, produces finding guides, collects personal papers, and reviews records for possible downgrading or declassification.
- **Research.** Writes books and papers; prepares lineage and honors of Air Force units; maintains records of the Air Force seal and flag, the records of unit and establishment emblems and flags, and the records of Air Force organizations; determines aerial victory credits; and performs other research and teaching services.
- **Oral History.** Conducts oral history interviews, monitors the USAF end-of-tour report program, and provides a training course for oral historians.
- **Technical Services.** Accessions, catalogs, abstracts, and indexes documents; conducts automated data processing and microfilming for the Center; and coordinates IRIS applications for the Air Force history program. ■

United States Air Force Academy

The Air Force Academy's mission is to provide cadets with instruction, knowledge, and character essential to leadership and with the motivation to become career officers in the US Air Force.

Each year, some 12,000 men and women pursue the goal of entering the Academy by seeking one of the approximately 1,400 gaining appointments. These appointees are intelligent, aggressive, and motivated toward the US Air Force. Ninety percent rank in the top twenty-five percent of their high school classes, and approximately eighty percent have earned high school athletic letters.

Cadets at the Academy are involved in one of the finest academic programs in the nation, designed to develop future Air Force officers who are innovative, analytical, and resourceful. A core curriculum comprised of basic engineering sciences, social sciences, and humanities provides the foundation that prepares cadets for their Air Force careers. Cadets can select from twenty-four academic majors in the fields of humanities, social sciences, engineering sciences, and basic sciences.

Throughout the academic year, cadets participate in a number of extracurricular learning experiences. The Academy Assembly, for example, brings students from other colleges and universities to the Academy to participate with cadets in discussing and analyzing major issues confronting the nation. Another example is the Distinguished Speakers Program. This program brings leaders from different walks of life to speak to cadets. During the past year, Dr. Edward Teller, former Secretary of State Dr. Henry Kissinger, and former President Jimmy Carter participated in the program.

During the summer, Air Force and Department of Defense research facilities around the world sponsor cadets under the auspices of the Cadet Summer Research Program. Last summer, ninety of the Academy's seniors participated in this program.

The Air Force Academy is fully integrating the use of microcomputers into the academic and military program. A local area network, to be installed by the summer of 1986, will connect microcomputers in cadet dormitory rooms with other microcomputers and with large academic computer systems. These efforts will enhance the educational experiences of each cadet and will help to prepare graduates for the Air Force of the future.

The Air Force Academy is now playing a leading role in the preparation for space. Academy graduates are America's current and future astronauts, engineers, and mission-support specialists. Fifteen Academy graduates are involved in the astronaut program, including Col. Karol Bobko, a 1959 graduate who piloted the Space Shuttle *Challenger* in 1983.

Military studies are central to the Academy experience and distinguish it from other institutions of higher learning. Following Basic Cadet Training, new cadets enter the Cadet Wing and receive a four-year, balanced program providing them with the necessary knowledge, skills, and values.

Part of their military training includes parachuting, sailplaning (soaring), T-43 navigation training, and T-41 pilot orientation. The Academy's goal is for seventy percent of each graduating class to be pilot-qualified. Under its "Soar for All" program, the Academy has acquired new powered sailplanes to afford every third-class (sophomore) cadet the opportunity to solo in a sailplane.

The soaring program is a definite success, as sixty-nine of the seventy-one cadets who entered the first Summer Training Period made solo flights. Graduating classes at the Academy have described the soaring program as one of the most motivational facets of the curriculum. Positive rewards are found in all courses, and each cadet is given a glimpse of an operational flying unit and a better understanding of the mission of the Air Force.

The leadership program, under the direction of the Commandant of Cadets, molds the basic cadet without military experience into an officer prepared and motivated to defend our nation.

The cornerstone of this preparation is the Academy's Honor Code, which states: "We will not lie, steal, or cheat, nor tolerate among us anyone who does." The Honor Code means many things to the Cadet Wing: the pride of knowing their word is trusted implicitly; the respect they have for the property of others; the consideration they can expect others to have for their personal achievements; and the moral courage to protect the Wing from those few who sometimes place their personal standards below those of the Wing's Honor Code. The Honor Code works because the cadets believe in it and live it every day.

Athletic programs stress physical fitness, intercollegiate excellence, and leadership development in a competitive environment. Cadets participate in twenty-eight men's and women's intercollegiate sports, with many of the teams, including football and basketball, competing in the Western Athletic Conference. In addition, a broad program of intramurals instills in cadets the spirit of teamwork and leadership that is essential in Air Force officers.

The Academy boasts some of the finest sports facilities anywhere, including a multifaceted fieldhouse, cadet gym, myriad tennis courts and outdoor playing fields, as well as two eighteen-hole golf courses. Civilian and military coaches combine their talents to instill a competitive spirit in the cadets, a spirit that has made winning an Academy tradition.

The spiritual aspect of the Academy is evident in all facets of cadet life, and it provides an extra dimension to traditional learning. The Cadet Chapel serves as the center of religious activities for the Cadet Wing, containing Protestant, Catholic, and Jewish worship areas as well as an all-faith worship room. It is a place where young cadets may contemplate future responsibilities and decisions apart from the bustle of everyday life. The chapel's spires reach skyward toward the high blue, and out on the terrazzo, static airplanes remind cadets of the future and goals they work toward.

Down the road is a cemetery where Academy graduates and Air Force heroes lie at rest, reminding cadets that the stakes are high and the commitment very deep.

Graduating cadets receive bachelor of science degrees and commissions as second lieutenants. To date, approximately 18,500 cadets have been graduated from the Air Force Academy. Of this number, 590 are women. The Academy has produced twenty-six Rhodes scholars in its thirty-two-year history. Since 1959, 11,441 graduates commissioned in the Air Force entered pilot training, 1,135 entered navigator training, and 252 entered helicopter training.

That's the Academy experience—meeting new challenges every day and producing our "leaders of tomorrow." ■

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Gallery of USAF Weapons

BY SUSAN H. H. YOUNG, ASSOCIATE COMPILER, JANE'S ALL THE WORLD'S AIRCRAFT
EDITED BY JOHN W. R. TAYLOR, EDITOR IN CHIEF, JANE'S ALL THE WORLD'S AIRCRAFT

Bombers

ATB

Engineering development of the Advanced Technology Bomber (ATB), seen by USAF as complementary to the B-1B, is described as being fully funded, within cost, and on schedule for an early 1990s initial operational capability. Sophisticated technologies are intended to extend the ATB's capability as a penetrating bomber well into the next century. In particular, the use of low-observable (Stealth) techniques will result in a low probability of intercept (LPI) in the face of current and projected Soviet air defenses. Its weapons will include the SRAM II nuclear air-to-surface missile.

Northrop is prime contractor for the ATB, with Boeing and LTV as key members of the development team. General Electric Engine Group will provide the power plant.

B-1B

Delivery of the first operational B-1B to Dyess AFB, Tex., on June 29, 1985, began the eagerly awaited re-equipment of SAC with this highly survivable long-range penetrating bomber. While smaller than the B-52, the B-1B carries a considerably greater weapons load because of improved engine performance and advanced aerodynamic technology. Three weapons bays provide the flexibility to carry long- and short-range nuclear air-to-surface missiles, nuclear or conventional gravity bombs, mines, other weapons, or fuel, as required by the assigned mission.

The B-1B is equipped with electronic jamming equipment, infrared countermeasures, radar location and warning systems, and other devices necessary to defeat enemy defensive systems. To facilitate very low-level penetration of hostile territory, it has a radar system that allows it to follow "the nap of the earth" at near supersonic speeds. This would make it extremely difficult for enemy radar systems to track the B-1B, as hills, mountains, towers, buildings, and even trees would clutter the radar screen. Flying low at high speeds also negates the effectiveness of enemy interceptors because it is difficult to acquire and track B-1Bs flying close to the ground. This would enable the B-1B to penetrate sophisticated enemy defenses well into the 1990s and to operate within less heavily defended areas into the next century.

Outwardly, the B-1B is generally similar to prototype No. 4 of the original B-1, but has structural strengthening to facilitate an increase in gross takeoff weight from 395,000 lb to 477,000 lb. The variable-geometry wing of the B-1 is retained, its unswept setting permitting rapid takeoff from a base threatened by imminent attack, or operation from shorter runways and less-sophisticated airfields; the fully swept position is used in supersonic flight and for the primary role of high-subsonic, low-level penetration. The use of radar-absorption materials reduces further the aircraft's radar cross section (the radar signature is already significantly less than that of the B-52). Ejection seats replace the crew ejection capsule of B-1 prototypes. The variable engine inlets of the original B-1 are replaced by fixed inlets, and new engine nacelles and simplified overwing fairings have been introduced. These modifications are designed to provide optimum performance for the high-subsonic, low-altitude penetration role.

Offensive and defensive electronics systems are much improved over the B-1. The offensive avionics include modern forward-looking and terrain-following radars, an extremely accurate inertial navigation system, a link to the Air Force Satellite Communications (AFSATCOM) system, and much of the new Offensive Avionics System (OAS) package installed in B-52Gs and Hs (strategic Doppler radar and radar altimeter). The defensive avionics package is built around the ALQ-161 electronic countermeasures (ECM) system with an extended frequency coverage. This flexible, reprogrammable system automatically detects and analyzes radars illuminating the aircraft. A central computer then selects an appropriate countermeasure and applies the best ECM technique at precisely the right time, with the right power and optimal angle to protect the aircraft from the probing radar. The defensive avionics package also includes a tail warning function using the ALQ-161 system and such expendables as chaff and flares.

Dyess AFB is expected to achieve IOC, with 15 of its scheduled 29 B-1Bs, later this year. Deliveries will then continue at the rate of approximately four aircraft per month to Ellsworth AFB, S. D. (35 aircraft), Grand Forks AFB, N. D. (17 aircraft), and McConnell AFB, Kan. (17 aircraft). Each base will also deploy supporting in-flight refueling tankers. Deliveries will be completed in 1988, with two B-1Bs allocated for ongoing test and development flying.

Contractors: Rockwell International, North American Aircraft Operations; Eaton Corporation, AIL Division; Boeing Military Airplane Company; and General Electric.

Power Plant: four General Electric F101-GE-102 turbofan engines; each 30,000 lb thrust class.

Accommodation: four: pilot, copilot, and two systems operators (offensive and defensive).

Dimensions: span spread 136 ft 8½ in, fully swept 78 ft 2½ in, length 147 ft, height 34 ft.

Rockwell B-1B

Boeing B-52G Stratofortress

Weight: max T-O weight 477,000 lb.

Performance: max speed at low-level high subsonic (supersonic at altitude); range intercontinental.

Armament: three internal weapons bays capable of accommodating in a nuclear role eight advanced cruise missiles, 24 AGM-69 SRAMs, 12 B-28 or B-43 free-fall nuclear bombs, or 24 B-61 or B-83 bombs; in a non-nuclear role up to 84 Mk 82 (500 lb) or 24 Mk 84 (2,000 lb) bombs. Eight underfuselage stores stations can carry an additional 14 ACMs or SRAMs, 8 B-28s, 14 B-43/B-61/B-83s, 14 Mk 84s, or 44 Mk 82s.

B-52 Stratofortress

After 30 years' service with USAF, the B-52 Stratofortress still constitutes the major piloted element of SAC's bomber force. The 263 B-52s currently operational are capable of delivering a wide range of weapons, including conventional and nuclear bombs, air-launched cruise missiles, and nuclear-tipped air-to-surface short-range attack missiles. Apart from their primary nuclear mission, the B-52s can be deployed in various conventional roles, including show of force, maritime interdiction, precision strikes, and defense suppression. Other collateral missions in recent years have included sea-surveillance flights, aerial minelaying and antisurface warfare operations in cooperation with the US Navy, and support for NATO exercises.

The two versions still in service are the **B-52G,** which introduced important changes, including a redesigned wing containing integral fuel tankage, fixed underwing external tanks, a new tail fin of reduced height and broader chord, and a remotely controlled tail gun turret that allowed the gunner to be repositioned with the rest of the crew; deliveries began in February 1959, and 193 were built; and the **B-52H,** the final version, which switched to TF33 turbofan engines, providing increased unrefueled range, and which has improved defensive armament, including a 20-mm Vulcan multibarrel tail gun; 102 were built, with deliveries starting in May 1961.

During the early 1970s, all B-52Gs and Hs were modified to carry AGM-69A Short-Range Attack Missiles (SRAMs). Additionally, all Gs and Hs have been equipped with an AN/ASQ-151 Electro-optical Viewing System (EVS), using forward-looking infrared (FLIR) and low-light-level TV sensors to improve low-level flight capability. Under USAF improvement programs begun in 1974, the Gs and Hs have been progressively updated with

Phase VI avionics. This includes ALQ-122 SNOE (Smart Noise Operation Equipment) and AN/ALQ-155(V) advanced ECM; an AFSATCOM kit permitting worldwide communication via satellite; a Dalmo Victor ALR-46 digital radar warning receiver; Westinghouse ALQ-153 pulse-Doppler tail warning radar; and improved versions of the ITT Avionics ALQ-117 ECM system for the B-52G or ALQ-172 ECM system for the B-52H. The G/Hs are also being fitted with a digital-based, solid-state Offensive Avionics System (OAS) that includes inertial guidance, Tercom (terrain comparison) guidance, and microprocessors to upgrade their navigation and weapons delivery systems. This program is scheduled for completion in FY '89.

Because of the long range and diversified payload capabilities of their aircraft, two B-52H wings of the 57th Air Division at Minot AFB, N. D., and Ellsworth AFB, S. D., have been assigned to support conventional operations by employing airpower over great distances on short notice. With the continued improvement of Soviet defenses and the development of USAF's next-generation bombers, the role of the B-52 is transitioning to ALCM (AGM-86) carrier. A typical profile would see multiple ALCM launches at high altitude, often followed by B-52 low-level descent to attack additional targets using gravity weapons or SRAMs. USAF completed deployment of AGM-86s on 90 on-line B-52Gs, each with 12 external cruise missiles, in December 1984. As more B-1Bs enter service, USAF will deploy ALCMs on B-52Hs for service well into the 1990s. Development of the Common Strategic Rotary Launcher, initiated in 1982, will further permit internal carriage of eight AGM-86s in the B-52H, giving it a total ALCM offensive weapon load. The 60 B-52Gs not scheduled for use as cruise missile carriers have replaced the now-retired B-52Ds in conventional roles. They achieved full operational capability in June 1985 in support of naval antisurface warfare operations through Harpoon employment. Two full squadrons are already equipped for this role, based at Loring AFB, Me., for Atlantic operations, and at Andersen AFB, Guam, for Pacific operations. (Data for B-52G, except where noted.)

Contractor: Boeing Military Airplane Company.
Power Plant: eight Pratt & Whitney J57-P-43WB turbojet engines, each 13,750 lb thrust.
Accommodation: two pilots, side by side, plus navigator, radar-navigator, ECM operator, and fire-control system operator (gunner).
Dimensions: span 185 ft 0 in, length 160 ft 11 in, height 40 ft 8 in.
Weights: G/H models gross more than 488,000 lb.
Performance (approx): max level speed at high altitude 595 mph, service ceiling 55,000 ft, range more than 7,500 miles.
Armament: G model has four 0.50-caliber guns in tail turret; H model has 20-mm gun. G/H models being adapted to carry 8 SRAMs and nuclear free-fall bombs internally and 12 AGM-86B ALCMs instead of SRAMs externally. Provision for eight more ALCMs instead of SRAMs internally on H model. Alternatively, modified G models can carry 8 to 12 Harpoons in underwing clusters.

FB-111A

Capable of providing accurate, low-altitude weapons delivery at night and in poor weather, the FB-111A is a two-seat, medium-range, strategic bomber version of the swingwing F-111, developed originally to provide SAC with a replacement for early versions of the Stratofortress and supersonic B-58A Hustlers. The first of 76 production aircraft flew in July 1968, and the initial delivery was made in October 1969 to the 340th Bomb Group; sixty-one aircraft remain, 56 for strike duties and five in reserve. Although the FB-111A is currently assigned to the nuclear mission, its conventional weapons capability will suit it to a tactical role when deployment of the ATB occurs. FB-111s will remain operational throughout the

General Dynamics FB-111A

1990s, with several Class IV modifications, including avionics modernization, engine work, and escape capsule modifications under way. Operational units equipped with FB-111As are the 380th and 509th Bomb Wings.

Contractor: General Dynamics Corporation.
Power Plant: two Pratt & Whitney TF30-P-7 turbofan engines; each 20,350 lb thrust with afterburning.
Accommodation: two, side-by-side.
Dimensions: span spread 70 ft 0 in, fully swept 33 ft 11 in, length 73 ft 6 in, height 17 ft 1.4 in.
Weight (approx): gross 100,000 lb.
Performance: max speed at 36,000 ft Mach 2.5, service ceiling more than 60,000 ft, range 4,100 miles with external fuel.
Armament: up to four AGM-69A SRAM air-to-surface missiles on external pylons, plus two in the weapons bay, or six nuclear bombs, or combinations of these weapons; provision for up to 31,500 lb of conventional bombs.

tical aircraft modification program. First version supplied to USAF was the **F-4C**, a two-seat twin-engine all-weather tactical fighter with J79-GE-15 turbojet engines, dual controls, an inertial navigation system, and boom flight refueling. F-4Cs still equip Air National Guard and Air Force Reserve units. The **F-4D** introduced major systems changes, including new weapon ranging and release computers to increase accuracy in air-to-air and air-to-surface weapon delivery. The **F-4E** was developed as a multirole fighter capable of performing counterair, close-support, and interdiction missions. A 20-mm Vulcan multibarrel gun is fitted, together with an improved fire-control system and an additional fuselage fuel tank. Leading-edge slats, to improve maneuverability, were retrofitted to all USAF F-4Es. In addition, from early 1973, some were fitted with Northrop's target-identification system electro-optical (TISEO) as an aid to positive long-range visual identification of airborne or ground targets. System improvements include the Pave Tack system, which provides a day/night adverse weather capability to acquire, track, and designate ground targets for laser, infrared, and electro-optically guided weapons; the Pave Spike day tracking/laser ordnance designator pod, for use with "smart" weapons; and a digital intercept computer that includes launch computations for USAF AIM-9 and AIM-7 missiles. As this version is replaced by F-15s and F-16s in the active force, it is being transferred to the ANG, replacing C and D models. The **F-4G** "Advanced Wild Weasel" is a modified F-4E with its gun replaced by AN/APR-38 electronic warfare equipment that enables it to detect, identify, and locate enemy radars and then direct against them weapons for their destruction or suppression. Primary armament includes Shrike (AGM-45) and HARM (AGM-88), with optional availability of the CBU Rockeye area weapon for suppression purposes, and the AGM-65 Maverick. First F-4Gs entered

McDonnell Douglas F-4G Phantom II

Fighters

F-4 Phantom II

Although the F-4 is being replaced by the F-15 and F-16 in active USAF units, many hundreds are still operational and are replacing older aircraft in reserve units. Designed in the mid-1950s, the F-4 has moved to a predominantly air-to-ground role, although it retains residual air-to-air capability. Continuous updating has maintained the effectiveness of the F-4s, some of which are scheduled to receive a low-smoke engine modification and radar warning receiver update during the FY '85–89 tac-

service in October 1978; to date 116 have been procured. Introduction of the AGM-88 HARM antiradiation missile has increased the F-4G's lethality; accuracy will be enhanced when the Precision Location Strike System (PLSS) is deployed.

Meanwhile, flight testing has been undertaken at ANG's 119th FIG at Fargo, N. D., of Hughes's infrared search and track (IRST) system, 300 of which could be transferred from deactivated USAF F-101, F-102, and F-106 interceptors to ANG F-4s to improve their air defense capabilities. (Data for F-4E.)

Contractor: McDonnell Aircraft Company, Division of McDonnell Douglas Corporation.
Power Plant: two General Electric J79-GE-17A turbojets, each 17,900 lb thrust with afterburning.
Accommodation: pilot and weapon systems operator in tandem.
Dimensions: span 38 ft 7½ in, length 63 ft 0 in, height 16 ft 5½ in.
Weights: empty 30,328 lb, gross 61,795 lb.
Performance: max speed at 40,000 ft Mach 2.0 class, range with typical tactical load 1,300 miles.
Armament: one 20-mm M61A1 multibarrel gun; provision for up to four AIM-7E Sparrow, AGM-45A Shrike, or AIM-9 Sidewinder missiles on four underfuselage and four underwing mountings, or up to 16,000 lb external stores.

Northrop F-5E Tiger II

F-5E/F Tiger II

Developed as the successor to Northrop's F-5A export fighter, the Tiger II is intended primarily to provide America's allies with an uncomplicated air-superiority tactical fighter that can be operated and maintained relatively inexpensively. The single-seat **F-5E**, first flown in August 1972, is basically a VFR day/night fighter with limited all-weather capability. Design emphasis is on maneuverability rather than high speed, notably through the use of maneuvering flaps. Well over a thousand F-5Es and two-

seat **F-5Fs** have been delivered. TAC, assisted by ATC, trains pilots and technicians of user air forces. For this purpose, 20 F-5Es were supplied to USAF, beginning in April 1973, before deliveries to foreign governments began in early 1974. TAC also operates two "aggressor squadrons" of camouflaged F-5Es, simulating late-model MiG threat aircraft, in "Red Flag" exercises at Nellis AFB, Nev. Similar training is provided by F-5Es of the 527th Tactical Fighter Training Aggressor Squadron, USAFE, at RAF Alconbury, England; and by PACAF's 26th Tactical Fighter Training Squadron, located at Clark AB, Philippines. (Data for F-5E.)

Contractor: Northrop Corporation, Aircraft Division.

Power Plant: two General Electric J85-GE-21A/B turbojet engines; each 5,000 lb thrust with afterburning.

Accommodation: pilot only.

Dimensions: span 26 ft 8 in, length 47 ft 4¾ in, height 13 ft 4¼ in. (F-5F length 51 ft 4 in, height 13 ft 2 in.)

Weights: empty 9,723 lb, gross 24,722 lb.

Performance (at 13,350 lb): max level speed at 36,000 ft Mach 1.64, service ceiling 51,800 ft, range with max fuel, with reserve fuel for 20 min max endurance at S/L (with external tanks retained), 1,543 miles.

Armament: two AIM-9 Sidewinder missiles on wingtip launchers; two M39-A2 20-mm cannon in nose, with 280 rounds per gun (one 20-mm in F-5F); up to 7,000 lb of mixed ordnance on four underwing attachments and one underfuselage station. Optional armament and equipment includes AGM-65 Maverick, laser-guided bombs, centerline multiple ejector rack, and centerline-mounted 30-mm gun pod.

F-15 Eagle

Since the mid-1970s, the Eagle has replaced the F-4 progressively as USAF's primary air-superiority aircraft. The original single-seat **F-15A** and two-seat **F-15B** were followed from June 1979 by the **F-15C** and **F-15D** respectively, with 2,000 lb of additional internal fuel and provision for carrying conformal fuel tanks (CFTs). Standard F-15 equipment includes a Hughes Aircraft APG-63 lightweight X-band pulse-Doppler radar for long-range detection and tracking of small high-speed objects down to treetop level. Under contracts initiated in February 1983, the F-15 is undergoing a Multi-Stage Improvement Program (MSIP). Improvements include a Programmable Armament Control Set (PACS), improved central computer, MIL-STD 1760 incorporation, APG-70 radar, and an expanded Tactical Electronic Warfare System (TEWS) allowing for the addition of weapons such as advanced versions of the AIM-7 and AIM-9, and AMRAAM. Delivery of MSIP-equipped F-15s began in June 1985.

In February 1984, USAF announced selection of the derivative **F-15E** as the service's new dual-role fighter for all-weather air-to-air and deep interdiction missions. It will be a two-seater, able to carry up to 23,500 lb of ordnance. Some of the F-15E's new systems have already been funded as part of the MSIP. Front cockpit modifications include redesigned controls, a wide field of view head-up display, and three CRT multipurpose displays. The digital, triple-redundant Lear Siegler flight-control system will permit coupled automatic terrain following, and navigational accuracy will be improved by a Honeywell ring laser gyro INS. For low-altitude, high-speed penetration and precision attack on tactical targets at night and in adverse weather, the F-15E will carry a high-resolution Hughes APG-70 radar, wide-field forward-looking infrared (FLIR), and LANTIRN (Low-Altitude Navigation and Targeting Infrared for Night) pods. To accommodate the new avionics, internal fuel capacity will be reduced slightly, but the F-15E can be fitted with CFTs, adapted to carry ordnance tangentially to reduce drag. In addition to its primary load of guided and unguided bombs, and other air-to-ground weapons, the F-15E will retain its air-superiority performance and weapons. A new engine bay is being developed by McDonnell Douglas to allow installation of either General Electric F110 or Pratt & Whitney F100 engines. The first of three prototype F-15Es is expected to fly in December of this year, followed by the first production aircraft one year later. Procurement of 392 dual-role Eagles is planned, with IOC scheduled for late 1988.

Planned production of all models of the F-15 totals 1,266 aircraft for USAF, plus the original 20 R&D models, by the mid-1990s. Orders to date total 862 for operational use by USAF, and 48 proposed for FY '87. Units already equipped with Eagles include TAC's 57th FWW, 405th TTW, and 1st, 33d, and 49th TFWs; USAFE's 32d TFS and 36th TFW; and PACAF's 18th TFW. Three squadrons in the USA are allocated to air defense with F-15s. The 325th TTW at Tyndall AFB, Fla., began conversion from F-106s to F-15s in October 1983. First US air defense squadron to receive Eagles was the 48th FIS at Langley AFB, Va., followed by the 318th FIS at McChord AFB, Wash., and the 5th FIS at Minot AFB, N. D. In addition, the 57th FIS at Keflavik NAS, Iceland, received its first aircraft for the air defense role in July 1985. AAC's base at Eimendorf became operational in 1982 in support of air defense. Part of the F-15 FIS role at Langley and McChord will be an antisatellite mission, using the ASAT weapon described briefly on page 156. Equipment of

McDonnell Douglas F-15 Eagle

General Dynamics F-16 Fighting Falcon

ANG units with F-15A/B aircraft began last year with the 159th TFG; delivery to the 116th TFW is scheduled to start this summer.

In response to a USAF request made in September 1983, McDonnell Douglas is to develop and flight-test an **F-15 STOL Demonstrator** with short takeoff and landing and new maneuvering capabilities. Scheduled to begin flight trials in 1986, the airplane will have movable foreplanes mounted at the front of its engine air intake trunks, forward of the wings, to increase lift and reduce overall drag. Rectangular jet nozzles will vector engine thrust during takeoff and inflight maneuvers, and will reverse thrust to shorten the landing run. The aircraft is expected to be capable of takeoff with full internal fuel and a 6,000 lb payload from a 1,000 ft runway; landing run with payload expended is expected to be under 1,250 ft on a wet runway. Flying control, engine, steering, and braking functions will be integrated with existing F-15 controls through a digital fly-by-wire system to take optimum advantage of the aircraft's added capability while reducing the pilot's work load. Radar, infrared, and inertial navigation systems will generate data to locate the runway and furnish guidance cues.

Eight world time-to-height records were set by the specially prepared F-15 **Streak Eagle** in early 1975, of which six remain unbeaten, including climb to 20,000 m (65,616 ft) in 2 min 2.94 sec. (Data for F-15C.)

Contractor: McDonnell Aircraft Company, Division of McDonnell Douglas Corporation.

Power Plant: two Pratt & Whitney F100-PW-100 turbofan engines; each approx 23,830 lb thrust. Improved F100-PW-220 will equip new F-15s.

Accommodation: pilot only.

Dimensions: span 42 ft 9¾ in, length 63 ft 9 in, height 18 ft 5½ in.

Weights: empty 27,300 lb, gross 68,000 lb.

Performance: max speed Mach 2.5, service ceiling 60,000 ft, ferry range, without external fuel tanks, more than 2,878 miles; with CFTs, 3,570 miles.

Armament: one internally mounted M61A1 20-mm multi-barrel cannon; four AIM-9L/M Sidewinder and four AIM-7F/M Sparrow air-to-air missiles, or eight AMRAAMs, carried externally. Provision for carrying up to 23,600 lb of ordnance on weapon stations.

F-16 Fighting Falcon

The F-16 was developed to replace F-4s in the active force and to modernize the air reserve forces. Advanced technologies incorporated in the original single-seat **F-16A** and two-seat **F-16B** versions made them two of the most maneuverable fighters ever built. The advances include decreased structural weight through the use of composites, decreased drag resulting from reduced static stability margin, fly-by-wire flight controls with side stick force controller, high *g* tolerance/high visibility cockpit with a 30-degree reclined seat and single-piece bubble canopy, blended wing-body aerodynamics with forebody strakes, and automatically variable wing leading-edge flaps. The F-16 is powered by a single afterburning turbofan engine. Equipment includes a multimode radar with clutter-free look-down capability, advanced radar warning receiver, a head-up display, internal chaff or flare dispensers, and a 500-round 20-mm internal gun. The aircraft also has provisions for ECM.

The F-16 entered operational service initially with TAC's 388th TFW at Hill AFB, Utah, in January 1979. A forward-looking plan for the aircraft, known as the Multinational Staged Improvement Program (MSIP), was implemented by USAF in February 1980. This assures its capability to accept systems under development, thereby minimizing retrofit costs. As a first stage, all F-16s delivered since November 1981 have built-in structural and wiring provisions and systems architecture that will expand the single-seater's multirole flexibility to perform precision strike, night attack, and beyond-visual-range interception missions. Advanced cockpit displays and controls have been introduced subsequently into the F-16C, and an improved fire control radar will enable F-16s to launch AMRAAM air-to-air missiles at multiple targets in rapid succession. Future systems improvements will include installation of the LANTIRN navi/attack system and the airborne self-protection jammer (ASPJ) now under development. Initial deliveries to TAC of the MSIP-configured **F-16C** (single-seat) and **F-16D** (two-seat) took place in January 1985. Under development is a reconnaissance variant of the F-16D, designated **F-16R**, as a potential replacement for the RF-4C. If evaluation of a General Dynamics-developed semi-conformal reconnaissance pod proves successful, production deliveries of as many as 410 of the pods could begin in FY '91. Each would house a video camera system to provide display images for the aircraft's crew and high-resolution near-real-time transmission to end users.

USAF has no plans to procure any version of the "cranked-arrow wing" F-16XL, of which it completed evaluation in October 1985. However, a sophisticated research variant of the F-16, known as the **AFTI/F-16**, continues in use to test and evaluate advanced fighter technologies, including flight-control systems, pilot/vehicle interface, an automated maneuvering attack system, and an advanced weapon interface, at Edwards AFB, Calif.

To date, USAF has initiated procurement of 1,139 F-16s, with a further 180 authorized for FY '86. A request for 216 more is included in the FY '87 budget proposals, including 96 F-16C/Ds, and 120 **F-16CMs** that will be modified and less expensive versions of the F-16C, capable of both air-to-air and air-to-surface use but with a less comprehensive multirole mission. Long-term procurement objectives involve a total of 2,694 F-16s for USAF. A modified F-16C is also a primary contender in the USAF competition to select an air defense fighter to replace the F-106 and F-4, together with the Northrop F-20 and any other candidate aircraft deemed suitable by the Air Force. Source selection is to be completed by the end of FY '86, with funds for procurement of the first 20 of an estimated 300 aircraft included in the FY '87 budget proposals.

In December 1985, USAF had approximately 823 F-16s in its inventory. F-16-equipped units include TAC's 56th and 58th TTWs, and 363d, 388th, and 474th TFWs; USAFE's 50th TFW at Hahn AB and 86th TFW at Ram-

stein AB in West Germany; and 401st TFW at Torrejon AB, Spain; PACAF's 8th TFW at Kunsan AB, Korea, and 432d TFW at Misawa AB, Japan. The 169th TFG at McEntire ANGB, S. C., was the first ANG squadron with F-16s, with the 149th TFG at Kelly AFB, Tex., scheduled to convert this year. The 419th TFW at Hill AFB, Utah, was the first AFRES unit to convert to F-16s, replacing F-105s, with the 302d SOS at Luke AFB, Ariz., scheduled to become an F-16-equipped TFG in 1987. F-16s also equip USAF's Thunderbirds Air Demonstration Squadron. More than 1,000 more have been delivered to, and ordered for, the air forces of Belgium, Denmark, Egypt, Israel, Netherlands, Norway, Pakistan, Singapore, South Korea, Turkey, and Venezuela. (Data for F-16C.)

Contractor: General Dynamics Corporation.

Power Plant: one Pratt & Whitney F100-PW-200(3) turbofan engine; approximately 25,000 lb thrust with afterburning. General Electric F110-GE-100 augmented turbofan will be alternative standard engine in future production aircraft.

Accommodation: pilot only.

Dimensions: span over missiles 32 ft 10 in, length overall 49 ft 3 in, height 16 ft 8½ in.

Weights: empty 16,794 lb, gross with external loads 37,500 lb.

Performance: max speed Mach 2 class, service ceiling more than 50,000 ft, ferry range more than 2,000 miles.

Armament: one M61A1 20-mm multibarrel cannon, with 500 rounds, mounted in fuselage; wingtip-mounted infrared missiles; seven other external stores stations for fuel tanks and air-to-air and air-to-surface munitions.

ATF

Seven aerospace companies (Boeing, General Dynamics, Grumman, Lockheed-California, McDonnell Douglas, Northrop, and Rockwell) have completed contracts for conceptual designs of the Advanced Tactical Fighter (ATF). The ATF will be primarily a low-signature air-superiority aircraft, but will have some inherent air-to-surface capability. STOL characteristics are considered important. Technologies of special note include use of composites and advanced metallic materials, advanced cockpit automation, integrated fire and flight controls, advanced radar and sensors, vectored thrust, and built-in test and support equipment. Later this year, three or four of the competing contractors will be selected to take the program through the demonstration/validation phase. A full-scale development decision will be made in FY '89, aiming toward an IOC by the mid-1990s.

F-106 Delta Dart

The F-106 air defense fighter was developed in the mid-1950s. Constant updating enabled USAF to maintain its effectiveness, but only five squadrons still serve with active Air Force and ANG units. The two production versions are the **F-106A** single-seat interceptor and the **F-106B**, a tandem two-seat dual-purpose combat trainer. All 105 in the active inventory will be phased out by 1988 and converted to QF-106 aerial target drones. (Data for F-106A.)

Contractor: Convair Division of General Dynamics.

Power Plant: one Pratt & Whitney J75-P-17 turbojet engine; 24,500 lb thrust with afterburning.

Accommodation: pilot only.

Dimensions: span 38 ft 3⅛ in, length 70 ft 8¾ in, height 20 ft 3½ in.

Weights (approx): empty 25,300 lb, gross 42,400 lb.

Performance (approx): max speed at 40,000 ft Mach 2.0, service ceiling 65,000 ft, range 1,200 miles.

Armament: four AIM-4F/G Falcon air-to-air missiles carried internally; and a 20-mm cannon on most F-106As.

F-111

Four versions of this pioneer variable-geometry tactical aircraft are currently in service with USAF, as its only current long-range, around-the-clock, interdiction fighters. Deliveries of production **F-111As** to the first operational wing began in October 1967 and 141 were built. This version served with distinction in SEA in 1972–73 and currently equips the 366th TFW. The A was superseded in production by the **F-111E**, with modified air intakes that improved engine performance above Mach 2.2. Ninety-four were built, and most of these serve with the 20th TFW, based at RAF Upper Heyford in the UK, in support of NATO. The replacement of current analog bombing and navigation systems with digital equipment will begin in 1989, with completion expected in 1993. This will enable F-111A/E aircraft to handle modern guided munitions and advanced sensors as well as future systems, such as Global Positioning System (GPS) and JTIDS. The **F-111D** was designed with advanced avionics, offering improvements in navigation and air-to-air weapon delivery. Ninety-six were built and equip the 27th TFW at Cannon AFB, N. M. The **F-111F**, of which 106 were built, has uprated turbofans. Equipping the 48th TFW at RAF Lakenheath, this version can carry in its weapons bay the Pave Tack system, which provides a day/night capability to acquire, track, and designate ground targets for laser, infrared, and electro-optically guided weapons.

Production of the F-111 was completed in 1976. Its EW capabilities are being updated with the ALQ-131 ECM pod system, and future improvements will include AIM-9L/M self-defense capability. In addition, French Durandal parachute-retarded, rocket-boosted, runway attack bombs were introduced into TAC's inventory during 1984 to equip F-111s, each of which is capable of carrying up to twelve bombs and delivering them at low altitudes and high speed. Another F-111 weapon is Gator, USAF's first air-delivered mine system, which is compatible also with the A-7, A-10, F-4, F-15, F-16, and B-52.

The **AFTI F-111** is the test-bed for the Mission Adaptive Wing (MAW) developed by ASD's Flight Dynamics Laboratory and Boeing Military Airplane Company. Research is directed at developing a wing without flaps, slats, ailerons, or spoilers, which changes its camber in flight through the use of internal hydraulic actuators while the flexible composite skin maintains a smooth surface. The MAW is expected to increase range, maneuverability, and survivability for tactical and strategic missions by using the automatic wing configuration control to maintain peak aerodynamic efficiency. The F-111 was chosen as test-bed because its variable geometry permits simulation of a variety of military aircraft.

The **EF-111A** is an ECM conversion of the F-111A *(see page 149)*. SAC has a strategic bomber version, designated **FB-111A** *(see page 144)*. The Royal Australian Air Force acquired 24 **F-111Cs** for strike duties, four of which were subsequently modified for tactical reconnaissance.

Contractor: General Dynamics Corporation.

Power Plant: F-111A/E: two Pratt & Whitney TF30-P-3 turbofan engines; each 18,500 lb thrust with afterburning. F-111D: two TF30-P-9 turbofan engines; each 19,600 lb thrust with afterburning. F-111F: two TF30-P-100 turbofan engines; each approx 25,100 lb thrust with afterburning.

Accommodation: crew of two side-by-side in escape module.

Dimensions: span spread 63 ft 0 in, fully swept 31 ft 11.4 in, length 73 ft 6 in, height 17 ft 1.4 in.

Weights (F-111F): empty, 47,481 lb, gross 100,000 lb.

Performance (F-111F): max speed at S/L Mach 1.2, max speed at altitude Mach 2.5, service ceiling more than 59,000 ft, range with max internal fuel more than 2,925 miles.

Armament: one 20-mm M61A1 multibarrel cannon and two nuclear bombs in internal weapon bay; four swiveling wing pylons carrying total external load of up to 25,000 lb of bombs, rockets, missiles, or fuel tanks.

Convair F-106A Delta Darts

General Dynamics F-111s

Attack and Observation Aircraft

A-7D/K Corsair II

Now operated by ANG units in eleven states and Puerto Rico, the **A-7D** Corsair II is a single-seat, subsonic close air support and interdiction aircraft of which 459 were delivered between 1968 and 1976. Thirty-one **A-7K** combat-capable two-seat training models were delivered from April 1981. The A-7Ds have demonstrated outstanding target kill capability, initially in Southeast Asia. This is achieved with the aid of a continuous-solution navigation and weapon-delivery system, including all-weather radar bomb delivery, and is undergoing continuous update. Pave Penny laser target-designation pods were installed on 383 A-7Ds. Under a recent contract, 48 A-7Ds and four A-7Ks are being fitted with forward-looking infrared (FLIR) equipment to provide round-the-clock effectiveness. To assist ANG pilots who might be called on to operate from short runways and in varying climatic conditions during rapid deployment, augmented wing flaps are under development. These will reduce landing speed, improve handling characteristics on the approach, and substantially reduce landing roll. (Data for A-7D.)

Contractor: LTV Aerospace and Defense Company (formerly Vought Corporation).

Power Plant: one Allison TF41-A-1 nonafterburning turbofan engine; 14,500 lb thrust.

Accommodation: pilot only.

Dimensions: span 38 ft 9 in, length 46 ft 1½ in, height 16 ft 0⅛ in.

Weights: empty 19,781 lb, gross 42,000 lb.

Performance: max speed at S/L 698 mph, ferry range with external tanks 2,871 miles.

Armament: one M61A1 20-mm multibarrel gun; up to 15,000 lb of air-to-air or air-to-surface missiles, bombs, Gator mines, rockets, or gun pods on six underwing and two fuselage attachments.

A-10 Thunderbolt II

Designed specifically for the close air support (CAS) mission, the A-10 offers a combination of large military load, long loiter, and wide combat radius. In a typical antiarmor close air support mission, the A-10 could fly 150 miles and remain on station for an hour. It can carry up to 16,000 lb of mixed ordnance with partial fuel or 12,066 lb with full internal fuel. The 30-mm GAU-8/A gun can fire 2,100 or 4,200 rds/min and provides a cost-effective weapon with which to defeat the whole array of ground targets encountered in the CAS role, including tanks. The A-10 achieves its survivability through a combination of high maneuverability and design features that make it a "hard" aircraft. Equipment includes an inertial navigation system, head-up display, laser seeker, target penetration aids, and associated equipment for Maverick missiles.

Delivery of 713 A-10s was completed in March 1984. The first operational squadron was activated at Myrtle Beach AFB, S. C., in June 1977, and achieved operational capability in October. Pave Penny laser target-designation pods, introduced in 1978, are now standard equipment for the aircraft. The first IR Maverick-equipped A-10 squadron was scheduled to become fully operational at RAF Bentwaters, UK, in February of this year.

Six squadrons of A-10s have been deployed at RAF Bentwaters and Woodbridge in the UK; TAC A-10 units include the 23d and 354th TFWs, 355th TTW, and 66th FWS; the 57th FWW at Nellis AFB, Nev., also has some A-10s. The 18th TFS is located at Eielson AFB, Alaska, and the 25th TFS at Suwon AB, Korea. A-10 equipment of the 128th and 174th TFWs and the 103d, 104th, and 175th TFGs of the ANG has been completed—the A-10 being the first first-line aircraft to be assigned to ANG units. A-10s also equip the 434th and 442d TFWs and the 917th and 926th TFGs of AFRES.

Contractor: Fairchild Republic Company, Division of Fairchild Industries.
Power Plant: two General Electric TF34-GE-100 turbofan engines; each approx 9,065 lb thrust.
Accommodation: pilot only.
Dimensions: span 57 ft 6 in, length 53 ft 4 in, height 14 ft 8 in.
Weights: empty 24,959 lb, max gross 50,000 lb.
Performance: combat speed at S/L, clean, 439 mph; range with 9,500 lb of weapons and 1.7 hr loiter, 20 min reserve, 288 miles.
Armament: one 30-mm GAU-8/A gun; eight underwing hard points and three under fuselage for up to 16,000 lb of ordnance, including various types of free-fall or guided bombs, gun pods, or six AGM-65 Maverick missiles, and jammer pods. Chaff and flares carried internally to counter radar- or infrared-directed threats. The centerline pylon and the two flanking fuselage pylons cannot be occupied simultaneously.

AC-130A/H Spectre

AC-130 gunships provided the principal fire support for US Army troops on the ground during the Grenada rescue operation in the autumn of 1983. **AC-130As** serve with the Air Force Reserve's 711th SOS at Eglin AFB, Fla. **AC-130Hs** continue in active service with MAC's 1st Special Operations Wing. AC-130As are equipped with two 40-mm cannon, two 20-mm Vulcan cannon, and two 7.62-mm Miniguns. AC-130Hs are similar, except that one 40-mm cannon is replaced with a 105-mm howitzer. Both models are equipped with sensors and target-acquisition systems, including forward-looking infrared and low-light-level TV. AC-130Hs are equipped for in-flight refueling.

Data basically as for C-130 *(page 151)*.

O-2A

A total of 346 specially equipped variants of the "push-and-pull" Cessna 337 Skymaster entered USAF service in 1966, originally to replace the Cessna O-1 in the forward air controller role in Vietnam. Though OA-37s and OV-10s have replaced O-2s, a few of these aircraft still serve with TAC's 507th TACW at Shaw AFB, S. C., and AAC's 25th TASS at Eielson AFB. In addition, all Air Force forward air controllers are trained by 549th Tactical Air Support Training Group at Patrick AFB, Fla., using O-2s and OV-10As. Specialized equipment and electronics installed in the O-2A permit control of air strikes, visual reconnaissance, target identification and marking, ground-air coordination, and damage assessment.

Contractor: Cessna Aircraft Company
Power Plant: two Continental IO-360-C/D piston engines; each 210 hp.
Accommodation: pilot and observer side-by-side; one passenger optional.
Dimensions: span 38 ft 2 in, length 29 ft 9 in, height 9 ft 2 in.
Weights: empty 2,848 lb, gross 5,400 lb.
Performance: max speed at S/L 199 mph, service ceiling 19,300 ft, range 1,060 miles.
Armament: four underwing pylons can carry light ordnance, including a 7.62-mm Minigun pack.

OA-37B Dragonfly

A-37B Dragonfly ground support aircraft withdrawn from operational service with AFRES have been adapted for forward air control duty, replacing O-2As in ANG's 110th, 111th, and 182d Tactical Air Support Groups. There are some OA-37Bs in the 602d TACW at Davis-Monthan AFB, Ariz.

Contractor: Cessna Aircraft Company.
Power Plant: two General Electric J85-GE-17A turbojet engines; each 2,850 lb thrust.
Accommodation: two, side-by-side.
Dimensions: span over tip-tanks 35 ft 10½ in, length excluding fuel probe 28 ft 3¼ in, height 8 ft 10½ in.
Weights: empty 6,211 lb, gross 14,000 lb.
Performance: max level speed at 16,000 ft 507 mph, service ceiling 41,765 ft, range with max payload, including 4,100 lb ordnance, 460 miles.
Armament: one GAU-2B/A 7.62-mm Minigun installed in forward fuselage, four pylons under each wing able to carry various combinations of rockets and bombs.

OV-10A Bronco

This counterinsurgency combat aircraft, first flown in August 1967, was acquired by USAF for use in the forward air control role, and for limited quick-response ground support pending the arrival of tactical fighters. One hundred and fifty-seven were delivered to USAF before production of the OV-10A for the US services ended in April 1969. Some have replaced older O-2As in such units as the 22d Tactical Air Support Squadron at Wheeler AFB, Hawaii. Versions are also in service with USN, US Marine Corps, and foreign air forces.

Contractor: Rockwell International Corporation, Aircraft Operations.
Power Plant: two Garrett T76-G-416/417 turboprop engines; each 715 hp.
Accommodation: two, in tandem.
Dimensions: span 40 ft 0 in, length 41 ft 7 in, height 15 ft 2 in.
Weights: empty 6,893 lb, overload gross weight 14,444 lb.
Performance: max speed at S/L, without weapons, 281 mph; service ceiling 24,000 ft; combat radius with max weapon load, no loiter, 228 miles.
Armament: four fixed forward-firing M60C 7.62-mm machine guns; four external weapon attachment points under short sponsons, for up to 2,400 lb of rockets, bombs, etc; fifth point, capacity 1,200 lb, under center fuselage. Provision for carrying one Sidewinder missile on each wing and, by use of a wing pylon kit, various stores, including rocket and flare pods and free-fall ordnance. Max weapon load 3,600 lb.

Fairchild Republic A-10 Thunderbolt II

Vought A-7D Corsair II

Cessna O-2A

Cessna OA-37B Dragonfly

Rockwell OV-10A Bronco

Reconnaissance and Special-Duty Aircraft

SR-71A/B Blackbird

Fastest, highest-flying production aircraft yet built, the multisensored **SR-71A** Blackbird is assigned to the 9th

Lockheed SR-71A Blackbird

Strategic Reconnaissance Wing, Beale AFB, Calif.; its mission is to respond to national and strategic requirements and to support theater commanders throughout the spectrum of conflict. Advanced equipment, including a remarkable synthetic aperture radar (SAR I) system, is capable of specialized coverage of up to 100,000 sq miles of territory in one hour, by day and night, and in all weather. In July 1976, flown by three USAF crews, the SR-71 set an absolute world speed record of 2,193.167 mph over a 15/25 km straight course, a speed of 2,092.294 mph around a 1,000-km closed circuit, and a sustained altitude of 85,069 ft in horizontal flight. Another SR-71A flew from New York to London, England, in 1 hr 54 min 56.4 sec in September 1974, at an average speed of 1,806.987 mph. The prototype flew for the first time in December 1964, and delivery of production aircraft began in January 1966. The **SR-71B** is a two-seat training version, with elevated rear cockpit.

Contractor: Lockheed Corporation.
Power Plant: two Pratt & Whitney JT11D-208(J58) turbojet engines; each 34,000 lb thrust with afterburning.
Accommodation: crew of two in tandem.
Dimensions: span 55 ft 7 in, length 107 ft 5 in, height 18 ft 6 in.
Weights (estimated): empty 60,000 lb, gross 170,000 lb.
Performance (estimated): max speed at 78,750 ft more than Mach 3, operational ceiling above 80,000 ft.
Armament: none.

U-2 and TR-1

Production of the basic U-2 began in the late 1950s. It is essentially a powered glider, with high aspect ratio wing and lightweight structure, designed to carry out strategic reconnaissance for long periods at very high altitudes. Fifty-five are believed to have been built, in various forms. All have similar dimensions except for the **U-2R,** which has much increased span and length. This is now the primary version. Air Force U-2s have performed important nonmilitary missions, including flights for the Department of Agriculture land management and crop estimate programs; photographic work in connection with flood, hurricane, and tornado damage; data gathering for a geothermal energy program; and search missions for missing boats and aircraft.

A derivative of the U-2R, the **TR-1A,** is a single-seat tactical reconnaissance aircraft designed for high-altitude standoff surveillance missions, primarily in Europe. Initial funding was provided by the FY '79 budget. A total of 19 (including one for NASA) was requested through FY '84, three more in FY '85, and four in FY '86, leaving three to be funded in FY '87 to complete the planned inventory of 26 TR-1As for USAF, plus two two-seat **TR-1Bs.** Fourteen had been delivered by early 1986. Each TR-1 is equipped with electronic sensors to provide continuously available, day or night, all-weather surveillance of the battle area, or potential battle area, in direct support of US and allied ground and air forces during peace, crises, and war situations. They include an advanced synthetic aperture radar system in side-looking airborne radar (SLAR) form, and modern ECM. The first TR-1A flew on August 1, 1981, and pilot training at Beale AFB began later that year. The first of 14 TR-1s to be stationed at RAF Alconbury in the UK arrived in February 1983; the last is scheduled to arrive by the end of this year. These TR-1As are operated by SAC for USAFE.

Some TR-1As are expected to be allocated to the Precision Location Strike System (PLSS) role, following a period of highly successful flight testing. The system, which involves a triangulation team of three TR-1As, will locate enemy defense emitters in near real time and all weathers, to allow attack from standoff ranges by ground or airborne weapon systems. One TR-1A has been illustrated with a large structure, like an AEW&C radar, mounted above its fuselage. (Data for TR-1A.)

Contractor: Lockheed Corporation.
Power Plant: one Pratt & Whitney J75-P-13B turbojet engine; 17,000 lb thrust.
Dimensions: span 103 ft 0 in, length 63 ft 0 in, height 16 ft 0 in.
Weight: gross 40,000 lb.
Performance: max cruising speed at over 70,000 ft more than 430 mph, range more than 3,000 miles.
Armament: none.

Lockheed TR-1

McDonnell Douglas RF-4C

RF-4C

This unarmed multisensor version of the F-4C Phantom II was developed to replace the day-only RF-101 for day/night, all-weather reconnaissance operations. The first production RF-4C flew in May 1964, and 505 were built before manufacture ended in December 1973. They are operated by six TAC, USAFE, and PACAF tactical reconnaissance squadrons and by six squadrons of the ANG. The RF-4 was the first tactical aircraft equipped with a forward-looking radar capable of simultaneous terrain-following and low-altitude navigation. The basic aircraft is configured with conventional optical cameras for day operations and infrared (IR) sensors for night. Both the radar and the camera systems are housed in a modified nose, which increases the length of the aircraft by 33 in compared with the fighter version. Sixteen RF-4Cs were fitted with side-looking airborne radar (SLAR) for all-weather standoff battlefield surveillance, and 24 with a tactical electronic reconnaissance (TEREC) sensor for locating electronic emitters. Other equipment includes the ARN-101 digital avionics system for improved navigation accuracy and greater reconnaissance capability; the Pave Tack IR pod for improved target locating by day, night, or in marginal weather; and data link transmission of SLAR and TEREC intelligence in near real time to enhance timeliness of information to tactical decision-makers. Preliminary efforts are now under way to modify the RF-4C with electro-optical sensors. (Data similar to F-4.)

EC-130H Compass Call

EC-130

A number of variants of the basic C-130 have been produced for specialized missions, including the **EC-130E ABCCC** (known until 1977 as C-130E-II) used by the 7th Airborne Command and Control Squadron of the 522d AWACW from Keesler AFB, Miss., as an Airborne Battlefield Command and Control Center; **EC-130E "Coronet Solo II"** electronic surveillance version operated by the 193d Special Operations Group, ANG, from Harrisburg IAP, Pa.; **EC-130H "Compass Call"** enemy communications jammer operated by 41st Electronic Combat Squadron of the 552d AWACW from Davis-Monthan AFB, Ariz. (Data basically as C-130, page 151.)

EC-135, etc.

Several aircraft in the KC-135 Stratotanker series were modified for specialized missions during production or at a later date. Thirty-nine are modified for strategic airborne command and control missions. Five KC-135A tankers were converted for Airborne Command Post use by SAC in 1960. Additional aircraft were modified in 1962, and 17 new production KC-135B turbofan aircraft entered the system in 1965. Currently, **EC-135A/C/G/L/H/P/Y** aircraft are assigned to SAC, TAC, PACAF, and USAFE. They are fitted with extensive communications equipment to support strategic command and control missions of their respective CINCs. At least one SAC EC-135C is airborne at all times, accommodating a flight crew of five, a general officer, and a staff of 18. EC-135Cs can be refueled by SAC tankers. Fourteen were built and have been adapted to provide control of Minuteman

Grumman EF-111A Raven

ICBMs. TAC provides overseas deployment control of tactical fighters with the **EC-135K**.

Three **EC-135E** derivative **Advanced Range Instrumentation Aircraft (ARIA)** are operated by ASD's 4950th Test Wing as telemetry and voice relay stations to supplement land and sea receiver stations for DoD and NASA space and missile programs. The aircraft's distinctive bulbous nose houses the world's largest airborne steerable antenna.

Versions of the C-135 Stratolifter series used for reconnaissance include turbofan **RC-135Vs** and **RC-135Ws**, equipped also for electronic reconnaissance with SAC, **RC-135Ss**, and **RC-135Us**. **WC-135Bs**, converted C-135Bs, are used by MAC for long-range weather reconnaissance missions. In addition, a highly instrumented version, designated **NKC-135** ALL (Airborne Laser Laboratory), has been utilized by USAF as a test-bed in support of the HEL (High Energy Laser) research program. The primary objective has been to acquire technology data on laser operations that might have combat potential in the airborne environment.

In order to minimize the cost of retrofitting the special-purpose -135s with more efficient turbofan engines, USAF has installed in some aircraft refurbished Pratt & Whitney JT3D-3Bs taken from Boeing 707-100B aircraft, purchased as surplus from commercial air carriers. (Data basically as C-135, page 152.)

EF-111A Raven

The EF-111A Raven is a conversion of the basic General Dynamics F-111A airframe fitted with mainly off-the-shelf components that enable it to accomplish important defense suppression missions in worldwide support of US tactical strike forces. Its ALQ-99E primary jammer is a modification of the Navy ALQ-99, and is carried internally. This extremely powerful system's frequency coverage, reliability, and effective use of available jamming power enables the EF-111A to suppress the densest known electronic defenses. Other equipment includes self-protection systems from the F/FB-111 (ALQ-137/ALR-62). The crew capsule is revised, and a new vertical stabilizer houses ALQ-99E receivers. An upgrade to the ALQ-99E processing and jamming subsystem, awarded to Eaton Corporation's AIL Division in 1984, will enable the EF-111A to counter advanced electronic defenses for the 1990s.

Forty-two EF-111As have been produced for missions that include barrier surveillance jamming, degradation of acquisition radars during close air support operations, and escort jamming for deep strike missions. Flight testing began in March 1977, and the first "production" EF-111s were delivered in late 1981 to the 366th TFW, at Mountain Home AFB, Idaho, where they achieved initial operational capability with the 390th Electronic Combat Squadron in December 1983. Second operational location was at RAF Upper Heyford in the UK, where the first EF-111 arrived in February 1984 for the 42d ECS.

Contractor: Grumman Aerospace Corporation.
Power Plant: two Pratt & Whitney TF30-P-3 turbofan engines, each 18,500 lb thrust with afterburning.
Accommodation: crew of two, side-by-side in escape module.
Dimensions: span spread 63 ft 0 in, fully swept 31 ft 11.4 in, length 76 ft 0 in, height 20 ft 0 in.
Weights: empty 55,275 lb, gross 88,948 lb.
Performance: max combat speed 1,377 mph, service ceiling with afterburning at combat weight 45,000 ft, combat radius with reserves 230–929 miles, according to mission.
Armament: none.

E-3 Sentry (AWACS)

AWACS is a mobile, flexible, survivable, and jamming-resistant surveillance and command control and communications (C^3) system, capable of all-weather, long-range, high- or low-level surveillance of all air vehicles, manned or unmanned, above all kinds of terrain. A modified Boeing 707-320B carries an extensive complement of mission avionics, including computer, radar, IFF, communications, display, and navigation systems. The capability of AWACS is provided by its Westinghouse Electric Corporation look-down radar, which makes possible all-altitude surveillance over land or water, thus correcting a serious deficiency in earlier surveillance systems.

USAF indicated an initial requirement for 34 AWACS aircraft. Deliveries of the basic version, designated **E-3A** Sentry, began in March 1977, when the first aircraft was handed over to TAC's 552d Airborne Warning and Control Wing at Tinker AFB, Okla. Thirty-three aircraft have been delivered to TAC; the 34th is presently a test system aircraft assigned to AFSC.

A **US/NATO Standard E-3A** configuration was introduced from the 25th USAF Sentry, delivered in December 1981, in which the data processing capability is improved and a maritime mission capability included. NATO is operating 18 standard E-3As, purchased as part of a cooperative program to update the command and control of NATO's air defense forces.

Each of the first 24 US E-3As is being updated to **E-3B** standard. Improvements include faster computer capabilities, antijam communications, an austere maritime surveillance capability, additional radio communications, and five additional display consoles. The first E-3B was redelivered to the 552d AWACW in April 1984. Beginning in November 1983, the ten US Standard E-3A aircraft are being upgraded with additional command and control capability and are being redesignated **E-3C**. NATO Sentrys will continue as E-3As.

ESD has proposed a $425 million MSIP for the E-3, phased over five years, to give the radar greater "detectability," add passive sensors, and make other improvements. Eventually, all US and NATO E-3s will be equipped with the Joint Tactical Information Distribution System (JTIDS) for antijam communications.

E-3s have had a role in US continental air defense since January 1979, when NORAD personnel began augmenting TAC E-3 flight crews on all operational NORAD missions by the 552d AWACW from Tinker AFB. Overseas units of the 552d include the 960th and 961st AWAC Squadrons based respectively at Keflavik, Iceland, and Kadena AB, Okinawa, Japan. Deployments have been made to the Pacific, the Middle East, the Mediterranean area, and Europe. AWACS aircraft are also used in support of the US drug enforcement program.

Contractor: Boeing Aerospace Company.
Power Plant: four Pratt & Whitney TF33-PW-100/100A turbofan engines; each 21,000 lb thrust.
Accommodation: basic operational crew of 20, including 16 AWACS specialists.
Dimensions: span 145 ft 9 in, length 152 ft 11 in, height 41 ft 9 in.
Weight: gross 325,000 lb.
Performance: max speed 530 mph, service ceiling above 29,000 ft, endurance six hr on station 1,000 miles from base.

E-4B

SAC is the Air Force single resource manager for the E-4 airborne command post aircraft, the main operating base for which is Offutt AFB, Neb. Three **E-4As** were built initially to support the National Emergency Airborne Command Post (NEACP). Each had a modified Boeing 747 airframe, and provided an interim capability by utilizing existing EC-135 command control and communications (C^3) equipment. Four fully-developed **E-4B** Airborne Command Post aircraft (three of them converted from E-4A) now support the NEACP mission. They are hardened against the effects of nuclear explosions, including electromagnetic pulse, equipped for in-flight refueling, contain a 1,200kVA electrical system designed to support advanced electronics, and have a wide variety of communications equipment. This includes a more powerful LF/VLF system, improved satellite communications system, and communications processing equipment. These systems have antijam features and will support operations in a nuclear environment over extended ranges. The E-4B system is capable of tying in to commercial telephone and radio networks and could, potentially, be used for radio broadcasts to the general population. Additional improvements, to include a data processing capability and more survivable C^3, including initial Milstar modification, are programmed. The first E-4B entered service with SAC in January 1980, and the first operational mission was flown in March that year.

Contractor: Boeing Aerospace Company.
Power Plant: four General Electric CF6-50E2 turbofan engines, each 52,500 lb thrust.
Dimensions: span 195 ft 8 in, length 231 ft 4 in, height 63 ft 5 in.
Weight: gross 800,000 lb.
Performance: unrefueled endurance in excess of 12 hours.

EC-18B ARIA

The EC-18B Advanced Range Instrumentation Aircraft (ARIA) is a modified former American Airlines Boeing 707-320 series transport, of which four are replacing the EC-135 ARIAs operated by ASD's 4950th Test Wing. In common with the EC-135 ARIAs, the 707s are being converted to house the world's largest airborne steerable antenna in a bulbous nose, with a probe antenna on each wingtip, and a completely new cockpit configuration; range, cabin space, and fuel efficiency are all being increased, to provide greater support for the expanding ARIA mission, including DoD and NASA space and missile programs. Following conversion, the first EC-18B was flown for the first time on February 27, 1985. All four are expected to be fully operational by 1988. Future modification will install a sonobuoy missile impact location system of the kind fitted to some USN P-3s.

Contractor: Boeing Military Airplane Company.

WC-130E/H

Modified C-130 Hercules transports, designated WC-130E and H, are equipped for weather reconnaissance duties, including penetration of tropical storms to obtain data for forecasting of storm movements. They are assigned to the 41st Rescue and Weather Reconnaissance Wing of MAC's Aerospace Rescue and Recovery

Boeing E-3 Sentry (AWACS)

Boeing EC-18B ARIA

Boeing E-4B NEACP

Grumman X-29 FSW Demonstrator

Service and the 403d Rescue and Weather Reconnaissance Wing of the Air Force Reserve. (Data similar to C-130.)

X-29 Forward Swept Wing Demonstrator

A further milestone in the development of the unique X-29 Forward Swept Wing (FSW) demonstrator was passed on December 13, 1985, when it made its first supersonic flight from NASA's Dryden Flight Research Center at Edwards AFB, Calif. Preliminary data showed Mach 1.03 airspeed at an altitude of 40,000 ft, piloted by Stephen D. Ishmael of NASA. Flight testing had been under way since December 1984. Day-to-day management of the program was handed over to NASA following acceptance of the aircraft by USAF's Aeronautical Systems Division in March 1985. USAF manages flight-test support.

The two X-29 demonstrators were built by Grumman. A standard Northrop F-5A forward fuselage and nose landing gear and many off-the-shelf components, such as F-16 main landing gear and control surface actuators, were utilized on each aircraft to reduce costs. Integrated with a "triplex" fly-by-wire flight-control system, the X-29's forward-swept wings, made of strong, lightweight graphite composites, and its stubby canards, which act as its main control surfaces, combine to enhance lift and reduce drag. In flight, the wings' trailing-edges change shape continuously to match flight conditions.

The current phase of the flight program, following the installation of an improved backup flight-control system last fall, is testing stability and control, loads, flutter, and wing divergence up to 40,000 ft and at speeds up to Mach 1.5 during a planned total of 100 flights. The second X-29 will explore the low-speed, high-angle-of-attack side of the envelope.

Contractor: Grumman Aerospace Corporation.
Power Plant: one General Electric F404-GE-400 turbofan engine; 16,000 lb st class.
Accommodation: pilot only.
Dimensions: span 27 ft 2½ in, length overall 53 ft 11¼ in, height 14 ft 3½ in.
Weights: empty 13,800 lb, gross 17,800 lb.
Performance: max level speed approx Mach 1.6.

Transports and Tankers

C-5 Galaxy

This air-refuelable, long-range, heavy logistics transport flew for the first time in June 1968. Deliveries of the basic **C-5A** to MAC began in December 1969, and all 81 of these aircraft had been received by May 1973. Each is capable of airlifting loads up to 241,000 lb, such as two M60 tanks or three CH-47 Chinook helicopters, over transoceanic ranges. Under a major modification program, Lockheed is producing kits of components to extend the service life of the C-5A's wings by 30,000 flight hours, without load restrictions. These kits replace only the five main load-carrying wing boxes, to which other existing components are transferred. The use of 7175-T73511 aluminum alloy provides greater strength and resistance to corrosion. Flight testing of a prototype installation was completed successfully during 1980, the converted C-5A being redelivered to USAF early in 1981. Installation of production kits began in 1982, and all 77 aircraft now in the inventory should be modified by FY '87. The 433d TAW at Kelly AFB, Tex., became the first AFRES unit to receive the C-5A when the first of 16 was delivered in December 1984, and the unit was renamed the 433d MAW. ANG's 105th MAG at Stewart IAP, N. Y., received its first C-5As in July last year; AFRES's 439th TAW is also scheduled to replace its C-130s with C-5As.

To meet an urgent need for additional heavy airlift capacity, USAF is acquiring 50 **C-5Bs**, generally similar to the C-5A but embodying all the improvements that have been introduced since completion of C-5A production. These include the strengthened wings, General Electric TF39-GE-1C turbofans, and updated avionics, including Bendix color weather radar and Delco triple INS. The original MADAR (MAlfunction Detection Analysis and Recording instrument) units are replaced by the more advanced MADAR II. The first C-5B flew for the first time on September 10, 1985, and was delivered to Altus AFB, Okla., on January 6 this year. Funding for the final 21 aircraft is sought in the FY '87 budget proposals. Deliveries are scheduled for completion in mid-1989. (Data for C-5B.)

Power Plant: four General Electric TF39-GE-1C turbofan engines; each 41,100 lb thrust.
Accommodation: crew of five, rest area for 15 (relief crew, etc); 75 troops and 36 standard 463L pallets or assorted vehicles, or additional 270 troops.
Dimensions: span 222 ft 8½ in, length 247 ft 10 in, height 65 ft 1½ in.

Lockheed C-5B Galaxy

Beech C-12A

McDonnell Douglas C-9A Nightingale

McDonnell Douglas C-17 (models)

Weights: empty 374,000 lb, max operational payload 241,000 lb, gross (for 2.25g) 837,000 lb.
Performance: max speed at 25,000 ft 571 mph, service ceiling (at 615,000 lb) 35,750 ft, range with max payload 1,700 miles.

C-9A Nightingale and C-9C

Derived from the DC-9 Srs 30 commercial airliner, the **C-9A** is an aeromedical airlift transport, in service since August 1968. Modifications include a special-care compartment with separate atmospheric and ventilation controls. Delivery of 21 to MAC's 375th Aeromedical Airlift Wing was completed by February 1973. The Nightingale also performs overseas theater aeromedical evacuation missions in Europe and the Pacific. Three specially configured **C-9Cs** were delivered to the 89th Military Airlift Wing at Andrews AFB, Md., in 1975 for Presidential and other US governmental duties. (Data for C-9A.)

Contractor: Douglas Aircraft Company, Division of McDonnell Douglas Corporation.
Power Plant: two Pratt & Whitney JT8D-9 turbofan engines; each 14,500 lb thrust.
Accommodation: crew of three; 40 litter patients or 40 ambulatory patients, or a combination of both, plus five medical staff.
Dimensions: span 93 ft 5 in, length 119 ft 3½ in, height 27 ft 6 in.
Weight: gross 108,000 lb.
Performance: max cruising speed at 25,000 ft 565 mph, ceiling 35,000 ft, range more than 2,000 miles.

C-12

Thirty military versions of the Beechcraft Super King Air 200 were delivered to USAF under the designation **C-12A.** Their role is to support attaché and military assistance advisory missions throughout the world. MAC uses two C-12As to train aircrews and to supplement support airlift. Also, under a contract awarded in September 1983, USAF has leased passenger/cargo Super King Air B200Cs, as **C-12Fs,** to replace (with C-21As) the fuel-inefficient CT-39s used in operational support missions. Forty have been delivered to MAC since May 1984. A purchase option may be exercised at the end of the lease period. ANG also has six C-12Fs ordered under FY '84 funding, with a further six ordered in FY '85. (Data for C-12A.)

Contractor: Beech Aircraft Corporation.
Power Plant: two Pratt & Whitney Canada PT6A-38 turboprop engines; each 750 shp. (C-12F: 850 shp PT6A-42s.)
Accommodation: crew of two; up to eight passengers or 4,764 lb of cargo.
Dimensions: span 54 ft 6 in, length 43 ft 9 in, height 15 ft 0 in.
Weight: gross 12,500 lb.
Performance: max speed at 14,000 ft 299 mph, service ceiling 31,000 ft, range at max cruising speed 1,824 miles.

C-17

The C-17 is being developed to meet USAF's requirement for a heavy-lift, air-refuelable cargo transport able to provide intertheater and intratheater airlift of military equipment, including the M1 tank, directly into airfields in potential combat areas. Operation will be possible from runways only 3,000 ft long and 90 ft wide. On the ground, the C-17 would be able to make a 180° turn in only 82 ft. A fully loaded aircraft, using thrust reversal, would be able to back up a two percent gradient.

McDonnell Douglas was announced as the selected prime contractor in August 1981 and received a low-level research and development contract the following July. This was intended to cover C-17 technologies that would also benefit other airlift programs while preserving the option to proceed to full-scale work on the C-17. Technologies investigated include a blown flap system on a swept supercritical wing with winglets, and an engine fan and redirected flow thrust reverser. Full-scale development was approved in February 1985, and is being continued under an FY '86 budget appropriation of $383.7 million. Current plans envisage construction of three aircraft being funded in FY '88, making possible a first flight in early 1990, and IOC with 12 aircraft in late FY '92. Delivery of the planned 210 aircraft might be completed by FY '98.

Contractor: McDonnell Douglas Corporation.
Power Plant: four Pratt & Whitney F117-PW-100 turbofan engines; each 37,600 lb thrust.
Accommodation: normal flight crew of two, plus loadmaster. Provision for a variety of military airlift roles.
Dimensions: span 165 ft 0 in, length 175 ft 2 in, height 55 ft 1 in.
Performance (estimated): cruising speed at high altitude 518 mph, typical range with 172,200 lb payload 2,765 miles.

C-18A

The designation C-18A has been given to eight former

American Airlines Boeing 707-323C transports acquired for service with USAF. (Data similar to C-137.)

C-20A

Selected to replace the aging, fuel-inefficient C-140B, the C-20A is a Gulfstream III executive transport acquired by USAF for VIP duties. Three aircraft were delivered to the 89th Military Airlift Wing under a lease/purchase agreement beginning September 1983, and were subsequently purchased in November 1984; eight more were requested in FY '86. Eight will eventually be assigned to Andrews AFB, Md., and three to Ramstein AB, West Germany.

Contractor: Gulfstream Aerospace Corporation.
Power Plant: two Rolls-Royce F113-RR-100 turbofan engines; each 11,400 lb thrust.
Accommodation: crew of five; 14–18 passengers.
Dimensions: span 77 ft 10 in, length 83 ft 1 in, height 24 ft 4½ in.
Weight: gross 69,700 lb.
Performance: max cruising speed 509 mph, service ceiling 45,000 ft, range 4,718 miles.

C-21A

In a program designed to replace aging, fuel-inefficent CT-39s, USAF has acquired 80 Learjet 35As (together with 40 C-12Fs) under a lease contract in which the contractor provides maintenance and logistics support for the aircraft at various USAF bases. Delivery of the Learjets, which are designated C-21A, took place between April 1984 and October 1985. They are based throughout the US and in Japan and Germany for operation by MAC as part of its Operational Support Airlift fleet, delivering high-priority, time-sensitive cargo, seasoning newly rated pilots, and, as a by-product, providing passenger airlift. They are capable of quick and easy conversion for such missions as medical evacuation and long-range ferry flights.

Contractor: Gates Learjet Corporation.
Power Plant: two Garrett TFE731-2A turbofan engines; each 3,500 lb thrust.
Accommodation: crew of two; cargo or eight passengers.
Dimensions: wing span over tip tanks 39 ft 6 in, length 48 ft 8 in, height 12 ft 3 in.
Weight: gross 17,000 lb.
Performance: max level speed at 25,000 ft 542 mph, service ceiling 45,000 ft, range with four passengers, max fuel, and 45 min reserves 2,634 miles.

C-23 Sherpa

Eighteen Sherpa light transports were delivered to USAF between November 1984 and December 1985. They are operated by MAC and controlled by CINC USAFE, primarily to ferry aircraft spares and complete engines to bases throughout Europe. The contract included options for 48 more Sherpas.

First flown on December 23, 1982, the Sherpa is an all-freight version of the Shorts 330 regional airliner, with a 6 ft 6 in square cabin section over an unimpeded hold length of 29 ft. Through loading is provided via a large forward freight door, a full-width hydraulically operated rear ramp door, and removable roller conveyors. The USAF aircraft are used in the European Distribution System Aircraft (EDSA) program, centered on Zweibrücken, in Germany, with main warehousing facilities at RAF Kemble in the UK and Torrejon AB in Spain. In peacetime, the Sherpas service at least 20 USAF bases, in a system analogous with the civil air freight operation carried out by Federal Express in the US.

Contractor: Short Brothers PLC.
Power Plant: two Pratt & Whitney Canada T101-CP-100 turboprop engines; each 1,198 shp.
Accommodation: crew of two; up to 7,000 lb of freight, including four LD3 containers, and engines the size of the F100 series.

Gulfstream C-20A

Gates Learjet C-21A

Rockwell CT-39 Sabreliner

Dimensions: span 74 ft 8 in, length 58 ft 0½ in, height 16 ft 3 in.
Weight: gross 22,900 lb.
Performance: max cruising speed at 10,000 ft 218 mph, range 770 miles with 5,000 lb payload.

CT-39 Sabreliner

Acquired in the late 1950s and early 1960s, the CT-39 Sabreliner has become increasingly less cost-effective and has been replaced in MAC by the C-12F and C-21A. **CT-39A/B** basic utility and training aircraft still in the inventory are in service with AFSC and with AFCC facility checking squadrons, which use two Sabreliners, together with four C-140As, to evaluate communications and navigation aids at Air Force bases. In addition, ATC has acquired CT-39As in support of the Air Force Instrument Flight Center.

Contractor: Sabreliner Division of Rockwell International Corporation.
Power Plant: two Pratt & Whitney J60-P-3 turbojet engines; each 3,000 lb thrust.
Accommodation: crew of two; four to seven passengers.
Dimensions: span 44 ft 5 in, length 43 ft 9 in, height 16 ft 0 in.
Weights: empty 9,300 lb, gross 17,760 lb.
Performance: max speed at 36,000 ft 595 mph, service ceiling 39,000 ft, range 1,950 miles.

Short Brothers C-23 Sherpa

C-123K

Four C-123K aircraft, operated by AFRES's 907th TAG, are being retained for aerial spray missions.

Contractor: The Fairchild Engine and Airplane Corporation.
Power Plant: two Pratt & Whitney R-2800-99W piston engines; each 2,500 hp; and two General Electric J85-GE-17 turbojet engines; each 2,850 lb thrust.
Dimensions: span 110 ft 0 in, length 76 ft 4 in, height 34 ft 6 in.
Weights: empty 35,366 lb, gross 60,000 lb.

C-130 Hercules

Although designed to a specification issued by TAC 35 years ago, the C-130 remains in production, with basic and specialized versions continuing to perform a diversity of roles worldwide, including airlift support, DEW Line and Arctic ice cap resupply, aeromedical missions, and fire fighting duties for the US Forest Service. The initial production model was the **C-130A,** first flown in April 1955, with 3,750 ehp Allison T56-A-11 or -9 turboprops; 219 were ordered, and deliveries began in December 1956. Two **DC-130As** (originally GC-130As) were built as drone launchers/directors for ARDC (now AFSC), carrying up to four drones on underwing pylons. All special equipment was removable, permitting the aircraft to be used as freighters, assault transports, or ambulances, as required. The **C-130B** introduced 4,050 ehp Allison T56-A-7 turboprops; the first of 134 entered USAF service in April 1959. Six C-130Bs were modified in 1961 for air-snatch recovery of classified USAF satellites by the 6593d Test Squadron at Hickam AFB. Twelve **C-130Ds** were modified C-130As for use in the Arctic, with wheel-ski landing gear, increased fuel capacity, and provision for JATO. The **C-130E** is an extended-range development of the C-130B, with large underwing fuel tanks; 389 were ordered for MAC and TAC with deliveries beginning in April 1962. Wing modifications to correct fatigue and corrosion on USAF's current force of 492 C-130B/Es, already under way, will extend the life of the aircraft well into the next century. C-130A wing repairs will allow operation into the 1990s. Fourteen C-130Es were modified to **MC-130E (Combat Talon I)** standard and equipped for use in low-level deep-penetration tactical missions by the 1st, 7th, and 8th Special Operations Squadrons based in the Philippines, West Germany, and Florida, respectively. This version is being supplemented by the **MC-130H (Combat Talon II),** of which six were funded in FY '83–86, with five more requested in FY '87. By 1992 the inventory is expected to include 21 of these aircraft, equipped with terrain-following radar, precision navigation/airdrop, in-flight refueling, and self-protection systems. Generally similar to the E, the basic **C-130H** has uprated T56-A-15 turboprop engines, a redesigned outer wing, and other, minor, improvements; delivery began in April 1975. Eighteen C-130Hs (four ski-equipped, as **LC-130Hs,** to replace ANG C-130Ds) were funded by Congress in the FY '83/84 budgets. C-130s are currently active in USAF regular, Reserve, and ANG airlift squadrons. Other variants include **HC-130H/N/P** for MAC's 23d Air Force and MAC-gained units of the ANG and Reserve, and the **AC-130A/H** and **WC-130E/H,** described separately. (Data for C-130H.)

Contractor: Lockheed-Georgia Company.
Power Plant: four Allison T56-A-15 turboprop engines; each 4,508 ehp.
Accommodation: crew of five; up to 92 troops, 64 paratroops, 74 litter patients, or up to five 463L standard freight pallets, etc.
Dimensions: span 132 ft 7 in, length 97 ft 9 in, height 38 ft 3 in.
Weights: empty 76,469 lb, gross 175,000 lb.
Performance: max cruising speed 374 mph, service ceiling at 130,000 lb AUW 33,000 ft, range with max payload 2,356 miles.

HC-130

Constituting a major element of MAC's 23d Air Force, the **HC-130H** is an extended-range version of the C-130, ordered in 1963, with uprated T56-A-15 engines and specialized search and rescue equipment for the recovery of aircrews and retrieval of space hardware. This includes advanced direction-finding equipment and air-to-air recovery (ATAR) systems. Initial flight was made in December 1964 and 43 were delivered. Crew complement is ten to twelve. Twenty **HC-130Ps** are similar, but adapted to refuel helicopters in flight. Four **JHC-130H** conversions were fitted with equipment for aerial recovery of reentering space capsules. Under a 1974 USAF contract, another HC-130H was modified by LAS to **DC-130H** standard, with four pylons each capable of carrying a 10,000 lb new-generation RPV. Fifteen **HC-130Ns,** a search-and-rescue version of the HC-130P with advanced direction-finding equipment, were ordered in 1969; these aircraft also are capable of refueling helicopters in flight. (Other data similar to C-130.)

C-131

Twenty-seven Convair C-131 twin-engine transports,

Lockheed C-130E Hercules

with an average age of around 30 years, remain in service with the ANG for support airlift.

KC-135 Stratotanker

As single manager of all USAF KC-135 tanker aircraft, SAC supports its own refueling requirements as well as aerial refueling requirements of other Air Force commands, the US Navy and Marines, and other nations. Although similar in size and appearance to commercial 707 aircraft, the KC-135 was designed to military specifications, incorporates different structural details and materials, and was designed to operate at high gross weights. The KC-135 fuel tankage is located in the "wet wings" and in fuel tanks below the floor in the fuselage. The first flight of the **KC-135A** was in August 1956. By 1966, a total of 732 had been built, of which 615 remain in operational service, including those currently assigned to three Air Force Reserve units and to thirteen Air National Guard units. Three programs have been initiated to enhance the KC-135's capability and extend its operational utility beyond the year 2000. First, the selection of 22,000 lb thrust General Electric/SNECMA F108-CF-100 (CFM56) fuel-efficient engines for retrofit of the KC-135 fleet was announced in 1980. Reengined aircraft are designated **KC-135R.** They embody modifications to 25 major systems/subsystems, and not only carry more fuel farther, but also have reduced maintenance costs, are able to operate from shorter runways, and are less pollution-prone. The first of them made its first flight in August 1982 and was delivered to SAC in July 1984. Second, the JT3D reengining program will upgrade 126 ANG and AFRES KC-135As by the end of 1986. These aircraft, redesignated **KC-135E**, use JT3D turbofan engines removed from surplus commercial 707s. Finally, the Life Extension Structural Modification provides for renewal of the lower wing skin, which eliminates peacetime airframe restrictions by ensuring the structural integrity of the aircraft. Development of new and improved aerial refueling systems is also currently under way. (Data for KC-135A.)

Contractor: Boeing Military Airplane Company.
Power Plant: four Pratt & Whitney J57-P-59W turbojet engines; each 13,750 lb thrust.
Accommodation: crew of four or five; up to 80 passengers.
Dimensions: span 130 ft 10 in, length 136 ft 3 in, height 38 ft 4 in.
Weights: empty 98,466 lb, gross 297,000 lb.
Performance: max speed at 30,000 ft 585 mph, service ceiling 50,000 ft, range with 120,000 lb of transfer fuel 1,150 miles, ferry mission 9,200 miles.

C-135 Stratolifter

Thirteen C-135 transports and variants, without the KC's refueling equipment, remain operational with MAC. They were ordered originally to serve as interim jet passenger/cargo transports, pending delivery of C-141s. Three converted KC-135s were followed by 45 production Stratolifters in two versions: the **C-135A** with J57-P-59W turbojet engines, and **C-135B** with Pratt & Whitney TF33-P-5 turbofans. Eleven Bs were retrofitted with revised interior for VIP transportation: others became **WC-135B** and **RC-135E/M.** Data similar to KC-135, except:

Dimensions: length 134 ft 6 in.
Weights (C-135B): operating weight empty 102,300 lb, gross 275,500 lb.
Accommodation: 126 troops; 44 litters and 54 sitting casualties; or 87,100 lb of cargo.
Performance (C-135B): max speed 600 mph, range with 54,000 lb payload 4,625 miles.

Boeing KC-135 Stratotanker

Boeing C-137C

C-137

Five specially modified Boeing 707 transports are operated by MAC's 89th Military Airlift Wing from Andrews AFB, Md., for VIP duties. Best known is "Air Force One," a **C-137C** for use by the President. It is basically a 707-320B with a special VIP interior. A second C-137C is also operated, together with three smaller 707-120s, originally designated VC-137As but later modified to **C-137B** standard by the installation of turbofan engines.

Contractor: The Boeing Company.
Power Plant: four Pratt & Whitney JT3D-3 turbofan engines; each 18,000 lb thrust.
Dimensions: C-137B span 130 ft 10 in, length 144 ft 6 in, height 42 ft 0 in; C-137C span 145 ft 9 in, length 152 ft 11 in, height 42 ft 5 in.
Weights: C-137B gross 258,000 lb; C-137C gross 322,000 lb.
Performance (C-137C): max speed 627 mph, service ceiling 42,000 ft, range 5,150 miles.

C-140 JetStar

JetStars entered USAF service in 1961. Four **C-140As** are used by Air Force Communications Command (AFCC) to evaluate landing systems, navigational aids, radar approach control equipment, and controllers and tower operators. Scheduled for replacement by the C-20A, MAC has eight **C-140B** transport versions, four of which serve with the 89th Military Airlift Wing, operating from Andrews AFB, Md. The other four are used by USAFE for operational support airlift.

Contractor: Lockheed-Georgia Company.
Power Plant: four Pratt & Whitney J60-P-5A turbojet engines; each 3,000 lb thrust.
Accommodation: C-140A crew of five; C-140B crew of three and eight passengers.
Dimensions: span 54 ft 5 in, length 60 ft 5 in, height 20 ft 5 in.
Weight: gross 40,920 lb.
Performance: max cruising speed at 20,000 ft 550 mph, ceiling above 45,000 ft, range with reserves 2,280 miles.

C-141 StarLifter

The **C-141A** began operations with MAC in April 1965. Two hundred and eighty-five were built, some of which were structurally modified to accommodate the 82,207 lb Minuteman ICBM. During operational use it became clear that the cargo compartment was often fully loaded without the aircraft's maximum payload capability being utilized. In order to realize the C-141's full potential, USAF funded modification of the entire force of 270 (now 267) aircraft to **C-141B** standard. The fuselage was lengthened by 23 ft 4 in, and an in-flight refueling capability was added. The first production C-141B was delivered to USAF in December 1979, and the final modified StarLifter was obtained in June 1982, ahead of schedule and below projected cost. The modification significantly increased MAC's airlift capability, giving USAF the equivalent of 90 additional C-141A aircraft. Latest C-141 modifications include the installation of new digital flight data recorders, enhanced station keeping equipment capability, 50 kHz VOR/ILS receivers, and secure voice capability on UHF and HF radios. In addition, twenty 437th MAW C-141Bs will have electroluminescent (EL) light panels installed on the flight deck for use in the wing's Special Operations Low Level (SOLL) mission.

This year 16 C-141s are being transferred from the active force, eight to AFRES's 459th TAW at Andrews AFB, Md., and eight to ANG's 172d TAG at Jackson MAP, Miss. A total of 80 aircraft will be transferred by 1995. (Data for C-141B.)

Contractor: Lockheed-Georgia Company.
Power Plant: four Pratt & Whitney TF33-P-7 turbofan engines; each 21,000 lb thrust.
Accommodation: crew of five; cargo on 13 standard 463L pallets. Alternative freight or vehicle payloads; 200 fully equipped troops, 155 paratroops, or 103 litter patients plus attendants.
Dimensions: span 159 ft 11 in, length 168 ft 3½ in, height 39 ft 3 in.
Weights: operating 149,000 lb, max payload 90,000 lb, gross 343,000 lb.
Performance: max cruising speed 566 mph, range with max payload 1,970 miles (range significantly increased if air refueling used).

KC-10A Extender

By the beginning of this year, USAF had contracted for 40 of a planned procurement of 60 KC-10As, with 12 more requested in FY '86 and the final eight in FY '87. One of the in-service aircraft gave a further demonstration of its capability in February 1985, by making a nonstop unrefueled flight of 8,982 miles from Riyadh, Saudi Arabia, to March AFB, Calif., in 17.6 hours.

The KC-10 was conceived to meet specific USAF requirements for an Advanced Tanker/Cargo Aircraft (ATCA); it is based on the commercial DC-10 Series 30CF, modified to include body bladder fuel cells in the lower cargo compartments, a boom operator's station, an aerial refueling boom, a refueling receptacle, and military avionics. In its primary role of increasing US air mobility on a worldwide scale, a single KC-10A is able to combine the tasks of tanker and cargo aircraft by refueling fighters and simultaneously carrying the fighters' support equipment and support personnel on overseas missions. It can refuel strategic transports, such as the C-5 and C-141, nearly doubling, for example, the nonstop range of a fully loaded C-5. It can refuel strategic offensive and reconnaissance aircraft during long-range conventional operations, and it can augment cargo-carrying capability on a selected basis. The range of refueling equipment installed also enables the KC-10A to service USN, USMC, and NATO aircraft. In terms of active deployment, the KC-10A's refueling capabilities and long range will, in many situations, dispense with the need for forward bases, while also leaving vital fuel supplies in the theater of operations untouched. In addition, similarity to the civilian DC-10 has led to a system whereby the Extender can use commercial facilities for most maintenance. The manufacturer orders parts and handles heavy repairs; only routine and flight-line maintenance is done by the Air Force.

The first KC-10A made its maiden flight in July 1980 and delivery of the first KC-10A to enter service took place in March 1981, for operation by SAC. USAF units equipped with KC-10As include the 9th ARS at March AFB, Calif., and 32d ARS at Barksdale AFB, La.; AFRES's 78th ARS (Associate) at Barksdale and 79th ARS (Associate) at March AFBs share the aircraft with the active-duty squadrons at their respective bases. In October 1985, Seymour Johnson AFB, N. C., became the third KC-10-equipped base.

Contractor: McDonnell Douglas Corporation.
Power Plant: three General Electric CF6-50C2 turbofan engines; each 52,500 lb st. Design fuel capacity 356,065 lb.
Accommodation: crew of four on flight deck; seating for limited number of essential support personnel; max 25/27 pallets; max cargo payload 169,409 lb.

Dimensions: span 165 ft 4.4 in, length 181 ft 7 in, height 58 ft 1 in.
Weight: gross 590,000 lb.
Performance: max speed at 42,000 ft 528 mph, service ceiling 42,000 ft, max range with max cargo 4,370 miles; or delivery of 200,000 lb of transfer fuel to a receiver 2,200 miles from its home base, and return.

Trainers

T-33A Shooting Star

USAF has awarded Sabreliner Corp. a $4.8 million contract for the upgrading and structural modification, weapon and avionics systems integration, and flight testing of 25 T-33 jet aircraft over a 30-month period. Derived from the F-80 Shooting Star jet fighter, those T-33s still in service are used for combat support missions and for proficiency and radar target evaluation training. Combat armament is replaced by an all-weather "navigational nose."
Contractor: Lockheed Aircraft Corporation.
Power Plant: one Allison J33-A-35 turbojet engine; 4,600 lb thrust.
Accommodation: crew of two in tandem.
Dimensions: span 38 ft 10½ in, length 37 ft 9 in, height 11 ft 4 in.
Weights: empty 8,084 lb, gross 15,100 lb.
Performance: max speed at 25,000 ft 543 mph, service ceiling 47,500 ft.
Armament: two 0.50-caliber machine guns on some early aircraft only.

T-37B

USAF's first purpose-built jet trainer, the T-37 is Air Training Command's standard two-seat primary trainer. The original T-37A was superseded in November 1959 by the T-37B, and all A models were converted subsequently to B standard. Well over a thousand T-37s were built, of which more than 600 remain in USAF's inventory.
Contractor: Cessna Aircraft Company.
Power Plant: two Continental J69-T-25 turbojet engines; each 1,025 lb thrust.
Accommodation: two, side-by-side.
Dimensions: span 33 ft 9.3 in, length 29 ft 3 in, height 9 ft 2.3 in.
Weights: empty 3,870 lb, gross 6,600 lb.
Performance: max speed at 25,000 ft 426 mph, service ceiling 35,100 ft, range at 360 mph with standard tankage 870 miles.

T-38A Talon and AT-38

Almost identical in structure to the F-5A tactical fighter, the **T-38** is a lightweight twin-jet advanced trainer that was in continuous production from 1956 to 1972. The first T-38 flew in April 1959, and production models entered operational service in March 1961. Of the total 1,187 T-38s built, more than 1,100 were delivered to USAF, and about 900 remain in service throughout the Air Force. Most are used by ATC; others fly with SAC and with the 479th Tactical Training Wing at Holloman AFB, N. M., where a slightly different version designated **AT-38,** with a gunsight and practice bomb dispensers, is used for Fighter Lead-In Training (FLIT).
Contractor: Northrop Corporation.
Power Plant: two General Electric J85-GE-5 turbojet engines; each 2,680 lb thrust dry, 3,850 lb thrust with afterburning.
Accommodation: student and instructor, in tandem.
Dimensions: span 25 ft 3 in, length 46 ft 4½ in, height 12 ft 10½ in.
Weights: empty 7,164 lb, gross 12,093 lb.
Performance: max level speed at 36,000 ft more than Mach 1.23 (812 mph), ceiling above 55,000 ft, range, with reserves, 1,093 miles.

T-41 Mescalero

The **T-41A** trainer is a standard Cessna Model 172 light aircraft acquired by USAF for use in a preliminary flight screening program for USAF pilot candidates. An initial order for 170 aircraft in 1964 was supplemented by a further 34 in July 1967. More powerful **T-41Cs,** based on the Cessna Model R172E, are used for cadet flight training at the USAF Academy. (Data for T-41A.)
Contractor: Cessna Aircraft Company.
Power Plant: one Continental O-300-C piston engine; 145 hp. (210 hp Continental O-360-D in T-41C.)
Accommodation: crew of two, side-by-side.
Dimensions: span 35 ft 10 in, length 26 ft 11 in, height 8 ft 9½ in.
Weights: empty 1,285 lb, gross 2,300 lb.
Performance: max speed at S/L 139 mph, service ceiling 13,100 ft, range 720 miles.

T-43A

Derived from the commercial Boeing Model 737-200, the T-43A navigation trainer made its first flight in April 1973. It was developed as a replacement for the piston-engine T-29 and was equipped with the same on-board avionics as the most advanced USAF operational aircraft of that time, including celestial, radar, and inertial navigation systems, LORAN, and other radio systems. Deliveries of the 19 aircraft ordered for ATC were completed in July 1974. Fifteen remain in the ATC inventory; the other four are assigned to the ANG.
Contractor: Boeing Aerospace Company.
Power Plant: two Pratt & Whitney JT8D-9 turbofan engines, each 14,500 lb thrust.
Accommodation: crew of two, 12 students, five advanced students, and three instructors.
Dimensions: span 93 ft 0 in, length 100 ft 0 in, height 37 ft 0 in.
Weight: gross 115,500 lb.
Performance: econ cruising speed at 35,000 ft Mach 0.7, operational range 2,995 miles.

Lockheed C-141B StarLifter

McDonnell Douglas KC-10A Extender

T-46A

The T-46A was intended to replace the T-37 as USAF's next-generation primary trainer. Under a contract awarded in 1982, Fairchild Republic Company received funding to design, develop, build, and test two development aircraft and two ground test airframes. The first flight of the first development aircraft was made on October 15, 1985, and both aircraft were to undergo intensive flight-test evaluation at Edwards AFB, Calif., in 1986. However, the future of the program was in doubt in early 1986, due to budgetary constraints and reported "contractor cost and schedule difficulties."

The T-46A retains the twin-engine and side-by-side seating features of the T-37, but adds pressurization, increased range, and greatly improved adverse weather capability, which would decrease significantly the number of training flights lost through weather factors. The combination of pressurization and the greater thrust of the engines would also enable the aircraft to utilize training airspace up to 35,000 ft, thereby reducing problems caused by growing commercial and private air activity. Operational cost savings were expected to result from the use of more fuel-efficient engines and from reliability improvements incorporated in the airframe, avionics, and power plant. Inherent in the basic T-46 design is a built-in flexibility that permits modification for a potential operational attack role.
Contractor: Fairchild Republic Company.
Power Plant: two Garrett F109-GA-100 turbofan engines; each 1,330 lb thrust.
Accommodation: pupil and instructor, side-by-side.
Dimensions: span 38 ft 7¾ in, length 29 ft 6 in, height 9 ft 11¾ in.
Weights: empty 5,590 lb, gross 7,295 lb.
Performance: max level speed at 30,000 ft 450 mph, service ceiling 45,700 ft, range with max fuel 1,080 miles.

Northrop T-38A Talon

Lockheed T-33A Shooting Stars

Boeing T-43A

Fairchild Republic T-46A

UV-18B

The UV-18B is a military version of the DHC-6 Twin Otter STOL utility transport. Two were procured in FY '77 for use as parachute jump training aircraft at the Air Force Academy. A third was acquired later.
Contractor: The de Havilland Aircraft of Canada Ltd.
Power Plant: two Pratt & Whitney Canada PT6A-27 turboprop engines; each 620 ehp.
Accommodation: crew of two, and up to 20 passengers.
Dimensions: span 65 ft 0 in, length 51 ft 9 in, height 19 ft 6 in.
Weight: gross 12,500 lb.
Performance: max cruising speed 210 mph, service ceiling 26,700 ft, range with 2,500 lb payload 806 miles.

Helicopters

TH/UH-1F, UH-1P, and HH-1H

Basically a military version of the Bell Model 204, the **UH-1F** was developed for missile site support duties. USAF ordered 146, of which a few were modified to **UH-1Ps** for classified psychological missions in Vietnam. **TH-1F** is a version of the UH-1F for instrument training. In November 1970, USAF ordered 30 larger 12/15-seat **HH-1Hs**, based on the Model 205, for local base rescue duties. All four models continue in service, and a UH-1F, assigned to the 37th ARRS (MAC), was the first USAF helicopter to pass the 10,000-hr flying mark. (Data for UH-1F.)

Contractor: Bell Helicopter Textron.
Power Plant: one General Electric T58-GE-3 turboshaft engine; 1,272 shp (derated to 1,100 shp).
Accommodation: one pilot and 10 passengers; or two crew and 2,000 lb of cargo.
Dimensions: rotor diameter 48 ft 0 in, length of fuselage 39 ft 7½ in, height 14 ft 8 in.
Weight: gross 9,000 lb (9,500 lb for HH-1H).
Performance: max speed 138 mph, service ceiling at mission gross weight 13,450 ft, max range, no allowances, at mission gross weight 347 miles.

UH-1N

The UH-1N is a twin-engine version of the UH-1 utility helicopter. Seventy-nine were ordered for USAF, most of which remain in the inventory for combat rescue duties with MAC's 23d Air Force.

Contractor: Bell Helicopter Textron.
Power Plant: Pratt & Whitney Canada T400-CP-400 Turbo "Twin-Pac," consisting of two PT6 turboshaft engines coupled to a combining gearbox with a single output shaft; flat-rated to 1,290 shp.
Accommodation: pilot and 14 passengers or cargo; or external load of 4,000 lb.
Dimensions: rotor diameter (with tracking tips) 48 ft 2¼ in, length of fuselage 42 ft 4¾ in, height 14 ft 10¼ in.
Weight: gross and mission weight 11,200 lb.
Performance: max cruising speed at S/L 115 mph, service ceiling 13,000 ft, max range, no reserves, 261 miles.
Armament (optional): two General Electric 7.62-mm Miniguns or two 40-mm grenade launchers; two seven-tube 2.75-in rocket launchers.

Sikorsky HH-53B

Sikorsky HH-3E Jolly Green Giant

Sikorsky HH-60A Night Hawk

HH-53H Pave Low III

CH-3E

This twin-engine amphibious transport helicopter, based on the US Navy's SH-3A Sea King, incorporates important design changes that permit speedier cargo handling and ease of maintenance, with built-in equipment for the removal and replacement of all major components in remote areas. The initial version was the CH-3C. Introduction of uprated engines led to the designation CH-3E in February 1966, applicable to 42 new production aircraft and 41 reengined CH-3Cs, of which 50 were adapted subsequently as HH-3Es *(see below)*. CH-3 missions include natural disaster relief and evacuation operations.

Contractor: Sikorsky Aircraft, Division of United Technologies Corporation.
Power Plant: two General Electric T58-GE-5 turboshaft engines; each 1,500 shp.
Accommodation: crew of two or three; 25 fully equipped troops, 15 litters, or 5,000 lb of cargo.
Dimensions: rotor diameter 62 ft 0 in, length of fuselage 57 ft 3 in, height 18 ft 1 in.
Weights: empty 13,255 lb, gross 22,050 lb.
Performance: max speed at S/L 162 mph, service ceiling 11,100 ft, max range, with 10% reserve, 465 miles.
Armament: General Electric 7.62-mm machine gun.

HH-3E Jolly Green Giant

Modified version of the CH-3E for USAF's Aerospace Rescue and Recovery Service, originally to facilitate penetration deep into North Vietnam on rescue missions. Additional equipment includes self-sealing fuel tanks, armor, defensive armament, a rescue hoist, and a retractable in-flight refueling probe. HH-3s are now assigned also to rescue units of the Reserve and ANG. (Data basically similar to CH-3E above.)

HH-53B

This twin-turbine heavy-lift helicopter was ordered in September 1966 for USAF's Aerospace Rescue and Recovery Service to supplement the HH-3E. The HH-53B carries the same general equipment as the HH-3E, including the in-flight refueling probe and all-weather avionics and armament, but is faster and larger. The first flew in March 1967; delivery began in June the same year. After extensive use for rescue operations in Southeast Asia, HH-53Bs continue in first-line service.

Contractor: Sikorsky Aircraft, Division of United Technologies Corporation.
Power Plant: two General Electric T64-GE-7 turboshaft engines; each 3,925 shp.
Accommodation: crew of five, basic accommodation for 38 combat-equipped troops or 24 litters and four attendants.
Dimensions: rotor diameter 72 ft 3 in, length of fuselage (without refueling probe) 67 ft 2 in, height 24 ft 11 in.
Weights: empty 23,125 lb, gross 42,000 lb.
Performance: max speed at S/L 186 mph, service ceiling 18,400 ft, max range, with 10% reserve, 540 miles.

HH-53C and CH-53C

The **HH-53C,** an improved version of the HH-53B, was first delivered to USAF in August 1968. With a maximum speed of 196 mph, it can transport 38 passengers or 18,500 lb of freight and has an external cargo hook of 20,000 lb capacity. Other data basically as for HH-53B above. A total of 72 HH-53B/Cs was built. Eight generally similar **CH-53Cs** are used to provide battlefield mobility for the Air Force mobile Tactical Air Control System.

HH-53H Pave Low

Under USAF's Pave Low III program, nine HH-53Cs were modified for night and adverse weather operations and redesignated HH-53H. Equipment includes a stabilized FLIR installation mounted below the refueling boom, an inertial navigation system, a new Doppler navigation system, and the computer-projected map display and radar from the A-7D, with the radar installed in an offset "thimble" fairing on the nose.

The first of the Pave Low III aircraft was delivered to Pensacola, Fla., in March 1979, and the last in 1980. These helicopters are part of USAF's Special Operations Forces, and are to be joined by 12 HH-53Bs that the Air Force is modifying to Pave Low Enhanced configuration under a program initiated in 1986.

UH-60A Black Hawk and HH-60A Night Hawk

Under a $38 million contract, Sikorsky Aircraft modified a standard US Army Black Hawk into a prototype of a combat rescue helicopter designated **HH-60A** Night Hawk, first flown in February 1984. Changes include uprated engines, extended range capability, and integrated avionics. USAF was expected to order 90 production Night Hawks, as combat rescue helicopters able to conduct aircrew retrieval missions deep behind enemy lines, in darkness, at treetop level to avoid radar detection. Funding for the first three aircraft was requested in FY '86, but budgetary constraints led to elimination of the program from the FY '87 proposals, and its future is in doubt. However, USAF has received ten **UH-60A** Black Hawks in standard US Army configuration, including a rescue hoist, deicing system, and winterization and air transportability kits. (Data, except where indicated, for standard UH-60A.)

Contractor: Sikorsky Aircraft, Division of United Technologies Corporation; IBM responsible for HH-60A avionics.
Power Plant: two General Electric T700-GE-700 turboshaft engines; each 1,560 shp. (HH-60A: two T700-GE-401s; each 1,690 shp.)
Accommodation: crew of two or three; 11–14 troops, up to six litters, or internal or external cargo.
Dimensions: rotor diameter 53 ft 8 in, length of fuselage 50 ft 0¾ in (HH-60A, incl retracted refueling probe, 57 ft 0¼ in), height 16 ft 10 in.
Weights: empty 10,624 lb, gross 16,260–20,250 lb. (HH-60A: empty 12,642 lb, gross 20,413–22,000 lb.)
Performance: max speed 184 mph (HH-60A: 167 mph), service ceiling 19,000 ft (HH-60A: 17,000 ft), max range, with reserves, 373 miles (internal fuel), 1,380 miles (external tanks).
Armament (HH-60A): 7.62-mm machine guns.

Strategic and Tactical Nuclear Missiles

LGM-25C Titan II

Phaseout of the Titan II two-stage liquid-fueled ICBM is under way. More than 20 years old, it is expensive to maintain and of decreasing value to the overall US strategic posture. As of January 1 this year, 18 Titan IIs were still deployed in three squadrons at McConnell AFB, Kan., and Little Rock AFB, Ark. Deactivation will be completed by 1987.

Titan II has a thermonuclear warhead with the largest yield of any carried by a US missile and a launch reaction

time of one minute from its fully hardened underground silo.
Contractor: Martin Marietta Aerospace.
Power Plant: first stage: Aerojet-General LR87 storable liquid-propellant engine; 430,000 lb thrust; second stage: Aerojet-General LR91 storable liquid-propellant engine; 100,000 lb thrust.
Guidance: inertial.
Dimensions: length 103 ft 0 in, max body diameter 10 ft 0 in.
Weight: launch weight 330,000 lb.
Performance: max speed 17,000 mph (approx), max range 6,300 miles.

LGM-30F/G Minuteman

Minuteman remains a key element of the US strategic deterrent posture despite its 23 years of operational service. It is a three-stage, solid-propellant ICBM, smaller and lighter than the liquid-propellant Titan and with a smaller payload. The operational missiles are housed in underground silos, for which an upgrade program was completed in 1980 to provide increased launch facility protection. Minuteman silos and launch control centers are currently undergoing a depot level maintenance, known as Rivet Mile, to correct existing, and retard future, age-related deterioration of facilities. This ongoing program will ensure viability of the weapon system beyond the year 2000. The current versions are:

LGM-30F Minuteman II: similar in configuration to the original Minuteman I, Minuteman II has increased range and targeting coverage; also increased accuracy and payload capacity. Operational since 1965, it is based at Malmstrom AFB, Mont.; Ellsworth AFB, S. D.; and Whiteman AFB, Mo.

LGM-30G Minuteman III: third-stage motor with fluid-injection thrust vector control gives longer range and, allied to MIRV capability, enables this version to place warheads on three targets with a high degree of accuracy. Minuteman III also increases the probability of penetrating enemy defense systems. First test launch was made in 1968, and Minuteman III is operational at Minot AFB, N. D.; F. E. Warren AFB, Wyo.; Grand Forks AFB, N. D.; and Malmstrom AFB, Mont. A command data buffer system permits rapid missile retargeting.

The Minuteman force is made up of 450 Minuteman IIs and 550 Minuteman IIIs, although 50 will be displaced by Peacekeeper, beginning this year. Recent modifications have been aimed at providing improved command control and communications and at refinements to improve Minuteman III effectiveness by almost 30 percent through greater accuracy. Deployment of the larger-yield Mk 12A RV was completed in early 1983.
Assembly and Checkout: Boeing Aerospace Company.
Power Plant: first stage: Thiokol M-55E solid-propellant motor; 210,000 lb thrust; second stage: Aerojet-General SR19-AJ-1 solid-propellant motor; 60,300 lb thrust; third stage: LGM-30F: Hercules, Inc., solid-propellant motor; LGM-30G: Thiokol SR73-AJ-1 solid-propellant motor; both 34,400 lb thrust.
Guidance: Autonetics Division of Rockwell International inertial guidance system.
Dimensions: length 59 ft 10 in, diameter of first stage 5 ft 6 in.
Weights: launch weight (approx) LGM-30F 73,000 lb, LGM-30G 78,000 lb.
Performance: speed at burnout more than 15,000 mph, highest point of trajectory approx 700 miles, range with max operational load LGM-30F more than 6,000 miles; LGM-30G more than 7,000 miles.

LGM-118A Peacekeeper (MX)

Initiated in response to the improved hardness of Soviet strategic forces, the MX program continues on schedule and within budgeted cost. The US plans to deploy 50 Peacekeeper missiles in existing Minuteman III silos near F. E. Warren AFB, Wyo., and is evaluating alternatives for the deployment of another 50 missiles. Fifty-four missiles were funded in FY '84–86, with 21 more requested in FY '87. Initial operational capability for the first ten Peacekeepers is planned for late this year; full operational capability with 50 missiles is scheduled for 1988.

The Peacekeeper is a four-stage ICBM that carries up to ten independently targetable reentry vehicles. It has many advantages over missile weapon systems currently in the US inventory. Peacekeeper will be more accurate, carry more warheads, and have greater range and target flexibility than the Minuteman ICBMs. In addition, its greater resistance to nuclear effects and its more capable guidance system provide Peacekeeper with a much improved ability to destroy very hard targets. The prompt retaliation made possible by these factors is expected to provide a decisive deterrent to any Soviet first strike. The initial test schedule is 50 percent completed, with excellent results. The tenth Peacekeeper flight test was conducted on November 13, 1985, when four Mk 21 reentry vehicles were carried 4,800 miles down the test range from Vandenberg AFB, Calif., and all impacted in the target area.
Basing: Boeing Aerospace Company.

Minuteman III

Titan II

Peacekeeper (MX)

Small ICBM (SICBM)

Currently in the R&D phase, this weapon will carry a single Mk 21 reentry vehicle and weigh approximately 30,000 lb, making it compatible with a hard mobile launcher (HML). New lightweight high-strength casing materials will avoid sacrifice of range or payload. Accuracy will be ensured by use of a lightweight version of the advanced inertial reference sphere (AIRS) guidance system, with advanced technology alternatives such as ring-laser gyroscopes and stellar inertial updates. Mobility test versions of the HML have been designed, built, and tested by Boeing and Martin Marietta under 21-month pre-full-scale development contracts. A further $1.4 billion for development and basing is requested in the FY '87 budget proposals, to begin full-scale development. Initial deployment is scheduled for December 1992. Decisions on where the missile is to be based, and whether this will be in mobile as well as fixed launchers, are to be made by the end of this year. Nominal range of the SICBM will be 6,900 miles.
Contractor: Martin Marietta Aerospace Corporation.
Dimension: length approx 46 ft.

AGM-69A SRAM

This defense suppression and primary attack missile was deployed initially with the B-52Gs of SAC's 42d Heavy Bombardment Wing at Loring AFB, Me., in 1972. USAF contracts covering the production of 1,500 AGM-69As were authorized, and deliveries to equip 17 B-52 wings and two FB-111 wings at 18 SAC bases were completed in July 1975.

Armed with a nuclear warhead, the supersonic air-to-surface SRAM was designed to attack and neutralize enemy terminal defenses, such as surface-to-air missile sites. An inertial guidance system makes the missile impossible to jam. Each SAC B-52G/H can carry eight AGM-69A SRAMs on a rotary dispenser in the aft bomb bay, together with up to four nuclear bombs. An FB-111A can carry four AGM-69As on swiveling underwing pylons and two internally. When carried externally, a tailcone, 22.2 in long, is added to reduce drag.
Contractor: Boeing Aerospace Company.
Power Plant: Lockheed Propulsion Company LPC-415 restartable solid-propellant two-pulse rocket engine.
Guidance: General Precision/Kearfott inertial system, permitting attack at high or low altitude and dogleg courses.
Warhead: nuclear, of similar yield to that of single Minuteman III warhead.
Dimensions: length 14 ft 0 in, body diameter 1 ft 5½ in.
Weight: launch weight approx 2,230 lb.
Performance: speed up to Mach 2.5, range 100 miles at high altitude, 35 miles at low altitude.

AGM-69A SRAM on B-52

AGM-86B Air-Launched Cruise Missile (ALCM)

Assembly and Test: Martin Marietta, Denver Aerospace.
Power Plant: first three stages solid-propellant, fourth stage storable liquid; by Thiokol, Aerojet, Hercules, and Rocketdyne, respectively.
Guidance: inertial; integration by Rockwell, IMU by Northrop.
Warheads: 10 Avco Mk 21 reentry vehicles.
Dimensions: length 70 ft, diameter 7 ft 8 in.
Weight: approx 192,000 lb.

SRAM II

This program calls for the development of an improved air-to-surface missile with nuclear capability, to augment and eventually replace the aging SRAM (AGM-69A). SRAM II will be capable of penetrating advanced defense systems from standoff ranges to strike hardened and heavily defended targets. It will use existing propulsion, guidance, and airframe technology to make possible significant performance improvements without un-

acceptable program risk. Major program activities include development of a new rocket motor to provide higher missile velocities and increased range; development of a guidance system that will ensure greater accuracy, even with extended range; and incorporation of a new warhead with modern safety features. Like the AGM-69A, SRAM II will be supersonic. It is expected to be about two-thirds the size of the existing missile.

Following the system definition phase, which involved Boeing Aerospace, Martin Marietta, and McDonnell Douglas Astronautics, a request for full-scale development proposals has been issued to industry. Source selection is expected in mid-year, with subsequent contract award. Production of 1,900 SRAM IIs is expected to begin in 1989, to give an IOC in the early 1990s.

AGM-86B ALCM

The AGM-86B air-launched cruise missile is a small, unmanned winged air vehicle capable of sustained subsonic flight following launch from a carrier aircraft. It has a turbofan engine and a nuclear warhead and is programmed for precision attack on surface targets. When launched in large numbers, each of the missiles would have to be countered, making defense against them both costly and complicated. Additionally, by diluting defenses, the ability of manned aircraft to penetrate to major targets is improved. Small radar signature and low-level flight capability enhance the missile's effectiveness. Production is expected to total 1,739 missiles, with deliveries to be completed in FY '87. SAC's 416th Bombardment Wing at Griffiss AFB, N. Y., became the first Air Force unit to attain operational capability with ALCM in December 1982, with 12 missiles fitted externally to each of its B-52Gs. This was followed by the 379th Bomb Wing at Wurtsmith AFB, Mich., and the 319th Bomb Wing at Grand Forks AFB, N. D. Other units that have received ALCMs are at Fairchild AFB, Wash., and Blytheville AFB, Ark. B-52Hs are undergoing similar conversion; ultimately, each B-52H is intended to be modified further to have a bomb-bay common strategic rotary launcher for eight more ALCMs, eight SRAMs, or a mix of both.

Contractor: Boeing Aerospace Company.
Power Plant: Williams International Corporation/Teledyne CAE F107-WR-100 turbofan engine; 600 lb thrust.
Guidance: inertial plus Tercom, by Litton.
Warhead: W80-1 nuclear.
Dimensions: length 20 ft 9 in, body diameter 2 ft 0½ in, wing span 12 ft.
Weight: 3,200 lb.
Performance (approx): speed 500 mph, range 1,500 miles.

ACM

Convair Division of General Dynamics was selected in April 1983 to develop and manufacture an air-launched advanced cruise missile (ACM) to arm the B-52H and B-1B, superseding the AGM-86 in production in the later 1980s. The ACM will have improved range, accuracy, survivability, and targeting flexibility, notably through embodiment of low-observability technology. It will be powered by a Williams International F112 turbofan engine.

BGM-109G GLCM

The GLCM is a small, mobile, ground-to-ground cruise missile developed to modernize NATO's intermediate-range nuclear forces (INF). Its characteristics include a small radar cross section, very low altitude flight profile, and all-weather capabilities; it is designed to complicate the enemy's targeting and defenses, thereby helping the survivability of other allied systems.

Deployment of the GLCM is well under way, with the first flight operational at RAF Greenham Common, UK, since December 1983; the second operational at Comiso, Sicily, since March 1984; and a third at Florennes, Belgium, since August 1984. Deployment is also planned in the Netherlands and West Germany to give a total of twenty-nine flights, stationed at six main European operating bases. A GLCM mobile flight comprises four transporter-erector launchers, each carrying four missiles, and two launch control centers. A total of 464 missiles is expected to be deployed by 1988.

Contractor: General Dynamics (Convair)/McDonnell Douglas Astronautics.
Power Plant: Williams International Corporation/Teledyne CAE F107-WR-400 turbofan engine; 600 lb thrust. Atlantic Research Corporation solid-propellant booster.
Guidance: inertial plus Tercom, by Litton.
Warhead: W84 nuclear.
Dimensions: length 20 ft 6 in, diameter 1 ft 8½ in, wing span 8 ft 7 in.
Weight: with booster, 3,250 lb.
Performance: max speed high subsonic, range 1,500 miles.

BGM-109G GLCM

AIM-7F Sparrow

AIM-4F Super Falcon

AIM-9J Sidewinder

Airborne Tactical and Defense Missiles

AIM-4F/G Super Falcon

These developed versions of the original AIM-4A/C Falcon were introduced simultaneously in 1960 to provide reduced susceptibility to enemy countermeasures and higher performance. The Super Falcon arms the F-106 Delta Dart, on which a mixed armament of four AIM-4F/Gs is carried internally.

Contractor: Hughes Aircraft Company.
Power Plant: Thiokol M46 two-stage solid-propellant motor; first-stage rating of 6,000 lb thrust.
Guidance: AIM-4F: Hughes semiactive radar homing guidance; AIM-4G: infrared homing system.
Warhead: high-explosive, weighing 40 lb.
Dimensions: length AIM-4F 7 ft 2 in; AIM-4G 6 ft 9 in, body diameter 6.6 in, wing span 2 ft 0 in.
Weights: launch weight AIM-4F 150 lb; AIM-4G 145 lb.
Performance: max speed Mach 2.5, max range 7 miles.

AIM-7 Sparrow

Sparrow is a radar-guided air-to-air missile with all-weather, all-altitude, and all-aspect capability. Approximately 34,000 AIM-7C, D, and E versions were produced. The **AIM-7E** is standard armament of the F-4 Phantom and is also used as a Sea Sparrow version against shipping targets. The **AIM-7E-2** is an improved version, providing better maneuverability and "dogfight" capability. A later version is the advanced solid-state **AIM-7F**, with larger motor, Doppler guidance, improved ECM, and better capability over both medium and "dogfight" ranges; this version equips USAF and USN F-4, F-14, F-15, and F-18 aircraft. Approximately 5,400 AIM-7Fs were produced. A monopulse version of Sparrow designated **AIM-7M**, aimed at reducing cost and improving performance in the ECM and look-down/clutter regions, entered production in FY '80 and began operational service during FY '83. Procurement has been proposed through FY '88, with $64.9 million for 379 missiles for USAF requested in FY '87. (Data for AIM-7F.)

Contractors: Raytheon Company/General Dynamics Pomona Division.
Power Plant: Hercules Mk 58 Mod 0 boost-sustained rocket motor.
Guidance: Raytheon semiactive Doppler radar homing system.
Warhead: high-explosive, blast fragmentation, weighing 88 lb.
Dimensions: length 12 ft 0 in, body diameter 8 in, wing span 3 ft 4 in.
Weight: launch weight 500 lb.
Performance (estimated): max speed more than Mach 3.5; range AIM-7E 14 miles, AIM-7F more than 25 miles.

AIM-9 Sidewinder

The AIM-9 Sidewinder is a close-range air-to-air missile using infrared guidance. Versions currently in production for USAF or in service are:

AIM-9E: modification by Philco of original-production AIM-9B, with improved guidance and control. Production completed, with more than 3,000 in service.

AIM-9H: version with improved close-range capability, produced for USN; one-time procurement of 800 by USAF in FY '76. Solid-state guidance, off-boresight acquisition/launch capability. Lead bias function moves missile impact point forward to more vulnerable area on target aircraft.

AIM-9J: conversion of AIM-9B/E, with increased range and new "front end" to improve maneuvering capability for dogfighting. About 14,000 were delivered to USAF by Ford Aerospace in 1977–78 to equip the F-15 and other Sidewinder-compatible aircraft.

AIM-9P: improved version of AIM-9J, produced by Ford Aerospace by conversion of existing AIM-9Es and -9Js. Increased target-acquisition envelope, solid-state electronics, and increased lethality due to seeker improvements.

AIM-9P-3: improved version of AIM-9P, with increased lethality due to fuze improvements and a new rocket motor, providing reduced smoke and increased range.

AIM-9L: third-generation Sidewinder for USAF and USN, with all-aspect intercept capability. New motor. Double-delta nose fins for improved inner boundary performance and maneuverability. AM-FM conical scan for increased seeker sensitivity and improved tracking stability. Annular blast fragmentation warhead and active optical fuze for increased lethality and low susceptibility to countermeasures. This version arms USAF F-15 and F-16 aircraft and features in USAF plans to provide self-defense capability for its A-7s, A-10s, F-4s, and F-111s.

AIM-9M: improved version of AIM-9L, with increased IRCCM capability, improved background discrimination, and reduced-smoke rocket motor. Full production began in FY '81 with an order for approximately 1,850 missiles. Procurement funded or proposed from FY '84 through FY '90 totals 4,779 missiles for USAF. (Data for AIM-9M.)

Contractor: Raytheon Company; Ford Aerospace and Communications Corporation.

Power Plant: Thiokol/Hercules Mk 36 Mod 11 solid-propellant motor.

Guidance: solid-state infrared homing guidance.

Warhead: high-explosive, weighing 20.8 lb.

Dimensions: length 9 ft 5 in, body diameter 5 in, fin span 2 ft 1 in.

Weight: launch weight 191 lb.

Performance: max speed above Mach 2.

AIM-9L Sidewinder

AGM-45A Shrike

Twelve versions of this supersonic air-to-surface missile were produced for USAF and USN, differing primarily in the frequency coverage of the front end detachable seeker sections. Designed to home automatically on enemy radar installations, the AGM-45 entered operational service in Vietnam during 1965. Thereafter, it played an important part in the US air offensive, becoming a standard penetration aid on US tactical aircraft. More than 13,000 were delivered to USAF between 1965 and 1978, and Shrikes continue to equip "Wild Weasel" F-4Gs and F-4Es. Modification under the Shrike gravity bias modification program will result in improved capabilities at low altitude.

AGM-45A Shrike

AGM-88A HARM

Contractor: Naval Weapons Center.

Power Plant: Rocketdyne Mk 39 Mod 7 or Aerojet Mk 53 solid-propellant rocket motor.

Guidance: passive homing head by Texas Instruments.

Warhead: high-explosive/fragmentation, weighing 145 lb.

Dimensions: length 10 ft 0 in, body diameter 8 in, span 3 ft 0 in.

Weight: launch weight 400 lb.

Performance (estimated): range more than 3 miles.

AGM-65 Maverick

The basic **AGM-65A** Maverick is a launch-and-leave TV-guided air-to-surface missile that enables the pilot of the launch aircraft to seek other targets or leave the target area once it has been launched. Production was initiated in 1971, following successful test launches over distances ranging from a few thousand feet to many miles and from high altitudes down to treetop level. Maverick missiles were first employed by USAF in Vietnam and are now carried by the A-7D, A-10, F-4D/E/G, F-5E/F, F-111F, and F-16, singly or in three-round underwing clusters, for use against pinpoint targets, such as tanks and columns of vehicles. Orders totaled 19,000.

AGM-65B has a "scene magnification" TV seeker that enables the pilot to identify and lock on to smaller or more distant targets.

To overcome limitations of the TV Maverick, which can be used only in daylight clear-weather conditions, a new version was developed:

AGM-65D: with imaging infrared seeker (IIR). Developmental and operational flight testing was completed with 23 live launches from A-7, A-10, F-4E, F-4G, and F-16 aircraft at Nellis AFB last fall, resulting in 22 direct hits on a variety of vehicles. USAF expects to procure a total of 58,864 AGM-65Ds, of which 8,630 had been authorized by FY '86, and 4,700 are requested in FY '87. IIR Maverick became operational on A-10s at RAF Bentwaters, UK, this year. Raytheon is second-source supplier.

AGM-65D Maverick

AGM-65G: uses the IIR seeker with an alternate 300-lb blast/fragmentation warhead for use against hardened targets. USAF plans to buy 1,800 AGM-65Gs. (Data for AGM-65A.)

Contractor: Hughes Aircraft Company.

Power Plant: Thiokol TX-481 solid-propellant rocket motor.

Guidance: self-homing electro-optical guidance system.

Warhead: high-explosive, shaped charge.

Dimensions: length 8 ft 2 in, body diameter 1 ft 0 in, wing span 2 ft 4½ in.

Weight: launch weight 462 lb.

Performance: range 0.6 to 14 miles.

AGM-88A HARM

The lethality of USAF's F-4G "Wild Weasel" is greatly enhanced by the availability of HARM (High-speed Anti-Radiation Missile), which achieved IOC in September 1984. The emphasis on high speed reflects experience gained in Vietnam, where Soviet-built surface-to-air missile radar systems sometimes detected the approach of first-generation Shrikes and ceased operation before the missiles could lock on them. HARM can cover a wide range of frequency spectra through the use of programmable digital processors in both the aircraft's avionics equipment and the missile. The missile is also suitable for adaptation to the F-4E, EF-111A, B-52, F-15, and F-16. By mid-1985, a total of 470 HARMs had been delivered, out of 2,805 ordered for the USN and USAF. The FY '87 budget proposals request 2,130 more for USAF.

Contractor: Texas Instruments, Inc.

Power Plant: Thiokol smokeless dual-thrust solid-propellant rocket motor. Hercules second source.

Guidance: passive homing guidance system, using seeker head that homes on enemy radar emissions.

Warhead: high-explosive.

Dimensions: length 13 ft 8½ in, body diameter 10 in, wing span 3 ft 8½ in.

Weight: 807 lb.

Performance: cruising speed supersonic, altitude limits S/L to 40,000 ft, range more than 10 miles.

GBU-15 and AGM-130

The **GBU-15** is an air-launched cruciform-wing glide bomb fitted with a guidance system designed to give it pinpoint accuracy from low or medium altitudes over short standoff ranges. Development began in 1974, based on experience gained in Vietnam with the earlier Pave Strike/GBU-8 HOBO modular weapon program. The GBU-15 is intended for tactical use to suppress enemy defenses and to destroy heavily defended targets. The target-detecting device is carried on the front of the warhead; the control module, with autopilot, and data link module attach to the rear.

The weapon offers two basic trajectories. For direct trajectory, the weapon is locked on target before launch and flies a near line-of-sight profile to impact. The indirect profile includes a midcourse glide phase, which extends standoff capability. In this profile, the seeker can be locked on to the target after launch, or the operator can fly the weapon manually to impact, using guidance updates provided through the data link. Successful launches have been achieved from F-4s and F-111s. The GBU-15(V)1/B TV guided variant qualified for operational service in 1983; the GBU-15(V)2/B IIR version is scheduled for deployment this year.

In addition, there is now a rocket-powered development of the GBU-15, designated AGM-130, which has roughly three times the range of the unpowered weapon when released at low altitude. It is available in two versions. USAF already plans to acquire more than 2,000 **AGM-130As**, which have a Mk 84 bomb as standard unitary warhead. It has not yet determined its requirement for the **AGM-130B**, which has a multiple warhead carrying BLU-97 combined effects bomblets or BLU-106 BKEP runway cratering submunitions in an SUU-54 or alternative dispenser. USAF has requested 159 AGM-130s in FY '87. (Data for GBU-15.)

Contractor: Rockwell International Corporation.
Guidance: TV or imaging infrared seeker.
Warhead: Mk 84 bomb (2,000 lb unitary). Adaptable to CBU-75 cluster munition and other warheads.
Dimensions: length 12 ft 10½ in, body diameter 1 ft 6 in, wing span 4 ft 11 in.
Weight: 2,617 lb.
Performance: cruising speed subsonic.

ASAT

Under USAF contract, Vought Missiles and Advanced Programs Division of LTV and the Boeing Company are developing and flight-testing a small high-technology air-launched antisatellite (ASAT) weapon capable of destroying enemy satellites at low orbital altitudes. This consists of a modified SRAM first stage, a Thiokol Altair III solid-propellant second stage rated at 6,000 lb thrust, and a Vought miniature vehicle (MV) with Hughes infrared terminal seeker and conventional warhead mounted forward of the second stage. The guidance system is by Singer-Kearfott. ASAT is about 17 ft long, with a launch weight of 2,700 lb.

ASAT was intended to be carried by designated air defense F-15s, based at Langley AFB, Va. In operational form, it would be released from the F-15 in a zoom climb. Immediately before separation from the Altair, the miniature homing vehicle would be spun up to 20 rps for stabilization. Small solid-propellant rocket motors would then provide course corrections as a laser gyro and the infrared seeker guided it to target impact.

Firing trials from an F-15 began in 1983, and the first live launch against a target in space occurred successfully on September 13, 1985. A total of $322 million is sought for continuation of the ASAT program in FY '87, but further testing is barred, under a restriction contained in the FY '86 Appropriations Bill, until the President certifies to Congress that the Soviet Union has conducted a similar test after October 3, 1985.

AGM-130

ASAT on F-15

AIM-120A (AMRAAM)

AIM-120A (AMRAAM)

TAC Commander Gen. Robert D. Russ referred to this advanced medium-range air-to-air missile (AMRAAM) as "the most important tactical weapon currently under development." It is intended as a replacement for the AIM-7 Sparrow, and will provide an all-weather, all-environment capability for USAF's F-15 and F-16 and the Navy's F-14 and F/A-18 fighters. Full-scale development has been under way since December 1981.

Designated AIM-120A, AMRAAM has inertial midcourse guidance and active radar terminal homing that provides launch-and-maneuver, launch-and-leave, and autonomous modes. There are significant improvements in operational effectiveness over the AIM-7 Sparrow, including increased average velocity, reduced miss distance, improved fuzing, increased warhead lethality, multiple target engagement capability, improved clutter rejection in low-altitude environments, improved ECCM capability, increased maximum launch range, reduced-smoke motor, and improved maintenance and handling.

Six completely successful launches have taken place in the FSD program, two of which scored direct hits on the target drones. A leader/follower program is in progress (Hughes/Raytheon), with a preproduction effort (producibility and qualification) in FY '86, and low-rate initial production to begin in FY '87 (260 missiles). First deliveries are scheduled for FY '88, and IOC for 1989. Total planned USAF/USN buy is 24,000 missiles.

AGM-84 Harpoon

Contractors: Hughes Aircraft Company/Raytheon Company.
Guidance: inertial midcourse, with active radar terminal homing.
Dimensions: length 11 ft 9 in, body diameter 7 in, span of tail control fins 2 ft 1 in.
Weight: 335 lb.
Performance: cruising speed approx Mach 4.

AGM-84 Harpoon

USAF has procured sufficient Harpoon all-weather antiship missiles to equip two 15-aircraft B-52G squadrons for maritime duties in support of Navy antisurface warfare operations. Compatibility testing began in spring 1983, and full operational capability was achieved that October. Modified aircraft are located at Loring AFB, Me., for Atlantic operations and at Andersen AFB, Guam, for Pacific operations. Each B-52G carries eight to twelve missiles.

Contractor: McDonnell Douglas Astronautics Company.
Power Plant: Teledyne CAE J402-CA-400 turbojet engine; 660 lb thrust.
Guidance: sea-skimming cruise monitored by radar altimeter; active radar terminal homing.
Warhead: penetration/high-explosive blast type, weighing 488 lb.
Dimensions: length 12 ft 7½ in, body diameter 1 ft 11½ in, wing span 3 ft.
Weight: 1,145 lb.
Performance: speed high subsonic, range over 57 miles.

HVM

Under a USAF contract awarded in late 1981, Vought Missiles and Advanced Programs Division of LTV is developing a guided air-to-surface hypervelocity missile (HVM) system capable of defeating all types of vehicles in an armored assault force. The system will consist of pods containing launch tubes for up to 18 HVMs per pod and a laser radar guidance system; each HVM will carry an inert, high-density warhead. Simultaneous multiple target engagement is an important requirement, and the small low-cost missiles will rely on kinetic energy derived from their speed for penetration. Initial ground-launched flight tests have demonstrated the missile's ability to receive laser guidance signals through the rocket motor plume and its ability to respond to signals from a ground-based laser and then maneuver to its target. HVM will reach a speed of more than 3,355 mph and is expected to weigh less than 48 lb. Estimated range is 3.7 miles. This is a joint USAF/Marine/Army program.

Rapier

Rapier is unique in that US land-based antiaircraft missiles are normally operated by the Army. Under a decision confirmed by an initial contract for 32 fire units in February 1981, British-built Rapier missile systems will be deployed at seven USAF bases in the UK to protect Air Force installations. The first USAF unit, which defends RAF Mildenhall and RAF Lakenheath, became operational in November 1984. Manned by RAF Regiment personnel, the USAF version of Rapier is intended primarily for defense against fast (Mach 1+) maneuvering, low-flying targets by day and night. The four-round fire unit, Blindfire radar, and a trailer of reload missiles are towed by Land Rovers loaded with support equipment.

Under a similar agreement, the government of Turkey will locate Rapiers procured by DoD to defend US air bases in that country.

Contractor: British Aerospace Dynamics Group.
Power Plant: IMI two-stage solid-propellant motor.
Guidance: Racal-Decca surveillance radar and command to line-of-sight guidance. Optional Marconi DN181 Blindfire radar or optical target tracking, according to conditions.
Warhead: semi armor-piercing, with impact fuze.
Dimensions: length 7 ft 3 in, body diameter 5 in, wing span 1 ft 3 in.
Weight: approx 92 lb.
Performance: max speed more than Mach 2, range 4 miles.

Roland

Roland is a highly mobile, short-range, all-weather missile system for defense against medium-, low-, and very-low-altitude aircraft and helicopter attack. All operational weapon system equipment and functions can be packaged into a single vehicle, including surveillance radar, tracking radar, optical sight, command computer and command transmitter link. Two launch tubes each contain a single missile, with eight reload missiles stored in a magazine. After firing one or both missiles, reloading can be accomplished in about ten seconds.

The DoD has purchased 27 Roland fire units, which the West German government has agreed to operate for ten years at three US air bases in Germany.

Contractor: Euromissile GIE.
Power Plant: two-stage solid-propellant motor.
Guidance: pulse-Doppler surveillance radar on launch vehicle and command to line-of-sight guidance. Radar or optical target tracking, according to conditions.
Warhead: high-explosive with proximity and impact fuzes, weighing 14.3 lb.
Dimensions: length 7 ft 10½ in, body diameter 6.3 in, wing span 1 ft 7¾ in.
Weight: 147 lb.
Performance: speed Mach 1.5, range 3.7 miles.

Rapier

Launch Vehicles

Atlas Launchers

Atlas is a "stage-and-a-half" vehicle, consisting of side booster and central sustainer sections. Current launch versions are as follows:

Atlas SLV-3A: An upgraded version of the earlier SLV-3 for USAF and NASA, with lengthened propellant tanks. No longer used with the Agena upper stage, but able to serve as a direct-ascent vehicle or in conjunction with other upper stages.

Atlas SLV-3D: Although intended for use primarily with the Centaur D-1A upper stage, the SLV-3D is standardized like the SLV-3A and can be used on other missions. In 1972, Pioneer-10 was launched on its flight path to Jupiter with the highest velocity ever imparted to a spacecraft, the launch vehicle being an Atlas/Centaur with an additional TE-M-364-4 solid-propellant rocket motor. First launch of a new, stretched, version of the Atlas/Centaur took place in spring 1984. This is able to place satellites weighing up to 5,000 lb into geosynchronous orbit.

Atlas E: ICBMs modified to space launch configuration, used to launch various USAF, Navy, and NOAA satellites.

Prime Contractor: General Dynamics Corporation, Convair Division.

Power Plant: uprated Rocketdyne MA-5 propulsion system, comprising central sustainer motor and two boosters; total S/L thrust approx 431,040 lb (60,000 lb from the central sustainer motor, 370,000 lb total from the boosters, 1,040 lb from two verniers).

Dimensions: length SLV-3A 78 ft 11 in; SLV-3D/Centaur 131 ft, max body diameter 10 ft 0 in.

Launch Weight (SLV-3A): 314,000 lb.

Performance (SLV-3A/Centaur): capable of putting payload of 11,300 lb into a 100 nm circular orbit, of launching 4,150 lb into synchronous transfer orbit, or of sending 1,250 lb to nearest planet.

Centaur

Centaur was the first US high-energy upper stage and first to utilize liquid hydrogen as a propellant. Its multiburn and extended coast capability were first used operationally during the 1977 Mariner Jupiter/Saturn missions. The D-1A version is used currently with the Atlas SLV-3D and has demonstrated widely ranging applications and capabilities. The nose section of Atlas is modified to a constant 10 ft diameter to accommodate the Centaur, which, in turn, generates most of the electronic command and control systems for the launch vehicle. A 10 ft diameter fairing protects payloads for Centaur D-1A. Two Centaur G variants are being developed for use on the Space Shuttle and the upgraded Titan 34D-7.

Prime Contractor: General Dynamics Corporation, Convair Division.

Power Plant: two Pratt & Whitney RL10A-3 liquid oxygen/liquid hydrogen engines; each 16,500 lb thrust.

Guidance: inertial guidance system.

Dimensions (Centaur only): length 30 ft 0 in, diameter 10 ft 0 in.

Launch Weight (approx): 35,000 lb.

Scout

Scout was designed to enable NASA and DoD to conduct space, orbital, and reentry research at comparatively low cost, using off-the-shelf major components where available. The basic current version, with an improved fourth stage, was launched successfully for the first time in August 1965. In addition to increasing the payload, this version can be maneuvered in yaw and can send a 100-lb payload more than 16,000 miles into space. Using the Algol IIIA first-stage motor, Scouts can put 377 lb payloads into a 310-mile polar orbit and have been used to launch many unmanned spacecraft, including satellites for DoD, NASA, and international groups.

Prime Contractor: LTV Aerospace and Defense Company (subsidiary of LTV Corporation).

Power Plant: first stage: CSD Algol IIIA; 109,000 lb thrust; second stage: Thiokol Castor IIA solid-propellant motor; 64,000 lb thrust; third stage: Thiokol Antares IIIA solid-propellant motor; 18,700 lb thrust; fourth stage: Thiokol Altair IIIA solid-propellant motor; 5,800 lb thrust.

Guidance: simplified Honeywell gyro guidance system.

Atlas-Centaur

Scout

Titan 34D

Dimensions: height overall 75 ft 5 in, max body diameter 3 ft 9 in.

Launch Weight: 47,619 lb.

Titan II

USAF plans to modify at least 13 deactivated Titan II ICBMs for use as space launch vehicles at Vandenberg AFB, Calif. Able to place payloads of more than 3,000 lb into polar orbit, the Titan IIs can be readied for launch much more quickly than a Space Shuttle. This would make them particularly valuable if it became necessary to launch such replacement satellites as Navstar GPS at short notice in an emergency.

Titan 34D and 34D-7

The basic **Titan 34D** has an uprated version of the two-stage Titan II ICBM as its core section, plus two five-and-a-half segment solid strap-on boosters and either the Boeing Inertial Upper Stage developed for the Shuttle or Transtage, an upper stage capable of functioning both in the boost phase of flight and as a restartable space propulsion vehicle. It can place a 4,000 lb payload into geostationary orbit or 30,000 lb into low earth orbit. Sixteen Titan 34Ds have been ordered to date by USAF. The first of them was launched from Cape Canaveral in October 1982.

In March 1985, the upgraded **Titan 34D-7** Complementary Expendable Launch Vehicle (CELV) was selected to augment the Space Shuttle and to allow greater flexibility in launching critical military payloads. It has stretched first and second stages, seven-segment solid boosters, and a Centaur upper stage, enabling it to place a 10,500 lb payload into geostationary orbit. USAF has been authorized to buy ten Titan 34D-7s initially, of which it is planned to launch two a year from late 1988. The first is requested in the FY '87 budget proposals. (Data for Titan 34D.)

Prime Contractor: Martin Marietta Denver Aerospace.

Power Plant: first and second stages: Aerojet liquid-propellant engines: first stage 526,000 lb thrust; second stage 102,000 lb thrust; Transtage: Aerojet twin-chamber liquid-propellant engine; 16,000 lb thrust; two CSD five and one-half segment solid-propellant booster rocket motors; each more than 1,150,000 lb thrust.

Dimensions: first and second stages of core: height 101 ft, diameter 10 ft; Transtage: height 14 ft 8 in, diameter 10 ft.

Launch Weight (approx): 1,400,000 lb.

Performance (Titan 34D/Transtage): 4,000 lb to geosynchronous orbit.

Space Transportation System

Developed for use by both DoD and NASA, the Space Shuttle is the first reusable space vehicle. It consists of an Orbiter, similar in configuration to a delta-wing airplane but powered by liquid-propellant rocket motors; a large jettisonable tank carrying the fuel for these motors, which is attached to the Orbiter at liftoff; and two solid-propellant rocket boosters, mounted on each side of the fuel tank for liftoff.

The Shuttle is launched vertically, with all engines firing in both the Orbiter and the boosters. At an altitude of approximately 28 miles, the booster stages separate and descend by parachute into the ocean for recovery and eventual reuse. The Orbiter then continues under its own power, jettisoning the external fuel tank just before attaining orbit. The Orbiter is provided with a series of smaller rocket engines for maneuvering and attitude control, and these ensure insertion of the vehicle into the final desired orbit. Its main tasks are to place satellites into orbit, retrieve satellites from orbit, and repair and service satellites in orbit. It can be used to place a propulsive stage and satellite into precise low earth orbit for subsequent transfer into synchronous orbit or to an "escape" mission into space. It also carries a pressurized and manned space laboratory in its payload bay on some missions, with a basic seven-day duration, extendable up to 10–12 days. On completion of a mission, the Orbiter flies back into the atmosphere and, once through the reentry phase, lands like an airplane, but without power.

Accommodation is provided in a two-level cabin for up to eight crew members. The upper flight deck level has side-by-side seating for two flight crew, with dual controls. Behind them are seats for one or two mission specialists. Four more mission specialists can be located on the mid-deck. Bunks on this deck can be removed to provide three additional seats in a rescue mission.

Four operational Orbiters, named *Columbia*, *Challenger*, *Discovery*, and *Atlantis*, have been funded to date. The first of four test flights (STS-1) was made by *Columbia* from Kennedy Space Center, Fla., in April 1981. The first operational mission ejected two satellites into space in November 1982. During subsequent missions, by all four Orbiters, further satellites have been deployed and recovered for repair; Spacelab was carried for the first time on STS-9; during the tenth mission, two astronauts made the first untethered orbital EVAs, using Martin Marietta's manned maneuvering units (MMUs).

Space Shuttle at Vandenberg AFB

First payload deployment for DoD, using the IUS booster, took place on January 24, 1985. To ensure adequate security and West Coast launch capability, new Shuttle facilities were completed at the Vandenberg AFB launch and landing site in October 1985.

Further flights of the Shuttle have been suspended pending the results of a Presidential enquiry into the cause of the explosion that led to loss of the Orbiter *Challenger* and its crew on January 28 this year.

Prime Contractors: Rockwell International (Orbiter), Martin Marietta (propellant tank), Thiokol (boosters), Lockheed Space Operations (Shuttle processing).

Power Plant: three Rocketdyne main engines, each 375,000 lb thrust at liftoff. Two Thiokol solid-propellant rocket boosters, each 3,300,000 lb thrust at liftoff.

Guidance: automatic and manual control.

Dimensions: Orbiter: length 122 ft, wing span 78 ft 0.7 in, height 56 ft 7 in.

Launch Weights: Shuttle complete approx 4,500,000 lb. Orbiter (empty) 150,000 lb, external tank (full) 1,655,600 lb, boosters (2) each 1,292,000 lb. Boosters with lighter-weight filament-wound casings are expected to be used in place of the current steel-case solid-rocket boosters for future missions requiring higher performance.

Inertial Upper Stage (IUS)

Used for the first time in October 1982, the IUS is intended to serve as an upper stage for both the Titan 34D/34D-7 and the Space Shuttle. Consisting of an aft skirt, an aft-stage solid rocket motor, an interstage, a forward-stage solid rocket motor, and an equipment support structure, it has the capability of boosting 5,000 lb into geosynchronous orbit during Shuttle missions and 4,000 lb into geosynchronous orbit when used with Titan.

Prime Contractor: Boeing Aerospace Company.

Power Plant: aft-stage solid rocket motor 21,400 lb thrust, forward-stage solid rocket motor 16,500 lb thrust.

Guidance: inertial, plus star tracker.

Dimensions: length 17 ft, diameter 9 ft 2¼ in.

Launch Weight: 32,500 lb.

BQM-34F Firebee II

MQM-107B

PAM-D II

The original PAM (Payload Assist Module) was developed as a commercial venture in 1976 to improve the load carrying capability of the Delta and Atlas launch vehicles, and for use on the Space Shuttle. An improved motor in PAM-D II enables it to boost a 4,200 lb satellite into geosynchronous orbit. It has been selected by USAF to put Navstar GPS satellites into 10,900 nautical mile, twelve-hour orbits from the Shuttle, under a multiyear purchase agreement that will procure 28 of the upper stages in 1985–90. A spring-loaded mechanism ejects the spinning PAM-D II and satellite from the Shuttle cargo bay. The spinning motion stabilizes the package from initial deployment to positioning in orbit.

Contractor: McDonnell Douglas Astronautics Company.

Remotely Piloted Vehicles (RPVs)

MQM-107B

A longer, reengined version of the earlier MQM-107A, originally ordered for the US Army in 1975, the **MQM-107B** is a recoverable, variable-speed target drone. Improvements tested and proven on the A version are incorporated on the B version. MQM-107Bs assigned to Tyndall AFB, Fla., and Wallace Air Station in the Philippines are used to test and evaluate air-to-air missiles. An initial order for ten each for the USAF and US Army was supplemented in April 1983, with major production orders for both services. Deliveries were made between August 1984 and May 1985, but it is planned to continue procurement of the MQM-107B as USAF's standard subscale target drone.

Contractor: Beech Aircraft Corporation.

Power Plant: one Microturbo TRI 60-2 Model 074 turbojet engine; 827 lb thrust.

Guidance and Control: analog or digital, for both ground control and preprogrammed flight. High-g autopilot provisions.

Dimensions: length 18 ft 1 in, body diameter 1 ft 3 in, span 9 ft 10 in.

Weight: launch weight (incl booster) 1,090 lb.

Performance: operating speed 317–615 mph, operating height 50–40,000 ft, endurance more than 1.5 hours.

BQM-34 Firebee

Since initial development of the **BQM-34A** in the late 1950s, more than 5,000 of these jet target vehicles have been delivered to support weapon system and target research, development, test, evaluation, quality assurance, training, and annual service practices by all three of the US services and foreign governments. The BQM-34s deployed at Wallace Air Station in the Philippines and Tyndall AFB, Fla., are used in the testing and evaluation of air-to-air missiles. In addition, the BQM-34A and supersonic **BQM-34F** Firebee II are used as targets in the William Tell exercise held every two years at Tyndall AFB. Final procurement of the BQM-34A was in 1985. This target is to be replaced by the MQM-107B. (Data for BQM-34A.)

Contractor: Teledyne Ryan Aeronautical.

Power Plant: one Teledyne CAE J69-T-29 turbojet engine; 1,700 lb thrust; latest models have one General Electric J85-GE-7 turbojet engine; 2,450 lb thrust.

Guidance and Control: remote control methods include choice of radar, radio, active seeker, and automatic navigator developed by Teledyne Ryan; Vega DTCS (drone tracking and control system); microwave command and guidance system also available.

Dimensions: length 22 ft 10.8 in, body diameter 3 ft 1.2 in, span 12 ft 10.8 in.

Weight: launch weight 2,500 lb.

Performance: max level speed at 6,500 ft 690 mph, operating height range 20 to more than 60,000 ft, max range 796 miles.

AQM-81A Firebolt

Teledyne Ryan is conducting full-scale development of the Firebolt high-altitude, high-speed target on behalf of the USAF Armament Division at Eglin AFB, Fla. The program includes a series of approximately 30 test flights, the first of which took place in June 1983. Five subsequent flights were made at altitudes between 40,000 and 100,000 ft and at speeds from Mach 1.2 to Mach 4. Entry into service is planned for 1987.

Contractor: Teledyne Ryan Aeronautical.

Power Plant: CSD hybrid rocket motor, throttleable from 120 to 1,200 lb thrust.

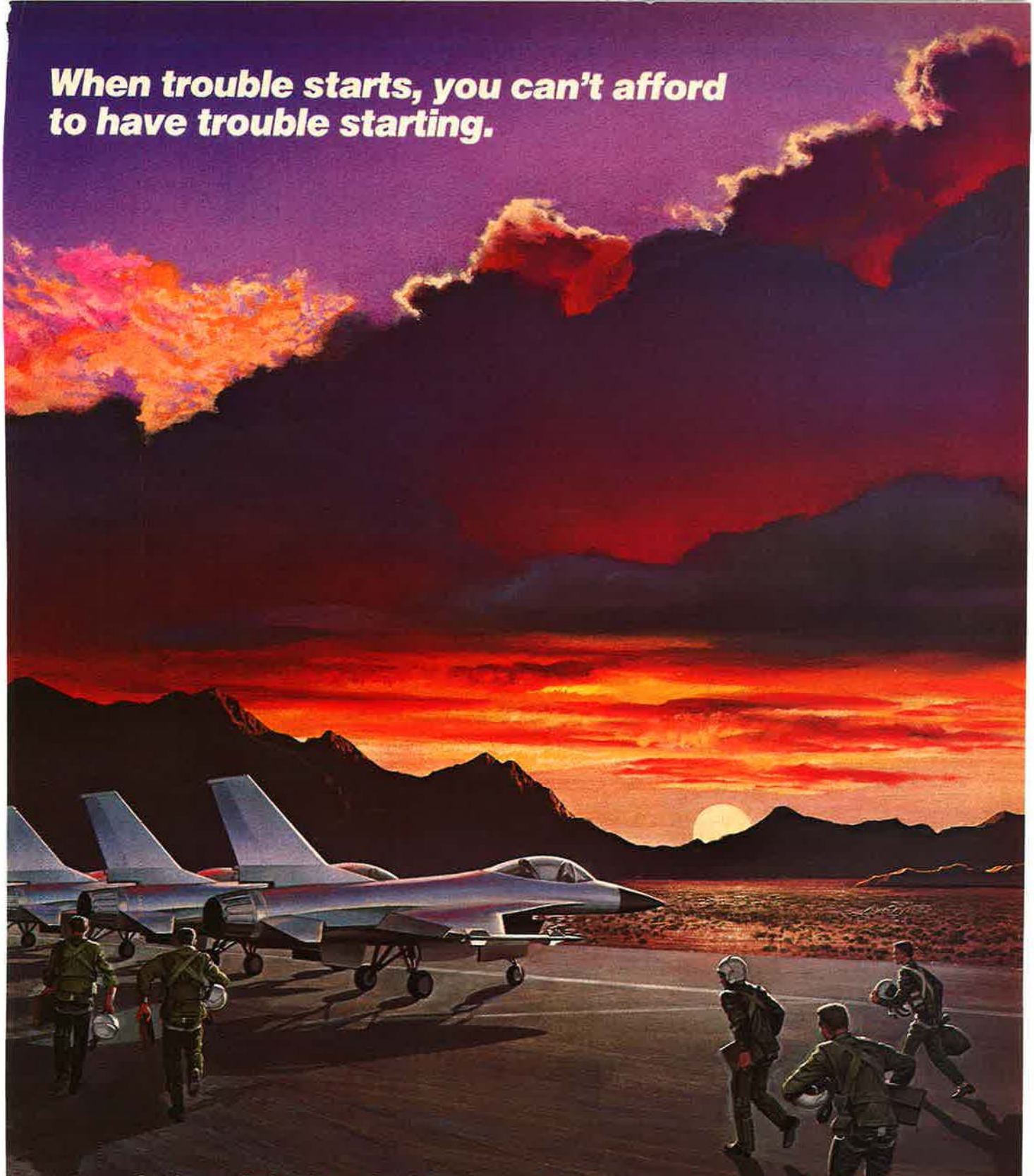
Guidance and Control: command and control link. Digital microprocessor for command updates; hybrid digital/analog flight control system. Maneuvers can be either preprogrammed or initiated via ground command radio link.

Dimensions: length 17 ft 0 in, body diameter (max) 1 ft 1 in, wing span 3 ft 4 in.

Weight: max launch weight 1,231 lb.

Performance: max speed Mach 4, service ceiling 100,000 ft, endurance 5 minutes at Mach 3. ■

When trouble starts, you can't afford to have trouble starting.



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Guide to USAF Bases at Home and Abroad

Altus AFB, Okla. 73523-5000; within Altus city limits. Phone (405) 482-8100; AUTOVON 866-1110. MAC base. 443d Military Airlift Wing (Training). Field Training Det. 403; 47th Flying Training Wing, OLC (ATC), T-37 aircraft operations; Det. 4, 17th Weather Sqdn.; Det. 3, 1600th Management Engineering Sqdn.; Det. 4, 1365th Audiovisual Sqdn. Base activated Jan. 1942; inactivated May 1945; reactivated Jan. 1953. Area 3,582 acres, plus 816 acres leased. Altitude 1,376 ft. Military 3,527; civilians 983. Payroll $75.5 million. Housing: 163 officer; 637 NCO; 171 VAQ, 158 VOQ, 4 transient family units. 25-bed hospital.

Andrews AFB, Md. 20331-5000; 11 mi. SE of Washington, D. C. Phone (301) 981-9111; AUTOVON 858-1110. MAC base. Hq. Air Force Systems Command; 1776th Air Base Wing; 76th Airlift Div.; 89th Military Airlift Wing; 113th Tactical Fighter Wing (ANG); 459th Tactical Airlift Wing (AFRES); 2045th Information Systems Gp. (AFCC); Det. 11, 1361st Audiovisual Sqdn.; Naval Air Facility; Marine Aircraft Gp. 41, Det. A. Base activated May 1943; named for Lt. Gen. Frank M. Andrews, military air pioneer and WW II commander of the European theater, killed in aircraft accident May 3, 1943, in Iceland. Area 4,982 acres. Altitude 281 ft. Military 5,700; civilians 2,212. Payroll $261.5 million. Housing: 389 officer; 1,695 NCO; 212 mobile home spaces; 354 transient (incl. 68 temp. living quarters for incoming personnel, 54 DV suites, 176 VOQ, 56 TAQ). 350-bed hospital.

Arnold AFS, Tenn. 37389; approx. 7 mi. SE of Manchester. Phone (615) 455-2611; AUTOVON 340-5011. AFSC station. Site of Arnold Engineering Development Center, free world's largest complex of wind tunnels, jet and rocket engine test cells, space simulation chambers, and hyperballistic ranges. AEDC supports the acquisition of new aerospace systems by conducting research, development, and evaluation testing for USAF, other services, and government agencies. Base activated Jan. 1, 1950; named for Gen. H. H. "Hap" Arnold, wartime Chief of the AAF. Area 40,118 acres. Altitude 950–1,150 ft. Military 186; civilians 230; contractor employees 3,600. Payroll $142.2 million. Housing: 24 officer; 16 NCO; 45 transient. Medical aid station.

Barksdale AFB, La. 71110; in Bossier City. Phone (318) 456-2252; AUTOVON 781-1110. SAC base. Hq. 8th Air Force; 2d Bomb Wing (B-52G, KC-135, and KC-10 aircraft operations); 1st Combat Evaluation Gp.; 46th Communications Gp. (AFCC); Det. 1, 307th Civil Engineering Sqdn. "Red Horse" (AFRES); Det. 1, 14th Flying Training Wing (ATC), T-37 aircraft operations; Det. 5, 3904th Management Engineering Sqdn.; 26th Weather Sqdn. (MAC); Det. 3, 1401st Military Airlift Sqdn. (MAC), CT-39 aircraft operations; 4201st Test Sqdn.; 3097th Aviation Depot Sqdn. (AFLC); Det. 2, 4200th Test Sqdn.; 3903d School Sqdn. (SAC NCO Academy); 745th Air Force Band Sqdn.; 78th Air Refueling Sqdn. (AFRES), KC-10 aircraft operations; 917th Tactical Fighter Gp. (AFRES), A-10 operations. The 917th trains all ANG and AFRES pilots in the 46th Tactical Fighter Training Sqdn. Also home of the 8th Air Force Museum. Base activated Feb. 2, 1933; named for Lt. Eugene H. Barksdale, WW I airman killed Aug. 1926 in crash near Wright Field, Ohio. Area 22,000 acres (20,000 acres reserved for recreation). Altitude 166 ft. Military 7,000; civilians 1,100. Payroll $145.3 million. Housing: 205 officer; 828 NCO; 29 transient. 70-bed hospital.

Beale AFB, Calif. 95903; 13 mi. E of Marysville. Phone (916) 634-3000; AUTOVON 368-1110. SAC base. 14th Air Div.; 9th Strategic Recon Wing; 7th Missile Warning Sqdn. (AFSPACECOM); 1883d Information Systems Sqdn. (AFCC). Aircraft include the SR-71, U-2, and TR-1 reconnaissance aircraft; KC-135 aerial tankers; and T-38 trainers. Originally US Army's Camp Beale. Became Air Force installation in Apr. 1948; became AFB in Nov. 1951. Named for Brig. Gen. E. F. Beale, Indian agent in California prior to Civil War. Area 22,944 acres. Altitude 113 ft. Military 4,300; civilians 526. Payroll $129.2 million. Housing: 395 officer; 1,330 NCO; 63 transient. 30-bed hospital.

Bergstrom AFB, Tex. 78743-5002; 7 mi. SE of downtown Austin. Phone (512) 479-4100; AUTOVON 685-4100. TAC base. 67th Tactical Reconnaissance Wing, RF-4C reconnaissance operations; Hq. 12th Air Force; Hq. 10th Air Force (AFRES); 924th Tactical Fighter Gp. (AFRES), F-4D fighter operations; TAC NCO Academy West; Det. 8, 602d Tactical Air Control Wing; Det. 1, 4400th Management Engineering Sqdn.; Det. 12, Tactical Information Systems Div. Base activated Sept. 22, 1942; named for Capt. John A. E. Bergstrom, first Austin serviceman killed in WW II; died Dec. 8, 1941, at Clark Field, Philippines. Area 3,998 acres. Altitude 541 ft. Military 5,199; civilians 960. Payroll $129.73 million. Housing: 78 officer; 642 enlisted; 235 transient. 35-bed hospital.

Blytheville AFB, Ark. 72317-5000; 4 mi. NW of Blytheville. Phone (501) 762-7000; AUTOVON 637-1110. SAC base. 42d Air Div.; 97th Bomb Wing. Aircraft include B-52s and KC-135s. Base activated June 1942; inactivated Feb. 1947; reactivated Aug. 1955. Area 3,092 acres. Altitude 254 ft. Military 2,894; civilians 334. Payroll $65.1 million. Housing: 197 officer; 733 NCO; 79 transient. 25-bed hospital.

Bolling AFB, D. C. 20332-5000; 3 mi. S of US Capitol. Phone (202) 545-6700; AUTOVON 227-0101. Air Force District of Washington. 1100th Air Base Gp.; US Air Force Honor Guard; US Air Force Band; Air Force Office of Scientific Research (AFSC); Air Force Chief of Chaplains; Air Force Surgeon General; Air Force Office of History; Hq. Air Force Office of Special Investigations; Defense Intelligence Agency. Activated Oct. 1917; named for Col. Raynal C. Bolling, first high-ranking Air Service officer killed in WW I. Area 604 acres. Military 2,675; civilians 1,970. Payroll $155.2 million. Housing: 405 officer; 990 NCO; 164 transient. Clinic.

Brooks AFB, Tex. 78235; 7 mi. SE of San Antonio. Phone (512) 536-1110; AUTOVON 240-1110. AFSC base. Aerospace Medical Div.; USAF School of Aerospace Medicine; USAF Occupational and Environmental Lab; USAF Human Resources Lab. Tenant units include the AFSC Systems Acquisition School, USAF Office of Medical Support, a security squadron, and a communications group. Base activated Dec. 8, 1917; named for Cadet Sidney J. Brooks, Jr., killed Nov. 13, 1917, on his final solo flight before commissioning. Area 1,310 acres. Altitude 600 ft. Military 1,500; civilians 1,100. Payroll $54.9 million. Housing: 70 officer; 100 NCO; 8 transient. Clinic.

Cannon AFB, N. M. 88103-5000; 7 mi. W of Clovis. Phone (505) 784-3311; AUTOVON 681-1110. TAC base. 27th Tactical Fighter Wing, F-111D fighter operations. Base activated Aug. 1942; named for Gen. John K. Cannon, WW II commander of all Allied air forces in the Mediterranean theater. Area 25,663 acres. Altitude 4,295 ft. Military 3,650; civilians 782. Payroll $84 million. Housing: 149 officer; 862 enlisted. 40-bed hospital.

Carswell AFB, Tex. 76127; 7 mi. WNW of downtown Fort Worth. Phone (817) 735-5000; AUTOVON 739-1110. SAC base. 19th Air Div.; 7th Bomb Wing (SAC); 301st Tactical Fighter Wing (AFRES); aircraft include B-52s, KC-135s, and AFRES F-4s. Base activated Aug. 1942; named Jan. 30, 1948, for Maj. Horace S. Carswell, Jr., native of Fort Worth, WW II B-24 pilot, and posthumous Medal of Honor recipient. Area 2,750 acres. Altitude 650 ft. Military 5,050; civilians 961. Payroll $134 million. Housing: 98 officer; 709 NCO; 44 VOQ, 22 TLF, VAQ under renovation. 120-bed hospital.

Castle AFB, Calif. 95342; 8 mi. NW of Merced. Phone (209) 726-2011; AUTOVON 347-1110. SAC base. 93d Bomb Wing. Conducts training of all SAC B-52G and H and KC-135 aircrews. Also houses 84th Fighter Interceptor Sqdn. (TAC) and is site of Castle Air Museum. Base activated Sept. 1941; named for Brig. Gen. Frederick W. Castle, WW II B-17 pilot and Medal of Honor recipient. Area 2,700 acres. Altitude 188 ft. Military 5,068; civilians 421. Payroll $100.9 million. Housing: 92 officer; 842 NCO; 432 transient (incl. 108 VAQ, 156 VOQ, 4 family quarters, and 24 DV quarters). 30-bed hospital.

Chanute AFB, Ill. 61868-5000; 14 mi. N of Champaign at Rantoul, Ill. Phone (217) 495-1110; AUTOVON 862-1110. ATC base. Chanute Technical Training Center provides training in missile and aircraft mechanics, aerospace ground equipment, life support, metallurgy and nondestructive inspection, weather forecasting, weather equipment, and fire protection and rescue. Chanute Technical Training Display Center is base museum. Base activated May 1, 1917; named for Octave Chanute, aeronautical engineer and glider pioneer who died in 1910. Area 2,125 acres. Altitude 735 ft. Military 6,574; civilians 1,236. Payroll $124.46 million. Housing: 160 officer; 1,344 enlisted; 194 VOQ, 948 VAQ, 30 TLF. 35-bed hospital.

Charleston AFB, S. C. 29404-5000; in North Charleston. Phone (803) 554-0230; AUTOVON 583-0111. MAC base. Joint-use airfield. 437th Military Airlift Wing; 315th MAW (AFRES Assoc.); 1968th Information Systems Sqdn.; Det. 1, 107th Fighter Interceptor Sqdn. (TAC); Det. 7, 1361st Audiovisual Sqdn. Base activated Dec. 1941; inactivated Feb. 1946; reactivated 1952. Area 6,314 acres. Altitude 45 ft. Military 7,777 (incl. AFRES); civilians 1,745. Payroll $139.4 million. Housing: 142 officer; 813 NCO; 75 trailer spaces; 472 transient (150 VOQ, 322 VAQ). Dispensary.

Columbus AFB, Miss. 39701-5000; 10 mi. NNW of Columbus. Phone (601) 434-7322; AUTOVON 742-1110. ATC base. 14th Flying Training Wing, undergraduate pilot training. Base activated 1941 for pilot training. Area 6,013 acres. Altitude 214 ft. Military 2,966; civilians 566. Payroll $99.5 million. Housing: 234 officer; 586 NCO. 20-bed hospital.

Davis-Monthan AFB, Ariz. 85707-5000; within city limits of Tucson. Phone (602) 748-3900; AUTOVON 361-1110. TAC base. 836th Air Div.; 355th Tactical Training Wing, A-10 combat crew training; 602d Tactical Air Control Wing, headquarters for OA-37, OV-10, and ground FAC tactical air control operations; 868th Tactical Missile Training Gp., ground-launched cruise missile training operation; 41st Electronic Combat Sqdn. (EC-130H). Also site of AFLC's Military Aerospace Maintenance and Regeneration Center. Base activated in 1927; named for two local early aviators—1st Lt. Samuel H. Davis, killed Dec. 28, 1921, and 2d Lt. Oscar Monthan, killed Mar. 27, 1924. Area 11,000 acres. Altitude 2,620 ft. Military 5,124; civilians 1,359. Payroll $134.4 million. Housing: 136 officer; 1,111 enlisted; 8 guest; 680 transient. 70-bed hospital.

Dover AFB, Del. 19902-5000; 3 mi. SE of Dover. Phone (302) 678-7011; AUTOVON 455-1110. MAC base. 436th Military Airlift Wing; 512th MAW (AFRES Assoc.). Dover is the largest C-5 air cargo port on the East Coast. Base activated Dec. 1941; inactivated 1946; reactivated Feb. 1951. Area 3,734 acres. Altitude 28 ft. Military 4,424; civilians 1,327. Payroll $205.5 million. Housing: 229 officer; 1,327 NCO; 670 transient (512 VAQ, 158 VOQ). 30-bed hospital.

Dyess AFB, Tex. 79607; WSW border of Abilene. Phone (915) 696-0212; AUTOVON 461-1110. SAC base. 12th Air Div.; 96th Bomb Wing; Det. 1, 4201st Test Sqdn. (SAC); 463d Tactical Airlift Wing; Det. 4, 1722d Combat Control Sqdn. (MAC); 1993d Information Systems Sqdn. (AFCC);

Major Active Air Force Installations in the US

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417th Field Training Det.; Det. 1, 47th Flying Training Wing (ATC); B-1B Site Activation Task Force (AFSC); B-1B FOT&E Test Team (AFOTEC). B-1B, KC-135, C-130, T-38 operations. Selected as the first base to activate an operational B-1B wing as well as to conduct B-1 combat crew training for the Air Force. First B-1B aircraft arrived June 1985; aircraft deliveries continuing, with initial operational capability Sept. 1986. Base activated Apr. 1942; deactivated Dec. 1945; reactivated as Abilene AB, Sept. 1955. In Mar. 1956, renamed for Lt. Col. William E. Dyess, WW II fighter pilot known best for his escape from a Japanese prison camp; killed in P-38 crash at Burbank, Calif., Dec. 1943. Area 6,058 acres. Altitude 1,789 ft. Military 5,264; civilians 459. Payroll $143 million. Housing: 150 officer; 848 NCO; 168 transient. 40-bed hospital.

Edwards AFB, Calif. 93523; 20 mi. E of Rosamond. Phone (805) 277-1110; AUTOVON 350-1110. AFSC base. Site of Air Force Flight Test Center (AFFTC), which conducts new and follow-on testing of aircraft and related avionics and weapon systems. AFFTC also operates the USAF Test Pilot School, which trains pilots and flight-test engineers. Also site of the Air Force Rocket Propulsion Laboratory, US Army Aviation Engineering Flight Activity, and the NASA Dryden Flight Research Facility. Edwards is the primary landing site for all Space Shuttle test and evaluation flights and is a backup landing site for all Shuttle missions. Base activated Sept. 1933 as Muroc Army Air Field; renamed for Capt. Glen W. Edwards, killed June 5, 1948, in crash of YB-49 "Flying Wing." Area 301,000 acres. Altitude 2,302 ft. Military 4,402; civilians 5,687. Payroll $270.5 million. Housing: 534 officer (including BOQ); 3,241 enlisted (includes 1,466 dormitory spaces and 196 bachelor NCO quarters); 213 transient (70 VAQ, 97 VOQ, 51 TLF); 164 mobile home park units. 25-bed hospital.

Eglin AFB, Fla. 32542; 2 mi. SE of the twin cities of Niceville and Valparaiso; 7 mi. NE of Fort Walton Beach. Phone (904) 881-6668; AUTOVON 872-1110. AFSC base. Eglin is the free world's largest air force base. Air Force Armament Division; Air Force Armament Test Lab; 3246th Test Wing; 39th Aerospace Rescue and Recovery Wing; 33d Tactical Fighter Wing; Tac Air Warfare Center; 1972d Communications Sqdn.; 55th Aerospace Rescue and Recovery Sqdn.; 919th Special Operations Gp. (AFRES). Base activated 1935; named for Lt. Col. Frederick I. Eglin, WW I flyer killed in aircraft accident Jan. 1, 1937. Area 464,980 acres. Altitude 85 ft. Military 10,750; civilians 5,367. Payroll $302.9 million (incl. AFRES). Housing: 322 officer; 2,014 NCO; 84 transient. 160-bed regional hospital. AFSC clinic at Hurlburt.

Eielson AFB, Alaska 99702; 26 mi. SE of Fairbanks. Phone (907) 377-1178; AUTOVON (317) 377-1110. AAC base. 343d Tactical Fighter Wing; 343d Combat Support Gp.; 18th Tactical Fighter Sqdn.; 25th Tactical Air Support Sqdn. 343d Tactical Fighter Wing is host unit. Close air support for ground forces and search and rescue for AAC; 6th Strategic Wing (SAC) tanker operations; communications for AFCC; Arctic Survival School (ATC). Base activated Oct. 1944; named for Carl B. Eielson, Arctic aviation pioneer, died Nov. 1929. Area 23,500 acres (approx.). Altitude 534 ft. Military 3,332; civilians 314. Payroll $68.4 million. Housing: 148 officer; 1,015 NCO; 60 transient. Clinic.

Ellsworth AFB, S. D. 57706; 11 mi. ENE of Rapid City. Phone (605) 342-2400; AUTOVON 747-1110. SAC base. 44th Strategic Missile Wing; 28th Bomb Wing; Det. 2, 37th Aerospace and Recovery Sqdn.; OL A, 64th Flying Training Wing (ATC); Det. 17, 9th Weather Sqdn.; 2148th Information Systems Sqdn. (AFCC). Base activated July 1942 as Rapid City Army Air Base; named for Brig. Gen. Richard E. Ellsworth, killed Mar. 18, 1953, in crash of RB-36. Area 4,906 acres. Altitude 3,200 ft. Military 6,698; civilians 535. Payroll $123.5 million. Housing: 331 officer; 1,526 NCO; 173 transient. 30-bed hospital.

Elmendorf AFB, Alaska 99506; bordering Anchorage. Phone (907) 552-1110; AUTOVON (317) 552-1110. AAC base. Hq. Alaskan Air Command; 21st Tactical Fighter Wing; NORAD Region Operations Control Center; Rescue Coordination Center; 11th Tactical Control Gp.; 43d Tactical Fighter Sqdn.; 5021st Tactical Operations Sqdn.; 1931st Information Systems Wing (AFCC); 6981st Electronic Security Sqdn. (ESC); 616th Military Airlift Gp. (MAC); 17th Tactical Airlift Sqdn. (MAC); 71st Aerospace Rescue and Recovery Sqdn. (MAC); 11th Weather Sqdn. (MAC); plus varied US Army, Navy, and Marine activities. 21st Tactical Fighter Wing is host unit. Base activated July 1940; named for Capt. Hugh Elmendorf, killed Jan. 13, 1933, at Wright Field, Ohio, while flight-testing a new type of pursuit plane. Area 13,130 acres. Altitude 118 ft. Military 6,174; civilians 1,216. Payroll $221 million. Housing: 232 officer; 1,638 NCO; transient incl. 52 family units (no pets), 140 VOQ, 230 VAQ. 95-bed hospital.

England AFB, La. 71311-5004; 5 mi. W of Alexandria. Phone (318) 448-2100; AUTOVON 683-1110. TAC base. 23d Tactical Fighter Wing, A-10 fighter operations. Base activated Oct. 1942; named for Lt. Col. John B. England, WW II P-51 pilot and ace credited with 17.5 victories, killed in France Nov. 17, 1954, in F-86 crash. Area 2,282 acres. Altitude 89 ft. Military 3,057; civilians 667. Payroll $44 million. Housing: 109 officer; 491 NCO; transient incl. 23 VAQ 40-bed double rooms, 26 VOQ single rooms, 10 family rooms. 25-bed hospital.

Fairchild AFB, Wash. 99011; 12 mi. WSW of Spokane. Phone (509) 247-1212; AUTOVON 352-1110. SAC base. 47th Air Div.; 92d Bomb Wing (SAC); 3636th Combat Crew Training Wing (ATC); 141st Air Refueling Wing (ANG); Det. 24, 40th Aerospace Rescue and Recovery Sqdn. (MAC); Det. 1, 1000th Satellite Operations Gp. (AFSPACECOM); 2039th Communications Sqdn. (AFCC). Base activated Jan. 1942; named for Gen. Muir S. Fairchild, USAF Vice Chief of Staff at his death in 1950. Area 6,127 acres. Altitude 2,462 ft. Military 4,353; civilians 587. Payroll $94 million for civilian and active-duty military; $12 million for ANG. Housing: 502 officer; 1,079 NCO; transient incl. 60 VOQ and 62 VAQ, no family transient quarters. 45-bed hospital.

Francis E. Warren AFB, Wyo. 82005; adjacent to Cheyenne. Phone (307) 775-1110; AUTOVON 481-1110. SAC base. 4th Air Div.; 90th Strategic Missile Wing. Selected for the deployment of the Peacekeeper missile system. Base activated July 4, 1867; under Army jurisdiction until 1947, when reassigned to USAF. Home of the first Atlas-D ICBM missile wing (1960–65); named for Francis Emory Warren, Wyoming senator and early governor. Base has 5,872 acres, plus 200 Minuteman III missile sites distributed over 12,600 sq. mi. in Wyoming, Colorado, and Nebraska. Altitude 6,142 ft. Military 3,516; civilians 533. Payroll $72.3 million. Housing: 203 officer; 628 NCO; 36 transient. 25-bed hospital.

George AFB, Calif. 92394-5000; 6 mi. NW of Victorville. Phone (619) 269-1110; AUTOVON 353-1110. TAC base. 831st Air Div.; 37th Tactical Fighter Wing, home of TAC's Wild Weasel F-4G squadrons; 35th Tactical Training Wing, F-4 transitional and upgrade training; German Air Force training in F-4; ANG F-4D detachment; 27th Tactical Air Support Sqdn. (OV-10); 2067th Information Systems Sqdn. (AFCC). Base activated 1941; named for Brig. Gen. Harold H. George, WW I fighter ace killed Apr. 29, 1942, in aircraft accident in Australia. Area 5,347 acres. Altitude 2,875 ft. Military 5,424; civilians 484. Payroll $154.53 million. Housing: 229 officer; 198 senior NCO; 1,214 NCO; 45 transient. 35-bed hospital.

Goodfellow AFB, Tex. 76908-5000; 2 mi. SE of San Angelo. Phone (915) 657-3231; AUTOVON 657-3231. ATC base. Goodfellow Technical Training Center provides cryptologic training for all services. Designated the newest technical training center Mar. 1, 1985. Will house all Air Force intelligence training by 1989 under the Intelligence Training Consolidation program. Other major units include 3480th Technical Training Center and 3480th Air Base Gp. (ATC); 2081st Communications Sqdn. (AFCC); Det. 12, 3314th Management Engineering Sqdn. (ATC); NCO Professional Military Education Center (ESC); US Army Intelligence Training Battalion; Naval Technical Training Center Detachment; Marine Corps Administrative Detachment. Base activated Jan. 1941; named for Lt. John J. Goodfellow, Jr., WW I fighter pilot killed in combat Sept. 14, 1918. Area 1,127 acres. Altitude 1,877 ft. Military 2,467; civilians 567. Payroll $66.66 million. Housing: 3 officer; 96 NCO; 105 transient (69 VAQ, 36 VOQ). New TLF scheduled for completion in FY '86. Clinic.

Grand Forks AFB, N. D. 58205; 16 mi. W of Grand Forks. Phone (701) 594-6011; AUTOVON 362-1110. SAC base. 319th Bomb Wing (B-52G and KC-135); 321st Strategic Missile Wing (Minuteman III). Base activated 1956, named after the city of Grand Forks, whose citizens bought the property for the Air Force. Area 6,912 acres; missile complex covers an additional 7,500 sq. mi. Altitude 911 ft. Military 5,537; civilians 561. Payroll $136.5 million. Housing: 434 officer; 1,843 NCO; 136 transient. 35-bed hospital.

Griffiss AFB, N. Y. 13441-5000; 1 mi. NE of Rome. Phone (315) 330-1110; AUTOVON 587-1110. SAC base. 416th Bomb Wing. Other major units are Rome Air Development Center (AFSC); 485th Engineering Installations Gp. (AFCC); 49th Fighter Interceptor Sqdn. (TAC); Hq. 24th Air Div. and the Northeast Region Operations Control Center (NORAD/ADTAC); 933d Civil Engineering Sqdn. (AFRES). Base activated Feb. 1, 1942; named for Lt. Col. Townsend E. Griffiss, killed in aircraft accident Feb. 15, 1942 (the first US airman to lose his life in Europe during WW II while in the line of duty). Area 3,896 acres. Altitude 504 ft. Military 4,523; civilians 3,204. Payroll $267 million. Housing: 169 officer; 566 NCO; 50 trailers; 109 transient. 70-bed hospital.

Grissom AFB, Ind. 46971; 7 mi. S of Peru. Phone (317) 689-5211; AUTOVON 928-1110. SAC base. 305th Air Refueling Wing; 434th Tactical Fighter Wing (AFRES); 931st Air Refueling Gp. (AFRES). Activated Jan. 1943 for Navy flight training; reactivated June 1954 as Bunker Hill AFB; renamed May 1968 for Lt. Col. Virgil I. "Gus" Grissom, killed Jan. 27, 1967, with other Astronauts Edward White and Roger Chaffee in Apollo capsule fire at Cape Kennedy, Fla. Area 3,000 acres. Altitude 800 ft. Military 2,350; civilians 1,056. Payroll $53.1 million (SAC only). Housing: 276 officer; 1,852 NCO; 138 transient. 10 bed hospital.

Gunter AFS, Ala. 36114; 4 mi. NE of Montgomery. Phone (205) 279-1110; AUTOVON 446-1110. AU station. Hq. Standard Information Systems Center; Air Force Logistics Management Center; USAF Extension Course Institute; USAF Senior NCO Academy. Base activated Aug. 27, 1940; named for William A. Gunter, longtime mayor of Montgomery and airpower exponent, died 1940. Area 368 acres. Altitude 220 ft. Military 1,257; civilians 859. Payroll included in Maxwell entry. Housing: 118 officer; 208 NCO; 305 transient (108 VOQ, 194 VAQ, 3 TLF).

Hanscom AFB, Mass. 01731; 17 mi. NW of Boston. Phone (617) 861-4441; AUTOVON 478-5980. AFSC base. Hq. Electronic Systems Div. (AFSC) manages development and acquisition of command control communications and intelligence (C^3I) systems. Also site of Air Force Geophysics Lab. center for research and exploratory development in the terrestrial, atmospheric, and space environments. Base has no flying mission; transient USAF aircraft use runways of Laurence G. Hanscom Field, state-operated airfield adjoining the base. Named for a pre-WW II advocate of private aviation, killed in a lightplane accident in 1941. Area 846 acres. Altitude 133 ft. Military 2,100; civilians 3,100. Payroll $152 million. Housing: 276 officer; 420 NCO; 30-unit TLF. 754 BOQ/VOQ. Clinic.

Hickam AFB, Hawaii 96853-5000; 10 mi. W of Honolulu. Phone (808) 422-0531 (Oahu military operator); AUTOVON 430-0111. PACAF base. Hq. Pacific Air Forces. Host unit 15th Air Base Wing, supporting Air Force units and installations in Hawaii and throughout the Pacific; subordinate unit 9th Airborne Command and Control Sqdn. Major associate units include 834th Airlift Div. (MAC); Hq. Pacific Information Systems Div. (AFCC); 1st Weather Wing (MAC); 6594th Test Gp. (AFSC); 154th Composite Gp. (ANG); 619th Military Airlift Support Sqdn. (MAC); Det. 1, 89th Military Airlift Wing (MAC). Base activated Sept. 1937; named for Lt. Col. Horace M. Hickam, air pioneer killed in crash Nov. 5, 1934, at Fort Crockett, Tex. Area 2,894 acres. Altitude sea level. Military 5,204; civilians 1,971. Payroll $223 million (includes Hickam and Wheeler AFBs and Bellows AFS). Housing: 527 officer; 4,420 enlisted. Clinic.

Hill AFB, Utah 84056; 5 mi. SW of Ogden. Phone (801) 777-7221; AUTOVON 458-1110. AFLC base. Hq. Ogden Air Logistics Center. Furnishes logistics support for Peacekeeper, Minuteman, and Titan II missiles; Bomarc drone and Maverick air-to-ground missiles; laser and electro-optical guided bombs; F-4 and F-16 systems manager; air munitions; aircraft landing gears; wheels, brakes and struts, tires, and tubes; photographic and aerospace training equipment. Also home of the 388th Tactical Fighter Wing; 419th Tactical Fighter Wing (AFRES); 40th Aerospace Rescue and Recovery Sqdn.; 6545th Test Gp. (AFSC), which includes management of Utah Test and Training Range and RPV test programs. Base activated Nov. 1940; named for Maj. Ployer P. Hill, killed Oct. 30, 1935, test-flying the first B-17. Area 6,666 acres; manages 961,012 acres. Altitude 4,788 ft. Military 5,500; civilians 15,200. Payroll $495 million. Housing: 263 officer; 882 NCO; 8 transient. 35-bed hospital.

Holloman AFB, N. M. 88330-5000; 8 mi. SW of Alamogordo. Phone (505) 479-6511; AUTOVON 867-1110. TAC base. 833d Air Div.; 49th Tactical Fighter Wing, F-15 operations; 479th Tactical Training Wing, AT-38B fighter lead-in training; 4449th Mobility Support Sqdn., Harvest Bare; 82d and 83d Tactical Control Flts.; 6585th Test Group (AFSC), conducts test and evaluation of aircraft and missile systems. Twenty-one other tenant units located at Holloman, including 1877th Information Systems Sqdn., 1025th Satellite Communications Sqdn. (AFSPACECOM), 1964th Communications Sqdn., 40th Aerospace Rescue and Recovery Sqdn., Air Force Geophysical Laboratory detachment, and a US Army unit. Base activated in 1942; named for Col. George Holloman, guided-missile pioneer, killed in B-17 crash in Formosa Mar. 19, 1946. Area 50,697 acres. Altitude 4,093 ft. Military 6,634; civilians 1,402. Payroll $238 million. Housing: 191 officer; 1,360 NCO; 255 transient. 35-bed hospital.

Homestead AFB, Fla. 33039-5000; 5 mi. NNE of Homestead. Phone (305) 257-8011; AUTOVON 791-0111. TAC base. 31st Tactical Training Wing, F-4D and F-16 fighter operations and training; site of ATC sea-survival school; 726th Tactical Control Sqdn. (TAC); Naval Security Group Activity; 482d Tactical Fighter Wing (AFRES); 301st Aerospace Rescue and Recovery Sqdn. (AFRES). Base activated Apr. 1955. Area 3,491 acres. Altitude 7 ft. Military 4,954; civilians 7,736. Payroll $311.9 million. Housing: 321 officer; 1,294 NCO; 359 transient. 80-bed hospital.

Hurlburt Field, Fla. 32544-5000; 5 mi. W of Fort Walton Beach. Phone (904) 881-6668; AUTOVON 872-1110. MAC base, though located on the Eglin AFB (AFSC) reserva-

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tion. Home of 2d Air Div., which is the focal point for all special operations matters for USAF. Under 2d AD's responsibility are the 1st Special Operations Wing, Hurlburt Field, equipped with the MC-130E (Combat Talon), AC-130H (Spectre Gunship), and HH-53 (Pave Low III); the USAF Special Operations School; 1723d Special Operations Combat Control Sqdn.; Special Operations Weather Team. Also under 2d AD's responsibility are 1st Special Operations Sqdn., Clark AB, the Philippines; 7th Special Operations Sqdn., Rhein-Main AB, Germany; and helicopters at Howard AFB, Panama. Tenant units assigned to Hurlburt Field include the Special Missions Operational Test and Evaluation Center; 4442d Tactical Control Gp., which includes the US Air Force Air-Ground Operations School and the 727th Tactical Control Sqdn.; 823d Civil Engineering Sqdn. "Red Horse." Base activated 1943; named for Lt. Donald W. Hurlburt, WW II pilot killed Oct. 2, 1943, in a crash on Eglin reservation. Altitude 35 ft. Military 3,723; civilians 320. Payroll $83 million. Housing: 74 officer; 306 NCO; 341 transient. Medical clinic only at Hurlburt; 160-bed hospital at Eglin Regional Hospital located 12 mi. away.

Indian Springs Air Force Auxiliary Field, Nev. 89018-5000; 45 mi. NW of Las Vegas. Phone (702) 897-6201; AUTOVON 682-6201. TAC base. 554th Combat Support Sqdn.; 4460th Helicopter Sqdn. Provides bombing and gunnery range support for tactical operations from Nellis AFB; manages construction of realistic target complexes; supports US Department of Energy research activities. Base activated in 1942. Area 1,652 acres. Altitude 3,124 ft. Military 400; civilians 37. Payroll included in Nellis AFB entry. Housing: 78 officer and NCO quarters; 30 trailer spaces. Dispensary.

Keesler AFB, Miss. 39534-5000; located in Biloxi. Phone (601) 377-1110; AUTOVON 868-1110. ATC base. Hq. Keesler Technical Training Center (communications, electronics, avionics, radar systems, computer and command and control systems, personnel, and administrative courses); Keesler USAF Medical Center. Hosts MAC and AFRES weather reconnaissance units, TAC airborne command and control sqdn., AFCC installation gp., AFCC NCO Academy/Leadership School. Base activated June 12, 1941; named for 2d Lt. Samuel R. Keesler, Jr., WW I aerial observer, killed in action Oct. 9, 1918, near Verdun, France. Area 3,600 acres. Altitude 26 ft. Military 11,523; civilians 3,076. Payroll $280 million. Housing: 363 officer; 1,594 NCO; 90 transient (399 VOQ and 658 VAQ units on space availability, tech training students occupy many units). 325-bed medical center.

Kelly AFB, Tex. 78245-5000; 5 mi. SW of San Antonio. Phone (512) 925-1110; AUTOVON 945-1110. AFLC base. Hq. Electronic Security Command. Hq. San Antonio Air Logistics Center provides logistics management, procurement, and distribution support for such USAF aircraft as the C-5A and B, C-17, C-9, F-5, O-2, OV-10, T-38, and T-46A. As a specialized repair activity, SA-ALC modernizes and performs heavy depot maintainance on the entire USAF fleet of C-5s, a significant portion of Strategic Air Command B-52s, Military Airlift Command C-130s, and various engines, including the TF39, TF56, and F100. SA-ALC also manages more than half of the Air Force's engine inventory, all fuel lubricants used by the Air Force and NASA, the Air Force's fleet of boats and ships, and the Department of Defense Working Dog Program. Tenant units include Air Force Electronic Warfare Center; Air Force Cryptologic Support Center; Joint Electronic Warfare Center; USAF Service Information and News Center; Hq. Air Force Commissary Service; 433d Military Airlift Wing (AFRES); 149th Tactical Fighter Gp. (ANG); 1923d Communications Gp.; 1827th Electronics Installation Sqdn.; Defense Reutilization and Marketing Office; Air Force Audit Agency Office. Base history dates back to Dec. 13, 1916. Kelly is one of the oldest continuously active AFBs in the US; named for Lt. George E. M. Kelly, first Army pilot to lose his life in a military aircraft, killed May 10, 1911. Area 4,660 acres. Altitude 689 ft. Military 4,932; civilians 20,600. Payroll $628 million. Housing: 46 officer; 368 NCO. Clinic.

Kirtland AFB, N. M. 87117-5000; S of Albuquerque. Phone (505) 844-0011; AUTOVON 244-0011. MAC base. 1606th Air Base Wing. Major agencies and units include Air Force Contract Management Div. (AFSC); Air Force Operational Test and Evaluation Center; Air Force Weapons Laboratory (AFSC); Office of the Chief of Security Police; New Mexico ANG; 1550th Combat Crew Training Wing (MAC); Defense Nuclear Agency Field Command; Naval Weapons Evaluation Facility, Sandia Laboratories; Lovelace Biomedical and Environmental Research Institute; Department of Energy's Albuquerque Operations Office; AFSC NCO Academy; USAF Directorate of Nuclear Surety; 150th Tactical Fighter Gp. (ANG); 1960th Communications Sqdn. (AFCC); 3098th Aviation Depot Sqdn.; Det. 1, 1369th Audiovisual Sqdn. These agencies furnish contract management; nuclear and laser research, development, and testing; operational test and evaluation services; advanced helicopter training; and HC-130 search and rescue training. Other major units are the Air Force Space Technology Center; AFLC Nuclear Support Office; Albuquerque Seismological Laboratory; Command Control Communications Countermeasures Joint Test Force; Univ. of New Mexico Civil Engineering Research Facility; Interservice Nuclear Weapons School. Base activated Jan. 1941; named for Col. Roy C. Kirtland, air pioneer and commandant of Langley Field in the 1930s, died May 2, 1941. Area 52,000 acres. Altitude 5,352 ft. Military 5,207; civilians 14,413. Payroll $760.7 million. Housing: 124 officer; 2,010 NCO; 380 transient (211 VOQ, 169 VAQ). Dispensary and 40-bed hospital.

K. I. Sawyer AFB, Mich. 49843; 20 mi. S of Marquette. Phone (906) 346-6511; AUTOVON 472-1110. SAC base. 410th Bomb Wing; ELF Transmitter Facility (Navy); 2001st Communications Sqdn. (AFCC). Base activated in 1959; named for Kenneth I. Sawyer, who proposed site for county airport, died 1944. Area 5,278 acres. Altitude 1,220 ft. Military 4,006; civilians 489. Payroll $72.5 million. Housing: 279 officer; 1,414 NCO; 26 BOQ units; 225 transient (incl. 20 fully furnished efficiency apartments and 149 trailer spaces in housing area), 8 VAQ and 22 VOQ (both under renovation). 25-bed hospital.

Lackland AFB, Tex. 78236-5000; 8 mi. WSW of San Antonio. Phone (512) 671-1110; AUTOVON 473-1110. ATC base. Provides basic military training for active-duty, Air Guard, and Air Reserve airmen; technical training of basic and advanced security police/law enforcement personnel; patrol dog-handler courses; training of instructors, recruiters, and social actions/drug abuse counselors; USAF marksmanship training; Officer Training School; Defense Language Institute English Language Center; Wilford Hall USAF Medical Center (USAF's largest medical center, also conducts medical education and clinical research); ATC NCO Academy; military training instructor reserve squadron; 539th Air Force Band; 3504th Recruiting Gp.; Det. 40, Air Logistics Center. Base activated 1941; named for Brig. Gen. Frank D. Lackland, early commandant of Kelly Field flying school, died 1943. Area 6,783 acres, incl. 3,972 acres at Lackland Training Annex. Altitude 787 ft. Military 19,562; civilians 5,279. Payroll $435.6 million. Housing: 106 officer; 619 NCO; 946 transient. 1,000-bed medical center.

Langley AFB, Va. 23665-5000; 3 mi. N of Hampton. Phone (804) 764-9990; AUTOVON 574-1110. TAC base. Hq. Tactical Air Command; 1st Tactical Fighter Wing, F-15 fighter operations; Hq. 1st Air Force; 5th Weather Wing (MAC); 2d Aircraft Delivery Gp. (TAC); 480th Reconnaissance Technical Gp. (TAC); US Army TRADOC Flight Det.; 48th Fighter Interceptor Sqdn. (TAC). Base activated Dec. 30, 1916, making Langley the oldest continuously active AFB in the US; named for aviation pioneer and scientist Samuel Pierpont Langley, died 1906. NASA Langley Research Center is located across base. Area 3,500 acres. Altitude 10 ft. Military 9,188; civilians 2,616. Payroll $235.1 million. Housing: 384 officer; 1,259 NCO; 262 transient. USAF regional 80-bed hospital.

Laughlin AFB, Tex. 78843-5000; 6 mi. E of Del Rio. Phone (512) 298-3511; AUTOVON 732-1110. ATC base. 47th Flying Training Wing, undergraduate pilot training. Base activated Oct. 1942; named for 1st Lt. Jack T. Laughlin, B-17 pilot killed over Java Jan. 29, 1942. Area 4,008 acres. Altitude 1,080 ft. Military 2,971; civilians 759. Payroll $99.2 million. Housing: 255 officer; 348 NCO; 37 transient, 22 temporary family lodging facilities. 20-bed hospital.

Laurence G. Hanscom AFB *(see Hanscom AFB).*

Little Rock AFB, Ark. 72099-5000; 12 mi. NE of Little Rock. Phone (501) 988-3131; AUTOVON 731-1110. MAC base. 314th Tactical Airlift Wing, only C-130 training base in DoD, training crew members from all branches of service and some foreign countries. Tenants include 308th Strategic Missile Wing, one of two Titan II missile wings in USAF; 2151st Information Systems Sqdn.; 22d Air Force Leadership School. Base activated 1955. Area 6,896 acres. Altitude 310 ft. Military 7,300; civilians 1,000. Payroll $159 million. Housing: 313 officer; 1,222 NCO; 387 transient (162 VAQ, 225 VOQ). 30-bed hospital.

Loring AFB, Me. 04751; 4 mi. W of Limestone. Phone (207) 999-1110; AUTOVON 920-1110. SAC base. 42d Bomb Wing. Base activated Feb. 25, 1953, as Limestone AFB; renamed for Maj. Charles J. Loring, Jr., F-80 pilot killed Nov. 22, 1952, in North Korea and posthumously awarded Medal of Honor. Area more than 9,000 acres. Altitude 746 ft. Military 3,682; civilians 880. Payroll $83.9 million. Housing: 271 officer; 1,565 NCO; 122 transient; 4 VIP. 23-bed hospital, with a new 20-bed hospital under construction.

Los Angeles AFS, Calif. 90009; in metropolitan Los Angeles area, city of El Segundo, 3 mi. S of Los Angeles IAP. Phone (213) 643-1000; AUTOVON 833-1110. AFSC station. Headquarters of AFSC's Space Division, which manages the design, development, acquisition, and launch of DoD's space program. Support unit is 6592d Air Base Gp. Station activated Dec. 14, 1960. 24 tenant units on station; also provides support to 41 off-station units/activities. Military 1,971; civilians 1,271. Payroll $95.2 million. Area 96 acres at Los Angeles AFS and 96 acres at Fort MacArthur Annex. Altitude 95 ft. Housing at Fort MacArthur Annex in San Pedro: 370 officer and enlisted townhomes; general officer houses; 27 enlisted dormitory rooms; 60 visiting and unaccompanied officer quarters. 23 TLF units under construction for completion in June 1986. Clinic, commissary, and Air Force Family Support Center.

Lowry AFB, Colo. 80230-5000; on border between Denver and Aurora. Phone (303) 370-1110; AUTOVON 926-1110. ATC base. Technical Training Center; Air Force Accounting and Finance Center; Air Reserve Personnel Center; 3320th Correction and Rehabilitation Sqdn. Lowry Technical Training Center conducts training in avionics, space operations, munitions, air intelligence, logistics, and audiovisual fields. Base activated Oct. 1, 1937; named for 1st Lt. Francis B. Lowry, killed in action Sept. 26, 1918, near Crepion, France, while on a photo mission. Area 1,863 acres on base and 3,833-acre training annex 25 mi. E of Lowry. Altitude 5,400 ft. Military 8,942; civilians 5,452. Payroll $222.8 million. Housing: 95 officer; 772 enlisted; 900 transient. Clinic.

Luke AFB, Ariz. 85309-5000; 20 mi. WNW of Phoenix. Phone (602) 856-7411; AUTOVON 853-1110. TAC base. 832d Air Div.; 405th Tactical Training Wing, F-15 operations; 58th Tactical Training Wing, F-16 operations; 302d Special Operations Sqdn. (AFRES). Luke, the largest fighter training base in the free world, conducts training of USAF aircrews in the F-15 and F-16 and foreign training in the F-5 (at nearby Williams AFB). Base activated in 1941; named for 2d Lt. Frank Luke, Jr., observation balloon-busting ace of WW I and first flyer to receive the Medal of Honor, killed in action Sept. 29, 1918, near Murvaux, France. Area 4,197 acres plus 2,700,000-acre range. Altitude 1,101 ft. Military 4,839; civilians 847. Payroll $190.3 million. Housing: 95 officer; 779 NCO; 40 transient. 105-bed hospital.

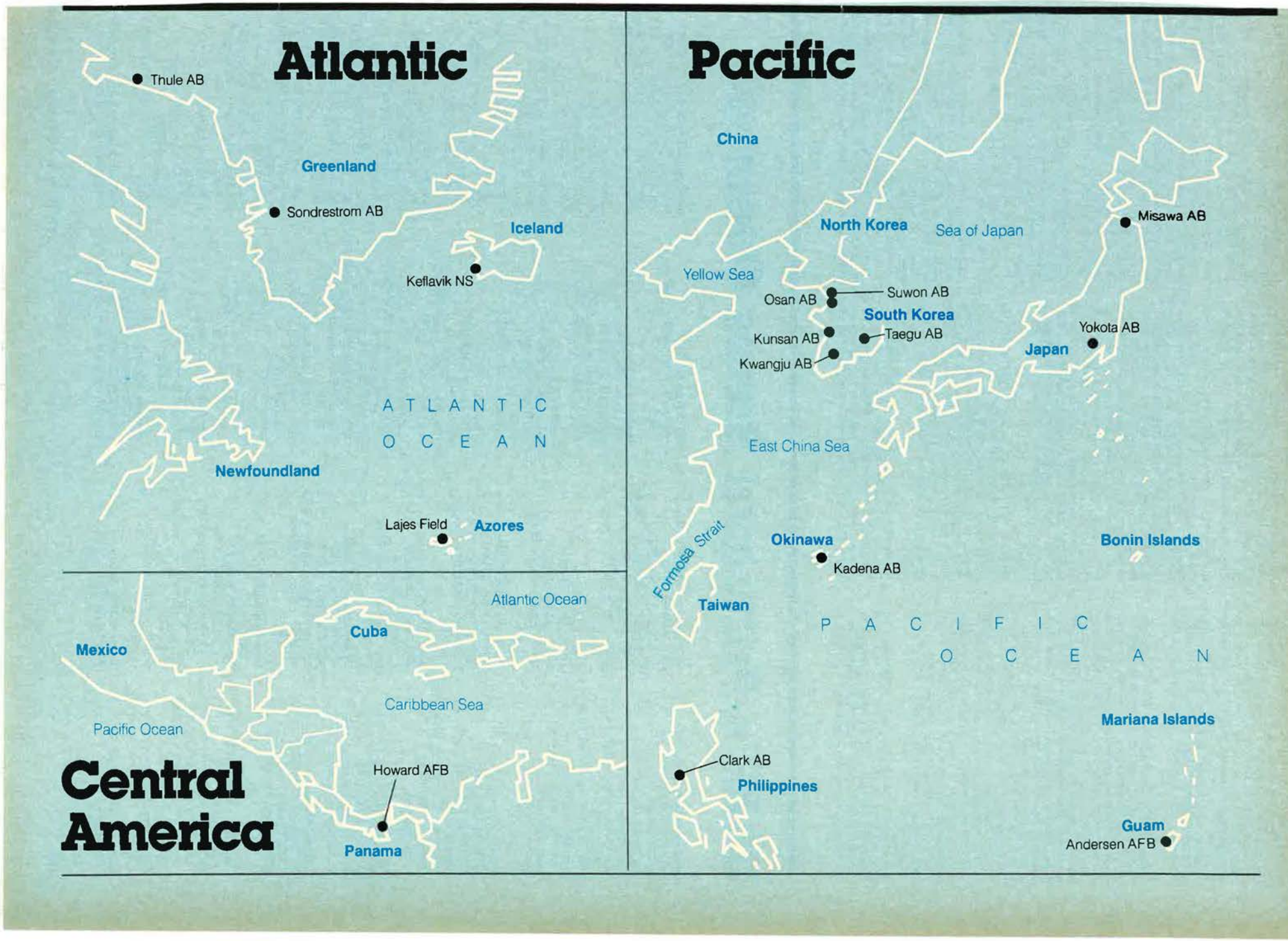
MacDill AFB, Fla. 33608-5000; adjacent to Tampa city limits. Phone (813) 830-1110; AUTOVON 968-1110. TAC base. 56th Tactical Training Wing, F-16 operations; Hq. US Readiness Command; Hq. US Central Command; Joint Communications Support Element. 56th Tactical Training Wing conducts replacement training in the F-16. Base activated Apr. 15, 1941; named for Col. Leslie MacDill, killed in an aircraft accident Nov. 8, 1938, near Washington, D. C. Area 5,631 acres. Altitude 6 ft. Military 7,000; civilians 1,915. Payroll $183 million. Housing: 58 officer; 746 enlisted; 350 transient. 75-bed USAF regional hospital.

Malmstrom AFB, Mont. 59402; 1.5 mi. E of Great Falls. Phone (406) 731-9990; AUTOVON 632-1110. SAC base. 341st Strategic Missile Wing. Base activated Dec. 15, 1942; named for Col. Einar A. Malmstrom, WW II fighter commander killed in air accident Aug. 24, 1954. Site of SAC's first Minuteman wing. Area 3,573 acres, plus about 23,000 sq. mi. of missile complex. Altitude 3,525 ft. Military 4,127; civilians 453. Payroll $77.6 million. Housing: 294 officer; 1,112 NCO; 107 transient. 29-bed hospital.

March AFB, Calif. 92518; 9 mi. SE of Riverside. Phone (714) 655-1110; AUTOVON 947-1110. SAC base. Hq. 15th Air Force; 22d Air Refueling Wing; 26th Air Div. Region (TAC); 452d Air Refueling Wing (AFRES); 943d Tactical Airlift Gp. (activated Apr. 1, 1985); 163d Tactical Fighter Gp. (ANG). Base activated Mar. 1, 1918; named for 2d Lt. Peyton C. March, Jr., who died in Texas of crash injuries Feb. 18, 1918. Area 7,117 acres. Altitude 1,530 ft. Military 3,966; civilians 1,196. Payroll $103 million. Housing: 103 officer; 608 NCO; 146 transient. 110-bed hospital.

Mather AFB, Calif. 95655-5000; 12 mi. ESE of Sacramento. Phone (916) 364-1110; AUTOVON 828-1110. ATC base. DoD executive manager for navigator training (USAF, Navy, and Marine Corps basic navigation training). Provides navigator training for 2d German AF and 50 other countries. Only navigator training base; also trains USAF electronic warfare officers. 323d Flying Training Wing (ATC); 320th Bomb Wing (SAC); 940th Air Refueling Gp. (AFRES); 3506th Recruiting Gp. Base activated 1918; named for 2d Lt. Carl S. Mather, killed in midair collision Jan. 30, 1918, in Texas. Area 5,800 acres. Altitude 96 ft. Military 5,112; civilians 2,221. Payroll $194.5 million. Housing: 451 officer; 820 NCO; 208 transient. 80-bed hospital.

Maxwell AFB, Ala. 36112; 1 mi. WNW of Montgomery. Phone (205) 293-1110; AUTOVON 875-1110. AU base. Hq. Air University, professional education center for USAF; 3800th Air Base Wing; site of Air War College; Air Command and Staff College; Center for Aerospace Doctrine, Research, and Education; Leadership and Management Development Center; Squadron Officer School; Air Force Historical Research Center; Hq. Air Force ROTC; Hq. Civil Air Patrol-USAF; Community College of the Air Force (ATC); 908th Tactical Airlift Gp. (AFRES). (The Senior NCO Academy and Extension Course Institute are at Gunter AFS.) Base activated 1918; named for 2d Lt. William C. Maxwell, killed in air accident Aug. 12, 1920, in the Philippines. Area 2,535 acres. Altitude 168 ft. Military 4,396; civilians 1,643. Payroll $193.8 million. Housing: 277 officer; 420 NCO; 1,184 transient (1,102 VOQ, 52 VAQ, and 30 TLF). 90-bed hospital.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Kwangju AB
East China Sea
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Kadena AB
Bonin Islands
Taiwan
PACIFIC
OCEAN
Mariana Islands
Clark AB
Philippines
Guam
Andersen AFB
Central America
Atlantic Ocean
Cuba
Mexico
Caribbean Sea
Pacific Ocean
Howard AFB
Panama

McChord AFB, Wash. 98438-5000; 8 mi. S of Tacoma. Phone (206) 984-1910; AUTOVON 976-1110. MAC base. 62d Military Airlift Wing; 25th Air Div. (TAC); 318th Fighter Interceptor Sqdn. (TAC); Region Operations Control Center (NORAD); 446th Military Airlift Wing (AFRES Assoc.). Base activated May 5, 1938; named for Col. William C. McChord, killed Aug. 18, 1937, while attempting a forced landing at Maidens, Va. Area 4,609 acres. Altitude 322 ft. Military 5,784; civilians 2,029. Payroll $152 million. Housing: 111 officer; 882 NCO; 284 transient. Dispensary.

McClellan AFB, Calif. 95652-5990; 9 mi. NE of Sacramento. Phone (916) 643-2111; AUTOVON 633-1110. AFLC base. Hq. Sacramento Air Logistics Center provides logistics management, procurement, maintenance, and distribution support for USAF weapon systems (incl. F-111, FB-111, A-10, EF-111), surveillance and warning systems, the Space Transportation System, communications-electronics equipment, radar sites, and generators; maintenance support for F-4 and F-106 aircraft. Associate units include 41st Rescue and Weather Reconnaissance Wing (MAC); 2049th Communications Gp. (AFCC); 1849th Electronics Installation Sqdn. (AFCC); Technical Operations Division (AFTAC); 431st Test and Evaluation Sqdn. (TAC); Hq. 4th Air Force (AFRES); Defense Logistics Agency; US Coast Guard Air Station, Sacramento (DOT). Named for Maj. Hezekiah McClellan, pioneer in Arctic aeronautical experiments who was killed in crash May 25, 1936. Area 2,790 acres. Altitude 76 ft. Military 3,288; civilians 14,471. Payroll $450.1 million. Housing: 168 officer; 507 NCO; 21 guest quarters. Clinic.

McConnell AFB, Kan. 67221; 5 mi. SE of Wichita. Phone (316) 681-6100; AUTOVON 743-1110. SAC base. 381st Strategic Missile Wing; 384th Air Refueling Wing; 184th Tactical Fighter Gp. (ANG). Base activated June 5, 1951; named for Capt. Fred J. McConnell, WW II B-24 pilot who died in crash of a private plane Oct. 25, 1945, and for his brother, 2d Lt. Thomas L. McConnell, also a WW II B-24 pilot, killed July 10, 1943, during attack on Bougainville in the Pacific. Area 3,066 acres. Altitude 1,371 ft. Military 3,722; civilians 1,181. Payroll $125.5 million. Housing: 149 officer; 440 NCO; 141 transient. 15-bed hospital.

McGuire AFB, N. J. 08641-5000; 18 mi. SE of Trenton. Phone (609) 724-1110; AUTOVON 440-0111. MAC base. 438th Military Airlift Wing; Hq. 21st Air Force; New Jersey ANG; New Jersey Civil Air Patrol; 170th Air Refueling Gp. (ANG); 108th Tactical Fighter Wing (ANG); 514th Military Airlift Wing (AFRES Assoc.); MAC NCO Academy East; Air Force Band of the East. Base adjoins Army's Fort Dix; formerly Fort Dix Army Air Base. Activated as AFB in 1949; named for Maj. Thomas B. McGuire, Jr., P-38 pilot, second leading US ace of WW II and recipient of Medal of Honor, killed in action Jan. 7, 1945, in the Philippines. Area 3,552 acres. Altitude 133 ft. Military 5,117; civilians 2,007. Payroll $117.8 million. Housing: 194 officer; 1,560 NCO; 620 transient (186 VOQ, 244 VAQ, 160 transient family units, 30 other transient). Dispensary and 150-bed hospital at Fort Dix.

Minot AFB, N. D. 58705; 13 mi. N of Minot. Phone (701) 727-4761; AUTOVON 344-1110. SAC base. 57th Air Div.; 91st Strategic Missile Wing; 5th Bomb Wing; 5th Fighter Interceptor Sqdn. (TAC). Base activated Feb. 1957. Area 5,050 acres, plus additional 19,324 acres for missile sites. Altitude 1,650 ft. Military 6,100; civilians 529. Payroll $135.5 million. Housing: 543 officer; 1,927 NCO; 104 transient. Dispensary and 40-bed military hospital in city of Minot.

Moody AFB, Ga. 31699-5000; 10 mi. NNE of Valdosta. Phone (912) 333-4211; AUTOVON 460-1110. TAC base. 347th Tactical Fighter Wing, F-4E fighter operations. Base activated June 1941; named for Maj. George P. Moody, killed May 5, 1941, while test-flying Beech AT-10. Area 6,050 acres. Altitude 233 ft. Military 3,369; civilians 500. Payroll $257 million. Housing: 36 officer; 268 NCO; 54 transient. 25-bed hospital.

Mountain Home AFB, Idaho 83648-5000; 56 mi. SE of Boise. Phone (208) 828-2111; AUTOVON 857-1110. TAC base. 366th Tactical Fighter Wing, F-111A fighter and EF-111A electronic countermeasures operations. 2036th Information Systems Sqdn. (AFCC); 513th Field Training Det. (ATC); Det. 22, 40th Aerospace Rescue and Recovery Sqdn. (MAC); OL/AF 4444th Operations Sqdn.; Det. 2, USAF Fighter Weapons School; Det. 3, Tactical Air Warfare Center; AFOSI Det. 2007; Det. 454, Air Force Audit Agency; Det. 11, 4400th Management Engineering Sqdn.; Det. 18, 25th Weather Sqdn. Base activated Apr. 1942. Area 6,639 acres. Altitude 3,000 ft. Military 3,906; civilians 506. Payroll $78 million. Housing: 152 officer; 1,369 NCO; 121 transient (16 TLF). 30-bed hospital.

Myrtle Beach AFB, S. C. 29579; in south Myrtle Beach. Phone (803) 238-7211; AUTOVON 748-1110. TAC base. Shares runway with Myrtle Beach Jetport. 354th Tactical Fighter Wing, A-10 fighter operations. Served as Army air base, 1941–47; USAF base since 1956. Area 3,793 acres. Altitude 25 ft. Military 3,450; civilians 455. Payroll $81 million. Housing: 95 officer; 682 NCO; 65 trailer lots; 117 transient. 25-bed hospital.

Nellis AFB, Nev. 89191-5000; 8 mi. NE of Las Vegas. Phone (702) 643-1800; AUTOVON 682-1800. TAC base. Tactical Fighter Weapons Center, F-5E, F-15, F-16, F-111, A-10, T-38, and UH-1N operations; 57th Fighter Weapons Wing, F-5E Aggressor operations; Thunderbirds Air Demonstration Sqdn.; 4440th Tactical Fighter Training Gp. (Red Flag); 554th Operations Support Wing; 554th Range Gp.; 474th Tactical Fighter Wing, F-16 operations; 4450th Tactical Training Gp.; 820th Civil Engineering Sqdn. "Red Horse"; 3096th Aviation Depot Sqdn.; 2069th Information Systems Sqdn. Base activated July 1941:

USAF's Principal Bases Overseas

Andersen AFB, Guam
APO San Francisco 96334
AUTOVON 322-1110
Hq. 3d Air Division, SAC
43d Strategic Wing
605th Military Airlift Support Squadron, MAC
54th Weather Reconnaissance Squadron, MAC
27th Information Systems Squadron, AFCC
Det. 11, 2d Aircraft Delivery Group, TAC

Ankara AS, Turkey
APO New York 09254
AUTOVON 672-1110
Hq. TUSLOG
7217th Air Base Group, USAFE
Command, logistical management

Aviano AB, Italy
APO New York 09293
AUTOVON 632-1110
40th Tactical Group, USAFE
Support base, USAFE

Bitburg AB, W. Germany
APO New York 09132
AUTOVON 453-1110
36th Tactical Fighter Wing, USAFE

Camp New Amsterdam, The Netherlands
APO New York 09292
(Call Sembach, AUTOVON 496-1110; ask for Camp New Amsterdam.)
32d Tactical Fighter Squadron, USAFE

Clark AB, Republic of the Philippines
APO San Francisco 96274-5000
AUTOVON 869-1110
Hq. 13th Air Force, PACAF
3d Tactical Fighter Wing, PACAF
374th Tactical Airlift Wing, MAC
6922d Electronic Security Squadron, ESC

Comiso AS, Italy
APO New York 09694
AUTOVON 628-8110
487th Tactical Missile Wing, USAFE

Florennes AB, Belgium
APO New York 09188
AUTOVON 791-3255
485th Tactical Missile Wing, USAFE

Hahn AB, W. Germany
APO New York 09109
AUTOVON 450-1110
50th Tactical Fighter Wing, USAFE

Hellenikon AB, Greece
APO New York 09223
AUTOVON 662-1110
7206th Air Base Group, USAFE
Support, communications, USAFE

Hessisch-Oldendorf AS, W. Germany
APO New York 09669
(Call Sembach, AUTOVON 496-1110; ask for Hessisch-Oldendorf.)
600th Combat Support Squadron, USAFE
Support, communications, USAFE

Howard AFB, Panama
APO Miami 34001-5000
AUTOVON 284-1110
Hq. USAF Southern Air Division, TAC

Incirlik AB, Turkey
APO New York 09289
AUTOVON 676-1110
39th Tactical Group, USAFE
Support base, USAFE

Iraklion AS, Crete
APO New York 09291
AUTOVON 668-1110
7276th Air Base Group, USAFE
Support base, USAFE

Izmir AS, Turkey
APO New York 09224
AUTOVON 675-1110
7241st Air Base Group, USAFE
Support base, USAFE

Kadena AB, Okinawa, Japan
APO San Francisco 96239-5000
AUTOVON 630-1110
313th Air Division, PACAF
18th Tactical Fighter Wing, PACAF
18th Combat Support Wing, PACAF
376th Strategic Wing, SAC
1962d Information Systems Group, AFCC
6990th Electronic Security Group, ESC
961st Airborne Warning and Control Squadron, TAC

Keflavik NS, Iceland
FPO New York 09571
AUTOVON 231-1290
Fighter-interceptor unit, TAC

Kunsan AB, Republic of Korea
APO San Francisco 96264-5000
AUTOVON 272-2345
8th Tactical Fighter Wing, PACAF

Kwangju AB, Republic of Korea
APO San Francisco 96264-5000
(Call Korea, AUTOVON 272-2345; ask for Kwangju AB.)
6171st Air Base Squadron, PACAF

Lajes Field, Azores
APO New York 09406
AUTOVON 723-1410
Airlift support base, MAC

Lindsey AS, W. Germany
APO New York 09633
AUTOVON 339-1110
7100th Combat Support Wing, USAFE
USAF Regional Medical Center (Wiesbaden)
Support base, USAFE

Misawa AB, Japan
APO San Francisco 96519-5000
AUTOVON 895-1101
432d Tactical Fighter Wing, PACAF
13th Tactical Fighter Squadron, PACAF
6920th Electronic Security Group, ESC

Osan AB, Republic of Korea
APO San Francisco 96570-5000
AUTOVON 284-4110
314th Air Division, PACAF
51st Tactical Fighter Wing, PACAF
5th Tactical Air Control Group, PACAF
6th Tactical Intelligence Group, PACAF
2146th Information Systems Group, AFCC
6903d Electronic Security Group, ESC

RAF Alconbury, United Kingdom
APO New York 09238

named for 1st Lt. William H. Nellis, WW II P-47 fighter pilot, killed Dec. 27, 1944, in Europe. Area 11,274 acres with ranges totaling 3,012,770 acres. Altitude 2,171 ft. Military 13,500; civilians 1,500. Payroll $426 million. Housing: 113 officer; 1,384 enlisted; 100 trailer spaces; 900 transient. 50-bed hospital.

Norton AFB, Calif. 92409-5000; 59 mi. E of Los Angeles, within San Bernardino corporate limits. Phone (714) 382-1110; AUTOVON 876-1110. MAC base. 63d Military Airlift Wing; Hq. Air Force Inspection and Safety Center; Hq. Air Force Audit Agency; Hq. Aerospace Audiovisual Service (MAC). Also Ballistic Missile Office (AFSC); 445th Military Airlift Wing (AFRES Assoc.); MAC NCO Academy West; 22d Air Force NCO Leadership School. Base activated Mar. 2, 1942; named for Capt. Leland F. Norton, native of San Bernardino, WW II A-20 attack bomber pilot, killed in action May 27, 1944, near Amiens, France. Area 2,430 acres. Altitude 1,156 ft. Military 8,646 (incl. AFRES); civilians 2,939. Payroll $350 million. Housing: 55 officer; 208 NCO; 350 transient. Clinic.

Offutt AFB, Neb. 68113; 8 mi. S of Omaha. Phone (402) 294-1110; AUTOVON 271-1110. SAC base. Hq. Strategic Air Command; 55th Strategic Reconnaissance Wing; 544th Strategic Intelligence Wing; Air Force Global Weather Central (MAC); 3d Weather Wing (MAC); Hq. Strategic Information Systems Wing (AFCC); 1st Aerospace Information Systems Wing (AFCC); 1000th Satellite Operations Gp. (AFSPACECOM); 6949th Electronic Security Sqdn. (ESC); 702d Air Force Band. Base activated 1896 as Army's Fort Crook; landing field named in 1924 for 1st Lt. Jarvis J. Offutt, WW I pilot, died Aug. 13, 1918, from injuries received at Valheureux, France. Area 1,914 acres (incl. housing area and off-base sites). Altitude 1,048 ft. Military 12,052; civilians 3,490 (incl. 518 contractor personnel). Payroll $330 million. Housing: 511 officer; 2,169 NCO; 60 transient. 90-bed hospital.

Patrick AFB, Fla. 32925; 2 mi. S of Cocoa Beach. Phone (305) 494-1110; AUTOVON 854-1110. AFSC base. Operated by the Eastern Space and Missile Center in support of DoD, NASA, and other agency missile and space programs. Major tenants are Defense Equal Opportunity Management Institute; Air Force Technical Applications Center; 549th Tactical Air Support Gp.; 2d Combat Information Systems Gp. (AFCC). Base activated 1940; serves as airhead for Cape Canaveral AFS. CCAFS has supported more than 2,300 launches since 1950. Named for Maj. Gen. Mason M. Patrick, chief of AEF's Air Service in WW I and chief of the Air Service/Air Corps, 1921–27. Area 2,341 acres. Altitude 9 ft. Military 4,494; civilians 1,640. Payroll $146.8 million. Housing: 168 officer; 1,408 NCO. 25-bed hospital.

Pease AFB, N. H. 03803; 3 mi. W of Portsmouth. Phone (603) 430-0100; AUTOVON 852-1110. SAC base. 45th Air Div.; 509th Bomb Wing (FB-111 medium bomber and KC-135 tanker operations); 541st Air Force Band; 1916th Information Systems Sqdn. (AFCC); 3519th USAF Recruiting Sqdn. (ATC); 157th Air Refueling Gp. (ANG). Base activated 1956; named for Capt. Hart Pease, Jr., WW II B-17 pilot and Medal of Honor recipient, killed Aug. 7, 1942, during attack on Rabaul, New Britain Island. Area 4,254 acres. Altitude 101 ft. Military 3,532; civilians 457. Payroll $99.8 million. Housing: 196 officer; 1,015 NCO (plus 50 trailer spaces); 124 transient (incl. 41 VOQ, 55 VAQ, 28 TLF). 70-bed hospital.

Peterson AFB, Colo. 80914-5000. Eastern edge of Colorado Springs. Phone (303) 554-7321; AUTOVON 692-7011. AFSPACECOM base. Host unit is 1st Space Wing (AFSPACECOM). Hq. US Space Command; Hq. USAF Space Command, Hq. North American Aerospace Defense Command; NORAD Cheyenne Mountain Complex; 2d Space Wing (Consolidated Space Operations Center located 9 mi. east at Falcon AFS); 302d TAW (AFRES). Base activated 1942; named for 1st Lt. Edward J. Peterson, killed Aug. 8, 1942, in aircraft crash at the base. Area 1,176 acres. Altitude 6,200 ft. Military active-duty 4,261; reserves 952; civilians 1,420. Payroll $135.9 million. Housing: 106 officer; 384 NCO; 40 transient. Clinic.

Plattsburgh AFB, N. Y. 12903; adjacent to Plattsburgh. Phone (518) 565-5000; AUTOVON 689-5000. SAC base. 380th Bomb Wing, medium bomber and tanker operations with FB-111 and KC-135. 4007th Combat Crew Training Sqdn. trains all FB-111 combat crews for SAC. Det. 16, 40th Aerospace Rescue and Recovery Sqdn. (MAC); 71st Flying Training Wing (ATC); 2042d Information Systems Sqdn. (AFCC); 210th Field Training Det. Second oldest active military installation in the US, established 1814; AFB since 1955. Area 3,388 acres. Altitude 235 ft. Military 4,029; civilians 671. Payroll $77 million. Housing: 230 officer; 1,412 NCO. 20-bed hospital.

Pope AFB, N. C. 28308-5000; 12 mi. NNW of Fayetteville. Phone (919) 394-0001; AUTOVON 486-1110. MAC base. USAF Airlift Center; 317th Tactical Airlift Wing; 1st Aeromedical Evacuation Sqdn.; 1943d Information Services Sqdn.; 53d Mobile Aerial Port Sqdn. (AFRES); 1721st Combat Control Sqdn. Base adjoins Army's Fort Bragg and provides intratheater airlift support for airborne forces and other personnel, equipment, and supplies. Base activated 1919; named for 1st Lt. Harley H. Pope, WW I flyer, killed Jan. 6, 1919, when his JN-4 "Jenny" ran out of fuel and crashed near Fayetteville. Area 1,750 acres. Altitude 218 ft. Military 3,872; civilians 686. Payroll $97.8 million. Housing: 89 officer; 370 NCO; 216 transient. Clinic.

Randolph AFB, Tex. 78150-5001; 20 mi. ENE of San Antonio. Phone (512) 652-1110; AUTOVON 487-1110. ATC base. Hq. Air Training Command; 12th Flying Train-

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AUTOVON 223-1110
10th Tactical Reconnaissance Wing, USAFE
17th Reconnaissance Wing, SAC

RAF Bentwaters, United Kingoom
APO New York 09755
AUTOVON 225-1110
81st Tactical Fighter Wing, USAFE

RAF Chicksands, United Kingdom
APO New York 09193
AUTOVON 234-1110
7274th Air Base Group, USAFE
Support base, USAFE

RAF Fairford, United Kingdom
APO New York 09125
AUTOVON 247-1110
7020th Air Base Group, USAFE
KC-135 refueling support base, USAFE

RAF Greenham Common, United Kingdom
APO New York 09150
AUTOVON 266-1110
501st Tactical Missile Wing, USAFE

RAF Lakenheath, United Kingdom
APO New York 09179
AUTOVON 226-1110
48th Tactical Fighter Wing, USAFE

RAF Mildenhall, United Kingdom
APO New York 09127
AUTOVON 238-1110
Hq. 3d Air Force, USAFE
513th Tactical Airlift Wing, USAFE
306th Strategic Wing, SAC (Rotational)
313th Tactical Airlift Group, MAC (Rotational)

RAF Upper Heyford, United Kingdom
APO New York 09194
AUTOVON 253-1110
20th Tactical Fighter Wing, USAFE

RAF Woodbridge, United Kingdom
APO New York 09405
AUTOVON 225-1110
81st Tactical Fighter Wing, USAFE
67th Aerospace Rescue and Recovery Squadron, MAC

Ramstein AB, W. Germany
APO New York 09012
AUTOVON 480-1110
Hq. USAFE
316th Air Division, USAFE
86th Tactical Fighter Wing, USAFE
Hq. European Information Systems Division, AFCC
7th Air Division, SAC
322d Airlift Division, MAC
2d Weather Wing, MAC

Rhein-Main AB, W. Germany
APO New York 09057
AUTOVON 330-1110
Tactical airlift base, MAC

San Vito AS, Italy
APO New York 09240
AUTOVON 622-1110
7275th Air Base Group, USAFE
Support base, USAFE

Sembach AB, W. Germany
APO New York 09130
AUTOVON 496-1110
Hq. 17th Air Force, USAFE
65th Air Division, USAFE
66th Electronic Combat Wing, USAFE
601st Tactical Control Wing, USAFE
Allied Tactical Operations Center (Sembach)
Command control communications, electronic combat

Sondrestrom AB, Greenland
APO New York 09121
(Call AUTOVON 834-1211; ask for Sondrestrom AB.)
Support base, AFSPACECOM

Spangdahlem AB, W. Germany
APO New York 09123
AUTOVON 452-1110
52d Tactical Fighter Wing, USAFE

Suwon AB, Republic of Korea
APO San Francisco 96461-5000
(Call Korea, AUTOVON 284-4110; ask for Suwon AB.)
25th Tactical Fighter Squadron, PACAF
(51st Tactical Fighter Wing)

Taegu AB, Republic of Korea
APO San Francisco 96213-5000
(Call Korea, AUTOVON 284-4110; ask for Taegu AB.)
497th Tactical Fighter Squadron, PACAF
(51st Tactical Fighter Wing)

Tempelhof Central Airport, West Berlin
APO New York 09611
AUTOVON 332-1110
7350th Air Base Group, USAFE
6912th Electronic Security Group, ESC
Support base, USAFE

Thule AB, Greenland
APO New York 09023-5000
(Call AUTOVON 834-1211; ask for Thule AB.)
Support base, AFSPACECOM

Torrejon AB, Spain
APO New York 09283
AUTOVON 723-1110
Hq. 16th Air Force, USAFE
401st Tactical Fighter Wing, USAFE

Wuescheim AS, W. Germany
APO New York 09109
AUTOVON 450-7619
38th Tactical Missile Wing, USAFE

Yokota AB, Japan
APO San Francisco 96328-5000
AUTOVON 248-1101
Hq. US Forces, Japan
Hq. 5th Air Force, PACAF
475th Air Base Wing, PACAF
316th Tactical Airlift Group, MAC
1956th Information Systems Group, AFCC
1837th Electronics Installation Squadron, AFCC

Zaragoza AB, Spain
APO New York 09286
AUTOVON 724-1110
406th Tactical Fighter Training Wing, USAFE
Tactical fighter training base, USAFE

Zweibrücken AB, W. Germany
APO New York 09860
AUTOVON 498-1110
26th Tactical Reconnaissance Wing, USAFE
10th Military Airlift Squadron, MAC

ing Wing. T-37 and T-38 pilot instructor training; Air Force Manpower and Personnel Center; Occupational Measurement Center; Office of Civilian Personnel Operations; Hq. USAF Recruiting Service. Base activated June 1930; named for Capt. William M. Randolph, killed Feb. 17, 1928, when his AT-4 crashed on takeoff at Gorman, Tex. Area 2,901 acres. Altitude 761 ft. Military 5,070; civilians 4,418. Payroll $228 million. Housing: 186 officer; 833 NCO; 150 transient. Clinic.

Reese AFB, Tex. 79489-5000; adjacent to Lubbock. Phone (806) 885-4511; AUTOVON 836-1110. ATC base. 64th Flying Training Wing, undergraduate pilot training. Base activated 1942; named for 1st Lt. Augustus F. Reese, Jr., P-38 fighter pilot killed in Sardinia May 14, 1943. Area 2,467 acres. Altitude 3,338 ft. Military 2,513; civilians 735. Payroll $73.3 million. Housing: 112 officer; 295 NCO; 63 transient. 15-bed hospital.

Robins AFB, Ga. 31098; at Warner Robins; 18 mi. SSE of Macon. Phone (912) 926-1110; AUTOVON 468-1110. AFLC base. Hq. Warner Robins Air Logistics Center; Hq. Air Force Reserve (AFRES); 2853d Air Base Gp.; 19th Air Refueling Wing (SAC); 5th Combat Information Systems Gp. (AFCC); 3503d Recruiting Gp.; 1926th Information Systems Sqdn. (AFCC). Base activated Mar. 1942; named for Brig. Gen. Augustine Warner Robins, an early Chief of the Materiel Division of the Air Corps, died June 16, 1940. Area 8,863 acres. Altitude 294 ft. Military 3,889; civilians 16,810. Payroll $583 million. Housing: 225 officer; 1,171 NCO; 40 TLF, 150 VOQ, 120 VAQ; 100 trailer spaces. 30-bed hospital.

Sawyer AFB *(see K. I. Sawyer AFB).*

Scott AFB, Ill. 62225-5000; 6 mi. ENE of Belleville. Phone (618) 256-1110; AUTOVON 638-1110. MAC base. Hq. Military Airlift Command; Hq. Air Force Communications Command; 375th Aeromedical Airlift Wing; Hq. 23d Air Force; Hq. Aerospace Rescue and Recovery Service; Hq. Air Weather Service; Defense Commercial Communications Office; Environmental Technical Applications Center; USAF Medical Center, Scott; 7th Weather Wing; 932d Aeromedical Airlift Gp. (AFRES Assoc.); Airlift Communications Div.; 375th Air Base Gp. Base activated June 14, 1917; named for Cpl. Frank S. Scott, first enlisted man to die in an air accident, killed Sept. 28, 1912, at College Park, Md. Area 3,000 acres. Altitude 453 ft. Military 7,034; civilians 3,113. Payroll $275.5 million. Housing: 393 officer; 1,366 NCO, plus 105 spaces for privately owned trailers; 300 transient, 185-bed hospital; 100-bed aeromedical staging facility.

Seymour Johnson AFB, N. C. 27531-5000; adjacent to Goldsboro. Phone (919) 736-0000; AUTOVON 488-1110. TAC base. 4th Tactical Fighter Wing, F-4E fighter operations; 68th Air Refueling Gp. (SAC); 2012th Information Systems Sqdn. (AFCC). Base activated June 12, 1942; named for Navy Lt. Seymour A. Johnson, Goldsboro native, killed Mar. 5, 1941, in an aircraft accident in Maryland. Area 4,122 acres. Altitude 109 ft. Military 4,389; civilians 816. Payroll $120 million. Housing: 217 officer; 1,483 enlisted; 149 transient (95 VAQ, 46 VOQ, 8 BOQ), plus 27 transient family units. 35-bed hospital.

Shaw AFB, S. C. 29152-5000; 10 mi. WNW of Sumter. Phone (803) 668-8110; AUTOVON 965-1110. TAC base. 363d Tactical Fighter Wing, F-16 fighter and RF-4C reconnaissance operations; Hq. 9th Air Force (TAC); 507th Tactical Air Control Wing, manages 407L/485L tactical air control systems. Base activated Aug. 30, 1941; named for 2d Lt. Ervin D. Shaw, one of the first Americans to see air action in WW I, killed in action in France on July 9, 1918, when his Bristol fighter was shot down during a reconnaissance mission. Area 3,363 acres; supports another 6,078 acres. Altitude 244 ft. Military 6,125; civilians 1,666. Payroll $135 million. Housing: 389 officer; 1,315 NCO; 189 transient. 40-bed hospital.

Shemya AFB, Alaska (APO Seattle 98736); located at western tip of the Aleutian Islands chain, midway between Anchorage, Alaska, and Tokyo, Japan. Phone (907) 392-3000; AUTOVON (317) 392-3000. AAC base. 5073d Air Base Gp. (AAC) host unit. Base activated 1943. Shemya was used as a bomber base in WW II. The international Date Line has been bent around Shemya so that the local date is the same as elsewhere in the US. Island area about 11.25 sq. mi. Altitude 270 ft. Military 596; civilian contract employees 399. Payroll $8.4 million. Housing: 70 transient. Dispensary.

Sheppard AFB, Tex. 76311-5000; 4 mi. N of Wichita Falls. Phone (817) 851-2511; AUTOVON 736-1001. ATC base. Sheppard Technical Training Center includes the 3700th Technical Training Wing, which provides resident courses in aircraft maintenance, civil engineering, communications, comptroller, transportation, and instructor training. The 3785th Field Training Wing provides specialized and advanced training at 76 field training detachments and 20 operating locations worldwide. The School of Health Care Sciences provides training in medicine, dentistry, nursing, biomedical sciences, medical readiness, and health services administration. The 80th Flying Training Wing conducts undergraduate pilot training and instructor training for the Euro-NATO Joint Jet Pilot Training Program. The wing trains allied fighter pilots for 12 NATO countries. Base activated June 14, 1941; named for Morris E. Sheppard, US Senator from Texas, died 1941. Area 5,000 acres. Altitude 1,015 ft. Military 7,954; civilians 1,477. Payroll $225.8 million. Housing: 244 officer; 1,063 NCO. 145-bed regional hospital.

Tinker AFB, Okla. 73145; 8 mi. SE of Oklahoma City. Phone (405) 734-7321; AUTOVON 735-1110. AFLC base. Hq. Oklahoma City Air Logistics Center; furnishes logistic support for bombers, jet engines, instruments, and electronics. Engineering Installation Div.; 3d Combat Communications Gp.; 28th Air Div. (TAC); 507th Tactical Fighter Gp. (AFRES). Base activated Mar. 1941; named for Maj. Gen. Clarence L. Tinker. On June 7, 1942, at the end of the Battle of Midway, General Tinker's LB-30 (an early model B-24) apparently went down at sea after attacking retreating enemy ships. Area 4,277 acres. Altitude 1,291 ft. Military 7,300; civilians 19,100. Payroll $640 million. Housing: 108 officer; 522 NCO. 30-bed hospital.

Travis AFB, Calif. 94535-5000; at Fairfield, 50 mi. NE of San Francisco. Phone (707) 438-4011; AUTOVON 837-1110. MAC base. Hq. 22d Air Force; 60th Military Airlift Wing; 349th Military Airlift Wing (AFRES Assoc.); David Grant Medical Center. Base activated May 25, 1943; named for Brig. Gen. Robert F. Travis, killed Aug. 5, 1950, in a B-29 accident. Area 7,580 acres. Altitude 62 ft. Military 12,318; civilians 3,389. Payroll $336.5 million. Housing: 241 officer; 1,926 NCO; 584 transient (incl. 40 TLQ, 204 VOQ, 188 VAQ, 83 aerial port quarters with cooking facilities, 69 aerial port quarters without). 290-bed hospital.

Tyndall AFB, Fla. 32403; 13 mi. E of Panama City. Phone (904) 283-1113; AUTOVON 970-1110. TAC base. USAF Air Defense Weapons Center; primary units are the 325th Tactical Training Wing, 475th Weapons Evaluation Gp., and 325th Combat Support Gp. Provides DoD a centralized location for operational and technical advice on air defense concepts and tactics and combat readiness training for tactical and strategic air defense aircrews and weapons controllers. Single-point management for all continental USAF subscale and full-scale drone aerial target operations. TAC units include 23d NORAD Region/23d Air Div.; home of Southeast Region Operations Control Center. Tenants include Air Force Engineering and Services Center; 3625th Technical Training Sqdn. (ATC); 2021st Information Systems Sqdn. (AFCC); TAC NCO Academy East. Base activated Dec. 7, 1941; named for 1st Lt. Frank B. Tyndall, WW I fighter pilot killed July 15, 1930, in crash of P-1 near Mooresville, N. C. Area 28,000 acres. Altitude 18 ft. Military 4,464; civilians 1,517. Payroll $128.7 million. Housing: 139 officer; 814 NCO. 50-bed hospital.

US Air Force Academy, Colo. 80840-5000; 10 mi. N of Colorado Springs. Phone (303) 472-3110; AUTOVON 259-3110. Direct reporting unit, activated Apr. 1, 1954, at Lowry AFB, Colo. Moved to permanent location Aug. 1958. Tenant units include 1876th Information Systems Support Gp.; Frank J. Seiler Research Lab (AFSC); DoD Medical Exam Review Board; Det. 470, Air Force Audit Agency; 557th Flying Training Sqdn.; 94th Air Training Sqdn. Area 18,000 acres. Altitude 7,280 ft. Military 2,382; cadets 4,327; civilians 1,750. Payroll $186 million. Housing: 452 officer; 779 NCO; 80 transient, plus 28 temporary family quarters. 85-bed hospital.

Vance AFB, Okla. 73705-5000; 3 mi. SSW of Enid. Phone (405) 237-2121; AUTOVON 962-7110. ATC base. 71st Flying Training Wing, undergraduate pilot training. Base activated Nov. 1941; named for Lt. Col. Leon R. Vance, Jr., native of Enid, 1939 West Point graduate, and Medal of Honor recipient; killed July 26, 1944, when the air-evac plane returning him to the US went down in the Atlantic near Iceland. Area 1,811 acres. Altitude 1,307 ft. Military 1,300; civilians 1,320 (1,200 contract employees). Payroll $72.7 million. Housing: 139 officer; 134 NCO; 39 transient, plus 10 TLF. Clinic.

Vandenberg AFB, Calif. 93437; 8 mi. NNW of Lompoc. Phone (805) 866-1611; AUTOVON 276-1110. SAC base. 1st Strategic Aerospace Div. (SAC); Space and Missile Test Organization (AFSC); Western Space and Missile Test (AFSC); Shuttle Test Group (AFSC). Host command conducts missile crew training and provides facilities and support for operational ballistic missiles in the SAC deterrent force. WSMC is responsible for conducting R&D testing of USAF space and ballistic missile programs and launching unmanned polar-orbiting space operations of DoD, USAF, and NASA. WSMC provides the test range and/or support for all base launches, aeronautical tests, and on-orbit activities, including those associated with Peacekeeper, antisatellite, Space Transportation System, and cruise-missile programs. The 6595th Shuttle Test Group (STG) is responsible for operation of the Vandenberg Space Shuttle Launch and Landing Site (VLS). Originally Army's Camp Cooke. Activated Oct. 1941. Base taken over by USAF June 7, 1957; renamed for Gen. Hoyt S. Vandenberg, USAF's second Chief of Staff. Area 98,400 acres. Altitude 400 ft. Military 3,962; civilians 1,197; civilian contractors 8,658. Payroll $180 million (military and civilian); $255 million (contractors). Housing: 511 officer; 1,567 NCO; 172 mobile trailer spaces; 400 transient. 45-bed hospital.

Warren AFB *(see Francis E. Warren AFB).*

Wheeler AFB, Hawaii 96854-5000; near center of the island of Oahu, adjacent to the Army's Schofield Barracks. Phone (808) 422-0531; AUTOVON 430-0111. PACAF base. Host unit 15th Air Base Sqdn. 326th Air Div. (Air Defense Control Center); 22d Tactical Airlift Support Sqdn.; 169th Aircraft Warning and Control Sqdn. (Hawaii

Guide to Air Force Stations

In addition to the major facilities in this Guide to Bases, USAF has a number of Air Force stations (AFS) throughout the US and overseas. These stations perform varied missions, including air defense and missile warning. Here is a listing of stations with state, ZIP code, and major command. Where a station can be reached by a general-purpose AUTOVON number, such a number (AV) is listed. If it can be reached by NORAD Tactical AUTOVON System (NTAS), the number (NTAS) is listed. Commercial telephone numbers (AC) are given for stations not having access to AUTOVON.

Albrook AFS, APO Miami 34002 (TAC) — AV 222-4012
Bellows AFS, Hawaii 96795-5000 (PACAF) — AC (808) 259-5941
Calumet AFS, Michigan 49913 (TAC) — NTAS 640-1301
Cape Canaveral AFS, Florida 32925-5000 (AFSC) — AV 467-1110
Cape Cod AFS, Massachusetts 02532-1419 (AFSPACECOM) — AV 557-2277
Cavalier AFS, North Dakota 28220-5000 (AFSPACECOM) — AV 330-3298
Clear AFS, APO Seattle 98704 (AFSPACECOM) — AV 317-585-6409
Cudjoe Key AFS, Florida 33039 (TAC) — AV 483-8452
Falcon AFS, Colorado 80912 (AFSPACECOM) — AV 692-7011
Fort Fisher AFS, North Carolina 28449 (TAC) — NTAS 652-2265
Galena Airport, APO Seattle 98723 (AAC) — AV 317-446-3311
Gentile AFS, Ohio 45401 (AFLC) — AV 986-5111
John Hay AS, APO San Francisco 96298-5000 (PACAF) — AV 822-1201
King Salmon Airport, APO Seattle 98713 (AAC) — AV 317-721-3301
Makah AFS, Washington 98357 (TAC) — NTAS 490-6343
Newark AFS, Ohio 43057-5000 (AFLC) — AV 580-2171
Oklahoma City AFS, Oklahoma 73145-5000 (AFLC) — AV 735-9011
Point Arena AFS, California 95468 (TAC) — NTAS 644-4316
Port Austin AFS, Michigan 48467 (TAC) — NTAS 779-3345
Sunnyvale AFS, California 94088-3430 (AFSC) — AV 359-3611
Wallace AS, APO San Francisco 96277-5000 (PACAF) — AV 822-1201

Air National Guard—Air Defense Direction Center); US Army aviation units from Schofield Barracks; 6924th Electronic Security Sqdn.; several other associate units. Base activated Feb. 1922; named for Maj. Sheldon H. Wheeler, CO of Luke Field, Hawaii, in 1919; killed there July 13, 1921, when his biplane crashed during an aerial exhibition. Area 1,369 acres. Altitude 845 ft. Military 1,337; civilians 114. Payroll included in entry for Hickam AFB. Housing: 102 officer; 390 NCO. Dispensary.

Whiteman AFB, Mo. 65305; 1.5 mi. S of Knob Noster. Phone (816) 687-1110; AUTOVON 975-1110. SAC base. 351st Strategic Missile Wing. Base activated 1942; named for 2d Lt. George A. Whiteman, shot down while taking off in a fighter from Wheeler Field, Hawaii, on Dec. 7, 1941—the first Army Air Forces airman to be shot down in WW II. Area 3,384 acres, plus missile complex of about 10,000 sq. mi. Altitude 869 ft. Military 3,300; civilians 400. Payroll $114.7 million. Housing: 200 officer; 792 NCO; 46 transient (incl. 4 guest houses, 24 VAQ, and 18 VOQ). 25-bed hospital.

Williams AFB, Ariz. 85240-5000; 14 mi. SE of Mesa. Phone (602) 988-2611; AUTOVON 474-1001. ATC base, 82d Flying Training Wing. Largest undergraduate pilot training base; also provides F-5 combat crew training for foreign students via the 425th Tactical Fighter Training Sqdn. Home of AFSC Human Resources Lab/Flying Training Div., doing extensive research on flight simulators. Base activated July 1941; named for 1st Lt. Charles D. Williams, killed in bomber crash near Fort De Russy, Hawaii, July 6, 1927. Area 4,761 acres. Altitude 1,385 ft. Military 3,232; civilians 1,355. Payroll $104 million. Housing: 247 officer; 453 NCO; 40 transient. 30-bed hospital.

Wright-Patterson AFB, Ohio 45433; 10 mi. ENE of Dayton. Phone (513) 257-1110; AUTOVON 787-1110. AFLC base. Hq. Air Force Logistics Command; Hq. Aeronautical Systems Div. (AFSC); Air Force Institute of Technology; USAF Medical Center, Wright-Patterson; US Air Force Museum; Air Force Acquisition Logistics Center; Logistics Operations Center; Logistics Management Systems Center; AFLC International Logistics Center; 2750th Air Base Wing (AFLC); 906th Tactical Fighter Gp. (AFRES); more than 78 other DoD activities and government agencies. Originally separate, Wright Field and Patterson Field were merged and redesignated Wright-Pattersoh AFB on Jan. 13, 1948; named for aviation pioneers Orville and Wilbur Wright and for 1st Lt. Frank S. Patterson, killed June 19, 1918, in the crash of a DH-4. The Wright brothers did much of their early flying on Huffman Prairie, now in Area C of present base. Area 8,145 acres. Altitude 824 ft. Military 9,500; civilians 17,500; contracted service and contractor employees 6,000. Payroll $755 million. Housing: 1,090 officer; 1,280 NCO; 40 transient. 265-bed hospital.

Wurtsmith AFB, Mich. 48753; 3 mi. NW of Oscoda. Phone (517) 739-2011; AUTOVON 623-1110. SAC base. 40th Air Div.; 379th Bomb Wing. Base activated in 1924 as Camp Skeel, gunnery camp for Selfridge Field; became Oscoda Army Air Field during WW II; renamed in 1953 for Maj. Gen. Paul B. Wurtsmith, killed Sept. 13, 1946, in a B-25 crash near Asheville, N. C. Base assigned to SAC Apr. 1, 1960. Area 5,213 acres. Altitude 634 ft. Military 3,308; civilians 697. Payroll $85.2 million. Housing: 197 officer; 1,144 NCO; 30 transient. 20-bed hospital. ■

Guide to ANG and AFRES Bases

NOTE: This section of the Guide consolidates major Air National Guard (ANG) and Air Force Reserve (AFRES) bases into a single listing. Most ANG locations are listed alphabetically, according to the city where they are located. AFRES units are listed by the names of their bases and are designated as AFRES facilities. There are, in addition, some ANG and AFRES units that are located on active-duty bases. These may be found in the main "Guide to Bases" section, which is the section immediately preceding this one.

Anchorage, Alaska (Kulis ANG Base at Anchorage IAP) 99502. Phone (907) 243-1145; AUTOVON (317) 626-1444. 176th Tactical Airlift Gp. (ANG); 144th Tactical Airlift Sqdn. (ANG). Named for Lt. Albert Kulis, killed in training flight in 1954. Area 101 acres. Altitude 124 ft. Military 862, technicians 241. Payroll $12.6 million. 6-bed hospital.

Atlanta, Ga. (McCollum Airport, Kennesaw, Ga.) 30144; 27 mi. N of Atlanta, 10 mi. from Dobbins AFB. Phone (404) 422-2500; AUTOVON 925-2474. 129th Tactical Control Sqdn. Area 13 acres. Altitude 1,060 ft. Military 350, technicians 44. Payroll through Dobbins AFB.

Atlantic City Airport, N. J. (Federal Aviation Administration Technical Center) 08405-5199; 10 mi. W of Atlantic City. Phone (609) 645-6000; AUTOVON 445-6000. 177th Fighter Interceptor Gp. (ANG). Area 123 acres. Altitude 76 ft. Military 978, full-time support 315. Payroll $13.1 million.

Baltimore, Md. (Glenn L. Martin State Airport) 21220-2899; 8 mi. E of Baltimore. Phone (301) 687-6270; AUTOVON 235-9210. 175th Tactical Fighter Gp. (ANG); 135th Tactical Airlift Gp. (ANG). Area 75 acres. Altitude 89 ft. Military 1,798, technicians 425. Payroll $18.8 million. Clinic.

Bangor ANG Base, Me. 04401-4393; 4 mi. NW of Bangor. Phone (207) 947-0571; AUTOVON 476-6210. 101st Air Refueling Wg. (ANG). Area 314 acres. Altitude 192 ft. Military 980, technicians 272. Payroll $12.6 million. Small BX-Foodland.

Battle Creek ANG Base, Mich. 49015-1291; adjacent to W. K. Kellogg Airport. Phone (616) 963-1596; AUTOVON 580-3210. 110th Tactical Air Support Gp. (ANG). Area 241 acres. Altitude 941 ft. Military 954, technicians 211. Payroll $10.3 million.

Birmingham Municipal Airport, Ala. 35217. Phone (205) 841-9200; AUTOVON 694-2260. 117th Tactical Recon Wg. (ANG). Area 86 acres. Altitude 650 ft. Military 1,316, technicians 328. Payroll $16.4 million.

Boise Air Terminal, Idaho (Gowen Field) 83707; 6 mi. S of Boise. Phone (208) 385-5011; AUTOVON 941-5011. 124th Tactical Recon Gp. (ANG). Also host to ARNG (Army field training site) and Marine Corps Reserve. Airport named for Lt. Paul R. Gowen, killed in B-10 crash in Panama July 11, 1938. Area 2,600 acres (467 acres military). Altitude 2,858 ft. Military 1,407, technicians 399. Payroll $15.0 million. Limited transient facilities available during Army Guard camps.

Buckley ANG Base, Colo. 80011; 8 mi. E of Denver. Phone (303) 366-5363; AUTOVON 877-9011. 140th Tactical Fighter Wg. (ANG); 154th Tactical Control Gp.; Hq. Colorado ANG. Also host to Navy Reserve, Marine Corps Reserve, ARNG, and Air Force units. Base activated Apr. 1, 1942, as a gunnery training facility. ANG assumed control from US Navy in 1959. Named for Lt. John H. Buckley, National Guardsman, killed in the Argonne, France, Sept. 27, 1918. Area 3,262 acres. Altitude 5,663 ft. Military 1,340, technicians 324. Payroll $21.4 million. Dispensary.

Burlington, Vt. (Burlington International Airport) 05401; 3 mi. E of Burlington. Phone (802) 658-0770; AUTOVON 689-4310. 158th Tactical Fighter Gp. (ANG). Area 326 acres. Altitude 371 ft. Military 990, technicians 269. Payroll $11.9 million.

Charleston, W. Va. (Yeager Airport) 25311-5000; 4 mi. NE of Charleston. Phone (304) 357-5100; AUTOVON 366-9210. 130th Tactical Airlift Gp. (ANG). Area 56 acres. Altitude 981 ft. Military 965, technicians 213. Payroll $10.8 million. Dispensary, clinic.

Charlotte, N. C. (Charlotte/Douglas Municipal Airport) 28208. Phone (704) 399-6363; AUTOVON 583-9210. 145th Tactical Airlift Gp. (ANG). Area 69 acres. Altitude 749 ft. Military 1,184, technicians 227. Payroll $12.3 million. Clinic.

Cheyenne, Wyo. (Cheyenne Municipal Airport) 82001. Phone (307) 772-6201; AUTOVON 943-6201. 153d Tactical Airlift Gp. (ANG). Area 46 acres. Altitude 6,156 ft. Military 973, technicians 217. Payroll $10.4 million.

Dallas Naval Air Station, Tex. (Hensley Field) 75211. Phone (214) 266-6111; AUTOVON 874-6111. 136th Tactical Airlift Wg. (ANG). Area 49 acres. Altitude 495 ft. Military 1,039, technicians 228. Payroll $11.7 million.

Des Moines Municipal Airport, Iowa 50321; in city of Des Moines. Phone (515) 285-7182; AUTOVON 939-8210. 132d Tactical Fighter Wg. (ANG). Area 112 acres. Altitude 957 ft. Military 1,074, technicians 293. Payroll $12.9 million.

Dobbins AFB, Ga. 30069-5000; 2 mi. S of Marietta, 16 mi. NW of Atlanta. Phone (404) 429-5055; AUTOVON 925-1110. AFRES base. Hq. 14th Air Force (AFRES); 94th Tactical Airlift Wg. (AFRES); 116th Tactical Fighter Wg. (ANG). Base activated 1943; named for Capt. Charles Dobbins, WW II pilot killed in action near Sicily. Area 1,729 acres. Altitude 1,068 ft. AFRES: military 268, technicians 214, civilians 432, Reservists 2,493. Payroll $34.7 million. ANG: military 1,181, technicians 324. Payroll $16.9 million. Housing: 3 officer, 5 NCO. Dispensary.

Duluth International Airport, Minn. 55811-5000; 5 mi. NW of Duluth. Phone (218) 727-6886; AUTOVON 825-7210. 148th Fighter Interceptor Gp. (ANG). Area 152 acres. Altitude 1,429 ft. Military 1,028, technicians 335 (+ 25 civilians). Payroll $14.2 million.

Ellington ANG Base, Tex. 77034-5586; adjacent to Ellington Field, a City of Houston Airport 17 mi. SE of downtown Houston. Phone (713) 481-1400; AUTOVON 954-2110. 147th Fighter Interceptor Gp. (ANG). Other tenants include NASA Flight Operations, US Coast Guard, Army National Guard, FAA. Named for Lt. Eric L. Ellington, a pilot killed Nov. 1913. Area 209 acres. Altitude 40 ft. Military 1,022, technicians 333. Payroll $16.3 million.

Fargo, N. D. (Hector Field) 58105-5536. Phone (701) 237-6030; AUTOVON 362-8110. 119th Fighter Interceptor Gp. (ANG). Area 133 acres. Altitude 900 ft. Military 1,098, technicians 330. Payroll $14 million.

Forbes Fjeld, Kan. 66619-5000; 2 mi. S of Topeka. Phone (913) 862-1234; AUTOVON 720-4210. 190th Air Refueling Gp. (ANG). Area 170 acres. Altitude 1,079 ft. Military 895, technicians 259 (+ 43 civilians). Payroll $11.8 million.

Fort Smith Municipal Airport, Ark. (Ebing ANG Base) 72906. Phone (501) 646-1501; AUTOVON 962-8210. 188th Tactical Fighter Gp. (ANG). Area 95 acres. Altitude 468 ft. Military 986, technicians 275. Payroll $11.5 million.

Fort Wayne, Ind. (Fort Wayne Municipal Airport) 46809-5000; 5 mi. SSW of Fort Wayne. Phone (219) 478-3210; AUTOVON 786-1210. 122d Tactical Fighter Wg. (ANG). Area 87 acres. Altitude 800 ft. Military 1,131, technicians 325. Payroll $14 million.

Fresno Air Terminal, Calif. 93727-2199; 5 mi. NE of Fresno. Phone (209) 454-5100; AUTOVON 949-9210. 26th NORAD Region and 26th Air Div. (TAC); 194th Fighter Interceptor Sqdn. (ANG); 144th Fighter Interceptor Wg. (ANG). Area 139 acres. Altitude 332 ft. Military 1,010, technicians 340. Payroll $14.4 million.

Gen. Billy Mitchell Field, Wis. 53207; SE of Milwaukee. AFRES base. Altitude 722 ft. ANG and AFRES have separate phones and facilities. ANG phone (414) 747-4410; AUTOVON 580-8410. 128th Air Refueling Gp. (ANG). ANG area 65 acres. Military 1,015, technicians 293. Payroll $11.4 million. AFRES phone (414) 481-6400; AUTOVON 786-9110. 440th Tactical Airlift Wg. (AFRES). AFRES area 100 acres. Military 11, technicians 199, Reservists 918. Payroll $11.88 million.

Greater Peoria Airport, Ill. 61607; 7 mi. SW of Peoria. Phone (309) 697-6400; AUTOVON 724-9210. 182d Tactical Air Support Gp. (ANG). Area 137 acres. Altitude 624 ft. Military 962, technicians 215. Payroll $10.5 million. Dispensary.

Greater Pittsburgh International Airport, Pa. 15231; 15 mi. NW of Pittsburgh. Altitude 1,203 ft. AFRES base. ANG and AFRES have separate phones and facilities. ANG phone (412) 269-8350; AUTOVON 277-8350. 171st Air Refueling Wg. (ANG); 112th Tactical Fighter Gp. (ANG). ANG area 90 acres. Military 1,708, technicians 460. Payroll $20.3 million. AFRES phone (412) 269-8000; AUTOVON 277-8000. 911th Tactical Airlift Gp. (host unit). AFRES area 165 acres. Military 21, technicians 133, civilians 209, Reservists 1,050. Payroll $11.5 million. Other units include 1998th Communications Installation Gp. (AFCC). Base activated 1943. 50 VOQ; 230 enlisted qtrs.

Great Falls International Airport, Mont. 59401-5000; 5 mi. SW of Great Falls. Phone (406) 727-4650; AUTOVON 279-2301. 25th NORAD Region and 25th Air Div. (ADTAC); 120th Fighter Interceptor Gp. (ANG). Area 139 acres. Altitude 3,674 ft. Military 1,004, technicians 388. Payroll $15.3 million. Dispensary.

Gulfport-Biloxi Regional Airport, Miss. 39501; within city limits of Gulfport. Phone (601) 868-6200; AUTOVON 363-8200. Training site; also host to 255th Combat Communications Sqdn., the Army National Guard Transportation Repair Shop, and 173d Civil Engineering Flt. An air-to-ground gunnery range is located 70 mi. due north of site. Area 211 acres. Altitude 28 ft. ANG military 374, technicians 75. Payroll $2.1 million. 2-bed dispensary.

Harrisburg International Airport, Middletown, Pa. 17057; 10 mi. E of Harrisburg. Phone (717) 948-2201; AUTOVON 454-9201. 193d Special Operations Gp. (ANG). ANG area 70 acres. Altitude 310 ft. Military 1,117, technicians 269. Payroll $15.4 million.

Jackson Municipal Airport, Miss. (Allen C. Thompson Field) 39208-0810; 7 mi. E of Jackson. Phone (601) 968-8321; AUTOVON 731-9310. 172d Tactical Airlift Gp. (ANG). ANG area 84 acres. Altitude 346 ft. Military 962, technicians 235. Payroll $11.9 million. 6-bed dispensary.

Jacksonville International Airport, Fla. 32229; 15 mi. NW of Jacksonville. Phone (904) 757-1360; AUTOVON 460-7210. 125th Fighter Interceptor Gp. (ANG). Area 158 acres. Altitude 26 ft. Military 1,010, technicians 338. Payroll $14.2 million. 5-bed dispensary.

Kingsley Field, Ore. 97603-0400; 5 mi. SE of Klamath Falls. Phone (503) 883-6350; AUTOVON 830-6350. 114th Tactical Fighter Training Sqdn. (ANG); 142d OLAD (ANG). Area 405 acres. Altitude 4,000 ft. Named for Lt. David Kingsley of Oregon, killed in the Pacific in WW II. Military 214, technicians 50. Payroll $6 million. Clinic.

Knoxville, Tenn. (McGhee Tyson Airport) 37901; 10 mi. SW of Knoxville. Phone (615) 970-3077; AUTOVON 588-8210. Host unit is 134th Air Refueling Gp. (ANG). Tenants include 228th Combat Communications Sqdn. and ANG's I. G. Brown Professional Military Education Center. Area 287 acres. Altitude 980 ft. Military 1,165, technicians 337 (+ 4 civilians). Payroll $13.8 million. Dispensary.

Lincoln Municipal Airport, Neb. 68524-1897; 1 mi. NW of Lincoln. Phone (402) 473-1326; AUTOVON 720-1210. 155th Tactical Recon Gp. (ANG). Also hosts Army National Guard unit. Area 163 acres. Altitude 1,207 ft. Military 1,148, technicians 292. Payroll $13.3 million. Tactical clinic.

Louisville, Ky. (Standiford Field) 40213. Phone (502) 366-9400; AUTOVON 989-4400. 123d Tactical Recon Wg. (ANG). Area 65 acres. Altitude 497 ft. Military 1,238, technicians 310. Payroll $14.5 million.

Mansfield Lahm Airport, Ohio 44901-5000; 3 mi. N of Mansfield. Phone (419) 522-9355; AUTOVON 696-6210. 179th Tactical Airlift Gp. (ANG). Named for nearby city and aviation pioneer Brig. Gen. Frank P. Lahm. Area 45 acres. Altitude 1,296 ft. Military 958, technicians 211. Payroll $10.5 million. Dispensary.

Martinsburg, W. Va. (Eastern West Virginia Regional Airport) 25401; 4 mi. S of Martinsburg. Phone (304) 267-5100; AUTOVON 242-9210. 167th Tactical Airlift Gp. (ANG). Area 346 acres. Altitude 556 ft. Military 1,019, technicians 215. Payroll $10.6 million. Dispensary.

McEntire ANG Base, S. C. 29044; 12 mi. E of Columbia. Phone (803) 776-5121; AUTOVON 583-8201. 169th Tactical Fighter Gp. (ANG). Also host to 240th Combat Communications Sqdn. (ANG) and Army Guard aviation unit. Base named for ANG Brig. Gen. B. B. McEntire, Jr., killed in an F-104 in 1961. Area 2,394 acres. Altitude 250 ft. Military 1,422, technicians 293. Payroll $14.5 million. Dispensary.

Memphis International Airport, Tenn. 38181-0026; within Memphis city limits. Phone (901) 369-4111; AUTOVON 966-8210. 164th Tactical Airlift Gp. (ANG). ANG occupies 85 acres. Altitude 332 ft. Military 957, technicians 166. Payroll $10.5 million. Clinic.

Meridian, Miss. (Key Field) 39302-1825; located at municipal airport near Highways 20 and 59. Phone (601) 693-5031; AUTOVON 694-9210. 186th Tactical Recon Gp. (ANG); host to 238th Combat Communications Sqdn. (ANG). Area 74 acres. Altitude 297 ft. Military 1,286, technicians 311. Payroll $14.3 million. 2-bed dispensary.

Minneapolis-St. Paul International Airport, Minn. 55450; in Minneapolis, near junction of Mississippi and Minnesota Rivers. AFRES base. Altitude 840 ft. ANG and AFRES have separate phones and facilities. ANG phone (612) 725-5011; AUTOVON 825-5681. 133d Tactical Airlift Wg. (ANG). ANG area 126 acres. Military 1,415, technicians 233. Payroll $14.6 million. AFRES phone (612) 725-5011; AUTOVON 825-5100. 934th Tactical Airlift Gp. (AFRES). AFRES area 300 acres. Reservists 999, technicians 135, civilians 225. Payroll $13.5 million for AFRES. Other units include 210th Engineering and Installation Sqdn. (ANG); 237th Air Traffic Control Flt. (ANG); 133d Field Training Flt. (ANG); Navy Readiness Comd., Region 16; Naval Air Reserve Center; Marine Wg. Support Gp., Det. 47; Defense Investigative Service; USAF-CAP/NCLR and CAP MNLO; Det. 3, 1974th Teleprocessing Gp. (USAF).

Moffett Naval Air Station, Calif. 94035; 2 mi. N of Mountain View. ANG phone (415) 966-4700; AUTOVON 462-4700. 129th Aerospace Rescue and Recovery Gp. (ANG). Area 12 acres. Altitude 34 ft. Military 703, technicians 222. Payroll $11.3 million.

Montgomery, Ala. (Dannelly Field) 36196; 7 mi. SW of Montgomery. Phone (205) 284-7210; AUTOVON 742-9210. 187th Tactical Fighter Gp. (ANG). Hosts 232d Combat Communications Sqdn. Named for Ens. Clarence Dannelly, Navy pilot killed at Pensacola, Fla., during WW II. Area 42 acres. Altitude 221 ft. Military 1,198, technicians 312. Payroll $15.3 million. Dispensary.

Muniz ANG Base, Puerto Rico 00914; E of San Juan. Phone (809) 728-5450; AUTOVON 860-9210. 156th Tactical Fighter Gp. (ANG). Base named for Lt. Col. José A. Muniz, killed in an aircraft accident July 4, 1960. Area 25 acres. Military 1,076, technicians 247. Payroll $13.9 million.

Nashville Metropolitan Airport, Tenn. 37217-0267; 6 mi. SE of Nashville. Phone (615) 361-4600; AUTOVON 446-6210. 118th Tactical Airlift Wg. (ANG). Area 75 acres. Altitude 597 ft. Military 1,677, technicians 322. Payroll $15.9 million.

New Orleans Naval Air Station, La. (Alvin Callender Field) 70143; 15 mi. S of New Orleans. ANG and AFRES have separate phones and facilities. ANG phone (504) 394-2816; AUTOVON 363-3399. 159th Tactical Fighter Gp. (ANG). ANG military 1,464, technicians 349. Payroll $14 million. AFRES phone (504) 393-3293; AUTOVON 363-3293. 926th Tactical Fighter Gp. (AFRES). Military 720, technicians 260. Payroll $8.5 million. NAS New Orleans was the first joint Air Reserve Training Facility. Named for Alvin A. Caliender, who served with the British Royal Flying Corps during WW I and who was shot down over France in 1918. Area 3,245 acres. Altitude 3 ft. Dispensary.

Niagara Falls International Airport, N. Y. 14304-5000; 6 mi. E of Niagara Falls. Phone (716) 236-2000; AUTOVON 489-3011. AFRES base. 914th Tactical Airlift Gp. (AFRES); 107th Fighter Interceptor Gp. (ANG). Base activated Jan. 1952. Area 979 acres. Altitude 590 ft. AFRES: 132 technicians, 237 civilians, 968 Reservists. Payroll $13.2 million. ANG: 1,018 military, 346 technicians. Payroll $13.5 million.

O'Hare Air Reserve Forces Facility, Ill. 60666; 22 mi. NW of Chicago's Loop. Phone (312) 694-6000; AUTOVON 930-1110. AFRES base. 928th Tactical Airlift Gp. (AFRES); 126th Air Refueling Wg. (ANG). Defense Contract Administration Services Region. Base activated Apr. 1946; named for Lt. Cmdr. Edward H. "Butch" O'Hare, USN Medal of Honor recipient, killed Nov. 26, 1943, during battle for the Gilbert Islands. Area 391 acres. Altitude 643 ft. ANG military 1,318, technicians 1,100, Reservists 1,599. Payroll $14.8 million.

Ontario International Airport, Ontario, Calif. 91761. Phone (714) 984-2705; AUTOVON 898-1895. 148th Combat Communications Gp. (ANG). Area 39 acres. Altitude 900 ft. Military 203, technicians 22. Payroll $9.2 million.

Otis ANG Base, Mass. 02542-5001; 7 mi. NNE of Falmouth. Phone (617) 968-4090; AUTOVON 557-4090. 102d Fighter Interceptor Wg. (ANG); 567th USAF Band (ANG). Military organizations on adjacent installations include Cape Cod Air Force Station (6th Missile Warning Sqdn., 2165th Communications Sqdn.); Coast Guard Air Station Cape Cod; Camp Edwards Army National Guard Installation; Headquarters Camp Edwards (ARNG); 26th Aviation Battalion (ARNG); 1st Battalion, 25th Marines (Reserve); Massachusetts National Cemetery (VA). Named for 1st Lt. Frank J. Otis, ANG flight surgeon and pilot killed in 1937 crash. Area 3,464 acres (plus 17,000 acres for neighboring installations). Altitude 132 ft. ANG military 1,144, ANG technicians 317, plus 281 Title 5 Civil Service. Payroll $22.5 million.

Phelps Collins ANG Base, Mich. 49707; 7 mi. W of Alpena. Phone (517) 354-4141; AUTOVON 722-3760. Training site detachment. Facilities used by ANG and AFRES units for annual field training and by ARNG and Marine Reserve for special training. Named for Capt. W. H. Phelps Collins, American Flying Corps, killed in France Mar. 1918. Area 2,711 acres. Altitude 689 ft. Military 54, full-time support 52. Payroll through Wurtsmith AFB. Housing: 1,500 personnel. 14-bed hospital. Dispensary.

Phoenix, Ariz. (Sky Harbor International Airport) 85034. Phone (602) 244-9841; AUTOVON 853-9211. 161st Air Refueling Gp. (ANG). Area 51 acres. Altitude 1,230 ft. Military 1,262, technicians 262. Payroll $12.1 million.

Portland International Airport, Portland, Ore. 97218-2797. Phone (503) 288-5611; AUTOVON 891-1701. 142d Fighter Interceptor Gp. (ANG); 244th Combat Communications Sqdn. (ANG); 244th Combat Communications Flt. (ANG); 116th Tactical Control Sqdn. (ANG); Det. 5, 2036th Communications Sqdn. (AFCC); 12th Special Forces Gp. (USAR); Oregon Wg., CAP. Also host to 939th Aerospace Rescue and Recovery Sqdn. (AFRES) and 83d Aerial Port Sqdn. (AFRES). Area 273 acres. Altitude 26 ft. Military 1,794, technicians 419 (+ 96 civilians). Payroll $23.7 million.

Providence, R. I. (Quonset Point State Airport) 02852; 20 mi. S of Providence. Phone (401) 885-3960; AUTOVON 478-3210. 143d Tactical Airlift Gp. (ANG). Area 79 acres. Altitude 9 ft. Military 1,031, technicians 228. Payroll $11.7 million.

Reno, Nev. (Cannon International Airport—May ANG Base) 89502; 5 mi. SE of Reno at 1776 ANG Way. Phone (702) 788-4500; AUTOVON 830-4500. 152d Tactical Recon Gp. (ANG). Named for Maj. Gen. James A. May, state Adjutant General. Area 123 acres. Altitude 4,411 ft. Military 1,049, technicians 274. Payroll $12.8 million. Dispensary.

Richards-Gebaur AFB, Mo. 64030-5000; 17 mi. S of Kansas City, Mo. Phone (816) 348-2000; AUTOVON 463-1110. 442d Tactical Fighter Gp. (AFRES); Navy and Army Reserve units. Base activated Mar. 1944; named for 1st Lt. John F. Richards and Lt. Col. Arthur W. Gebaur, Jr. Richards was killed Sept. 26, 1918, in France, while on an artillery spotting mission; Gebaur, an F-84 pilot, was killed Aug. 29, 1952, over North Korea during his 99th mission. Area 620 acres; another 120 acres occupied by non-Air Force military units and federal agencies. Joint-use airport facility with Kansas City, Mo. Altitude 1,090 ft. AFRES and active-duty USAF military 1,471, technicians/civilians 348. Payroll $13 million. On-base, Marine Corps-operated, all-service housing: 27 officer, 214 enlisted. Consolidated open mess and 300 transient quarters available.

Richmond, Va. (Byrd International Airport) 23150; 4 mi. SE of downtown Richmond. Phone (804) 222-6884; AUTOVON 274-8210. 192d Tactical Fighter Gp. (ANG). Airfield named for Adm. Richard E. Byrd, famous Arctic and Antarctic explorer. Area 143 acres. Altitude 167 ft. Military 997, technicians 275. Payroll $12.2 million.

Rickenbacker ANG Base, Ohio 43217; 13 mi. SSW of Columbus. Phone (614) 492-8211; AUTOVON 950-1110. Base transferred from SAC to ANG Apr. 1, 1980. 121st Tactical Fighter Wg. (ANG); 907th Tactical Airlift Gp. (AFRES); 160th Air Refueling Gp. (ANG); 2032d Communications Sqdn. (AFCC); Naval Air Reserve and Naval Construction (USNR). Base activated 1942. Formerly Lockbourne AFB; renamed May 7, 1974, in honor of Capt. Edward V. Rickenbacker, top US WW I ace and Medal of Honor recipient who died July 23, 1973. Area 4,100 acres. Approx. 1,800 acres declared excess and turned over to General Services Administration. Altitude 744 ft. ANG military 1,836, technicians 406. Payroll $21.9 million. On-base Capehart housing. VOQ and VAQ available, limited on weekends. Consolidated open mess available.

Roslyn ANG Station, Roslyn, N. Y. 11576; 27 mi. E of New York City. Phone (516) 299-5201; AUTOVON 456-5201. 152d Tactical Control Gp., 213th Engineering Installation Sqdn. Also hosts two Army National Guard units. Area 50.3 acres. Altitude 320 ft. Military 466, technicians 29. Payroll through Stewart IAP, N. Y.

Salt Lake City International Airport, Utah 84116; 3 mi. W of Salt Lake City. Phone (801) 521-7070; AUTOVON 790-9210. 151st Air Refueling Gp. (ANG). Also hosts ANG's 130th Engineering Installation Sqdn. and 106th and 109th Tactical Control Flts. Area 75 acres. Altitude 4,220 ft. Military 1,510, technicians 307 (+ 41 civilians). Payroll $15.7 million. Dispensary.

Savannah International Airport, Ga. 31402; 4 mi. NW of Savannah. Phone (912) 964-1941; AUTOVON 860-8210. 165th Tactical Airlift Gp. (ANG). Also field training site. Area 232 acres. Altitude 50 ft. Military 1,197, technicians 274. Payroll $14 million. Housing: 156 officer; 736 enlisted. 3-bed dispensary.

Schenectady County Airport, Scotia, N. Y. 12302-9752; 2 mi. N of Schenectady. Phone (518) 381-7300; AUTOVON 974-9221. 109th Tactical Airlift Gp. (ANG). Area 106 acres. Altitude 378 ft. Military 987, technicians 217. Payroll $10.7 million. Dispensary.

Selfridge ANG Base, Mich. 48045; 3 mi. NE of Mount Clemens. Phone (313) 466-4011; AUTOVON 273-0111. 127th Tactical Fighter Wg. (ANG); 191st Fighter Interceptor Gp. (ANG); 927th Tactical Airlift Gp. (AFRES). Also hosts Air Force, Navy Reserve, Marine Air Reserve, Army Reserve, Army units, and US Coast Guard Air Station for Detroit. Base activated July 1917; transferred to Michigan ANG July 1971. Named for 1st Lt. Thomas E. Selfridge, first Army officer to fly an airplane and first fatality of powered flight, killed Sept. 17, 1908, at Fort Myer, Va., when plane piloted by Orville Wright crashed. Area 3,727 acres. Altitude 583 ft. ANG military 2,014, ANG technicians 503 (+ 560 civilians). Payroll $36.9 million. Dispensary.

Sioux City Municipal Airport, Iowa 51110; 7 mi. S of Sioux City. Phone (712) 255-3511; AUTOVON 939-6210. 185th Tactical Fighter Gp. (ANG). Area 114 acres. Altitude 1,098 ft. Military 931, technicians 253. Payroll $11.2 million. Dispensary.

Sioux Falls, S. D. (Joe Foss Field) 57104; N side of Sioux Falls. Phone (605) 336-0670; AUTOVON 939-7210. 114th Tactical Fighter Gp. (ANG). Named for Brig. Gen. Joseph J. Foss, WW II ace, former governor of South Dakota, former National President of AFA, and founder of the South Dakota ANG. Area 145 acres. Altitude 1,428 ft. Military 927, technicians 249. Payroll $11.4 million.

Springfield, Ill. (Capitol Airport) 62707; NW of Springfield. Phone (217) 753-8850; AUTOVON 631-8210. 183d Tactical Fighter Gp. (ANG). Area 70 acres. Altitude 592 ft. Military 1,218, technicians 320. Payroll $14.3 million. Dispensary.

Springfield-Beckley Municipal Airport, Ohio 45501-1780; 5 mi. S of Springfield. Phone (513) 323-8653; AUTOVON 346-2311. 178th Tactical Fighter Gp. (ANG); 251st Combat Information Systems Gp. (ANG). Area 113 acres. Altitude 1,052 ft. Military 1,133, technicians 270. Payroll $15 million. 6-bed dispensary.

St. Joseph, Mo. (Rosecrans Memorial Airport) 64503; 4 mi. W of St. Joseph. Phone (816) 271-1300; AUTOVON 720-9210. 139th Tactical Airlift Gp. (ANG). Area 298 acres. Altitude 724 ft. Military 872, technicians 255. Payroll $9.9 million.

St. Louis International Airport, Mo. (Lambert Field) 63145. Phone (314) 263-6356; AUTOVON 693-6356. 131st Tactical Fighter Wg. (ANG). Area 50 acres. Altitude 589 ft. Military 1,587, technicians 342. Payroll $18.1 million.

Stewart International Airport, Newburgh, N. Y. 12550-6148; 4 mi. W of Newburgh, 15 mi. N of USMA (West Point). Phone (914) 563-3345; AUTOVON 247-3345. Hq. NYANG; 106th Military Airlift Gp. (ANG); USMA subpost airport. Formerly Stewart AFB; acquired by state of New York in 1970. ANG area 260 acres. Altitude 491 ft. ANG military 1,551, technicians 390. Payroll $11.7 million. Dispensary.

Suffolk County Airport, Westhampton Beach, N. Y. 11978-1294; within corporate limits of Westhampton Beach. Phone (516) 288-4200; AUTOVON 456-7210. 106th Aerospace Rescue and Recovery Gp. (ANG). Area 70 acres. Altitude 67 ft. Military 736, technicians 218. Payroll $10.2 million.

Syracuse, N. Y. (Hancock Field) 13211-7099; 5 mi. NE of Syracuse. Phone (315) 458-5500; AUTOVON 587-9110. 174th Tactical Fighter Wg. (ANG). Base operations for Hancock ANG Base. 152d Tactical Control Gp.; 108th and 113th Tactical Control Flts. Area 443 acres. Altitude 421 ft. Military 1,355, technicians 359. Payroll $14.8 million. Dispensary.

Terre Haute, Ind. (Hulman Regional Airport) 47803; 5 mi. E of Terre Haute. Phone (812) 877-5210; AUTOVON 724-1210. 181st Tactical Fighter Gp. (ANG). Area 279 acres. Altitude 585 ft. Military 1,002, technicians 277. Payroll $12.6 million. 5-bed dispensary.

Toledo Express Airport, Swanton, Ohio 43558; 14 mi. W of Toledo. Phone (419) 866-2078; AUTOVON 580-2078. 180th Tactical Fighter Gp. (ANG). Area 79 acres. Altitude 684 ft. Military 966, technicians 253. Payroll $13 million. 4-bed clinic.

Truax Field, Madison, Wis. (Dane County Regional Airport) 53704-2591; 2 mi. N of Madison. Phone (608) 241-6200; AUTOVON 273-8210. 128th Tactical Fighter Wg. (ANG). Activated June 1942 as AAF base; taken over by Wisconsin ANG in Apr. 1968. Named for Lt. T. L. Truax, killed in a P-40 training accident in 1941. Area 153 acres. Altitude 862 ft. Military 1,038, technicians 270. Payroll $11.4 million. Housing: 7 transient. Dispensary.

Tucson International Airport, Ariz. 85734; within Tucson city limits. Phone (602) 573-2210; AUTOVON 853-4210. 162d Tactical Fighter Gp. (ANG). Area 49 acres. Altitude 2,650 ft. Military 1,187, technicians 600. Payroll $20.9 million.

Tulsa International Airport, Okla. 74115. Phone (918) 832-5208; AUTOVON 956-5297. 138th Tactical Fighter Gp. (ANG); 219th Electronic Installation Sqdn. Area 78 acres. Altitude 676 ft. Military 1,093, technicians 263. Payroll $12.6 million.

Utah ANG Base, Utah 84116; 3 mi. W of Salt Lake City. Phone (801) 521-7070; AUTOVON 790-9210. 151st Air Refueling Gp. (ANG). Also hosts ANG's 130th Engineering Installation Sqdn. and 106th and 109th Tactical Control Flts. Area 75 acres. Altitude 4,220 ft. Military 1,510, technicians 307. Payroll $13.7 million. Dispensary.

Van Nuys ANG Base, Calif. (Van Nuys Airport) 91409. Phone (213) 781-5980; AUTOVON 873-6310. 146th Tactical Airlift Wg. (ANG); 147th Combat Communications Sqdn. (Contingency). Area 62 acres. Altitude 799 ft. Military 1,759, technicians 363. Payroll $19.3 million.

Volk Field ANG Base, Wis. 54618-5001; 90 mi. NW of Madison. Phone (608) 427-1210; AUTOVON 798-3210. ANG field training site featuring air-to-air and air-to-ground gunnery ranges and providing training for ANG flying units. Named for Lt. Jerome A. Volk, first Wisconsin ANG pilot killed in the Korean War. Area 10,265 acres. Altitude 910 ft. Military 58, technicians 54. Payroll $2.4 million. 6-bed dispensary.

Westfield, Mass. (Barnes Municipal Airport) 01085; 3 mi. N of Westfield. Phone (413) 568-9151; AUTOVON 636-1210/11. 104th Tactical Fighter Gp. (ANG). Area 133 acres. Altitude 270 ft. Military 970, technicians 262. Payroll $12.4 million.

Westover AFB, Mass. 01022-5000; 5 mi. NE of Chicopee Falls. Phone (413) 557-1110; AUTOVON 589-1110. AFRES base. 439th Tactical Airlift Wg. (AFRES). Also home of Army, Navy, and Marine Corps Reserve and Massachusetts Army National Guard. Base dedicated Apr. 6, 1940; named for Maj. Gen. Oscar Westover, Chief of the Air Corps, killed Sept. 21, 1938, in crash near Burbank, Calif. Area 2,500 acres. Altitude 244 ft. Reservists 2,130, technicians (AFRES and tenant units) 211, civilians 469. Payroll $17.5 million. Housing: 313 family quarters; 432 dormitory rooms; 25 VOQ; 174 BOQ.

Willow Grove Air Reserve Facility, Pa. 19090; 14 mi. N of Philadelphia. ANG and AFRES have separate phones and facilities. Altitude 356 ft. ANG phone (215) 443-1500; AUTOVON 991-1500. 111th Tactical Air Support Gp. (ANG); 270th Engineering Installation Sqdn. (ANG). ANG area 41 acres. Military 925, technicians 209. Payroll $10 million. AFRES phone (215) 443-1062; AUTOVON 991-1062. 913th Tactical Airlift Gp. (AFRES). AFRES area 162 acres. Reservists 856, technicians 147, civilians 122. Payroll $9.3 million. Other units include Army, Navy, and Marine Corps Reserve. Defense Contract Administration Services Region, Philadelphia; 92d Aerial Port Sqdn. (MAC) off-base tenant. Base activated Aug. 1958. Navy transient quarters available, but limited.

Will Rogers World Airport, Okla. 73169-5000; 7 mi. SW of Oklahoma City. Phone (405) 686-5210; AUTOVON 956-8210. 137th Tactical Airlift Wg. (ANG). Area 71 acres. Altitude 1,290 ft. Military 1,112, technicians 215. Payroll $12.1 million.

Wilmington, Del. (Greater Wilmington Airport) 19720; 5 mi. S of Wilmington. Phone (302) 322-3361; AUTOVON 455-3000. 166th Tactical Airlift Gp. (ANG); Army National Guard aviation company. Area 57 acres. Altitude 80 ft. Military 1,040, technicians 214. Payroll $10.6 million. 2-bed dispensary.

Windsor Locks, Conn. (Bradley International Airport) 06096; 15 mi. N of Hartford. Phone (203) 623-8291; AUTOVON 636-8310. 103d Tactical Fighter Gp. (ANG); Army National Guard aviation battalion. Named for Lt. Eugene M. Bradley, killed in P-40 crash Aug. 1941. Area 158 acres. Altitude 173 ft. Military 922, technicians 265. Payroll $12 million.

Youngstown Municipal Airport, Ohio 44473-5000; 16 mi. N of Youngstown. Phone (216) 392-1000; AUTOVON 346-1000. AFRES base. 910th Tactical Airlift Gp. (AFRES); 757th Tactical Airlift Sqdn. (AFRES). Other units include OLC, 2046th Communications Gp.; Defense Contract Administration Services. Base activated 1952. Area 230 acres. Altitude 1,196 ft. Reservists 816, technicians 136, civilians 184. Payroll $12 million. ●

A Guide to USAF's R&D Facilities

Principal AFSC R&D Facilities

From AFSC headquarters at Andrews AFB, Md., Gen. Lawrence A. Skantze, AFSC Commander, directs the operations of the command's divisions, development and test centers, ranges, and laboratories. These organizations are described below.

Product Organizations

Aeronautical Systems Division (ASD), Wright-Patterson AFB, Ohio—ASD directs the design, development, and acquisition of aeronautical systems, such as fighters, tactical reconnaissance aircraft, bombers, transports, aerial tankers, rescue helicopters, manned vehicles, long- and short-range air-to-surface missiles, simulators, reconnaissance and electronic warfare systems, aircraft engines, and other aeronautical equipment. ASD comprises more than 11,000 military and civilians working in research, development, and acquisition programs. Scientists, engineers, logisticians, business and program managers, technicians, and support people make up the work force.

Current aircraft programs include the priority effort to acquire, test, and deploy the new B-1B strategic bomber, development of the Advanced Tactical Fighter (ATF) for the mid-1990s and beyond, full-scale development of the C-17 airlift aircraft, continued production and improvements to the F-15 Eagle and F-16 Fighting Falcon fighters, development and production of the F-15E dual-role fighter, development of the Advanced Technology Bomber (ATB), continued production of the C-5B, and development and production of the alternate fighter engine for F-15 and F-16 aircraft. The C-12F, C-21A, and C-23A production/acquisition programs were completed on schedule within one year.

Missile systems include development of the advanced cruise missile, continued production and deployment of the air-launched cruise missile, and production of the tactical infrared Maverick missile, which is capable of air strikes at night and in adverse weather.

Technology modernization—an ASD strategy to help aerospace manufacturers modernize their facilities to improve productivity—is a demonstrated success and has been expanded to include most major weapon system programs at ASD and at other AFSC product organizations as well.

ASD's 4950th Test Wing operates and maintains most of AFSC's inventory of specially modified aircraft for conducting test flights and gathering and analyzing test results. These include the Advanced Range Instrumentation Aircraft (ARIA), which deploy worldwide to receive, record, and retransmit telemetry data from missiles, satellites, and spacelaunch vehicles. The ARIA aircraft are maintained at Wright-Patterson AFB along with a fleet of test-bed aircraft, including C-130, C-141, C-18, C-135, T-39, and T-37 aircraft, to provide customers a low-cost test-bed option.

Also a part of ASD are the Air Force Wright Aeronautical Laboratories (AFWAL).

Air Force Wright Aeronautical Laboratories (AFWAL), Wright-Patterson AFB, Ohio—AFWAL includes four major organizations at Wright-Patterson AFB—the Flight Dynamics, Materials, Avionics, and Aero Propulsion Laboratories—and is organizationally located under ASD. AFWAL was established to enhance the integration of technologies across what formerly existed as four independent laboratories. AFWAL conducts and supports research, exploratory development, and advanced development in many fields and is responsible for selected engineering development efforts as well as the Air Force's Manufacturing Technology program.

Air Force Avionics Laboratory conducts research and development programs in the primary areas of navigation, surveillance, reconnaissance, electronic warfare, fire control, weapon delivery, communications, system architecture, information and signal processing and control, subsystem integration and supporting electronics, software, and electromagnetic device research and development to provide a broad technology base for future systems and ensure application to Air Force aerospace needs. Avionics is defined as all of the electronics on board an aerospace vehicle. In the area of electromagnetic device research and development, the intensive very-high-speed integrated circuit (VHSIC) triservice effort led by Avionics Laboratory is expected to yield orders-of-magnitude improvements in speed, size, and power capabilities.

Aero Propulsion Laboratory conducts Air Force exploratory and advanced development programs in turbine engines, ramjets, fuels, turbine engine lubricants, aircraft fire protection, synthetic fuels, and flight vehicle power. It houses the unique Compressor Research Facility, which supports in-house and contracted efforts in addition to providing support to the Army, Navy, and NASA. Advanced turbine engine compressor, combustor, and turbine engine concepts and components are assessed by means of the Advanced Propulsion Subsystems Integration and the Advanced Turbine Engine Gas Generator advanced development programs.

Flight Dynamics Laboratory is concerned with the development of flight-vehicle technology. Specific technical areas include structural design and durability, vehicle dynamics, vehicle equipment, environmental control, crew escape and recovery, survivability and vulnerability, flight control, crew station design, flight simulation, performance analysis, aerodynamics, configuration synthesis, and technology integration. Testbeds for flight-control and other technologies include AFTI/F-16, DIGITAC, and the X-29A forward-sweptwing (jointly with DARPA) and AFTI/F-111 mission-adaptive wing. Additionally, design studies are under way for a short takeoff and landing and maneuver technology demonstrator.

Materials Laboratory conducts the complete USAF program in materials exploratory development and manufacturing technology. Areas of current emphasis include thermal protection materials; metallic and nonmetallic structural materials; aerospace propulsion materials; fluids, lubricants, and fluid-containment materials; protective coatings; electronic and electromagnetic materials; laser-hardened materials; integrated computer-aided manufacturing, robotics, smart processing, and flexible automated batch manufacturing; and nondestructive evaluation.

Armament Division (AD), Eglin AFB, Fla.—The Division plans, researches, develops, and acquires conventional air armaments and tests and evaluates armament and electronic warfare systems and related equipments.

The four major mission areas assigned to AD are research and technology, systems development and acquisition, test and evaluation, and host and base support. This full spectrum of missions assigns to one organization cradle-to-grave responsibility for air armaments. This synergism is further enhanced by the using command tenant organizations assigned to Eglin AFB, Fla. While the Division develops and tests weapon systems, the Air Force Tactical Air Warfare Center and the 33d Tactical Fighter Wing, collocated at Eglin AFB, offer their expertise in the tactical applications of those weapons.

The research and technology and systems development and acquisition mission areas are organized under a single manager, the Deputy Commander for Development and Acquisition. He controls the efforts of AD's Air Force Armament Test Laboratory and the development plans, systems acquisition, and acquisition logistics organizations. This one focal point ties together the basic research, exploratory development, advanced development, master planning, and conceptual, validation, and full-scale engineering development, production, and deployment phases of acquisition. The elements of integrated logistics support are provided by a joint AFSC and AFLC office.

AD's 3246th Test Wing, equipped with a fleet of approximately forty aircraft and highly instrumented ground facilities, manages the Division's overall test and evaluation program. To accomplish its mission, the wing uses several large land test ranges scattered throughout the 724-square-mile Eglin complex as well as 86,000 square miles of water ranges located in the adjacent Gulf of Mexico. Major tests on or above AD's ranges cover all kinds of equipment, including aircraft systems, subsystems, missiles, guns, bombs, rockets, targets and drones, high-powered radars, and airborne electronic countermeasures equipment. Equipment is tested in a variety of environments, and combat conditions are realistically simulated. One of the Test Wing's unique assets is the McKinley Climatic Laboratory, capable of testing military hardware as large as a bomber in environments ranging from minus 65 to plus 165 degrees Fahrenheit with 100 mph winds, icing clouds, rain, and snow.

Also under the Test Wing is the 6585th Test Group located at Holloman AFB, N. M. Among its unique facilities are a 50,000-foot high-speed test track, two radar target scatter facilities (RATSCAT), and the Central Inertial Guidance Test Facility (CIGTF).

Air Force Armament Laboratory (AFAL), Eglin AFB, Fla.—AFAL is the principal Air Force laboratory conducting research and development in guided and unguided nonnuclear munitions, exploring the technology for future armament for America's defenses. Specific technologies under development include advanced seekers, missile airframes, guidance and control components, explosives, warheads, fuzes, guns, and ammunition. Additionally, kinetic energy launchers and guided projectiles are being developed to support the Strategic Defense Initiative program. AFAL also provides technical support to system program offices in such areas as hardware-in-the-loop missile simulations and warhead vulnerability and lethality analysis. AFAL is organizationally assigned to the Armament Division at Eglin AFB.

Electronic Systems Division (ESD), Hanscom AFB, Mass.—ESD is responsible for development, acquisition, and delivery of electronic systems and equipment for the command control communications and intelligence functions of aerospace forces. More than 100 projects are currently under way, including modernization of the World-Wide Military Command and Control System, which is used by DoD to control its military forces; replacement of the Distant Early Warning (DEW) Line radars with new-technology sensors that require little on-site manning and that, in some cases, will operate unattended; radars in the four corners of the nation to detect attack by sea-launched ballistic missiles and to track satellites; upgrading of the Ballistic Missile Early Warning System in England, Greenland, and Alaska to meet the modern missile threat; an Air Force/Army radar to detect, track, and direct weapons against stationary or slow-moving ground and airborne targets; a triservice secure and survivable tactical communications network for air, ground, and sea forces; improvements to NORAD's Space Operations Center and Cheyenne Mountain Complex to facilitate the direction of the defense of North America; an unmanned low-frequency radio network throughout the US to pass emergency messages should the electromagnetic pulse from nuclear detonations disrupt normal communications; a worldwide chain of optical satellite-tracking stations; the E-3 Sentry airborne radar/direction center for the Air Force, North Atlantic Treaty Organization, and Saudi Arabia; and an over-the-horizon backscatter radar for long-range (out to 1,800 miles) warning of aircraft approaching North America.

ESD manages the Department of Defense Electromagnetic Compatibility Analysis Center at Annapolis, Md., and maintains an office at Kapaun AS, Germany, for the coordination and management of many European-wide C^{3}I programs.

Rome Air Development Center at Griffiss AFB, N. Y., supports ESD by developing a technology base for C^{3}I projects. ESD also works directly with the major commands to plan for evolutionary C^{3}I improvements.

Rome Air Development Center (RADC), Griffiss AFB, N. Y.—RADC is the principal organization charged with Air Force research and development programs related to C^{3}I (command control communications and intelligence). RADC mission areas include communications, electromagnetic guidance and control, surveillance of ground and aerospace objects, intelligence data handling, information systems technology, artificial intelligence and battle management, ionospheric propagation, solid state sciences, microwave physics, and electronic reliability, maintainability, and compatibility. Reporting to the Commander, ESD, Hanscom AFB, Mass., RADC is also responsible for assisting in the demonstration and acquisition of selected systems and subsystems within its areas of expertise.

Space Division (SD), Los Angeles AFS, Calif.—SD provides and manages the majority of the nation's military space systems. SD's responsibilities include providing and maintaining space-based communications, meteorological, navigation, and surveillance systems in support of combat forces on the ground, at sea, and in the atmosphere; developing spacecraft, launch vehicles, and ground-terminal equipment to maintain and improve military space capabilities; launching and controlling on-orbit satellites for DoD and other government agencies; developing space defense and survivability technology to ensure protection of the nation's space assets; managing DoD activities in the national Space Transportation System (Space Shuttle); operating national test ranges and launch facilities to support space and missile programs for the Air Force, DoD, NASA, and other agencies; operating a worldwide network of satellite tracking stations; and operating the Space and Missile Test Organization, the Air Force Satellite Control Facility, the Air Force Space Technology Center, and the Manned Space Flight Support Group, major field elements of SD that are described below.

To meet these global responsibilities, SD has 3,050 officer, 2,640 enlisted, and 4,490 civilian personnel. Aerospace Corporation, based adjacent to SD headquarters, also devotes the principal efforts of its highly qualified, 1,710-member technical staff to SD programs.

Air Force Space Technology Center (AFSTC), Kirtland AFB, N. M.—AFSTC is under the command of Space Division, AFSC. The Space Technology Center directs three Air Force Systems Command laboratories: Air Force Weapons Laboratory at Kirtland AFB, Air Force Rocket Propulsion Laboratory, Edwards AFB, Calif., and Air Force Geophysics Laboratory, Hanscom AFB, Mass.

AFSTC integrates technology efforts to explore military space capabilities and the needs of future space systems.

The expertise of AFSTC headquarters and laboratory staffs provides a focus for information about space-related developments in such diverse areas as electronics hardening, laser research, rocket propulsion, rail guns, infrared sensors, and the earth and space environment.

The Center works through Air Force Systems Command and Space Command to provide research results for future systems needs and to identify key technology areas for long-range plans.

AFSTC works closely with NASA and other military agencies on joint development programs.

Air Force Weapons Laboratory (AFWL), Kirtland AFB, N. M.—AFWL conducts Air Force Systems Command nonconventional weapons research and development in high-energy laser technology, advanced weapon concepts, and nuclear weapon technology, including nuclear survivability and vulnerability. AFWL also acts as the AFSC focal point for the technical aspects of nuclear safety and the development of nuclear hardness criteria for Air Force systems.

Air Force Rocket Propulsion Laboratory (AFRPL), Edwards AFB, Calif.—AFRPL conducts exploratory and advanced development programs for liquid, solid, and hybrid rockets, advanced rocket propellants, and associated ground-support equipment. AFRPL development supports ballistic missile, air-launched missile, and space propulsion mission areas. AFRPL also conducts system support programs for other units and divisions of AFSC, other branches of the armed services, and NASA.

Air Force Geophysics Laboratory (AFGL), Hanscom AFB, Mass.—AFGL is the center for research, exploratory, and advanced development involving earth, atmospheric, and space environments. AFGL scientists study the effects of the space environment on Air Force space vehicles, the interactions of the ionosphere and upper atmosphere with Air Force systems, the optical properties of the atmosphere, both as a transmission medium and as an emitter of radiation, the measurement of the earth's gravity field and its crustal motions to determine their effects on ballistic missiles, and new and better ways to predict the weather and measure weather elements.

Ballistic Missile Office (BMO), Norton AFB, Calif.—BMO is responsible for the planning, implementation, and management of Air Force programs to acquire ballistic missile systems and subsystems.

BMO is managing the development of the Peacekeeper system, a new ICBM that is currently undergoing a flight-test program at Vandenberg AFB, Calif. The scheduled date for the initial operational capability of the Peacekeeper is December 1986.

BMO is also managing the development of the Small Intercontinental Ballistic Missile program. This new program office opened at BMO in May 1983 as part of the President's ICBM Modernization Program.

Another major BMO development program is the Advanced Strategic Missile Systems (ASMS). ASMS is responsible for providing advanced technology to ensure the effectiveness, survivability, and penetration of strategic missile systems in response to evolving missions, threats, and technologies. ASMS provides support for operational systems, alternatives for future systems, and arms-control support.

Test Organizations

Space and Missile Test Organization (SAMTO), Vandenberg AFB, Calif.—SAMTO has two specific functions. First is the management of field-test and launch operations for all DoD-directed space programs and long-range ballistic research and development programs. The other is development, management, and operation, through the Eastern and Western Space and Missile Centers, of the national test ranges.

Western Space and Missile Center (WSMC), Vandenberg AFB, Calif.—WSMC is responsible for conducting launch and launch support of research and development ballistic missile testing and polar-orbiting space launches for DoD, USAF, and other agencies. Stretching halfway around the world from the California coast to the Indian Ocean, the Western Test Range is operated in support of ballistic and space test operations. The Range also supports Space Shuttle operational flight tests and other aeronautical tests employing the same sensors and data-gathering equipment used for ballistic and space booster flights. WSMC is responsible for planning and subsequent execution of the Peacekeeper research and development flight tests and providing support for west coast Space Shuttle launch operations.

Eastern Space and Missile Center (ESMC), Patrick AFB, Fla.—ESMC is responsible for conducting launch and launch support activities of manned and unmanned space launches and ballistic missiles for the Air Force, DoD, foreign governments, and other government agencies. Support includes the initial assembly, checkout, and ground processing for launch of the Inertial Upper Stage for the Space Shuttle, all space launches requiring geosynchronous orbits, and the Trident and Pershing II missile programs. In addition, it operates Patrick AFB. The Eastern Test Range extends more than 10,000 miles down the Atlantic into the Indian Ocean, where it joins the Western Test Range to form a worldwide network. Tracking and data-gathering stations are located at Grand Bahama, Antigua, and Ascension Islands.

Air Force Satellite Control Facility (AFSCF), Sunnyvale AFS, Calif.—AFSCF develops, maintains, and operates for the Space Division a worldwide network of tracking stations to perform on-orbit tracking, data acquisition, and command and control of DoD space vehicles.

Manned Space Flight Support Group (MSFSG), John-

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The ANDVT is easy to operate and requires no preventative maintenance or adjustment. And it has built-in on and off-line testing. It gives you clear, clean transmissions, reliability and above all—security.

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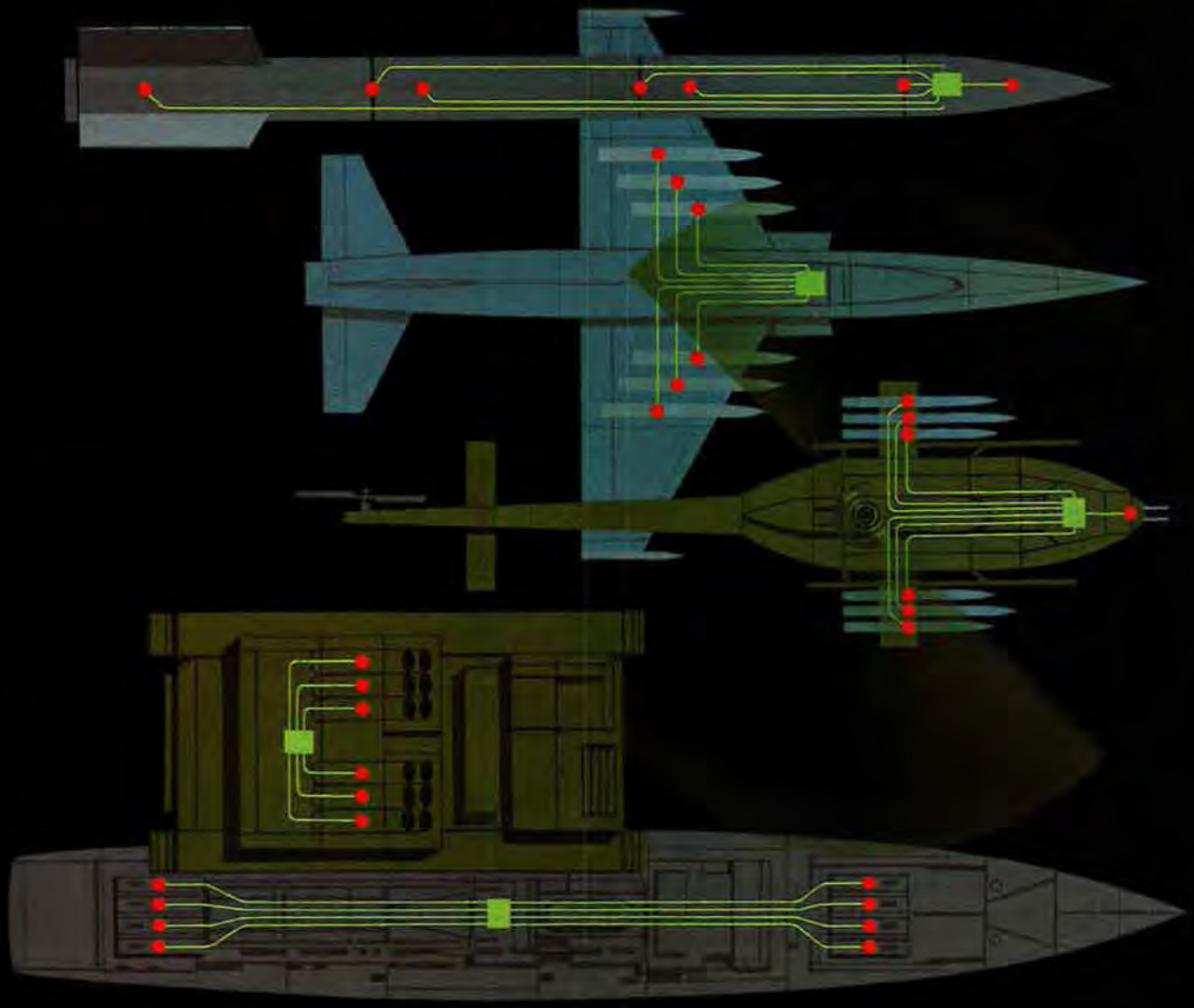

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The system uses a laser firing unit to transmit light energy through fiber optics for initiating various ordnance applications.

Low cost, light weight and re-use capability makes the Laser Ordnance System ideal for air, vehicle and shipboard arm/fire devices.

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son Space Center, Houston, Tex.—The MSFSG is developing the capability to plan for and control DoD Space Transportation System missions and to ensure that those missions are secure. In addition, MSFSG will manage the acquisition phase of the Shuttle Operations and Planning Center portion of the Consolidated Space Operations Center. The MSFSG will also train personnel to support the command and control of DoD Space Shuttle missions directly and to transition those personnel to the Space Operations Center.

Air Force Flight Test Center (AFFTC), Edwards AFB, Calif.—AFFTC conducts and supports flight testing and evaluation of manned aircraft, research vehicles, and related propulsion, weapons, avionics, and flight-control systems within or entering the Air Force inventory. Similar tests and evaluation can also be carried out by AFFTC on aircraft belonging to other US military services and government agencies.

AFFTC is also the Air Force organization responsible for testing and evaluating remotely piloted vehicles, Air Force versions of air-launched and ground-launched cruise missiles, plus crew, cargo, and special mission parachutes.

Among the aerospace test programs currently under way at AFFTC are those related to the B-1B bomber, the F-15 Eagle, the F-16 Fighting Falcon, and the T-46A trainer and follow-on testing and evaluation of the B-52 avionics and cruise-missile systems.

AFFTC operates the Air Force Test Pilot School at Edwards AFB, where experienced pilots and engineers are trained for flight test and aerospace research work.

AFFTC has management responsibility for the Utah Test and Training Range (UTTR), a 2,700-square-mile facility in northwest Utah where many test and development flights of remotely piloted vehicles and cruise missiles are carried out. Units administering the UTTR are located at Hill AFB, Utah.

AFFTC is involved in the nation's Space Shuttle program by providing the landing site for certain missions and carrying out the comprehensive evaluation of the Shuttle's descent characteristics for the Department of Defense. Edwards AFB also remains a contingency landing site for the Space Shuttle.

Arnold Engineering Development Center (AEDC), Arnold AFS, Tenn.—AEDC operates the world's most advanced and largest complex of aerospace flight-simulation test facilities—some forty aerodynamic and propulsion wind tunnels, rocket motor and turbine engine test cells, space environmental chambers, arc heaters, ballistic ranges, and other specialized units. Twenty-seven of the Center's test units have capabilities unmatched anywhere. Facilities can simulate flight conditions from sea level to altitudes around 1,000 miles and from subsonic velocities to those well over Mach 20.

The Center's mission is to test aircraft, missile, and space systems at the flight conditions experienced during an operational mission. Testing helps developers qualify the systems for flight, improve designs, and establish performance levels before production and assists in troubleshooting problems with operational systems.

Testing done at the Center cannot completely replace a flight test, but can significantly reduce the amount of flight-test time and total development time and cost. Testing in ground-based facilities allows careful instrumentation of hardware and the precise control, observation, and repetition of test variables to determine impact on the test article. In most cases, a less-expensive model can be used in place of full-scale flight hardware. Failure cause and analysis can be determined more easily with recoverable hardware. And flight tests can be conducted more safely and with greater confidence after the operational characteristics have been established during ground testing.

Arnold Center has contributed to practically every one of the nation's top-priority aerospace programs, including the Peacekeeper, Space Shuttle, F-15, and B-1. Customers include the National Aeronautics and Space Administration; the Federal Aviation Administration; the Air Force, Army, and Navy; private industry; allied foreign governments; and US government and educational institutions.

AEDC appropriately commemorates the name of the man directly responsible for its conception—Gen. Henry H. "Hap" Arnold. General Arnold commissioned a study shortly before the end of World War II to determine how the Germans had made such rapid progress in developing high-performance jet aircraft and rocket-powered missiles. The study was conducted under the leadership of Dr. Theodore von Kármán, one of the world's leading aeronautical scientists, who recommended that the Army Air Forces construct facilities for proper test and evaluation of weapon systems needed to guarantee the national security.

Laboratories

DCS/Science and Technology (DL), Andrews AFB, Md.—The DCS/Science and Technology provides policy, planning, and technical direction to programs of the command's research and development laboratories.

Laboratories directly under DL are:

Air Force Office of Scientific Research (AFOSR), Bolling AFB, D. C.—AFOSR is the single manager of Air Force basic research. It awards grants and contracts for basic research related directly to Air Force needs. Research is selected to support the search for new knowledge and the expansion of scientific principles. AFOSR is also responsible for the activities of the Frank J. Seiler Research Laboratory, the European Office of Aerospace Research and Development, and the AFOSR Liaison Office, Far East.

The Frank J. Seiler Research Laboratory (FJSRL), USAF Academy, Colo.—This laboratory is engaged in basic research in physical and engineering sciences, usually centering around chemistry, applied mathematics, and aerospace mechanics. The laboratory sponsors related research conducted by the faculty and cadets of the USAF Academy.

European Office of Aerospace Research and Development (EOARD), London, England—This unit links the Air Force and the scientific communities in Europe, Africa, and the Near East. It identifies foreign technology, engineering, and manufacturing advances that can be applied to USAF requirements.

The AFOSR Liaison Office, Far East (AFOSR/FE), Tokyo, Japan—This office is the Far East counterpart to the EOARD and provides liaison with the scientific and engineering communities of the Far East.

Special Organizational Considerations

Air Force Engineering and Services Center, Research and Development Division (AFESC/RD), Tyndall AFB, Fla.— AFESC/RD is organizationally assigned to Headquarters Air Force Engineering and Services Center. It acts as the Systems Command agent in executing civil engineering, environmental quality, and facilities energy RDT&E. AFESC/RD evaluates methods and techniques to detect, assess, control, and abate Air Force environmental problems. The Division also conducts civil engineering R&D to improve air base survivability, aircraft contingency launch and recovery surfaces, aircraft and tactical shelters, and air base equipment and facilities.

Special AFSC Organizations

Foreign Technology Division (FTD), Wright-Patterson AFB, Ohio—FTD acquires, evaluates, analyzes, and disseminates information on foreign aerospace technology in concert with other divisions, laboratories, and centers. Information collected from a wide variety of sources is processed by unique electronic data-handling and laboratory-processing equipment and analyzed by scientific and technical specialists.

Air Force Contract Management Division (AFCMD), Kirtland AFB, N. M.—AFCMD is responsible for DoD contract management activities in twenty-five major contractor plants assigned to the Air Force under the DoD National Plant Cognizance Program. AFCMD evaluates contractor performance and manages the administration of contracts executed by Air Force, Army, Navy, Defense Logistics Agency, NASA, and other government purchasing agencies.

Air Force Drug Testing Laboratory (AFDTL), Brooks AFB, Tex.—Designated as a subordinate unit reporting directly to the Aerospace Medical Division commander, AFDTL analyzes more than 250,000 urine specimens annually. AFDTL is the only Air Force agency that implements the Army-Air Force drug abuse detection program. It tests samples from all Air Force members stationed in the CONUS, Alaska, and the Panama Canal Zone and from Army members stationed at nine installations in the south central United States.

Aerospace Medical Division (AMD), Brooks AFB, Tex.—AMD is charged with the management and conduct of research and development in aerospace biotechnology that supports the Air Force mission. AMD is responsible for the activities of the Air Force Human Resources Laboratory, the Wilford Hall Medical Center, the USAF School of Aerospace Medicine, and the USAF Occupational and Environmental Health Laboratory. Specialized and postgraduate professional education is also conducted in medicine, dentistry, and aerospace medical subjects at the USAF School of Aerospace Medicine. AMD scientists at the USAFSAM and the Harry G. Armstrong Aerospace Medical Research Laboratory seek to counter potential hazards and ensure maximum crew performance in all aerospace environments.

Air Force Human Resources Laboratory (AFHRL), Brooks AFB, Tex.—AFHRL manages and conducts research and exploratory and advanced development programs for manpower and personnel, operational and technical training, simulation, and logistics systems. The Manpower and Personnel and Training Systems Divisions are located at Brooks AFB. The other AFHRL divisions are the Logistics and Human Factors Division at Wright-Patterson AFB, Ohio, and the Operations Training Division at Williams AFB, Ariz.

Wilford Hall USAF Medical Center (WHMC), Lackland AFB, Tex.—WHMC is a 1,000-bed facility that serves more than 1,000,000 outpatients and 24,000 inpatients per year. Wilford Hall has four missions: medical readiness, patient care, medical education, and medical research.

Medical readiness involves the training of medical and support personnel. A training site, Camp Rissington, was created in 1985. The medical readiness staff trained more than 2,500 personnel during the year.

Wilford Hall's patient-care mission provides state-of-the-art health care to active-duty and retired people and their families who live in the San Antonio area. Also, as the major referral center, WHMC receives personnel with complicated medical situations by way of the air evac system.

The Medical Center offers patient care in eighty clinical specialties and subspecialties, including open-heart surgery, advanced cancer therapy, kidney transplants, neonatal care, and sophisticated dental care and oral surgery.

The newborn intensive care unit has one of the lowest infant mortality rates in the world. The neonatal staff continues to be a leader in the development of such medical technology as the portable extracorporeal heart-lung bypass unit, designed especially for infants, and the high frequency ventilator, which has been instrumental in saving the lives of premature and full-term infants experiencing lung deficiencies.

Organ transplantation is performed at Wilford Hall, with kidney, corneal, and bone-tissue transplants increasing. Wilford Hall manages all allogenic (primarily sibling to sibling) bone-marrow transplants for DoD via a five-year Transplantation Demonstration Project.

More than fifty percent of all Air Force postgraduate medical education is accomplished at Wilford Hall. Training is provided in twenty-six specialties. A hospital Dentistry Preceptorship was recently initiated to educate career dental officers in dental care for hospitalized and other medically compromised patients.

The Clinical Investigation facility provides the setting for medical research and currently supports 240 clinical investigations and forty-four training projects. Clinical investigations have resulted in unprecedented advances in surgical and treatment procedures in such areas as oral surgery, dental treatment, drug therapy, internal medicine, psychiatric treatment, cancer treatment, surgery and organ transplantation, and infant care.

Air Force Harry G. Armstrong Aerospace Medical Research Laboratory (AAMRL), Wright-Patterson AFB, Ohio—The Harry G. Armstrong Aerospace Medical Research Laboratory is part of the Aerospace Medical Division. It conducts behavioral and biomedical research to enhance human performance under conditions of environmental stress. AAMRL also establishes design criteria and new biotechnology techniques to protect and sustain personnel in future aerospace systems. The four areas of laboratory research are occupational and environmental toxic hazards in Air Force operations, safety and aircrew effectiveness in mechanical force environments, man-machine integration technology, and manned weapon-system effectiveness.

USAF School of Aerospace Medicine (USAFSAM), Brooks AFB, Tex.—The school is part of the Aerospace Medical Division. Its research mission includes both in-house and contractual work dealing with applied aspects of aeromedical research. Investigations in the Divisions of Clinical Sciences, Environmental Sciences, and Radiobiology encompass laboratory and clinical studies in biological, environmental, and dynamic conditions that may affect the health and efficiency of aircrews. The Epidemiology Division serves as a reference and consultant laboratory to Air Force medical facilities throughout the world. One of its principal responsibilities is to give advice and assistance in the investigation of disease outbreaks at Air Force installations. The school also has aeromedical education responsibility for a variety of specialists, including all DoD flight nurses and bioenvironmental specialists. USAFSAM operates the USAF Hyperbaric Treatment Center and twenty-four-hour worldwide consultation service.

USAF Occupational and Environmental Health Laboratory (OEHL), Brooks AFB, Tex.—OEHL provides consultation and specialized laboratory services to support requirements of occupational, radiological, environmental health, and environmental quality programs.

AFSC NCO Academy/Leadership School, Kirtland AFB, N. M.—The Air Force Systems Command (AFSC) Noncommissioned Officer Academy and Leadership Schools are located at Kirtland AFB, N. M. The AFSC NCO Academy has been in continuous operation for more than thirty years—longer than any other Air Force NCO Academy. Both the Academy and Leadership School are important phases of the Air Force's four levels of professional military education offered to USAF's NCO corps. ■

Guide to NASA's Research Centers

The National Aeronautics and Space Administration (NASA) operates a number of research, development, test, and evaluation (RDT&E) field centers that frequently participate in or coordinate their work with USAF R&D programs. Following is a descriptive listing of key NASA installations.

Ames Research Center, Moffett Field, Calif.—Programs at Ames involve research and development in aeronautics, life sciences, space sciences and applications, space technology, and new science and technology growing from aerospace programs. The Center's major program responsibilities are concentrated in theoretical and experimental fluid mechanics and aerodynamics, rotorcraft technology, high-performance aircraft technology, flight simulation, flight testing, computational fluid dynamics, fluid and thermal physics, space sciences, airborne sciences and applications, human factors and space biology, and ground and flight projects in support of aeronautics and space technology. Named for Dr. Joseph S. Ames (1864–1943), Chairman of the National Advisory Committee for Aeronautics (NACA) from 1927 to 1939.

Hugh L. Dryden Flight Research Facility, Edwards AFB, Calif.—Dryden Flight Research Facility is concerned with manned flight within and outside the atmosphere, including low-speed supersonic, hypersonic, and reentry flight and aircraft operations. Flight testing includes HiMAT (Highly Maneuverable Aircraft Technology), RPRVs (Remotely Piloted Research Vehicles), pivot-wing subsonic aircraft, digital fly-by-wire flight-control systems, and wake vortex alleviation methods. Dryden served as a Shuttle landing site for the first four orbital flights and thereafter as a contingency landing site. Named for Dr. Hugh L. Dryden (1898–1965), Director of NACA from 1949–58 and then Deputy Administrator of the new NASA.

Goddard Space Flight Center, Greenbelt, Md.—The Goddard Space Flight Center conducts a wide-ranging program in space science and applications. The GSFC manages the development of wholly integrated spacecraft, ranging from systems engineering to development, integration, and testing; the development and operation of both the ground network of tracking and data acquisition facilities and the Tracking and Data Relay Satellite System; scientific research, including both theoretical studies and development of significant scientific experiments flown on satellites; and the operation of a research airport located at Wallops Island, Va. Goddard is also the manager of the Delta launch vehicle. Named for Dr. Robert H. Goddard (1882–1945), the "father" of rocketry and the space age.

Jet Propulsion Laboratory, Pasadena, Calif.—Jet Propulsion Laboratory is operated for NASA under contract by the California Institute of Technology. The Jet Propulsion Laboratory is primarily responsible for the conduct of NASA automated missions concerned with deep space scientific exploration; tracking, data acquisition, reduction, and analysis required by deep space flight; and development of advanced spacecraft propulsion, guidance, and control systems. The Laboratory is also responsible for selected automated earth-orbital projects. Activities include a broad range of engineering, scientific, and management functions devoted to planetary exploration, physics and astronomy, space applications, spacecraft operations, operation of the Deep Space Network, and research and analysis.

John F. Kennedy Space Center, Fla.—The principal role of the Center includes Space Shuttle launch preparation, launch, landing, and refurbishment, Spacelab and Spacelab payloads ground processing, cargo/experiment integration and processing, upper stages ground processing, and operation and maintenance of ground-support equipment. The Center is also responsible for launch preparation, checkout, and launch of the current inventory of expendable launch vehicles. Kennedy is also responsible for the operation of the KSC Space Transportation System (STS) Resident Office, located at Vandenberg AFB, Calif. The Resident Office supports the Air Force in the design, construction, and activation of the Space Shuttle Vandenberg launch and landing site, provides support for all NASA Deployable Payload Operations, and assists the KSC Cargo Projects Office in planning for all STS cargo operations at Vandenberg. The two principal Shuttle launching sites are at Kennedy and at Vandenberg AFB, Calif.

Langley Research Center, Hampton, Va.—Langley's primary mission is research and development of advanced concepts and technology for future aircraft and spacecraft systems, with particular emphasis on environmental effects, performance, range, safety, and economy. The aeronautical research program is directed at pursuing basic and applied research opportunities leading to increases in performance, efficiency, and capability. Major research disciplines include aerodynamics; operations and airworthiness; acoustics and noise reduction; structures and materials; flutter, aeroelasticity, dynamic loads, and structural response; fatigue and fracture; electronic and mechanical instrumentation; and flight dynamics and control. Named for Samuel P. Langley (1834–1906), astronomer and aerodynamicist who pioneered in the theory and construction of heavier-than-air craft.

George C. Marshall Space Flight Center, Huntsville, Ala.—Marshall serves as one of NASA's primary centers for the design and development of space transportation systems, orbital systems, scientific payloads, and other means for space exploration. The Marshall Center has major responsibilities for Space Shuttle development, testing, and fabrication, including the main engine and solid rocket boosters and external tanks. Other major projects are Spacelab, Space Telescope, High-Energy Astronomy Observations, solar electric propulsion, and materials processing in space. It manages the Michoud Assembly Facility in New Orleans. Named for the late Gen. George C. Marshall, recipient of the Nobel Peace Prize.

Wallops Flight Facility, Wallops Island, Va.—Wallops, a part of Goddard Space Flight Center, is responsible for managing NASA's Suborbital Sounding Rocket Projects from mission and flight planning to landing and recovery, including payload and payload carrier design, development, fabrication, and testing; experiment management support; launch operations; and tracking and data acquisition. Launch vehicles used by Wallops include the four-stage Scout rocket with orbital capability. Wallops also manages the NASA balloon program and is responsible for operating the National Scientific Balloon Facility at Palestine, Tex.

Lewis Research Center, Cleveland, Ohio—LeRC was established as an aircraft engine research laboratory for aircraft propulsion systems. Since then, LeRC has developed many unique facilities for testing full-scale aircraft engines and engine components, chemical rocket engines, electric propulsion systems, space and terrestrial power generation systems, and space communication systems. Lewis is the lead center for aeronautical propulsion and power-transfer technologies, including engine materials and structures, tribology, bearings, seals, inlets, nozzles, propulsion system integration, compressors, turbines, transmissions, propellers, instrumentation, and controls. Lewis also manages the Atlas and Centaur launch vehicle systems and development of the Shuttle Centaur Cryogenic Upper Stage for the Space Transportation System. Named for Dr. George W. Lewis (1882–1948), NACA Director of Aeronautical Research from 1924–47.

Lyndon B. Johnson Space Center, Houston, Tex.—The Center designs, tests, and develops manned spacecraft and selects and trains astronauts. It directs the Space Shuttle program and is the lead center for the Space Station. Mission Control for manned spaceflight is located at the Center, and responsibilities include operational planning, crew selection and training, flight control, and experiment/payload flight control for the Space Transportation System. Definition and development of in-flight biomedical experiments are included in the life sciences research responsibilities of the Center. The Center is named for the late President Johnson.

National Space Technology Laboratories, Bay St. Louis, Miss.—NSTL is NASA's prime static test facility for large liquid-propellant rocket engines and propulsion systems. NSTL plays a key role in the development and acceptance testing of the Space Shuttle main engines and main propulsion system development testing and also conducts applied research and development in the fields of remote sensing, environmental sciences, and other selected applications. NSTL manages the installation and provides support and facilities to collocated elements of other agencies, including the Department of Defense, Department of Interior, Department of Commerce, the Environmental Protection Agency, and the Department of Transportation. ■

Key Installations of the National Aeronautics and Space Administration

Yesterday's larger jets were never designed to carry today's smaller C-FIN equipment.

Flight inspection equipment has changed quite dramatically in the past few years. For instance, operators' consoles are now about 50% smaller than they were just 10 years ago. And data is recorded on multi-function displays, instead of space-hungry meters.

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An Air Force Almanac

On the following pages appears a variety of information and statistical material about the US Air Force—its people, organization, equipment, funding, activities, bases, and heroes. This "Almanac" section was compiled by the staff of Air Force Magazine. We especially acknowledge the help of the Secretary of the Air Force Office of Public Affairs in its role as liaison with Air Staff agencies in bringing up to date the comparable data from last year's "Almanac." A word of caution: Personnel figures that appear in this section in different forms will not agree (nor will they always agree with figures in command and separate operating agency reports or in the "Guide to Bases") because of different cutoff dates, rounding off, differing methods of reporting, or categories of personnel that are excluded in some cases. These figures do illustrate trends, however, and may be helpful in placing force fluctuations in perspective.

—THE EDITORS

USAF—EVOLUTION OF THE NAME AND THE SERVICE'S LEADERS THROUGH THE YEARS*

DESIGNATION	FROM	TO	COMMANDER (at highest rank)	TITLE	FROM	TO
Aeronautical Div., US Signal Corps	Aug. 1, 1907	July 18, 1914	Brig. Gen. James Allen	Chief Signal Officer	Aug. 1, 1907	Feb. 13, 1913
			Brig. Gen. George P. Scriven	Chief Signal Officer	Feb. 13, 1913	July 18, 1914
Aviation Section, US Signal Corps	July 18, 1914	May 24, 1918	Brig. Gen. George P. Scriven	Chief Signal Officer	July 18, 1914	Feb. 13, 1917
			Maj. Gen. George O. Squier	Chief Signal Officer	Feb. 14, 1917	May 20, 1918
Army Air Service (AAS)	May 24, 1918	July 2, 1926	Maj. Gen. William L. Kenly	Chief, Div. of Military Aeronautics	May 20, 1918	Dec. 22, 1918
			Maj. Gen. Charles T. Menoher	Chief of the Air Service	Dec. 23, 1918	Oct. 4, 1921
			Maj. Gen. Mason M. Patrick	Chief of the Air Service	Oct. 5, 1921	July 1, 1926
Army Air Corps (AAC)	July 2, 1926	June 20, 1941	Maj. Gen. Mason M. Patrick	Chief of the Air Corps	July 2, 1926	Dec. 12, 1927
			Maj. Gen. James E. Fechet	Chief of the Air Corps	Dec. 13, 1927	Dec. 18, 1931
			Maj. Gen. Benjamin D. Foulois	Chief of the Air Corps	Dec. 19, 1931	Dec. 21, 1935
			Maj. Gen. Oscar Westover	Chief of the Air Corps	Dec. 22, 1935	Sept. 21, 1938
			Gen. H. H. Arnold	Chief of the Air Corps	Sept. 29, 1938	June 20, 1941
Army Air Forces (AAF)	June 20, 1941	Sept. 18, 1947	Gen. H. H. Arnold	Chief of the AAF	June 20, 1941	Mar. 8, 1942
			Gen. of the Army H. H. Arnold	Commanding General, AAF	Mar. 9, 1942	Feb. 9, 1946
			Gen. Carl A. Spaatz	Commanding General, AAF	Feb. 10, 1946	Sept. 25, 1947
United States Air Force (USAF)*	Sept. 18, 1947		Gen. Carl A. Spaatz	Chief of Staff, USAF	Sept. 26, 1947	Apr. 29, 1948

*For USAF leaders since 1948, see p. 194.

UNITED STATES AIR FORCE PERSONNEL STRENGTH—1907 THROUGH 1986

YEAR	STRENGTH	YEAR	STRENGTH
1907	3	1947	305,827
1908	13	1948	387,730
1909	27	1949	419,347
1910	11	1950	411,277
1911	23	1951	788,381
1912	51	1952	973,474
1913	114	1953	977,593
1914	122	1954	947,918
1915	208	1955	959,946
1916	311	1956	909,958
1917	1,218	1957	919,835
1918	195,023	1958	871,156
1919	25,603	1959	840,028
1920	9,050	1960	814,213
1921	11,649	1961	820,490
1922	9,642	1962	883,330
1923	9,441	1963	868,644
1924	10,547	1964	855,802
1925	9,670	1965	823,633
1926	9,674	1966	886,350
1927	10,078	1967	897,426
1928	10,549	1968	904,759
1929	12,131	1969	862,062
1930	13,531	1970	791,078
1931	14,780	1971	755,107
1932	15,028	1972	725,635
1933	15,099	1973	690,999
1934	15,861	1974	643,795
1935	16,247	1975	612,551
1936	17,233	1976	585,207
1937	19,147	1977	570,479
1938	21,089	1978	569,491
1939	23,455	1979	559,450
1940	51,165	1980	557,969
1941	152,125	1981	570,302
1942	764,415	1982	582,845
1943	2,197,114	1983	592,044
1944	2,372,292	1984	597,125
1945	2,282,259	1985	601,515
1946	455,515	1986	606,500*
		1987	607,400*

*Programmed

USAF TOTAL ACTIVE-DUTY STRENGTH BY GRADE

(As of September 30, 1985)

OFFICERS

GRADE	NUMBER
GENERAL	13
LIEUTENANT GENERAL	37
MAJOR GENERAL	117
BRIGADIER GENERAL	171
COLONEL	5,569
LIEUTENANT COLONEL	12,547
MAJOR	19,955
CAPTAIN	40,879
FIRST LIEUTENANT	14,548
SECOND LIEUTENANT	14,564
TOTAL	**108,400**

AIRMEN

GRADE	NUMBER
CHIEF MASTER SERGEANT	4,891
SENIOR MASTER SERGEANT	9,764
MASTER SERGEANT	37,590
TECHNICAL SERGEANT	57,369
STAFF SERGEANT	111,060
SERGEANT/SENIOR AIRMAN	116,197
AIRMAN FIRST CLASS	97,356
AIRMAN	30,158
AIRMAN BASIC	24,218
TOTAL	**488,603**

OFFICERS	108,400
CADETS	4,512
AIRMEN	488,603
TOTAL STRENGTH	**601,515**

USAF AND AIR RESERVE FORCES PERSONNEL BY CATEGORIES

CATEGORY	FY '82	FY '83	FY '84	FY '85	FY '86	FY '87[1]
AIR FORCE MILITARY						
Officers	102,000	104,600	106,200	108,400	108,600	109,300
Airmen	476,000	483,000	486,400	488,600	493,500	493,700
Cadets	4,000	4,500	4,500	4,500	4,400	4,400
TOTAL, AIR FORCE MILITARY	**582,000**	**592,100**	**597,100**	**601,500**	**606,500**	**607,400**
Career Reenlistments	44,400	43,500	38,000	36,000	42,200	44,700
Rate	90%	92%	90%	89%	90%	90%
First-Term Reenlistments	27,100	31,100	24,700	25,700	22,800	21,700
Rate	57%	66%	62%	54%	52%	50%
CIVILIAN PERSONNEL						
Direct Hire (Including Technicians)	235,500	230,000	239,800	250,400	248,635	249,971
Indirect Hire—Foreign Nationals	13,000	13,000	13,000	13,468	13,105	13,327
TOTAL, CIVILIAN PERSONNEL	**248,500**	**243,000**	**252,800**	**263,868**	**261,740**	**263,298**
TOTAL, MILITARY AND CIVILIAN[2]	**830,500**	**835,100**	**849,900**	**865,368**	**868,240**	**870,698**
Technicians (Included above as Direct Hire Civilians)						
AFRES Technicians	7,748	7,984	7,634	8,064	8,899	9,178
ANG Technicians	21,834	22,160	22,671	22,671	22,792	23,082
AIR RESERVE FORCES						
Air National Guard, Selected Reserve	100,700	102,200	104,104	109,398	110,859	115,166
Air Force Reserve, Paid	64,500	67,227	70,318	75,214	77,400	80,548
Air Force Reserve, Nonpaid[3]	43,000	42,864	37,230	42,371	39,225	42,500
TOTAL, READY RESERVE[3]	**208,200**	**212,291**	**214,422**	**226,983**	**227,484**	**238,214**
Standby	33,000	28,939	29,121	28,321	28,700	28,700
TOTAL, AIR RESERVE FORCES[4]	**241,200**	**241,230**	**243,543**	**255,304**	**256,184**	**266,914**

[1]President's Budget Request.
[2]FY '82–85 are actual figures; FY '86–87 are estimates; excludes nonchargeable personnel.
[3]Excludes training/pay categories J, K, and L.
[4]Excludes Retired Air Force Reserve.

NOTE: Totals may not add because of rounding.

USAF PERSONNEL STRENGTH BY COMMANDS, SOAs, AND DRUs

MAJOR COMMANDS	MILITARY	CIVILIAN	TOTAL
Air Force Communications Command (AFCC)	49,412	8,270	57,682
Air Force Logistics Command (AFLC)	11,668	90,157	101,825
Air Force Systems Command (AFSC)	29,270	28,643	57,913
Air Training Command (ATC)	75,130	14,910	90,040
Air University (AU)	6,983	1,733	8,716
Alaskan Air Command (AAC)	7,523	1,350	8,873
Electronic Security Command (ESC)	12,783	1,066	13,849
Military Airlift Command (MAC)	77,190	15,968	93,158
Pacific Air Forces (PACAF)	28,641	9,728	38,369
Space Command (SPACECOM)	4,994	1,223	6,217
Strategic Air Command (SAC)	104,168	12,270	116,438
Tactical Air Command (TAC)	99,894	11,840	111,734
United States Air Forces in Europe (USAFE)	63,564	10,715	74,279
TOTALS	**571,220**	**207,873**	**779,093**

SEPARATE OPERATING AGENCIES (SOAs)	MILITARY	CIVILIAN	TOTAL
Air Force Accounting and Finance Center (AFAFC)	208	2,203	2,411
Air Force Audit Agency (AFAA)	238	761	999
Air Force Commissary Service (AFCOMS)	1,134	8,278	9,412
Air Force Engineering and Services Center (AFESC)	395	515	910
Air Force Inspection and Safety Center (AFISC)	359	144	503
Air Force Intelligence Service (AFIS)	591	189	780
Air Force Legal Services Center (AFLSC)	432	146	578
Air Force Management Engineering Agency (AFMEA)	186	93	279
Air Force Military Personnel Center (AFMPC)	1,541	1,065	2,606
Air Force Office of Medical Support (AFOMS)	91	60	151
Air Force Office of Security Police (AFOSP)	72	59	131
Air Force Office of Special Investigations (AFOSI)	1,822	467	2,289
Air Force Operational Test and Evaluation Center (AFOTEC)	498	154	652
Air Force Reserve (AFRES)	330	12,173	12,503
Air Force Service Information and News Center (AFSINC)	702	180	882
Air Reserve Personnel Center (ARPC)	124	627	751
DIRECT REPORTING UNITS (DRUs)			
Air Force Technical Applications Center (AFTAC)	1,231	84	1,315
Combat Operations Staff (CBT)	224	20	244
USAF Historical Research Center (USAFHRC)	22	75	97
National Guard Bureau (NGB)	2,284	1,204	3,488
United States Air Force Academy (USAFA)[1]	2,639	1,622	4,261
Air Force District of Washington (AFDW)	4	*	4
Air Force Civilian Personnel Management Center (AFCPMC)	0	**	**
Other	10,656	25,876	36,532
TOTALS, SOAs and DRUs	**25,783**	**55,995**	**81,778**
TOTALS, COMMANDS, SOAs, and DRUs	**597,003**	**263,868**	**860,871**

[1]4,512 cadets not included.
*Numbers unconfirmed because of recent establishment of organization.
**Established formally on January 1, 1986. Number included in AFMPC figures.

AIR FORCE MILITARY PERSONNEL DISTRIBUTION BY GEOGRAPHIC AREA

(As of September 30, 1985)

TOTAL MILITARY PERSONNEL	**601,515**
US TERRITORY AND SPECIAL LOCATIONS	**469,897**
TOTAL IN FOREIGN COUNTRIES	**131,618**
Western and Southern Europe (Major concentrations in Germany—41,112, UK—26,584, Spain—5,165, Italy—5,620, Turkey—3,860)	91,606
East Asia and Pacific (Major concentrations in Japan/Okinawa—16,171, Philippines—9,307, South Korea—11,206)	37,028
Africa, Near East, S. Asia (Major concentrations in Egypt—70, Saudi Arabia—205)	397
Western Hemisphere (Major concentrations in Canada—109, Panama [Republic]—2,271)	2,474
Eastern Europe	19
Undistributed	94

NUMBER OF OFFICERS IN EACH MAJOR CAREER FIELD*

CODE	UTILIZATION FIELD TITLE	ASSIGNED
00**	Commanders and Directors	3,282
02	International-Politico-Military Affairs	269
05	Disaster Preparedness	200
09	Special Duty	1,710
10–14	Pilot	21,185
15 & 22	Navigator	9,025
16	Air Traffic Control	440
17	Air Weapons Director	2,105
18	Missile Operations	3,092
20	Space Systems	1,301
23	Audiovisual	116
25	Weather	1,399
26	Scientific	1,626
27	Acquisition Program Management	2,588
28	Development Engineer	6,401
29	Program Management	233
31	Missile Maintenance	492
40	Aircraft Maintenance & Munitions	3,860
49	Information Systems	7,082
55	Civil Engineering	2,467
57	Cartography/Geodesy	97
60	Transportation	1,009
62	Supply Service	441
64	Supply Management	1,355
65	Procurement Manufacturing Management	1,652
66	Logistics Plans & Programs	1,127
67	Financial	1,307
69	Management Analysis	252
70	Administration	2,555
73	Personnel	1,834
74	Manpower Management	573
75	Education & Training	706
79	Public Affairs	564
80	Intelligence	3,236
81	Security Police	1,098
82	Special Investigations & Counterintelligence	557
87	Band	31
88	Legal	1,311
89	Chaplain	835
90	Health Services Management	1,184
91 & 92	Biomedical Sciences	2,273
93–95	Physician	3,834
97	Nurse	4,924
98	Dental	1,591
99	Veterinary	30

*These figures do not include general officers or UPT/UNT/medical/law students.

**Commanders and director specialties in various career fields, e.g., operations, logistics, programming, etc.

NUMBER OF ENLISTED IN EACH MAJOR CAREER FIELD

CODE	CAREER FIELD TITLE	ASSIGNED
10	First Sergeant	1,710
11	Aircrew Operations	8,928
12	Aircrew Protection	3,192
20	Intelligence	13,156
22	Photomapping	116
23	Audiovisual	3,014
24	Safety	1,319
25	Weather	3,192
27	Command Control Systems Operations	16,318
29	Communications Operations	2,234
30	Communications-Electronics Systems	28,076
31	Missile Electronic Maintenance	768
32	Avionics Systems	28,494
34	Training Devices	2,142
36	Wire Communications Systems Maintenance	4,351
39	Maintenance Management Systems	3,200
40	Intricate Equipment Maintenance	806
41	Missile Systems Maintenance	5,384
42	Aircraft Systems Maintenance	45,049
43	Aircraft Maintenance	44,335
46	Munitions & Weapons Maintenance	23,690
47	Vehicle Maintenance	5,836
49	Information Systems	14,728
54	Mechanical/Electrical	10,743
55	Structural/Pavements	12,999
56	Sanitation	1,842
57	Fire Protection	6,090
59	Marine	106
60	Transportation	14,712
61	Supply Services	3,072
62	Food Services	4,575
63	Fuels	7,246
64	Supply	25,929
65	Procurement	1,671
66	Logistics Plans	1,015
67	Accounting & Finance and Auditing	5,908
69	Management Analysis	451
70	Administration	29,243
73	Personnel	11,622
74	Morale, Welfare & Recreation	1,907
75	Education & Training	3,681
79	Public Affairs	1,298
81	Security Police	39,066
82	Special Investigations & Counterintelligence	866
87	Band	1,101
90–92	Medical	25,268
98	Dental	3,597
99	Miscellaneous (Special Duty, Patients, Unclassified, etc.)	14,560

USAF PERSONNEL BY GRADE, RACE, AND SEX

(As of September 30, 1985)

OFFICERS

GRADE	FORCE	BLACK*	OTHER**	WOMEN***
GENERAL	338	6	2	2
COLONEL	5,569	116	65	92
LIEUTENANT COLONEL	12,547	253	212	383
MAJOR	19,955	624	287	1,189
CAPTAIN	40,879	2,993	778	5,553
FIRST LIEUTENANT	14,548	1,078	346	2,208
SECOND LIEUTENANT	14,564	798	396	2,500
TOTALS	**108,400**	**5,868**	**2,086**	**11,927**

AIRMEN

GRADE	FORCE	BLACK*	OTHER**	WOMEN***
CHIEF MASTER SERGEANT	4,891	542	69	20
SENIOR MASTER SERGEANT	9,764	1,445	136	62
MASTER SERGEANT	37,590	5,899	714	618
TECHNICAL SERGEANT	57,369	10,493	1,555	3,142
STAFF SERGEANT	111,060	20,683	3,841	14,709
SERGEANT/SENIOR AIRMAN	116,197	22,266	4,392	16,740
AIRMAN FIRST CLASS	97,356	14,901	4,225	13,695
AIRMAN	30,158	4,448	1,336	4,460
AIRMAN BASIC	24,218	3,504	1,044	4,140
TOTALS	**488,603**	**84,181**	**17,312**	**57,586**
TOTALS, INCLUDING OFFICERS	**597,003**	**90,049**	**19,398**	**69,513**

*Includes 14,368 women.
**Includes 2,379 women.
***Includes women from black and other categories.

AVERAGE AGES OF MILITARY PERSONNEL

(As of September 30, 1985)

Officers	Average 34 years of age
Airmen	Average 26 years of age

MONTHLY MILITARY BASIC RATES OF PAY

(Effective October 1, 1985)

PAY GRADE	YEARS OF SERVICE: UNDER 2	2	3	4	6	8	10	12	14	16	18	20	22	26
COMMISSIONED OFFICERS*														
O-10	$5,221	$5,405	$5,405	$5,405	$5,405	$5,612	$5,612	$5,724	$5,724	$5,724	$5,724	$5,724	$5,724	$5,724
O-9	4,627	4,749	4,850	4,850	4,850	4,973	4,973	5,180	5,180	5,612	5,612	5,724	5,724	5,724
O-8	4,191	4,317	4,419	4,419	4,419	4,749	4,749	4,973	4,973	5,180	5,405	5,612	5,724	5,724
O-7	3,483	3,719	3,719	3,719	3,886	3,886	4,111	4,111	4,317	4,749	5,075	5,075	5,075	5,075
O-6	2,581	2,836	3,021	3,021	3,021	3,021	3,021	3,021	3,124	3,618	3,803	3,886	4,111	4,459
O-5	2,064	2,424	2,592	2,592	2,592	2,592	2,670	2,814	3,002	3,227	3,412	3,515	3,638	3,638
O-4	1,740	2,119	2,260	2,260	2,302	2,404	2,568	2,712	2,836	2,960	3,042	3,042	3,042	3,042
O-3	1,617	1,808	1,932	2,138	2,241	2,321	2,447	2,568	2,631	2,631	2,631	2,631	2,631	2,631
O-2	1,410	1,540	1,850	1,912	1,952	1,952	1,952	1,952	1,952	1,952	1,952	1,952	1,952	1,952
O-1	1,224	1,274	1,540	1,540	1,540	1,540	1,540	1,540	1,540	1,540	1,540	1,540	1,540	1,540
COMMISSIONED OFFICERS WITH MORE THAN 4 YEARS OF ACTIVE ENLISTED OR WARRANT OFFICER SERVICE														
O-3E	—	—	—	2,138	2,241	2,321	2,447	2,568	2,670	2,670	2,670	2,670	2,670	2,670
O-2E	—	—	—	1,912	1,952	2,014	2,119	2,200	2,260	2,260	2,260	2,260	2,260	2,260
O-1E	—	—	—	1,540	1,645	1,705	1,767	1,829	1,912	1,912	1,912	1,912	1,912	1,912
ENLISTED MEMBERS														
E-9	—	—	—	—	—	—	1,916	1,959	2,004	2,050	2,095	2,136	2,249	2,467
E-8	—	—	—	—	—	1,607	1,653	1,696	1,740	1,786	1,827	1,872	1,983	2,204
E-7	1,122	1,211	1,256	1,300	1,344	1,387	1,431	1,476	1,543	1,587	1,631	1,652	1,763	1,983
E-6	965	1,052	1,096	1,143	1,185	1,228	1,273	1,339	1,381	1,425	1,447	1,447	1,447	1,447
E-5	847	922	966	1,009	1,075	1,119	1,163	1,206	1,228	1,228	1,228	1,228	1,228	1,228
E-4	790	834	883	952	989	989	989	989	989	989	989	989	989	989
E-3	744	785	816	849	849	849	849	849	849	849	849	849	849	849
E-2	716	716	716	716	716	716	716	716	716	716	716	716	716	716
E-1**	639	639	639	639	639	639	639	639	639	639	639	639	639	639

NOTE: Amounts less than $1 have been omitted.
*Basic pay is limited to $5,724.90, or Level V of the Executive Schedule.
**Basic pay for E-1s with less than four months of service is $590.70.
Basic pay while serving as Chairman of the Joint Chiefs of Staff or as Chief of Staff of the Air Force is $5,724.90, regardless of cumulative years of service.
Basic pay while serving as Chief Master Sergeant of the Air Force is $2,999.40, regardless of cumulative years of service.

MONTHLY BASIC ALLOWANCE FOR QUARTERS (BAQ)

(Effective October 1, 1985)

Pay Grade	Without Dependents		With Dependents
	Full [1]	Partial [2]	
O-10	$553.50	$50.70	$680.70
O-9	553.50	50.70	680.70
O-8	553.50	50.70	680.70
O-7	553.50	50.70	680.70
O-6	507.90	39.60	617.40
O-5	479.40	33.00	568.80
O-4	439.50	26.70	519.90
O-3	355.80	22.20	433.50
O-2	286.50	17.70	371.70
O-1	245.70	13.20	333.30
E-9	324.90	18.60	442.80
E-8	300.90	15.30	412.50
E-7	256.80	12.00	383.70
E-6	228.00	9.90	348.00
E-5	210.90	8.70	309.30
E-4	183.00	8.10	267.30
E-3	177.60	7.80	245.70
E-2	150.90	7.20	245.70
E-1	137.40	6.90	245.70

[1]Payment of the full rate of basic allowance for quarters at these rates to members of the uniformed services without dependents is authorized by 37 U.S.C. 403 and Part IV of Executive Order 11157, as amended.
[2]Payment of the partial rate of basic allowance for quarters at these rates to members of the uniformed services without dependents who, under 37 U.S.C. 403(b) or 403(c), are not entitled to the full rate of basic allowance for quarters is authorized by 37 U.S.C. 1009(c) and Part IV of Executive Order 11157, as amended.

AVIATION CAREER INCENTIVE PAY RATES

(Effective October 1, 1985)

PHASE I

Monthly Rate	Years of Aviation Service as an Officer *(including flight training)*
$125	2 or less
$156	more than 2
$188	more than 3
$206	more than 4
$400	more than 6

PHASE II

Monthly Rate	Years of Service as an Officer
$370	more than 18
$340	more than 20
$310	more than 22
$280	more than 24
$250	more than 25 (O-6 and below)

Nonrated Flight Pay

	Monthly Rate
Officer	$110
Enlisted Non-Crew Member	$110

NOTE: An officer in pay grade O-7 may not be paid at a rate greater than $200 a month. An officer in pay grade O-8 or above may not be paid at a rate greater than $206 a month. Officers with more than 18 years of commissioned service and less than 6 years of aviation service are entitled to Phase I rates.

BASIC ALLOWANCE FOR SUBSISTENCE (BAS)

Officers (Monthly)	Enlisted (Daily)		
	Separate Rations	Rations in Kind Not Available	Emergency Rations
$109.37	$5.21 $4.82*	$5.89 $5.45*	$7.80 $7.21*

*Applies to E-1s with less than four months of active-duty service.

EDUCATIONAL LEVELS—USAF LINE OFFICERS

Level	End of September 1985 Number	Percent
Below baccalaureate/unknown	112	0.12
Baccalaureate, no master's degree	55,532	60.30
Master's degree, no doctorate	35,139	38.15
Doctoral and professional degrees	1,313	1.43
TOTALS	**92,096**	**100.00**

EDUCATIONAL LEVELS—USAF ENLISTED FORCE

Level	End of September 1985 Number	Percent
Below high school	1,155	0.24
High school	287,883	58.92
Some college (less than two years)	129,499	26.50
AA/AS degree	19,608	4.01
Two to three years of college	36,542	7.48
Baccalaureate, no master's	12,777	2.62
Master's or higher	1,139	0.23
TOTALS	**488,603**	**100.00**

FEDERAL CIVILIAN PAY SCALE

General Schedule

(Effective January 1, 1985)

GRADE	1	2	3	4	5	6	7	8	9	10
GS-1	$9,339	$9,650	$9,961	$10,271	$10,582	$10,764	$11,071	$11,380	$11,393	$11,686
GS-2	10,501	10,750	11,097	11,393	11,521	11,860	12,199	12,538	12,877	13,216
GS-3	11,458	11,840	12,222	12,604	12,986	13,368	13,750	14,132	14,514	14,896
GS-4	12,862	13,291	13,720	14,149	14,578	15,007	15,436	15,865	16,294	16,723
GS-5	14,390	14,870	15,350	15,830	16,310	16,790	17,270	17,750	18,230	18,710
GS-6	16,040	16,575	17,110	17,645	18,180	18,715	19,250	19,785	20,320	20,855
GS-7	17,824	18,418	19,012	19,606	20,200	20,794	21,388	21,982	22,576	23,170
GS-8	19,740	20,398	21,056	21,714	22,372	23,030	23,688	24,346	25,004	25,662
GS-9	21,804	22,531	23,258	23,985	24,712	25,439	26,166	26,893	27,620	28,347
GS-10	24,011	24,811	25,611	26,411	27,211	28,011	28,811	29,611	30,411	31,211
GS-11	26,381	27,260	28,139	29,018	29,897	30,776	31,655	32,534	33,413	34,292
GS-12	31,619	32,673	33,727	34,781	35,835	36,889	37,943	38,997	40,051	41,105
GS-13	37,599	38,852	40,105	41,358	42,611	43,864	45,117	46,370	47,623	48,876
GS-14	44,430	45,911	47,392	48,873	50,354	51,835	53,316	54,797	56,278	57,759
GS-15	52,262	54,004	55,746	57,488	59,230	60,972	62,714	64,456	66,198	67,940
GS-16	61,296	63,339	65,382	67,425	69,468*	71,511*	73,554*	75,597*	77,640*	
GS-17	71,840*	74,197*	76,590*	78,983*	81,376*					
GS-18	84,157*									

Senior Executive Service**

LEVEL	1	2	3	4	5	6
	$61,296	$63,764	$66,232	$68,700	$70,500	$72,300

*Pay limited to Level V of the Executive Schedule, $68,700.
**Basic pay for employees at these rates is limited to $72,300, in accordance with Public Law 97-377.

AIR FORCE FULL-TIME CIVILIAN EMPLOYMENT BY GRADE

(As of September 30, 1985)

GS/OTHER		WG		WL		WS	
GR	POP	GR	POP	GR	POP	GR	POP
1	218	1	280	1	0	1	30
2	969	2	1,294	2	32	2	37
3	6,783	3	1,091	3	5	3	121
4	16,995	4	1,510	4	51	4	214
5	25,071	5	4,779	5	58	5	373
6	8,910	6	4,175	6	52	6	535
7	14,334	7	5,882	7	55	7	800
8	2,225	8	7,964	8	161	8	1,022
9	17,442	9	7,247	9	258	9	1,389
10	910	10	20,437	10	1,026	10	1,847
11	18,066	11	5,752	11	132	11	611
12	18,461	12	1,997	12	16	12	357
13	8,756	13	330	13	0	13	253
14	3,427	14	114	14	0	14	322
15	1,130	15	2	15	0	15	212
16	2					16	123
17	0					17	57
18	1					18	9
ST	5					19	0
SES	202						
TOTALS	**143,907**		**62,854**		**1,846**		**8,312**

GR = Grade
GS = General Schedule
ST = Scientific and Professional
SES = Senior Executive Service

POP = Population
WG = Wage Grade Positions
WL = Wage Grade Leader Positions
WS = Wage Grade Supervisory Positions

NOTE: Table does not include ANG technicians, local national employees, or non-appropriated fund employees.

AIR FORCE CIVILIAN PERSONNEL AVERAGE AGE AND LENGTH OF SERVICE

(As of October 31, 1985)

Average age	43 years
Average length of service	14 years

DoD FINANCIAL SUMMARY BY COMPONENT FOR FY 1983–87

(TOA in Billions of Constant FY '87 Dollars)

Component	FY '83	FY '84	FY '85	FY '86[1]	FY '87[2]
Army	$ 65.88	$ 69.10	$ 78.34	$ 78.07	$ 81.81
Navy	91.32	89.90	99.93	99.76	104.60
Air Force	82.79	94.54	104.13	99.59	105.40
Defense Agencies/OSD	10.61	11.84	13.73	15.84	19.58
Defense-wide	19.02	19.16	1.03	1.91	0.91
TOTALS[3]	**$269.62**	**$284.54**	**$297.17**	**$295.16**	**$312.29**
(Percent real growth)	(8.5%)	(5.5%)	(4.4%)	(−0.7%)	(5.8%)

[1]Estimated.
[2]President's proposed FY '87 budget.
[3]Totals may not add because of rounding.

DoD BUDGET BY MISSION CATEGORIES FOR FY 1985–89

(Billions of Dollars)

Military Program	Total Budget Authority in Current Dollars (1985 figures actual; 1986–89 estimates) 1985	1986	1987	1988	1989	Change FY 1986–87
Strategic Forces[1]	$ 27.4	$ 24.8	$ 25.4	$ 27.4	$ 29.7	+ 0.6
General-Purpose Forces	118.4	109.8	128.6	138.0	146.5	+18.8
Intelligence and Communications	25.1	25.9	29.5	30.1	32.4	+ 3.6
Airlift and Sealift	8.7	8.1	7.5	7.0	7.3	− 0.6
Guard and Reserve Forces	15.8	15.8	17.9	19.4	21.0	+ 2.1
Research and Development[2]	24.4	26.2	32.5	34.4	35.8	+ 6.3
Central Supply and Maintenance	26.7	23.3	26.4	28.6	30.6	+ 3.1
Training, Medical, and Other General Personnel Activities	33.6	36.9	37.0	40.4	42.7	+ 0.1
Administrative and Associated Activities	6.1	7.1	6.0	6.2	6.6	− 1.1
Support of Other Nations	0.6	0.5	0.8	0.9	0.9	+ 0.3
TOTAL BUDGET AUTHORITY	**$286.8**	**$278.4**	**$311.6**	**$332.4**	**$353.5**	**+33.2**
(Prior-year funds and other adjustments)	−8.2	7.0	0.7	0.8	0.8	− 6.3
TOTAL OBLIGATIONAL AUTHORITY	**$278.6**	**$285.4**	**$312.3**	**$333.2**	**$354.3**	**+26.9**

NOTE: Totals may not add because of rounding.

[1]Excludes strategic systems development included in the research and development category.
[2]Excludes research and development in other program areas on systems approved for production.

INSTALLATIONS OF THE US AIR FORCE

MAJOR INSTALLATIONS	FY '78	FY '79	FY '80	FY '81	FY '82	FY '83	FY '84	FY '85	FY '86
US and Possessions*	107	107	107	107	106	105	104	104	104
Foreign	27	27	27	27	28	30	32	33	35
Worldwide	**134**	**134**	**134**	**134**	**134**	**135**	**136**	**137**	**139**
MINOR INSTALLATIONS									
US and Possessions	2,205	2,169	2,098	2,074	2,086	2,039	2,028	1,998	2,007
Foreign	661	645	642	619	641	643	671	692	704
Worldwide	**2,866**	**2,814**	**2,740**	**2,693**	**2,727**	**2,682**	**2,699**	**2,690**	**2,711**
"Minor Installations" includes:									
Missile Sites	1,157	1,157	1,157	1,157	1,158	1,158	1,158	1,159	1,158
Air National Guard	127	128	131	133	136	136	137	142	144
Electronics Station or Site	545	530	485	467	484	461	461	452	453
General Support Annex	1,019	981	950	919	933	911	927	921	939
Auxiliary Airfield	18	18	17	17	16	16	16	16	17

*Includes Air Reserve Forces (AFRES and ANG).

AIR FORCE BUDGET AND FINANCE—FISCAL YEARS 1982–87

(Figures in millions of dollars)

	FY '82	FY '83	FY '84	FY '85	FY '86	FY '87
Gross National Product	$3,141,500	$3,320,900	$3,695,300	$3,936,800	$4,192,200	$4,536,100
Federal Budget, Outlays (Current $)	745,700	808,300	851,800	946,300	979,900	994,000
DoD Budget, Outlays (Current $)	180,741	204,430	220,840	245,371	263,551	278,022
DoD Percent of: GNP	5.8%	6.2%	6.0%	6.2%	6.3%	6.1%
Federal Budget	24.2%	25.3%	25.9%	25.9%	26.9%	28.0%
Air Force Budget Outlays						
Current Dollars	55,104	62,894	68,620	81,988	87,250	91,257
Constant FY '87 Dollars	62,864	71,244	75,304	87,186	90,363	91,257
AF Percent of: GNP	1.8%	1.9%	1.9%	2.1%	2.1%	2.0%
Federal Budget	7.4%	7.8%	8.1%	8.7%	8.9%	9.2%
DoD Budget	30.5%	30.8%	31.1%	33.4%	33.1%	32.8%
Total Obligational Authority						
DoD—Current Dollars	211,014	237,293	257,592	278,629	285,360	312,291
Constant FY '87 Dollars	248,519	269,622	284,538	297,165	295,164	312,291
AF—Current Dollars	65,017	73,499	85,923	97,759	96,363	105,399
Constant FY '87 Dollars	73,709	82,792	94,541	104,127	99,585	105,399
(With anticipated supplementals)						
Current Dollars						
Aircraft Procurement (3010)	13,640	16,976	21,051	25,224	23,031	19,127
Missile Procurement (3020)	4,478	4,668	7,761	8,273*	8,317	8,982
Other Procurement (3080)	5,408	5,723	6,894	8,595	8,568	10,900
Procurement Subtotal	23,526	27,367	35,706	42,092	39,916	39,009
Military Construction—AF (3300)	1,558	1,460	1,551	1,573	1,663	1,773
Military Construction—AFRES (3730)	37	36	41	68	63	59
Military Construction—ANG (3830)	105	128	109	111	121	140
Military Construction Subtotal	1,700	1,624	2,101	1,752	1,847	1,972
RDT&E (3600)	8,866	10,621	12,230	13,283	13,787	17,275
Stock Fund (4921)	79	162	1,289	549	416	239
TOTAL, INVESTMENT	**34,171**	**39,774**	**51,326**	**57,676**	**55,966**	**58,495**
Military Personnel—AF (3500)	11,467	12,216	12,825	17,962	19,007	19,291
Reserve Personnel—AF (3700)	327	361	388	568	612	646
National Guard Personnel—AF (3850)	478	534	579	885	994	1,059
Military Personnel Subtotal	12,272	13,111	13,792	19,415	20,613	20,996
Operation & Maintenance—AF (3400)	16,133	17,179	17,824	19,227	20,177	21,215
Operation & Maintenance—AFRES (3740)	676	762	783	878	903	976
Operation & Maintenance—ANG (3840)	1,669	1,815	1,801	1,825	1,813	1,933
Family Housing** (0704)	—	859	798	856	833	854
TOTAL, OPERATING	**30,750**	**33,726**	**34,998**	**42,201**	**44,339**	**45,974**
Programs, TOA (Current $)						
I Strategic Forces	11,534	14,070	19,978	22,812*	19,704	17,189
II General-Purpose Forces	19,246	18,952	21,062	24,832	25,943	28,333
III Intelligence & Communications	7,138	9,365	10,698	13,918	15,143	16,903
IV Airlift & Sealift Forces	4,091	4,418	5,185	6,305	7,071	6,715
V Reserve & Guard Forces	3,621	4,167	4,433	5,240	5,206	5,325
VI Research & Development	7,074	8,400	9,286	9,764	9,358	11,607
VII Central Supply & Maintenance	5,564	6,285	7,347	7,413	7,868	8,412
VIII Training, Medical, & Other General Activities	5,585	6,711	6,720	8,142	8,626	8,659
IX Administration & Associated Activities	762	886	1,071	1,361	1,276	1,237
X Support of Other Nations	403	247	143	89	90	89

NOTE: Totals may not add because of rounding. FY '86 column is a revised estimate. FY '87 is President's budget request.
*Includes $1.5 billion for Peacekeeper.
**OSD appropriation prior to FY '83.

USAF AIRCRAFT PROCUREMENT—FY '79–87

CATEGORY	FY '79	FY '80	FY '81	FY '82	FY '83	FY '84	FY '85	FY '86	FY '87
Fixed-Wing Aircraft									
Total Units Budgeted	392	408	313	200	197	241	286	333	359
Accepted/Scheduled Acceptances	288	354	396	370	302	218	240	245	313
Helicopters									
Total Units Budgeted	0	0	5	6	0	0	0	0	0
Accepted/Scheduled Acceptances	0	0	0	0	11	0	0	0	0

NOTE: FY '79–85 columns are actual. FY '86–87 figures are planned.

USAF'S AIRCRAFT—HOW MANY OF EACH TYPE AND HOW OLD?*

(Current as of September 30, 1985)

	0–3 yrs.	3–6 yrs.	6–9 yrs.	9–12 yrs.	12–15 yrs.	15–18 yrs.	18–21 yrs.	21–24 yrs.	24+ yrs.	TOTAL NUMBER	AVERAGE AGE
A-7	–	2	–	1	11	12	–	–	–	26	14.1 years
A-10	65	277	105	13	–	–	–	–	–	460	4.9 years
OA-37	–	–	–	16	15	3	–	–	–	34	12.2 years
B-1	3	–	1	1	–	–	–	–	–	5	3.3 years
B-52	–	–	–	–	–	–	–	58	205	263	25.0 years
FB-111	–	–	–	–	39	23	–	–	–	62	14.9 years
C-5	–	–	–	2	56	11	–	–	–	69	13.9 years
C-9	–	–	–	3	9	11	–	–	–	23	14.5 years
C-10	25	11	–	–	–	–	–	–	–	36	2.0 years
C-12	46	–	7	22	–	–	–	–	–	75	4.2 years
C-18	–	8	–	–	–	–	–	–	–	8	3.4 years
C-20	3	–	–	–	–	–	–	–	–	3	1.9 years
C-21	76	–	–	–	–	–	–	–	–	76	0.7 years
C-22	1	–	–	–	–	–	–	–	–	1	1.6 years
C-23	16	–	–	–	–	–	–	–	–	16	0.5 years
C-130	2	2	8	57	26	41	84	133	9	362	17.9 years
C-131	–	–	–	–	–	–	–	–	1	1	30.5 years
C-135	–	–	–	–	–	–	34	267	310	611	24.2 years
C-137	1	–	–	–	1	–	–	1	3	6	19.1 years
C-140	–	–	–	–	–	–	–	12	–	12	22.9 years
C-141	–	–	–	–	–	26	238	7	–	271	19.1 years
E-3	5	9	15	5	–	–	–	–	–	34	5.9 years
E-4	–	–	–	2	2	–	–	–	–	4	11.3 years
F-4	–	–	7	113	117	431	127	9	–	804	15.5 years
F-5	7	–	8	67	20	–	–	1	–	103	9.7 years
F-15	112	211	306	87	3	–	–	–	–	719	6.0 years
F-16	415	329	43	–	–	–	–	–	–	787	2.9 years
F-100	–	–	–	–	–	–	–	–	3	3	27.8 years
F-106	–	–	–	–	–	–	–	–	24	24	25.7 years
F-111	–	2	–	20	181	135	–	–	–	338	14.4 years
H-1	–	–	–	–	80	11	33	–	–	124	15.3 years
H-3	–	–	–	–	3	19	26	8	–	56	18.6 years
H-53	–	–	–	4	12	22	5	–	–	43	15.3 years
H-60	11	–	–	–	–	–	–	–	–	11	2.5 years
O-2	–	–	–	–	–	68	–	–	–	68	15.7 years
OV-10	–	–	–	–	–	77	–	–	–	77	16.9 years
T-33	–	–	–	–	–	–	–	–	112	112	27.6 years
T-37	–	–	–	–	–	132	64	44	371	611	23.3 years
T-38	–	–	–	–	46	211	284	268	7	816	19.5 years
T-39	–	–	–	–	–	–	–	10	8	18	23.8 years
T-41	–	–	–	–	–	50	–	–	–	50	17.4 years
T-43	–	–	–	13	2	–	–	–	–	15	11.6 years
T-46	1	–	–	–	–	–	–	–	–	1	0.0 years
TR-1	9	4	–	–	–	–	–	–	–	13	1.9 years
TG-7	7	–	–	–	–	–	–	–	–	7	2.2 years
U-6	–	1	–	–	–	–	–	–	–	1	5.0 years
UV-18	–	–	2	–	–	–	–	–	–	2	8.0 years
U-26	1	–	–	–	–	–	–	–	–	1	2.0 years
TOTALS	**806**	**856**	**502**	**426**	**623**	**1,283**	**895**	**818**	**1,053**	**7,262**	**14.6 years**
PERCENT	**11%**	**12%**	**7%**	**6%**	**9%**	**18%**	**12%**	**11%**	**14%**		

Fewer than 9 years old: 2,164 aircraft (30%).
More than 9 years old: 5,098 aircraft (70%).
*Aircraft age measured in quarters.

NOTE: ARF not included in calendar age.

AIR NATIONAL GUARD AIRCRAFT—HOW MANY, HOW OLD?

(Current as of November 30, 1985)

	0–3 yrs.	3–6 yrs.	6–9 yrs.	9–12 yrs.	12–15 yrs.	15–18 yrs.	18–21 yrs.	21–24 yrs.	24+ yrs.	TOTAL NUMBER	AVERAGE AGE
A-7	4	24	2	56	238	23	–	–	–	347	12.2 years
A-10	–	35	70	–	–	–	–	–	–	105	6.2 years
OA-37	–	–	–	25	9	19	–	–	–	53	12.7 years
C-5	–	–	–	–	1	2	–	–	–	3	15.3 years
C-22	4	–	–	–	–	–	–	–	–	4	0.9 years
C-130	21	17	8	–	–	3	8	50	91	198	20.1 years
C-131	–	–	–	–	–	–	–	–	26	26	30.3 years
KC-135	–	–	–	–	–	–	–	–	102	102	26.8 years
F-4	–	–	–	–	1	62	489	130	–	682	19.5 years
F-15	–	–	–	20	–	–	–	–	–	20	10.4 years
F-16	–	25	–	–	–	–	–	–	–	25	5.4 years
F-106	–	–	–	–	–	–	–	–	78	78	26.0 years
H-3	–	–	–	–	–	4	7	–	–	11	18.3 years
T-33	–	–	–	–	–	–	–	–	40	40	30.0 years
T-39	–	–	–	–	–	–	–	4	–	4	22.6 years
T-43	–	–	–	4	–	–	–	–	–	4	11.6 years
TOTALS	**29**	**101**	**80**	**105**	**249**	**113**	**504**	**184**	**337**	**1,702**	**16.8 years**
PERCENT	**2%**	**6%**	**5%**	**6%**	**15%**	**7%**	**30%**	**11%**	**20%**		

Fewer than 9 years old: 210 aircraft (12%).
More than 9 years old: 1,492 aircraft (88%).

AIR FORCE RESERVE AIRCRAFT—HOW MANY, HOW OLD?

(Current as of September 30, 1985)

	0–3 yrs.	3–6 yrs.	6–9 yrs.	9–12 yrs.	12–15 yrs.	15–18 yrs.	18–21 yrs.	21–24 yrs.	24+ yrs.	TOTAL NUMBER	AVERAGE AGE
A-10	–	45	54	–	–	–	–	–	–	99	6.1 years
C-5	–	–	–	–	3	2	–	–	–	5	14.8 years
C-123	–	–	–	–	–	–	–	–	4	4	29.1 years
C-130A	–	–	–	–	–	–	–	–	60	60	27.9 years
AC-130A	–	–	–	–	–	–	–	–	10	10	29.0 years
C-130B	–	–	–	–	–	–	–	14	20	34	24.3 years
C-130E	–	–	–	–	–	–	–	41	–	41	22.0 years
C-130H	7	1	–	–	–	–	–	–	–	8	2.1 years
HC-130H	–	–	–	–	–	–	10	–	–	10	20.1 years
WC-130H	–	–	–	–	–	–	7	–	–	7	19.7 years
HC-130N	–	–	–	–	–	4	–	–	–	4	15.3 years
KC-135	–	–	–	–	–	–	–	–	24	24	26.5 years
F-4	–	–	–	–	–	29	83	–	–	112	18.1 years
F-16	–	26	–	–	–	–	–	–	–	26	5.6 years
H-1	–	–	–	–	10	–	–	–	–	10	13.5 years
H-3	–	–	–	–	–	6	7	1	–	14	18.1 years
TOTALS	**7**	**72**	**54**	**–**	**13**	**41**	**107**	**56**	**118**	**468**	**18.3 years**
PERCENT	**1%**	**15%**	**12%**	**0%**	**3%**	**9%**	**23%**	**12%**	**25%**		

Fewer than 9 years old: 133 aircraft (28%).
More than 9 years old: 335 aircraft (72%).

ACTIVE-DUTY MILITARY PERSONNEL, RESERVE COMPONENT MILITARY PERSONNEL, AND CIVILIAN PERSONNEL STRENGTH

(Figures in thousands)

	FY '81	FY '82	FY '83	FY '84	FY '85	FY '86	FY '87
Active-Duty Military							
Army	781	784	780	780	777	781	781
Navy	541	553	570	578	586	586	593
Marine Corps	191	192	194	197	198	200	202
Air Force	570	581	592	597	602	607	607
Total	**2,083**	**2,110**	**2,136**	**2,152**	**2,163**	**2,174**	**2,183**
Reserve Components (Selected Reserve)							
Army National Guard	389	408	417	433	441	450	563
Army Reserve	225	257	266	278	277	294	309
Naval Reserve	88	94	109	122	130	142	156
Marine Corps Reserve	37	40	43	44	42	43	44
Air National Guard	98	101	102	104	109	111	115
Air Force Reserve	62	64	67	70	75	77	81
Total	**899**	**964**	**1,004**	**1,051**	**1,074**	**1,117**	**1,168**
Direct Hire Civilian							
Army*	318	322	334	342	364	352	349
Navy	307	306	325	316	326	341	340
Air Force*	233	235	239	241	250	249	250
Defense Agencies	79	81	82	87	91	93	98
Total*	**937**	**944**	**980**	**986**	**1,031**	**1,035**	**1,037**

NOTE: Totals may not add because of rounding.

*These totals include Army and Air National Guard technicians, who were converted from State to Federal employees in FY '69.

USAF FLYING SQUADRONS BY MISSION TYPE[1]

ACTIVE FORCES	FY '82	FY '83	FY '84	FY '85	FY '86*	FY '87*
Strategic Bomber	23	21	22	22	23	25
Air Refueling	33	34	34	32	31	30
Strategic Command and Control	7	6	6	6	6	6
Intelligence	–	3	3	3	3	3
Strategic Reconnaissance	–	1	1	1	1	1
Strategic Interceptor	5	5	5	4	3	3
Fighter	79	78	77	78	78	80
Tactical Reconnaissance	6	8	8	8	8	7
Tactical Electronic Warfare	2	2	3	3	3	4
Special Operations Forces	5	5	5	5	5	5
Tactical Air Command Control Systems[2]	3	3	3	3	3	4
Tactical Air Control Systems[2]	9	9	7	6	6	6
Weather	3	3	3	3	3	3
Rescue	8	8	8	8	8	8
Tactical Airlift	14	14	14	14	14	13
Strategic Airlift	17	17	17	17	17	17
Special Mission	1	1	1	1	1	1
Aeromedical Airlift	3	3	3	3	3	3
ICBM	26	25	24	23	22	20
TOTAL	**244**	**246**	**244**	**240**	**238**	**239**
RESERVE FORCES						
ANG Selected Reserve	91	91	91	91	91	91
Air Force Reserve[3]	54	56	56	56	57	57
TOTAL	**145**	**147**	**147**	**147**	**148**	**148**
GRAND TOTAL	**389**	**393**	**391**	**387**	**386**	**387**

*Estimate.
[1]Includes training, support, and OT&E units.
[2]Includes consolidation of certain functional groups.
[3]Includes Associate squadrons.

NUMBER OF AIRCRAFT PER ACTIVE-DUTY USAF SQUADRON

Aircraft Type	Number*
A-7	18 or 24
A-10	18 or 24
B-1	16
B-52	14, 16, or 19
C-5	15 or 16**
C-9	3 or 11
C-130	16
AC-130	10
KC-10	19
KC-135	9 to 25
C-141	17 or 18**
E-3A	2, 4, or 16
F-4	12, 18, or 25
RF-4	18
F-5	11, 18, 20, or 21
F-15	18 or 24
F-16	18 or 24
F-106	18
F-111	12, 18, or 24
FB-111	12

*For some types of aircraft, squadrons vary in size as shown here. HC-130, WC-130, T-39, and T-38 aircraft are counted as total Unit Equipment, not by squadrons.
**Reflects ongoing transfer of assets to Air Reserve Forces. (Temporary situation in C-5 squadrons.)

THE NUMBER OF ACTIVE AIRCRAFT AND FLYING HOURS

TYPE OF AIRCRAFT	FY '81	FY '82	FY '83	FY '84	FY '85	FY '86	FY '87
Bomber, Strategic	412	391	338	328	330	343	388
Tanker	534	542	546	556	559	594	604
Fighter/Interceptor/Attack	2,850	2,900	2,997	3,019	3,057	3,055	3,009
Reconnaissance/Electronic Warfare	344	363	385	404	418	424	430
Cargo/Transport	835	825	827	863	859	871	842
Search & Rescue (Fixed Wing)	36	36	35	35	37	36	33
Helicopter (includes Rescue)	230	227	236	237	234	226	227
Trainer	1,644	1,642	1,624	1,622	1,613	1,655	1,639
Utility/Observation/Other	207	193	206	191	180	180	179
TOTAL, USAF	**7,092**	**7,119**	**7,194**	**7,255**	**7,287**	**7,384**	**7,351**
Air National Guard total	1,636	1,647	1,703	1,688	1,688	1,729	1,768
Air Force Reserve total	452	447	458	458	468	478	501
TOTAL, ACTIVE AIRCRAFT, USAF, ANG, AFRES	**9,180**	**9,213**	**9,355**	**9,401**	**9,443**	**9,591**	**9,620**
Active aircraft including foreign government owned	(9,321)	(9,346)	(9,445)	(9,489)	(9,529)	(9,677)	(9,706)
FLYING HOURS (000)							
USAF	2,661	2,800	2,843	2,870	2,914	2,971	2,960
Air National Guard	406	411	414	416	423	435	443
Air Force Reserve	134	130	132	136	140	149	152
TOTAL FLYING HOURS	**3,201**	**3,341**	**3,389**	**3,422**	**3,477**	**3,555**	**3,555**

NOTE: Figures in FY '81–85 columns are actual; FY '86 and FY '87 figures are estimated.

USAF AIRCRAFT TAIL MARKINGS

Code	Aircraft	Unit, location, and command
AD	Various	Armament Division, Eglin AFB, Fla. (AFSC)
AK	F-15	21st TFW, Elmendorf AFB, Alaska (AAC)
AK	A-10, O-2	343d TFW, Eielson AFB, Alaska (AAC)
AL	F-4D	187th TFG, Dannelly Field, Ala. (ANG)
AR	RF-4C, F-5E	10th TRW, RAF Alconbury, UK (USAFE)
AZ	A-7D (F-16)[1]	162d TFW, Tucson IAP, Ariz. (ANG)
BA	RF-4	67th TRW, Bergstrom AFB, Tex. (TAC)
BC	OA-37	110th TASG, Battle Creek ANGB, Mich. (ANG)
BD	A-10	917th TFG, Barksdale AFB, La. (AFRES)
BT	F-15	36th TFW, Bitburg AB, Germany (USAFE)
CC	F-111D	27th TFW, Cannon AFB, N. M. (TAC)
CM	F-15	159th TFG, New Orleans NAS, La. (ANG)
CO	A-7D	140th TFW, Buckley ANGB, Colo. (ANG)
CR	F-15	32d TFS, Camp New Amsterdam, Netherlands (USAFE)
CT	A-10	103d TFG, Bradley ANGB, Conn. (ANG)
DC	F-4D	113th TFW, Andrews AFB, Md. (ANG)
DM	A-10	355th TTW, Davis-Monthan AFB, Ariz. (TAC)
DO	F-4D	906th TFG, Wright-Patterson AFB, Ohio (AFRES)
EG	F-15	33d TFW, Eglin AFB, Fla. (TAC)
ED	Various	Flight Test Center, Edwards AFB, Calif. (AFSC)
EL	A-10	23d TFW, England AFB, La. (TAC)
FF	F-15	1st TFW, Langley AFB, Va. (TAC)
FL	O-2, OV-10	549th TASTG, Patrick AFB, Fla. (TAC)
FM	F-4D	482d TFW, Homestead AFB, Fla. (AFRES)
FW	F-4C	122d TFW, Fort Wayne MAP, Ind. (ANG)
GA	F-4	35th TTW, George AFB, Calif. (TAC)
GU	F-4E	497th TFS, Taegu AB, Korea (PACAF)
HA	A-7D	185th TFG, Sioux City, Iowa (ANG)
HF	F-4C	181st TFG, Hulman RAP, Ind. (ANG)
HI	F-16	419th TFW, Hill AFB, Utah (ANG)
HL	F-16	388th TFW, Hill AFB, Utah (TAC)
HM	AT-38	479th TTW, Holloman AFB, N. M. (TAC)
HO	F-15	49th TFW, Holloman AFB, N. M. (TAC)
HR	F-16	50th TFW, Hahn AB, Germany (USAFE)
HW	O-2, OA-37	24th COMPW, Howard AFB, Panama (TAC)
IA	A-7D	132d TFW, Des Moines MAP, Iowa (ANG)
ID	A-10	46th TFS, Grissom AFB, Ind. (AFRES)
IL	OA-37	182d TASG, Greater Peoria Airport, Ill. (ANG)
IN	A-10	434th TFW, Grissom AFB, Ind. (AFRES)
IS	F-15, T-33	57th FIS, Keflavik NAS, Iceland (TAC)
KC	A-10	442d TFW, Richards-Gebaur AFB, Mo. (AFRES)
KE	RF-4C	186th TRG, Key Field, Miss. (ANG)
KS	EC-130	7th ACCS, Keesler AFB, Miss. (TAC)
KY	RF-4C	123d TRW, Standiford Field, Ky. (ANG)
LA	F-15	405th TTW, Luke AFB, Ariz. (TAC)
LF	F-16	58th TTW, Luke AFB, Ariz. (TAC)
LH	CH-3	302d SOS, Luke AFB, Ariz. (AFRES)
LN	F-111F	48th TFW, RAF Lakenheath, UK (USAFE)
LV	A-7	4450th TACG, Nellis AFB, Nev. (TAC)
MA	A-10	104th TFG, Barnes MAP, Mass. (ANG)
MB	A-10	354th TFW, Myrtle Beach AFB, S. C. (TAC)
MC	F-16	56th TTW, MacDill AFB, Fla. (TAC)
MD	A-10	175th TFG, Martin Airport, Md. (ANG)
MI	A-7D	127th TFW, Selfridge ANGB, Mich. (ANG)
MJ	F-16	432d TFW, Misawa AB, Japan (PACAF)
MO	F-111, EF-111	366th TFW, Mountain Home AFB, Idaho (TAC)
MY	F-4E	347th TFW, Moody AFB, Ga. (TAC)
NA	F-16	474th TFW, Nellis AFB, Nev. (TAC)
NF	OA-37, OV-10	602d TAC/CW, Davis-Monthan AFB, Ariz. (TAC)
NJ	F-4D	108th TFW, McGuire AFB, N. J. (ANG)
NM	A-7D	150th TFG, Kirtland AFB, N. M. (ANG)
NO	A-10	926th TFG, New Orleans NAS, La. (AFRES)
NY	A-10	174th TFW, Hancock Field, N. Y. (ANG)
OH	A-7D	121st TFW, Rickenbacker AFB; 178th TFG, Springfield; 180th TFG, Toledo, Ohio (ANG)
OK	A-7D	138th TFG, Tulsa IAP, Okla. (ANG)
OS	F-4E, OV-10	51st TFW, Osan AB, Korea (PACAF)
OT	Various	TAWC, Eglin AFB, Fla. (TAC)
PA	OA-37	111th TASG, Willow Grove ARF, Pa. (ANG)
PA	EC-130H	193d SOG, Harrisburg IAP, Pa. (ANG)
PN	F-4E/G, F-5	3d TFW, Clark AB, Philippines (PACAF)
PR	A-7D	156th TFG, Muñiz ANGB, Puerto Rico (ANG)
PT	A-7D	112th TFG, Greater Pittsburgh IAP, Pa. (ANG)
RG	Various	Warner Robins ALC, Robins AFB, Ga. (AFLC)
RS	F-4E	86th TFW, Ramstein AB, Germany (USAFE)
SA	F-4C (F-16)[1]	149th TFG, Kelly AFB, Tex. (ANG)
SC	F-16	169th TFG, McEntire ANGB, S. C. (ANG)
SD	A-7D	114th TFG, Joe Foss Field, S. D. (ANG)
SH	F-4D	507th TFG, Tinker AFB, Okla. (AFRES)
SI	F-4D	183d TFG, Capitol MAP, Ill. (ANG)
SJ	F-4E	4th TFW, Seymour Johnson AFB, N. C. (TAC)
SL	F-4E	131st TFW, Bridgeton, Mo. (ANG)
SP	F-4E/G	52d TFW, Spangdahlem AB, Germany (USAFE)
SW	F-16, RF-4C	363d TFW, Shaw AFB, S. C. (TAC)
SU	A-10	51st TFW, Suwon AB, Korea (PACAF)
TH	F-4D	301st TFW, Carswell AFB, Tex. (AFRES)
TJ	F-16	401st TFW, Torrejon AB, Spain (USAFE)
TX	F-4D	924th TFG, Bergstrom AFB, Tex. (AFRES)
TY	F-15,T-33	325th TTW, Tyndall AFB, Fla. (TAC)
UH	F-111E, EF-111	20th TFW, RAF Upper Heyford, UK (USAFE)
VA[2]	A-7D	192d TFG, Byrd Field, Va. (ANG)
VT	F-4D (F-16)[1]	158th TFG, Burlington IAP, Vt. (ANG)
VV	OV-10	27th TASS, George AFB, Calif. (TAC)
WA	Various	57th FWW, Nellis AFB, Nev. (TAC)
WI	A-10	128th TFW, Truax ANGB, Wis. (ANG)
WH	OV-10	22d TASS, Wheeler AFB, Hawaii (PACAF)
WP	F-16	8th TFW, Kunsan AB, Korea (PACAF)
WR	A-10	81st TFW, RAF Bentwaters, UK (USAFE)
WW	F-4G	37th TFW, George AFB, Calif. (TAC)
ZF	F-4D	31st TTW, Homestead AFB, Fla. (TAC)
ZR	RF-4C	26th TRW, Zweibrücken AB, Germany (USAFE)
ZZ	F-15, RF-4C	18th TFW, Kadena AB, Okinawa (PACAF)

[1]Converting to F-16s in FY '86.
[2]Not yet approved.

AIR DEFENSE UNIT FIN FLASHES

Color code	Aircraft	Unit and location
	Active Duty (TAC)*	
Gold lightning bolt with dark-blue border	F-15, T-33	5th FIS, Minot AFB, N. D.
Blue/white stripes	F-15, T-33	48th FIS, Langley AFB, Va.
White/green eagle	F-106, T-33	49th FIS, Griffiss AFB, N. Y.
Dark blue/light blue/white star	F-15, T-33	318th FIS, McChord AFB, Wash.
	Air National Guard Units	
Sea-blue wedge	F-106, T-33	102d FIW, Otis ANGB, Mass.
Rainbow	F-4C, T-33	107th FIG, Niagara Falls IAP, N. Y.
Red stripe with "Happy Hooligans" logo	F-4D, T-33	119th FIG, Hector Field, N. D.
Blue triangle and two blue stripes bearing "Montana" and "Big Sky Country" logos	F-106, T-33	120th FIG, Great Falls IAP, Mont.
Red hawk	F-4C, T-33	123d FIS (142d FIG), Portland IAP, Ore.
Blue/white lightning bolt	F-106, T-33	125th FIG, Jacksonville IAP, Fla.
Blue stripe with "California" logo	F-4D, T-33	144th FIW, Fresno Air Terminal, Calif.
Texas flag with red/white jagged stripes	F-4, T-33	147th FIG, Ellington ANGB, Tex.
Stars of Little Dipper constellation	F-4D	148th FIG, Duluth IAP, Minn.
Red dart	F-106, T-33	177th FIG, Atlantic City Airport, N. J.
Yellow and black checkerboard	F-4C, T-33	191st FIG, Selfridge ANGB, Mich.
	Air Defense Training Units (ANG)	
Red, white, and blue lightning bolts	T-33	84th FITS, Castle AFB, Calif.
Black hawk	F-4C	114th TFTS (142d FIG), Kingsley Field, Ore.

*The F-15 and T-33 aircraft assigned to the 57th FIS, Keflavik NAS, Iceland, carry the letter tail code IS and are listed in the chart above.

UNITED STATES AIR FORCE MEDAL OF HONOR RECIPIENTS—1918–1985

NAMES, ALPHABETICALLY BY WARS AND RANK AT TIME OF ACTION	HOME TOWN	DATE AND PLACE OF ACTION	PRESENT ADDRESS OR DATE OF DEATH
WORLD WAR I			
Bleckley, 2d Lt. Erwin R.	Wichita, Kan.	Oct. 6, 1918, Binarville, France	KIA, Oct. 6, 1918
Goettler, 2d Lt. Harold E.	Chicago, Ill.	Oct. 6, 1918, Binarville, France	KIA, Oct. 6, 1918
Luke, 2d Lt. Frank, Jr.	Phoenix, Ariz.	Sept. 29, 1918, Murvaux, France	KIA, Sept. 29, 1918
Rickenbacker, Capt. Edward V.	Columbus, Ohio	Sept. 25, 1918, Billy, France	Died, July 23, 1973
WORLD WAR II			
Baker, Lt. Col. Addison E.	Chicago, Ill.	Aug. 1, 1943, Ploesti, Romania	KIA, Aug. 1, 1943
Bong, Maj. Richard I.	Poplar, Wis.	Oct. 10–Nov. 15, 1944, Southwest Pacific	Killed, Aug. 6, 1945, Burbank, Calif.
Carswell, Maj. Horace S., Jr.	Fort Worth, Tex.	Oct. 26, 1944, South China Sea	KIA, Oct. 26, 1944
Castle, Brig. Gen. Frederick W.	Manila, P.I.	Dec. 24, 1944, Liège, Belgium	KIA, Dec. 24, 1944
Cheli, Maj. Ralph	San Francisco, Calif.	Aug. 18, 1943, Wewak, New Guinea	Died as POW, Mar. 6, 1944
Craw, Col. Demas T.	Traverse City, Mich.	Nov. 8, 1942, Port Lyautey, French Morocco	KIA, Nov. 8, 1942
Doolittle, Lt. Col. James H.	Alameda, Calif.	Apr. 18, 1942, Tokyo, Japan	Monterey, Calif. (Ret. Lt. Gen.)
Erwin, SSgt. Henry E.	Adamsville, Ala.	Apr. 12, 1945, Koriyama, Japan	Leeds, Ala.
Femoyer, 2d Lt. Robert E.	Huntington, W. Va.	Nov. 2, 1944, Merseburg, Germany	KIA, Nov. 2, 1944
Gott, 1st Lt. Donald J.	Arnett, Okla.	Nov. 9, 1944, Saarbrücken, Germany	KIA, Nov. 9, 1944
Hamilton, Maj. Pierpont M.	Tuxedo Park, N. Y.	Nov. 8, 1942, Port Lyautey, French Morocco	Died, Mar. 4, 1982
Howard, Lt. Col. James H.	Canton, China	Jan. 11, 1944, Oschersleben, Germany	Belleair Bluffs, Fla. (Ret. Brig. Gen.)
Hughes, 2d Lt. Lloyd H.	Alexandria, La.	Aug. 1, 1943, Ploesti, Romania	KIA, Aug. 1, 1943
Jerstad, Maj. John L.	Racine, Wis.	Aug. 1, 1943, Ploesti, Romania	KIA, Aug. 1, 1943
Johnson, Col. Leon W.	Columbia, Mo.	Aug. 1, 1943, Ploesti, Romania	McLean, Va. (Ret. Gen.)
Kane, Col. John R.	McGregor, Tex.	Aug. 1, 1943, Ploesti, Romania	Barber, Ark. (Ret. Col.)
Kearby, Col. Neel E.	Wichita Falls, Tex.	Oct. 11, 1943, Wewak, New Guinea	KIA, Mar. 5, 1944, Wewak, New Guinea
Kingsley, 2d Lt. David R.	Portland, Ore.	June 23, 1944, Ploesti, Romania	KIA, June 23, 1944
Knight, 1st Lt. Raymond L.	Houston, Tex.	Apr. 25, 1945, Po Valley, Italy	KIA, Apr. 25, 1945
Lawley, 1st Lt. William R., Jr.	Leeds, Ala.	Feb. 20, 1944, Leipzig, Germany	Montgomery, Ala. (Ret. Col.)
Lindsey, Capt. Darrell R.	Jefferson, Iowa	Aug. 9, 1944, Pontoise, France	KIA, Aug. 9, 1944
Mathies, SSgt. Archibald	Scotland	Feb. 20, 1944, Leipzig, Germany	KIA, Feb. 20, 1944
Mathis, 1st Lt. Jack W.	San Angelo, Tex.	Mar. 18, 1943, Vegesack, Germany	KIA, Mar. 18, 1943
McGuire, Maj. Thomas B., Jr.	Ridgewood, N.J.	Dec. 25–26, 1944, Luzon, P.I.	KIA, Jan. 7, 1945, Negros, P.I.
Metzger, 2d Lt. William E., Jr.	Lima, Ohio	Nov. 9, 1944, Saarbrücken, Germany	KIA, Nov. 9, 1944
Michael, 1st Lt. Edward S.	Chicago, Ill.	Apr. 11, 1944, Brunswick, Germany	Fairfield, Calif. (Ret. Lt. Col.)
Morgan, 2d Lt. John C.	Vernon, Tex.	July 28, 1943, Kiel, Germany	Marina del Rey, Calif. (Ret. Col.)
Pease, Capt. Harl, Jr.	Plymouth, N.H.	Aug. 7, 1942, Rabaul, New Britain	KIA, Aug. 7, 1942
Puckett, 1st Lt. Donald D.	Longmont, Colo.	July 9, 1944, Ploesti, Romania	KIA, July 9, 1944
Sarnoski, 2d Lt. Joseph R.	Simpson, Pa.	June 16, 1943, Buka, Solomon Is.	KIA, June 16, 1943
Shomo, Maj. William A.	Jeannette, Pa.	Jan. 11, 1945, Luzon, P.I.	Pittsburgh, Pa. (Ret. Lt. Col.)
Smith, SSgt. Maynard H.	Caro, Mich.	May 1, 1943, St. Nazaire, France	Died, May 11, 1984
Truemper, 2d Lt. Walter E.	Aurora, Ill.	Feb. 20, 1944, Leipzig, Germany	KIA, Feb. 20, 1944
Vance, Lt. Col. Leon R., Jr.	Enid, Okla.	June 5, 1944, Wimereaux, France	Killed, July 26, 1944, near Iceland
Vosler, TSgt. Forrest L.	Lyndonville, N.Y.	Dec. 20, 1943, Bremen, Germany	Baldwinsville, N.Y.
Walker, Brig. Gen. Kenneth N.	Cerrillos, N.M.	Jan. 5, 1943, Rabaul, New Britain	KIA, Jan. 5, 1943
Wilkins, Maj. Raymond H.	Portsmouth, Va.	Nov. 2, 1943, Rabaul, New Britain	KIA, Nov. 2, 1943
Zeamer, Maj. Jay, Jr.	Carlisle, Pa.	June 16, 1943, Buka, Solomon Is.	Boothbay Harbor, Me. (Ret. Lt. Col.)
KOREA			
Davis, Maj. George A., Jr.	Dublin, Tex.	Feb. 10, 1952, Sinuiju-Yalu River, No. Korea	KIA, Feb. 10, 1952
Loving, Maj. Charles J., Jr.	Portland, Me.	Nov. 22, 1952, Sniper Ridge, No. Korea	KIA, Nov. 22, 1952
Sebille, Maj. Louis J.	Harbor Beach, Mich.	Aug. 5, 1950, Hamch'ang, So. Korea	KIA, Aug. 5, 1950
Walmsley, Capt. John S., Jr.	Baltimore, Md.	Sept. 14, 1951, Yangdok, No. Korea	KIA, Sept. 14, 1951
VIETNAM			
Bennett, Capt. Steven L.	Palestine, Tex.	June 29, 1972, Quang Tri, So. Vietnam	KIA, June 29, 1972
Day, Col. George E.	Sioux City, Iowa	Conspicuous gallantry while POW	Shalimar, Fla. (Ret. Col.)
Dethlefsen, Maj. Merlyn H.	Greenville, Iowa	Mar. 10, 1967, Thai Nguyen, No. Vietnam	Fort Worth, Tex. (Ret. Col.)
Fisher, Maj. Bernard F.	San Bernardino, Calif.	Mar. 10, 1966, A Shau Valley, So. Vietnam	Kuna, Idaho (Ret. Col.)
Fleming, 1st Lt. James P.	Sedalia, Mo.	Nov. 26, 1968, Duc Co, So. Vietnam	Active duty, Col., Lackland AFB, Tex.
Jackson, Lt. Col. Joe M.	Newnan, Ga.	May 12, 1968, Kham Duc, So. Vietnam	Kent, Wash. (Ret. Col.)
Jones, Lt. Col. William A. III	Norfolk, Va.	Sept. 1, 1968, Dong Hoi, No. Vietnam	Killed, Nov. 15, 1969, Woodbridge, Va.
Levitow, A1C John L.	Hartford, Conn.	Feb. 24, 1969, Long Binh, So. Vietnam	Vienna, Va.
Sijan, Capt. Lance P.	Milwaukee, Wis.	Conspicuous gallantry while POW	Died while POW, Jan. 1968
Thorsness, Lt. Col. Leo K.	Walnut Grove, Minn.	Apr. 19, 1967, No. Vietnam	Santa Monica, Calif. (Ret. Col.)
Wilbanks, Capt. Hilliard A.	Cornelia, Ga.	Feb. 24, 1967, Dalat, So. Vietnam	KIA, Feb. 24, 1967
Young, Capt. Gerald O.	Anacortes, Wash.	Nov. 9, 1967, Da Nang area, So. Vietnam	Anacortes, Wash. (Ret. Lt. Col.)

SOME FAMOUS FIRSTS AMONG US BOMBARDMENT UNITS

June 12, 1918 First bombs dropped by an AEF bomb unit: 8 Breguet 14s of the 96th Aero Sqdn., led by Maj. Harry M. Brown, on Dommary-Baroncourt railyards in France.

Dec. 10, 1941 First heavy bomb mission of WW II: 5 B-17s of the 93d Bomb Sqdn., 19th Bomb Gp., led by Maj. Cecil Combs, attacked Japanese convoy near Vigan, P.I., also sank the first enemy vessel by US aerial combat bombing.

Apr. 18, 1942 First mission against Japan: 16 B-25s of the 17th Bomb Gp. and 89th Recce Sqdn., led by Lt. Col. James H. Doolittle, launched from the carrier *Hornet*.

June 12, 1942 First mission against a European target: 13 B-24s of HALPRO Detachment, led by Col. H. A. Halverson, flying from Egypt against Ploesti oil fields.

Jan. 27, 1943 First mission against the German homeland: 53 B-17s and B-24s of the 1st and 2d Bomb Wgs., flying from the UK, attacked the Wilhelmshaven naval base.

Aug. 6, 1945 First atomic bomb mission: The *Enola Gay*, a 509th Composite Gp. B-29, piloted by Col. Paul W. Tibbets, Jr., flying from Tinian, attacked Hiroshima, Japan.

USAF Leaders Through The Years

SECRETARIES OF THE AIR FORCE

Stuart Symington	Sept. 18, 1947	Apr. 24, 1950
Thomas K. Finletter	Apr. 24, 1950	Jan. 20, 1953
Harold E. Talbott	Feb. 4, 1953	Aug. 13, 1955
Donald A. Quarles	Aug. 15, 1955	Apr. 30, 1957
James H. Douglas, Jr.	May 1, 1957	Dec. 10, 1959
Dudley C. Sharp	Dec. 11, 1959	Jan. 20, 1961
Eugene M. Zuckert	Jan. 24, 1961	Sept. 30, 1965
Harold Brown	Oct. 1, 1965	Feb. 15, 1969
Robert C. Seamans, Jr.	Feb. 15, 1969	May 14, 1973
John L. McLucas	July 18, 1973	Nov. 23, 1975
James W. Plummer (acting)	Nov. 24, 1975	Jan. 1, 1976
Thomas C. Reed	Jan. 2, 1976	Apr. 6, 1977
John C. Stetson	Apr. 6, 1977	May 18, 1979
Hans Mark	July 26, 1979	Feb. 9, 1981
Verne Orr	Feb. 9, 1981	Nov. 30, 1985
Russell A. Rourke	Dec. 6, 1985	Apr. 7, 1986
Edward C. Aldridge (nominee)	Apr. 8, 1986	

USAF CHIEFS OF STAFF

Gen. Carl A. Spaatz	Sept. 26, 1947	Apr. 29, 1948
Gen. Hoyt S. Vandenberg	Apr. 30, 1948	June 29, 1953
Gen. Nathan F. Twining	June 30, 1953	June 30, 1957
Gen. Thomas D. White	July 1, 1957	June 30, 1961
Gen. Curtis E. LeMay	June 30, 1961	Jan. 31, 1965
Gen. John P. McConnell	Feb. 1, 1965	July 31, 1969
Gen. John D. Ryan	Aug. 1, 1969	July 31, 1973
Gen. George S. Brown	Aug. 1, 1973	June 30, 1974
Gen. David C. Jones	July 1, 1974	June 20, 1978
Gen. Lew Allen, Jr.	July 1, 1978	June 30, 1982
Gen. Charles A. Gabriel	July 1, 1982	

CHIEF MASTER SERGEANTS OF THE AIR FORCE

CMSAF Paul W. Airey	Apr. 3, 1967	Aug. 1, 1969
CMSAF Donald L. Harlow	Aug. 1, 1969	Oct. 1, 1971
CMSAF Richard D. Kisling	Oct. 1, 1971	Oct. 1, 1973
CMSAF Thomas N. Barnes	Oct. 1, 1973	Aug. 1, 1977
CMSAF Robert D. Gaylor	Aug. 1, 1977	Aug. 1, 1979
CMSAF James M. McCoy	Aug. 1, 1979	July 1, 1981
CMSAF Arthur L. Andrews	Aug. 1, 1981	Aug. 1, 1983
CMSAF Sam E. Parish	Aug. 1, 1983	

AIR FORCE COMMUNICATIONS COMMAND

Maj. Gen. Harold W. Grant	July 1, 1961	Feb. 15, 1962
Maj. Gen. Kenneth P. Bergquist	Feb. 16, 1962	June 30, 1965
Maj. Gen. J. Francis Taylor, Jr.	July 1, 1965	Oct. 31, 1965
Maj. Gen. Richard P. Klocko	Nov. 1, 1965	July 2, 1967
Maj. Gen. Robert W. Paulson	July 15, 1967	Aug. 1, 1969
Maj. Gen. Paul R. Stoney	Aug. 1, 1969	Oct. 31, 1973
Maj. Gen. Donald L. Werbeck	Nov. 1, 1973	Aug. 24, 1975
Maj. Gen. Rupert H. Burris	Aug. 25, 1975	Oct. 31, 1977
Maj. Gen. Robert E. Sadler	Nov. 1, 1977	July 1, 1979
Maj. Gen. Robert T. Herres	July 1, 1979	July 27, 1981
Maj. Gen. Robert F. McCarthy	July 27, 1981	June 1, 1984
Maj. Gen. Gerald L. Prather	June 1, 1984	

Formerly Air Force Communications Service.
Redesignated Air Force Communications Command Nov. 15, 1979.

AIR FORCE LOGISTICS COMMAND

Gen. Joseph T. McNarney	Oct. 14, 1947	Aug. 31, 1949
Lt. Gen. Benjamin W. Chidlaw	Sept. 1, 1949	Aug. 20, 1951
Gen. Edwin W. Rawlings	Aug. 21, 1951	Feb. 28, 1959
Lt. Gen. William F. McKee	Mar. 1, 1959	Mar. 14, 1959
Gen. Samuel E. Anderson	Mar. 15, 1959	July 31, 1961
Gen. William F. McKee	Aug. 1, 1961	June 30, 1962
Gen. Mark E. Bradley, Jr.	July 1, 1962	July 31, 1965
Gen. Kenneth B. Hobson	Aug. 1, 1965	July 31, 1967
Gen. Thomas P. Gerrity	Aug. 1, 1967	Feb. 24, 1968
Lt. Gen. Lewis L. Mundell (acting)	Feb. 24, 1968	Mar. 28, 1968
Gen. Jack G. Merrell	Mar. 29, 1968	Sept. 11, 1972
Gen. Jack J. Catton	Sept. 12, 1972	Aug. 31, 1974
Gen. William V. McBride	Sept. 1, 1974	Aug. 31, 1975
Gen. F. Michael Rogers	Sept. 1, 1975	Jan. 27, 1978
Gen. Bryce Poe II	Jan. 28, 1978	July 31, 1981
Gen. James P. Mullins	Aug. 1, 1981	Nov. 1, 1984
Gen. Earl T. O'Loughlin	Nov. 1, 1984	

Formerly Air Material Command.
Redesignated as Air Force Logistics Command Apr. 1, 1961.

AIR FORCE SYSTEMS COMMAND

Maj. Gen. David M. Schlatter	Feb. 1, 1950	June 24, 1951
Lt. Gen. Earle E. Partridge	June 24, 1951	June 20, 1953
Lt. Gen. Donald L. Putt	June 30, 1953	Apr. 14, 1954
Lt. Gen. Thomas S. Power	Apr. 15, 1954	June 30, 1957
Maj. Gen. John W. Sessums, Jr.	July 1, 1957	July 31, 1957
Lt. Gen. Samuel E. Anderson	Aug. 1, 1957	Mar. 9, 1959
Maj. Gen. John W. Sessums, Jr.	Mar. 10, 1959	Apr. 24, 1959
Gen. Bernard A. Schriever	Apr. 25, 1959	Aug. 31, 1966
Gen. James Ferguson	Sept. 1, 1966	Aug. 30, 1970
Gen. George S. Brown	Sept. 1, 1970	July 31, 1973
Gen. Samuel C. Phillips	Aug. 1, 1973	Aug. 31, 1975
Gen. William J. Evans	Sept. 1, 1975	July 31, 1977
Gen. Lew Allen, Jr.	Aug. 1, 1977	Mar. 13, 1978
Gen. Alton D. Slay	Mar. 14, 1978	Feb. 1, 1981
Gen. Robert T. Marsh	Feb. 1, 1981	Aug. 1, 1984
Gen. Lawrence A. Skantze	Aug. 1, 1984	

Formerly Air Research and Development Command.
Redesignated as Air Force Systems Command Apr. 1, 1961.

AIR TRAINING COMMAND

Lt. Gen. John K. Cannon	Apr. 15, 1946	Oct. 15, 1948
Lt. Gen. Robert W. Harper	Oct. 14, 1948	June 30, 1954
Maj. Gen. Glenn O. Barcus	July 1, 1954	July 25, 1954
Lt. Gen. Charles T. Myers	July 26, 1954	July 31, 1958
Lt. Gen. Frederic H. Smith, Jr.	Aug. 1, 1958	July 31, 1959
Lt. Gen. James E. Briggs	Aug. 1, 1959	July 31, 1963
Lt. Gen. Robert W. Burns	Aug. 1, 1963	Aug. 10, 1964
Lt. Gen. William W. Momyer	Aug. 11, 1964	June 30, 1966
Lt. Gen. Sam Maddux, Jr.	July 1, 1966	Aug. 30, 1970
Lt. Gen. George B. Simler	Sept. 1, 1970	Sept. 9, 1972
Lt. Gen. William V. McBride	Sept. 9, 1972	Aug. 31, 1974
Lt. Gen. George H. McKee	Sept. 1, 1974	Aug. 31, 1975
Gen. John W. Roberts	Sept. 1, 1975	Apr. 1, 1979
Gen. B. L. Davis	Apr. 1, 1979	July 29, 1981
Gen. Thomas M. Ryan, Jr.	July 29, 1981	June 30, 1983
Gen. Andrew P. Iosue	July 1, 1983	

AIR UNIVERSITY

Maj. Gen. Muir S. Fairchild	Mar. 15, 1946	May 17, 1948
Maj. Gen. Robert W. Harper	May 17, 1948	Oct. 15, 1948
Gen. George C. Kenney	Oct. 16, 1948	July 27, 1951
Lt. Gen. Idwal H. Edwards	July 28, 1951	Feb. 28, 1953
Lt. Gen. Laurence S. Kuter	Apr. 15, 1953	May 31, 1955
Lt. Gen. Dean C. Strother	June 1, 1955	June 30, 1958
Lt. Gen. Walter E. Todd	July 15, 1958	July 31, 1961
Lt. Gen. Troup Miller, Jr.	Aug. 1, 1961	Dec. 31, 1963
Lt. Gen. Ralph P. Swofford, Jr.	Jan. 1, 1964	July 31, 1965
Lt. Gen. John W. Carpenter III	Aug. 1, 1965	July 31, 1968
Lt. Gen. Albert P. Clark	Aug. 1, 1968	July 31, 1970
Lt. Gen. Alvan C. Gillem II	Aug. 1, 1970	Oct. 31, 1973
Lt. Gen. F. Michael Rogers	Nov. 1, 1973	Aug. 31, 1975
Lt. Gen. Raymond B. Furlong	Sept. 1, 1975	July 1, 1979
Lt. Gen. Stanley M. Umstead	July 1, 1979	July 24, 1981
Lt. Gen. Charles G. Cleveland	July 24, 1981	Aug. 1, 1984
Lt. Gen. Thomas C. Richards	Aug. 1, 1984	

Air University was part of Air Training Command between May 1978 and July 1983.

ALASKAN AIR COMMAND

Brig. Gen. Joseph H. Atkinson	Oct. 1, 1946	Feb. 25, 1949
Brig. Gen. Frank A. Armstrong, Jr.	Feb. 26, 1949	Dec. 27, 1950
Maj. Gen. William D. Old	Dec. 27, 1950	Oct. 14, 1952
Brig. Gen. W. R. Agee	Oct. 27, 1952	Feb. 26, 1953
Maj. Gen. George R. Acheson	Feb. 26, 1953	Feb. 1, 1956
Lt. Gen. Joseph H. Atkinson	Feb. 24, 1956	July 16, 1956
Maj. Gen. Frank A. Armstrong, Jr.	July 17, 1956	Oct. 23, 1956
Maj. Gen. James H. Davies	Oct. 24, 1956	June 27, 1957
Lt. Gen. Frank A. Armstrong, Jr.	June 28, 1957	Aug. 18, 1957
Brig. Gen. Kenneth H. Gibson	Aug. 19, 1957	Aug. 13, 1958
Maj. Gen. C. F. Necrason	Aug. 14, 1958	July 19, 1961
Maj. Gen. Wendell W. Bowman	July 26, 1961	Aug. 8, 1963
Maj. Gen. James C. Jensen	Aug. 15, 1963	Nov. 14, 1966
Maj. Gen. Thomas E. Moore	Nov. 15, 1966	July 24, 1969
Maj. Gen. Joseph A. Cunningham	July 25, 1969	July 31, 1972
Maj. Gen. Donavon F. Smith	Aug. 1, 1972	June 5, 1973
Maj. Gen. Charles W. Carson, Jr.	June 18, 1973	Mar. 2, 1974
Maj. Gen. Jack K. Gamble	Mar. 19, 1974	June 30, 1975
Lt. Gen. James E. Hill	July 1, 1975	Oct. 14, 1976
Lt. Gen. M. L. Boswell	Oct. 15, 1976	June 30, 1978
Lt. Gen. Winfield W. Scott, Jr.	July 1, 1978	Apr. 1, 1981
Lt. Gen. Lynwood E. Clark	Apr. 1, 1981	Aug. 31, 1983
Lt. Gen. Bruce K. Brown	Sept. 1, 1983	Sept. 26, 1985
Lt. Gen. David L. Nichols	Sept. 27, 1985	

ELECTRONIC SECURITY COMMAND

Col. Roy H. Lynn	Oct. 26, 1948	July 5, 1949

Col. Travis M. Hetherington	July 6, 1949	Feb. 21, 1951
Maj. Gen. Roy H. Lynn	Feb. 22, 1951	Feb. 13, 1953
Maj. Gen. Harold H. Bassett	Feb. 14, 1953	Jan. 3, 1957
Maj. Gen. Gordon L. Blake	Jan. 4, 1957	Aug. 5, 1959
Maj. Gen. John B. Ackerman	Aug. 6, 1959	Sept. 20, 1959
Maj. Gen. Millard Lewis	Sept. 21, 1959	Aug. 31, 1962
Maj. Gen. Richard P. Klocko	Sept. 1, 1962	Oct. 15, 1965
Maj. Gen. Louis E. Coira	Oct. 16, 1965	July 18, 1969
Maj. Gen. Carl W. Stapleton	July 19, 1969	Feb. 23, 1973
Maj. Gen. Walter T. Galligan	Feb. 24, 1973	May 16, 1974
Maj. Gen. Howard P. Smith	May 17, 1974	July 31, 1975
Maj. Gen. K. D. Burns	Aug. 1, 1975	Jan. 18, 1979
Maj. Gen. Doyle E. Larson	Jan. 19, 1979	July 31, 1983
Maj. Gen. John B. Marks	Aug. 1, 1983	Apr. 16, 1985
Maj. Gen. Paul H. Martin	Apr. 17, 1985	

Formerly USAF Security Service.
Redesignated Electronic Security Command Aug. 1, 1979.

MILITARY AIRLIFT COMMAND

Lt. Gen. Laurence S. Kuter	June 1, 1948	Oct. 28, 1951
Lt. Gen. Joseph Smith	Nov. 15, 1951	June 30, 1958
Lt. Gen. William H. Tunner	July 1, 1958	May 31, 1960
Gen. Joe W. Kelly, Jr.	June 1, 1960	July 18, 1964
Gen. Howell M. Estes, Jr.	July 19, 1964	July 31, 1969
Gen. Jack J. Catton	Aug. 1, 1969	Sept. 12, 1972
Gen. Paul K. Carlton	Sept. 20, 1972	Mar. 31, 1977
Gen. William G. Moore, Jr.	Apr. 1, 1977	June 30, 1979
Gen. Robert E. Huyser	July 1, 1979	June 26, 1981
Gen. James R. Allen	June 26, 1981	June 30, 1983
Gen. Thomas M. Ryan, Jr.	July 1, 1983	Sept. 19, 1985
Gen. Duane H. Cassidy	Sept. 20, 1985	

Formerly Military Air Transport Service.
Redesignated as Military Airlift Command Jan. 1, 1966.

PACIFIC AIR FORCES

Lt. Gen. Ennis C. Whitehead	Dec. 30, 1945	Apr. 25, 1949
Lt. Gen. George E. Stratemeyer	Apr. 26, 1949	May 20, 1951
Lt. Gen. Earle E. Partridge (acting)	May 21, 1951	June 9, 1951
Gen. O. P. Weyland	June 10, 1951	Mar. 25, 1954
Gen. Earle E. Partridge	Mar. 26, 1954	May 31, 1955
Gen. Laurence S. Kuter	June 1, 1955	July 31, 1959
Gen. Emmett O'Donnell, Jr.	Aug. 1, 1959	July 31, 1963
Gen. Jacob E. Smart	Aug. 1, 1963	July 31, 1964
Gen. Hunter Harris, Jr.	Aug. 1, 1964	Jan. 31, 1967
Gen. John D. Ryan	Feb. 1, 1967	July 31, 1968
Gen. Joseph J. Nazzaro	Aug. 1, 1968	July 31, 1971
Gen. Lucius D. Clay, Jr.	Aug. 1, 1971	Sept. 30, 1973
Gen. John W. Vogt	Oct. 1, 1973	June 30, 1974
Gen. Louis L. Wilson, Jr.	July 1, 1974	May 31, 1977
Lt. Gen. James A. Hill	June 1, 1977	June 14, 1978
Lt. Gen. James D. Hughes	June 15, 1978	July 1, 1981
Lt. Gen. Arnold W. Braswell	July 1, 1981	Sept. 30, 1983
Gen. Jerome F. O'Malley	Oct. 8, 1983	Nov. 1, 1984
Gen. Robert W. Bazley	Nov. 1, 1984	

Formerly Far East Air Forces.
Redesignated as Pacific Air Forces July 1, 1957.

SPACE COMMAND

Gen. James V. Hartinger	Sept. 1, 1982	Aug. 1, 1984
Gen. Robert T. Herres	Aug. 1, 1984	

STRATEGIC AIR COMMAND

Gen. George C. Kenney	Mar. 21, 1946	Oct. 15, 1948
Gen. Curtis E. LeMay	Oct. 16, 1948	June 30, 1957
Gen. Thomas S. Power	July 1, 1957	Nov. 30, 1964
Gen. John D. Ryan	Dec. 1, 1964	Jan. 31, 1967
Gen. Joseph J. Nazzaro	Feb. 1, 1967	July 31, 1968
Gen. Bruce K. Holloway	Aug. 1, 1968	Apr. 30, 1972
Gen. John C. Meyer	May 1, 1972	July 31, 1974
Gen. Russell E. Dougherty	Aug. 1, 1974	July 31, 1977
Gen. Richard H. Ellis	Aug. 1, 1977	Aug. 1, 1981
Gen. B. L. Davis	Aug. 1, 1981	Aug. 1, 1985
Gen. Larry D. Welch	Aug. 1, 1985	

TACTICAL AIR COMMAND

Lt. Gen. E. R. Quesada	Mar. 21, 1946	Nov. 23, 1948
Maj. Gen. Robert M. Lee	Dec. 24, 1948	June 20, 1950
Maj. Gen. Glenn O. Barcus	July 17, 1950	Jan. 25, 1951
Gen. John K. Cannon	Jan. 25, 1951	Mar. 31, 1954
Gen. O. P. Weyland	Apr. 1, 1954	July 31, 1959
Gen. Frank F. Everest	Aug. 1, 1959	Sept. 30, 1961
Gen. Walter C. Sweeney, Jr.	Oct. 1, 1961	July 31, 1965
Gen. Gabriel P. Disosway	Aug. 1, 1965	July 31, 1968
Gen. William W. Momyer	Aug. 1, 1968	Sept. 30, 1973
Gen. Robert J. Dixon	Oct. 1, 1973	Apr. 30, 1978
Gen. W. L. Creech	May 1, 1978	Nov. 1, 1984
Gen. Jerome F. O'Malley	Nov. 1, 1984	Apr. 20, 1985
Gen. Robert D. Russ	May 22, 1985	

US AIR FORCES IN EUROPE

Brig. Gen. John F. McBain	Aug. 15, 1947	Oct. 20, 1947
Lt. Gen. Curtis E. LeMay	Oct. 20, 1947	Oct. 15, 1948
Lt. Gen. John K. Cannon	Oct. 16, 1948	Jan. 20, 1951
Gen. Lauris Norstad	Jan. 21, 1951	July 26, 1953
Lt. Gen. William H. Tunner	July 27, 1953	June 30, 1957
Gen. Frank F. Everest	July 1, 1957	July 31, 1959
Gen. Frederic H. Smith, Jr.	Aug. 1, 1959	June 30, 1961
Gen. Truman H. Landon	July 1, 1961	July 31, 1963
Gen. Gabriel P. Disosway	Aug. 1, 1963	July 31, 1965
Gen. Bruce K. Holloway	Aug. 1, 1965	July 31, 1966
Gen. Maurice A. Preston	Aug. 1, 1966	July 31, 1968
Gen. Horace M. Wade	Aug. 1, 1968	Jan. 31, 1969
Gen. Joseph R. Holzapple	Feb. 1, 1969	Aug. 31, 1971
Gen. David C. Jones	Sept. 1, 1971	June 30, 1974
Gen. John W. Vogt	July 1, 1974	Aug. 31, 1975
Gen. Richard H. Ellis	Sept. 1, 1975	July 31, 1977
Gen. William J. Evans	Aug. 1, 1977	Aug. 1, 1978
Gen. John W. Pauly	Aug. 1, 1978	Aug. 1, 1980
Gen. Charles A. Gabriel	Aug. 1, 1980	June 30, 1982
Gen. Billy M. Minter	July 1, 1982	Nov. 1, 1984
Gen. Charles L. Donnelly, Jr.	Nov. 1, 1984	

USAF ACADEMY SUPERINTENDENTS

Lt. Gen. Hubert R. Harmon	July 27, 1954	July 27, 1956
Maj. Gen. James E. Briggs	July 28, 1956	Aug. 16, 1959
Maj. Gen. William S. Stone	Aug. 17, 1959	June 30, 1962
Maj. Gen. Robert H. Warren	July 1, 1962	June 30, 1965
Lt. Gen. Thomas S. Moorman	July 1, 1965	July 31, 1970
Lt. Gen. Albert P. Clark	Aug. 1, 1970	July 31, 1974
Lt. Gen. James R. Allen	Aug. 1, 1974	July 31, 1977
Lt. Gen. Kenneth L. Tallman	Aug. 1, 1977	June 16, 1981
Maj. Gen. Robert E. Kelley	June 16, 1981	July 4, 1983
Lt. Gen. Winfield W. Scott, Jr.	July 5, 1983	

AIR (AEROSPACE) DEFENSE COMMAND

Lt. Gen. George E. Stratemeyer	Mar. 27, 1946	Nov. 30, 1948*
Maj. Gen. Gordon P. Saville	Dec. 1, 1948	Sept. 1, 1949
Lt. Gen. Ennis C. Whitehead	Jan. 8, 1951	Aug. 24, 1951
Gen. Benjamin W. Chidlaw	Aug. 25, 1951	May 31, 1955
Maj. Gen. Frederic H. Smith, Jr. (acting)	June 1, 1955	July 19, 1955
Gen. Earle E. Partridge	July 20, 1955	Sept. 16, 1956
Lt. Gen. Joseph H. Atkinson	Sept. 17, 1956	Feb. 28, 1961
Lt. Gen. Robert M. Lee	Mar. 1, 1961	July 5, 1963
Maj. Gen. Robert H. Terrill (acting)	July 6, 1963	July 31, 1963
Lt. Gen. Herbert B. Thatcher	Aug. 1, 1963	July 31, 1967
Lt. Gen. Arthur C. Agan, Jr.	Aug. 1, 1967	Feb. 28, 1970
Lt. Gen. Thomas K. McGehee	Mar. 1, 1970	June 30, 1973
Gen. Seth J. McKee	July 1, 1973	Sept. 30, 1973
Gen. Lucius D. Clay, Jr.	Oct. 1, 1973	Aug. 31, 1975
Gen. Daniel James, Jr.	Sept. 1, 1975	Dec. 6, 1977
Gen. James E. Hill	Dec. 6, 1977	Dec. 31, 1979
Gen. James V. Hartinger	Jan. 1, 1980**	Mar. 31, 1980

*After September 1, 1949, ADC was reduced to paper status and finally inactivated on July 1, 1950. It was reestablished on January 1, 1951.
**With the activation of the Aerospace Defense Center on December 1, 1979, General Hartinger became commander of both ADCOM and the Center. When the major command inactivated in March 1980, he continued as commander of the Center.

AIR FORCE RESERVE

Maj. Gen. Rollin B. Moore, Jr.	Aug. 1, 1968	Jan. 26, 1972
Brig. Gen. Alfred Verhulst (acting)	Jan. 27, 1972	Mar. 15, 1972
Maj. Gen. Homer I. Lewis	Mar. 16, 1972	Apr. 8, 1975
Maj. Gen. William Lyon	Apr. 16, 1975	Apr. 16, 1979
Maj. Gen. Richard Bodycombe	Apr. 17, 1979	Oct. 31, 1982
Maj. Gen. Sloan R. Gill	Nov. 1, 1982	

Since Mar. 16, 1972, the Chief of Air Force Reserve has been dual-hatted as Commander, Hq. Air Force Reserve (AFRES). The earlier chief of Air Force Reserve was Maj. Gen. Tom E. Marchbanks, Jr., from Jan. 18, 1968, to Feb. 1, 1971.

AIR NATIONAL GUARD

Col. William A. R. Robertson	Nov. 28, 1945	Oct. 1948
Maj. Gen. George G. Finch	Oct. 1948	Sept. 25, 1950
Maj. Gen. Earl T. Ricks	Oct. 13, 1950	Jan. 4, 1954
Maj. Gen. Winston P. Wilson	Jan. 26, 1954	Aug. 5, 1962
Maj. Gen. I. G. Brown	Aug. 6, 1962	Apr. 19, 1974
Maj. Gen. John J. Pesch	Apr. 20, 1974	Jan. 31, 1977
Maj. Gen. John T. Guice	Feb. 1, 1977	Apr. 1, 1981
Maj. Gen. John B. Conaway	Apr. 1, 1981	

The ANG head was Chief, Aviation Group, National Guard Bureau until 1948, when the title changed to Chief, Air Force Division, NGB. In Dec. 1969 the title was changed to the present Director, Air National Guard.

Air Force Magazine's Guide to Aces

In compiling this list of aces who flew with USAF and its predecessor organizations (the Air Service and the Army Air Forces), AIR FORCE Magazine has used official USAF sources except for World War I. During that war, many Americans scored victories serving with foreign countries. As a result, these men do not appear on official lists as "American" aces. We have included in our list of World War I aces both those who flew with the American Air Service and with the British or French. The lists for World War II, Korea, and Vietnam include only AAF/USAF airmen.

The USAF Historical Research Center, Maxwell AFB, Ala., has completed a detailed accounting of the Air Service victory credits in World War I, AAF victory credits in World War II, and USAF victory credits in Korea and Southeast Asia. The World War II list took much time as a result of the great number of victories (16,591 full and partial credits) and the many different procedures used to record them. The final documented list of all World War II combat scores is now available in printed form. It is USAF Historical Study No. 85, titled "USAF Credits for the Destruction of Enemy Aircraft, World War II." Copies at $8.85 each may be ordered from the USAF Historical Research Center, Maxwell AFB, Ala. 36112.

Although some World War I totals (notably Frank Luke's) include balloons, all entries for subsequent conflicts are for air-to-air victories.

—THE EDITORS

LEADING AMERICAN ACES OF WORLD WAR I

(Ten or more victories)

Rickenbacker, Capt. Edward V. (AEF)	26	Luke, 2d Lt. Frank, Jr. (AEF)	18	Bennett, 1st Lt. Louis B. (RFC)	12
Lambert, Capt. William C. (RFC)	22	Lufbery, Maj. Raoul G. (FFC/LE)	17	Kindley, Capt. Field E. (AEF)	12
Gillette, Capt. Frederick W. (RFC)	20	Kullberg, Lt. Harold A. (RFC)	16	Putnam, 1st Lt. David E. (LE/AEF)	12
Malone, Capt. John J. (RN)	20	Rose, Capt. Oren J. (RFC)	16	Springs, Capt. Elliott W. (AEF)	12
Wilkinson, Maj. Alan M. (RFC)	19	Warman, Lt. C. T. (RFC)	15	Iaccaci, Lt. Thayer A. (RFC)	11
Hale, Capt. Frank L. (RFC)	18	Libby, Capt. Frederick (RFC)	14	Landis, Capt. Reed G. (AEF)	11
Iaccaci, Capt. Paul T. (RFC)	18	Vaughn, 1st Lt. George A. (AEF)	13	Swaab, Capt. Jacques M. (AEF)	10
		Baylies, Lt. Frank L. (FFC/LE)	12		

AEF—American Expeditionary Force
FFC—French Flying Corps
LE—Lafayette Escadrille
RFC—Royal Flying Corps (British)
RN—Royal Navy (British)

LEADING ARMY AIR FORCES ACES OF WORLD WAR II

(Fourteen and a half or more victories)

Bong, Maj. Richard I.	40	Duncan, Col. Glenn E.	19.50	Anderson, Capt. Clarence E., Jr.	16.25
McGuire, Maj. Thomas B., Jr.	38	Carson, Capt. Leonard K.	18.50	Dunham, Lt. Col. William D.	16
Gabreski, Lt. Col. Francis S.	28*	Eagleston, Maj. Glenn T.	18.50*	Harris, Lt. Col. Bill	16
Johnson, Capt. Robert S.	27	Hill, Col. David L. (AVG/USAF) (12.25)	18.25**	Welch, Capt. George S.	16
MacDonald, Col. Charles H.	27	Older, Lt. Col. Charles H. (AVG/USAF) (11.25)	18.25**	Beerbower, Capt. Donald M.	15.50
Preddy, Maj. George E.	26.83	Beckham, Maj. Walter C.	18	Brown, Maj. Samuel J.	15.50
Meyer, Lt. Col. John C.	24*	Green, Maj. Herschel H.	18	Peterson, Capt. Richard A.	15.50
Schilling, Col. David C.	22.50	Herbst, Lt. Col. John C.	18	Whisner, Capt. William T., Jr.	15.50*
Johnson, Lt. Col. Gerald R.	22	Zemke, Lt. Col. Hubert	17.75	Blakeslee, Col. Donald J. M. (ES/USAF) (3.5)	15**
Kearby, Col. Neel E.	22	England, Maj. John B.	17.50	Bradley, Lt. Col. Jack T.	15
Robbins, Maj. Jay T.	22	Beeson, Capt. Duane W.	17.33	Cragg, Maj. Edward	15
Christensen, Capt. Fred J.	21.50	Thornell, 1st Lt. John F., Jr.	17.25	Foy, Maj. Robert W.	15
Wetmore, Capt. Ray S.	21.25	Reed, Lt. Col. William N. (AVG/USAF) (11)	17**	Hofer, 2d Lt. Ralph K.	15
Voll, Capt. John J.	21	Varnell, Capt. James S., Jr.	17	Homer, Capt. Cyril F.	15
Mahurin, Maj. Walker M.	20.75*	Johnson, Maj. Gerald W.	16.50	Bochkay, Capt. Donald H.	14.84
Lynch, Lt. Col. Thomas J.	20	Godfrey, Capt. John T.	16.33	Landers, Lt. Col. John D.	14.50
Westbrook, Lt. Col. Robert B.	20			Powers, Capt. Joe H., Jr.	14.50
Gentile, Capt. Donald S.	19.83				

* Aces who added to these scores by victories in the Korean War. Ranks are as of last victory in World War II.
AVG—American Volunteer Group
ES—Eagle Squadron
** The Historical Research Center has no way of verifying kills claimed (in parentheses) while flying with AVG or ES.

USAF ACES OF THE KOREAN WAR

McConnell, Capt. Joseph, Jr.	16	Hagerstrom, Maj. James P.	8.50*	Whisner, Maj. William T., Jr.	5.50*
Jabara, Maj. James	15*	Risner, Capt. Robinson	8	Baldwin, Col. Robert P.	5
Fernandez, Capt. Manuel J.	14.50	Ruddell, Lt. Col. George I.	8*	Becker, Capt. Richard S.	5
Davis, Maj. George A., Jr.	14*	Buttlemann, 1st Lt. Henry	7	Bettinger, Maj. Stephen L.	5
Baker, Col. Royal N.	13*	Jolley, Capt. Clifford D.	7	Creighton, Maj. Richard D.	5*
Blesse, Maj. Frederick C.	10	Lilley, Capt. Leonard W.	7	Curtin, Capt. Clyde A.	5
Fischer, 1st Lt. Harold E.	10	Adams, Maj. Donald E.	6.50	Gibson, Capt. Ralph D.	5
Garrison, Lt. Col. Vermont	10*	Gabreski, Col. Francis S.	6.50*	Kincheloe, Capt. Iven C., Jr.	5
Johnson, Col. James K.	10*	Jones, Lt. Col. George L.	6.50	Latshaw, Capt. Robert T., Jr.	5
Moore, Capt. Lonnie R.	10	Marshall, Maj. Winton W.	6.50	Moore, Capt. Robert H.	5
Parr, Capt. Ralph S., Jr.	10	Kasler, 1st Lt. James H.	6	Overton, Capt. Dolphin D., III	5
Foster, Capt. Cecil G.	9	Love, Capt. Robert J.	6	Thyng, Col. Harrison R.	5*
Low, 1st Lt. James F.	9			Westcott, Maj. William H.	5

*These are in addition to World War II victories.

AAF/USAF ACES OF WORLD WAR II AND LATER WARS

	WW II	KOREA	TOTAL		WW II	KOREA	TOTAL
Gabreski, Col. Francis S.	28	6.50	34.50	Johnson, Col. James K.	1	10	11
Meyer, Col. John C.	24	2	26	Ruddell, Lt. Col. George I.	2.50	8	10.50
Mahurin, Col. Walker M.	20.75	3.50	24.25	Thyng, Col. Harrison R.	5	5	10
Davis, Maj. George A., Jr.	7	14	21	Colman, Capt. Philip E.	5	4	9
Whisner, Maj. William T., Jr.	15.50	5.50	21	Heller, Lt. Col. Edwin L.	5.50	3.50	9
Eagleston, Col. Glenn T.	18.50	2	20.50	Chandler, Maj. Van E.	5	3	8
Garrison, Lt. Col. Vermont	7.33	10	17.33	Hockery, Maj. John J.	7	1	8
Baker, Col. Royal N.	3.50	13	16.50	Creighton, Maj. Richard D.	2	5	7
Jabara, Maj. James	1.50	15	16.50	Emmert, Lt. Col. Benjamin H., Jr.	6	1	7
Olds, Col. Robin	12	4*	16	Bettinger, Maj. Stephen L.	1	5	6
Mitchell, Col. John W.	11	4	15	Visscher, Maj. Herman W.	5	1	6
Brueland, Maj. Lowell K.	12.50	2	14.50	Liles, Capt. Brooks J.	1	4	5
Hagerstrom, Maj. James P.	6	8.50	14.50	Mattson, Capt. Conrad E.	1	4	5
Hovde, Lt. Col. William J.	10.50	1	11.50	Shaeffer, Maj. William F.	2	3	5

* Colonel Olds's 4 additional victories came during the Vietnam War.

AMERICAN ACES OF THE VIETNAM WAR

DeBellevue, Capt. Charles B. (USAF)	6
Cunningham, Lt. Randy (USN)	5
Driscoll, Lt. William (USN)	5
Feinstein, Capt. Jeffrey S. (USAF)	5
Ritchie, Capt. Richard S. (USAF)	5

LEADING AIR SERVICE/ AAF/USAF ACES OF ALL WARS

Bong, Maj. Richard I.	40	WW II	Kearby, Col. Neel E.	22	WW II
McGuire, Maj. Thomas B., Jr.	38	WW II	Robbins, Maj. Jay T.	22	WW II
Gabreski, Col. Francis S.	34.50	WW II, Korea	Christensen, Capt. Fred J.	21.50	WW II
Johnson, Lt. Col. Robert S.	27	WW II	Wetmore, Capt. Ray S.	21.25	WW II
MacDonald, Col. Charles H.	27	WW II	Davis, Maj. George A., Jr.	21	WW II, Korea
Preddy, Maj. George E.	26.83	WW II	Voll, Capt. John J.	21	WW II
Meyer, Col. John C.	26	WW II, Korea	Whisner, Maj. William T., Jr.	21	WW II, Korea
Rickenbacker, Capt. Edward V.	26	WW I	Eagleston, Col. Glenn T.	20.50	WW II, Korea
Mahurin, Col. Walker M.	24.25	WW II, Korea	Lynch, Lt. Col. Thomas J.	20	WW II
Schilling, Col. David C.	22.50	WW II	Westbrook, Lt. Col. Robert B.	20	WW II
Johnson, Lt. Col. Gerald R.	22	WW II	Gentile, Capt. Donald S.	19.83	WW II

SOME FAMOUS FIGHTER FIRSTS

First American to down 5 enemy aircraft in WW I	Capt. Frederick Libby (serving with the RFC)
First American ace of WW I	Capt. Alan M. Wilkinson (RFC)
First American ace to serve with the AEF	Capt. Raoul G. Lufbery (FFC/LE)
First American AEF ace of WW I	Capt. Douglas Campbell
First American ace of WW II	Pilot Officer William R. Dunn (RAF)
First American USAAF ace of WW II	Lt. Boyd D. "Buzz" Wagner
First American to score an aerial victory in Korea	1st Lt. William G. Hudson (June 27, 1950)
First jet-to-jet kill of the Korean War	1st Lt. Russell J. Brown (Nov. 8, 1950)
First American ace of the Korean War	Capt. James Jabara (May 20, 1951)
First American ace of two wars	Maj. A. J. "Ajax" Baumler (8 in Spain; 5 in WW II)
First USAF ace of two wars	Maj. William T. Whisner, Jr. (15.5 in WW II; 5.5 in Korea)
First USAF ace with victories in WW II and Vietnam	Col. Robin Olds (12 in WW II; 4 in Vietnam)

Source: *Fighter Aces*, by Col. Raymond F. Toliver and Trevor J. Constable, Macmillan Co., N. Y., 1965.

So far, the Blue Ribbon panel has not delivered a solution to defense acquisition problems.

Packard's Partial Fix

BY GEN. ROBERT T. MARSH, USAF (RET.)
CHAIRMAN, AFA SCIENCE AND TECHNOLOGY COMMITTEE

ON THE last day of February, the President's Blue Ribbon Commission on Defense Management issued its long-awaited, two-month-delayed, initial report. Its reception at the White House and the Defense Department was surprisingly warm, considering that the first draft had been rejected as too hard-hitting and was toned down at the last minute.

The Administration's favorable reaction is understandable since the report's general findings can be interpreted to endorse—or at least deem nearly adequate—DoD's acquisition improvement initiatives of the last five years. Undoubtedly, however, Administration critics and reformists will read the report as confirmation that today's weapon-acquisition process is desperately in need of major overhaul.

Anyone familiar with the history of defense acquisition and the seemingly countless studies conducted in recent years will find this report tame stuff. For the most part, its recommendations are benign and unspecific. Because of its skeletal nature, it begs more questions than it answers. Certainly the interim report does not fulfill the promise of a single blueprint for overall improvement in defense management. Further, the report does not dig far enough below the surface to examine some critical acquisition fundamentals. Among the issues not explored are the reliance on actual contractor costs incurred as a basis for system pricing and the relationship of acquisition policy to defense industrial base objectives.

The report's broad perspective on acquisition is at once a limitation and a strong point. By failing to deal with discrete aspects of the process, it will have limited use for those seeking ideas and guidance to improve management of individual programs. On the other hand, the broad focus does call attention to the key acquisition roles played by the many partners outside DoD, including Congress, industry, and other federal agencies. The report poses some cogent recommendations for their consideration.

Although the report delves superficially into such matters as lines of military command and control during contingency operations, the discussion here will concentrate on the Commission's most significant findings about resource allocation and acquisition.

National Security Planning/Budget Process

The Commission's recommendations on defense planning and budgeting add up to a charge that better early planning must be conducted within realistic fiscal constraints and that sound military strategy must be developed, top down, to drive that planning. Generally, I believe such changes will increase the stability of resource decisions made early in the process and, therefore, have merit.

Perhaps more significant, the Commission proposes that a two-year budget be built and provided to Congress along with a five-year defense program. This idea has been considered frequently in the past and has the support of most everyone in the executive branch of government as well as in industry. It is particularly timely now,

since Congress has directed DoD to build and present a "strawman" two-year budget this year.

A related suggestion was that Congress authorize and appropriate funds for major weapon systems at the two key milestones in the process—full-scale development and high-rate production—although the panel did not say how this might be integrated with the two-year budget cycle. The acquisition community will certainly welcome this change as an important step toward program stability.

Another Commission finding sure to win widespread DoD support—but which will have much trouble in Congress—involves presenting a budget based on strategy and operational concepts rather than on hardware line items. (It can be argued that strategy is a part of the budget base today, but when it gets down to cases, the line items are dominant.) This budget proposal might even lead to congressional approval for mission-area funding. Congress, for example, might appropriate funds for specific mission categories, such as offensive strategic forces, and leave DoD and the services to allocate funds to specific programs within those categories. Among the positive results of such a process would be increased program stability and more effective use of the resources made available by Congress. Implicit is the need for flexibility to assign priorities within mission areas based on strategy and changes in the threat and the authority to reallocate funding accordingly.

Military Organization and Command

Few of the Commission's thoughts about military organization, planning for the employment of unified forces, and chains of command and communication have much bearing on acquisition. Of note, however, were ideas for improved interaction of the Commanders in Chief (CINCs) of the unified and specified commands and the JCS in planning and budgeting matters. Largely, these recommendations are procedural and should result in more effectively addressing the complementary and competing requirements generated by the services.

Further, the Commission urged creation of the position of Vice Chairman of the JCS. The Vice Chairman envisioned by the Commission—as contrasted with the recommendations of other reform groups—is to be an important post in its own right. The Vice Chairman would have responsibilities associated with acquisition. He would represent the CINCs' interests in the requirements arena and cochair the Joint Requirements Management Board (JRMB) with the new Under Secretary of Defense for Acquisition. Although the Commission does not explicitly say so, this recommendation would elevate control of the JRMB from the services to OSD and JCS. The Commission apparently sided with the service Chiefs and the Secretary of Defense in recommending that the Secretary determine the procedure for designating the "Acting Chairman."

Acquisition Organization and Procedures

The Commission acknowledged that the over-publicized spare-parts "horror stories" are not the real problem in defense procurement. In fact, the eye-catching stories of overpriced hammers and toilet covers are described as diverting attention from more fundamental problems.

The Commission's first recommendation—and probably the most significant one in the entire report—is the establishment of a new and very powerful position, an Under Secretary of Defense for Acquisition. The authority of this position would be ensured by putting it on the same executive level as the Deputy Secretary and the service Secretaries.

This properly recognizes that acquisition is a broad, complex, and highly visible process, involving research, development, test, procurement, and production. It would consolidate under a single position the OSD acquisition staff responsibilities that today are fragmented among the Under Secretary for Research and Engineering, the Assistant Secretary (Acquisition and Logistics), the Inspector General, the Director of Test and Evaluation, the Deputy Secretary in his Defense Acquisition Executive role, and others with various acquisition responsibilities. Further, designating the new Under Secretary as the Defense Acquisition Executive with authority for approving programs would vest policymaking and decision-making authority in the same person.

The skeletal nature of the report invites differing interpretations and leaves key questions hanging.

However, the Commission also wants to restructure the military departments by creating Service Acquisition Executives responsible for all acquisition programs, and that raises serious questions.

Currently, acquisition decisions are made by the service Secretary or his designated representative. On the surface, the Commission's recommendation appears to be redundant. However, the report goes on to sketch a skeletal framework for a new organization, in which each Service Acquisition Executive would have a group of senior Program Executive Officers (PEOs) reporting to him. These PEOs would, in turn, have a number of program managers reporting directly to them. (The Air Force currently has more than 200 program managers.)

The benefits of this change, according to the Commission, would be to insulate program managers from non-value-adding requirements, streamline the process, and reduce the number of acquisition personnel.

While I applaud the Commission's effort to strengthen program manager authority and accountability, I have serious reservations about this "solution." This scheme could effectively eliminate the acquisition commands, such as Air Force Systems Command—but not eliminate the need for them. Since the program managers would report directly to the PEOs (presumably located in the Secretariat or some direct reporting unit), the commanders of AFSC and the product divisions would be out of the management loop.

The proposed reporting chain is no more "streamlined" than the current one—and it would take some valuable talent out of the loop.

At first glance, this appears to be a more direct reporting chain. But there are a number of essential oversight and supporting functions provided by the acquisition commands that would have to be replicated somewhere—in a newly formed headquarters for the PEOs, within a considerably augmented program office, or at the Secretariat with much increased staff. There are too many of these essential functions to list completely here, but they include contract legal review, pricing analysis, contractor and government facilities review, production capability surveys, cost modeling, independent cost analyses, "should-cost" reviews, external interface definition/control, financial report analysis, budget review, test support, on-site contract administration, and other assorted support activities ranging from software management assistance to accident investigation. Experienced acquisition personnel will not argue the essential nature of these functions or label them as "staff meddling."

This recommendation fails to recognize that program offices are not and cannot be autonomous. The tremendous resources are simply not available to man each of the hundreds of program offices with comprehensive self-support capabilities. In very special cases, an unusual degree of autonomy may be accorded certain programs because of security, urgency, or high national priority. Even in these cases, though, the need for infrastructure support is recognized and provided for, and contrary to popular belief, this is done on an extensive and high-priority basis. In reality, program offices are formed to operate within an infrastructure designed to accomplish a multitude of acquisition tasks in the most efficient manner with the least possible overhead.

Having program managers report outside of that infrastructure would violate the most fundamental management principles. What could be simpler or better than the current Air Force system?

The Commander of AFSC controls acquisition resources and is responsible to the Secretary and Chief of Staff for acquisitions. In turn, he allocates resources to four product division commanders and holds them responsible for their assigned acquisitions. These four commanders apportion their resources among program managers and supporting functions and, in turn, hold the program managers responsible.

I fail to see how a reporting chain that runs from the program manager to the program executive officer to the service acquisition executive to the Secretary is any more streamlined than the current chain of program manager to product division commander to AFSC Commander to the Chief of Staff and the Secretary. While the change would realign the organization and redefine roles slightly, it does not actually reduce reporting requirements. The program manager might not notice much difference between the two. Further, the Commission leaves open the possibility that the new structure might be imposed in addition to the existing structure, rather than instead of it.

Further, I don't see how switching accountability of program managers from today's three- and four-star commanders with decades of operational and acquisition experience to political appointees and executive assistants of doubtful experience will assure more effective oversight. Legitimate functions of oversight include sensing when a program is in trouble, diagnosing the problem, assisting the program manager with guidance born of experience, and then providing the additional resources or whatever else is necessary to fix the problem. This kind of responsible oversight must be exercised by the level of supervision that controls support resources and functions.

My strongest concern, however, is the possibility that such a system would lead to a *de facto* civilian acquisition agency with drastically curtailed influence of experienced professional military personnel. If the PEOs are civilians, there would be no senior military officer in the chain above the program manager. While there may be no adverse impact on dealing with many acquisition business matters—cost overruns, contract structuring, competition, and the like—who would be overseeing the operational capability and utility to the combat forces?

Today, those same commanders responsible for acquisition are also responsible for the research and development program in the laboratories and nonsystem work. The long-lead technology ventures take much of their strength from a close association with ongoing acquisition programs—benefiting from lessons learned, testing, and familiarity with evolution in requirements. The acquisition programs, on the other hand, are often improved by technology transfers attributable to their organizational proximity to the laboratories. I believe separation of the acquisition function would be harmful to both missions.

I concur with the Commission's objectives of strengthening the program manager's authority and accountability. I do not believe, as apparently the Commission does, that management layers and oversight are *per se* the root cause of the problems. The problem is simply that personnel at all levels above the execution level indulge in far too much "management" of the program instead of the activity appropriate to their legitimate roles of policy direction, decision implementation, resource allocation, and assistance.

True reform must come to grips with the issues of cost-based pricing and industrial base policy.

This is a significant matter. When narrow-minded bureaucrats or zealous advocates for some limited aspect or discipline of acquisition engage in micromanaging instead of supporting and assisting, the program manager's authority is diluted. But such behavior does not necessarily negate the need for attention to the questions raised. In short, management and oversight must be carefully applied rather than eliminated—or, as could result from the Packard Commission recommendations, duplicated.

Reversing the centralization and micromanagement trend is a most difficult challenge. But if we are willing to establish strong policies and back them resolutely, then there are some techniques available. Charters signed by the service Secretary can and should be issued, vesting complete authority and responsibility for the acquisition in the program manager. Decisions and directions affecting the program made above the program manager's level should be documented with the signature of a senior responsible official attesting that he understands the impact on the program. This is now the case with the Air Force's baseline program, and I endorse the Commission's recommendation that all programs be baselined. Baselining is a strong and effective deterrent to meddling in program requirements.

Beyond the Packard Commission Report

The Packard Commission's report, as it stands, will prove useful to the Department of Defense and services in their effort to improve acquisition management. However, I am struck by the lack of attention to several important issues that, if not addressed, will leave harmful gaps.

The most important of these issues left out of the report are (1) the deep-rooted system of basing hardware prices on "actual cost" and (2) the lack of a coherent industrial base policy.

Under our pervasive cost-based philosophy of procurement, we generally try to satisfy ourselves that actual costs incurred are legitimate. Then we add some appropriate percentage of that cost as a profit. This provides little incentive for the contractor to reduce the cost base or do better on quality, productivity, and efficiency. I believe it's debatable how much the current emphasis on competition in procurement will further those goals and improve system quality and prices. And beyond that, a substantial part of our acquisitions, including those that are follow-ons to earlier competition, will continue to have prices based on actual costs incurred.

Equally important is the subject of defense industrial base policy. There are many vital questions in this area, such as: What are our mobilization and/or surge needs—qualitatively and quantitatively? What control should the government exercise? Is there a limit on numbers of contractors required or desired (since much of the cost of maintaining the defense industrial base is borne by the government) in major defense commodity areas? Or is more always better? To what degree are we—and should we be—dependent on foreign sources for critical defense materials and products? What is required at the lower supplier and subcontractor tiers in industry—qualitatively and quantitatively?

All of these questions bear directly on our acquisition policy and procedures. I do not believe any study of the acquisition process can be concluded without addressing these two critical areas.

So far as it went, the Packard Commission took on some of the significant issues. Unfortunately, I believe that it did not go far enough and that it focused on organizational changes as a means of improvement when the problems are more fundamental than that. The organization may need adjusting, but it does not need scrapping or duplicating. Management and oversight need tight control and better definition throughout the system—at DoD, services, acquisition commands, at non-DoD agencies, and in Congress. Program managers must have authority and responsibility to manage, but they must also have support from a seasoned, well-prepared infrastructure.

The Commission's recommendations will be useful, but they alone do not provide the promised solution. ■

Gen. Robert T. Marsh, USAF (Ret.), is former Commander of Air Force Systems Command, Andrews AFB, Md. A graduate of West Point, General Marsh served twenty-four years in various capacities with AFSC and a total of forty-one years in the Air Force before his retirement in 1984. He is currently an aerospace consultant and chairman of AFA's new Science and Technology Committee. General Marsh's most recent contribution to this magazine was "Our Dangerous Shortfall in Technical Education," which appeared in the December '85 issue.

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With MX deployments capped at fifty missiles and the Soviets MIRVing their ICBMs, the single-warhead Midgetman design is losing support fast.

The SICBM Consensus Splits

BY EDGAR ULSAMER
SENIOR EDITOR (POLICY & TECHNOLOGY)

Martin Marietta technicians work on a full-scale model of the SICBM. Lately, the missile's single-warhead design has been questioned, and more warheads may be added.

SOME agonizing choices lie ahead for the nation's decision-makers as they weigh the size and nature of the small ICBM (SICBM) and the basing of the second fifty Peacekeeper ICBMs. In line with recommendations by the President's Commission on Strategic Forces (also known as the Scowcroft Commission), Congress mandated that the SICBM be a single-warhead missile in the 30,000-pound range. This stipulation was contingent on the prompt deployment of 100 MX (LGM-118A) Peacekeepers and on evidence of Soviet willingness to desist from the deployment of MIRVed mobile ICBMs. Since then, these noble notions have faltered. Congress reneged on the deployment of the second fifty MXs, and the Soviet commitment to MIRVed mobile ICBMs, es-

pecially evident in the SS-24 and SS-25, has become clear-cut.

As a concomitant, the previously monolithic support for a single-warhead SICBM has developed major cracks, with influential members of the Administration and Congress arguing that for reasons of both military effectiveness and sound economics, MIRVed approaches to the SICBM need to be examined. For instance, Under Secretary of Defense for Research and Engineering Donald A. Hicks has told a number of congressional committees that the SICBM's weight limit should be raised from 30,000 pounds to at least 37,000 pounds and that the Air Force must be given a chance to look in detail at three other design options, namely two- or three-warhead mobile ICBMs in the 40,000-pound, 50,000-pound, and 70,000-pound class.

Stressing that "we have done and are continuing to do everything that Congress has requested on this program," Dr. Hicks testified that this isn't enough: "I don't believe we have the technical data to evaluate all the potentially viable alternatives." Common sense suggests, he pointed out, "that two- or three-warhead missiles should be cheaper per warhead than single-warhead missiles." But because of the congressional mandate to confine all analyses to a 30,000-pound, single-RV design, the Air Force has not been able to assess the tradeoffs between MIRVing and mobility.

Spending Less, Achieving More

For the time being, the Pentagon lacks adequate knowledge about the "feasibility or cost of maintaining the same mobility with the larger missiles that we have achieved with the single-warhead missile," Secretary Hicks recently told the Senate Armed Services Committee's Strategic and Theater Nuclear Forces Subcommittee. Yet the answer to this question, he added, is obviously critical with regard to the stability arguments that make a small missile appealing: "If we can maintain the same mobility, we can generate [disperse them over] the same area. If we can generate the same area, the Soviets have to use the same number of warheads to attack the area of dispersal." The advantage of shifting to a MIRVed SICBM that remains fully mobile is that the US would "spend less money for [fewer] missiles and launchers while charging the enemy the same price."

He pointed out that it is "my personal opinion that the answer to these questions is positive, but I am not absolutely certain. What does appear certain is that no one yet knows definitively. We need more data." Under questioning, Dr. Hicks maintained that there is some evidence that if the combined weight of the hard mobile launcher (HML) and the missile it carries can be held to between 230,000 and 250,000 pounds, full mobility can be retained. In turn, it appears that a missile carrying three RVs and penetration aids can be accommodated within that limit.

The Administration's acceptance, in 1983, of the Scowcroft Commission's recommendations and Congress's subsequent bipartisan endorsement of the resultant strategic force-modernization program were based on a firm national requirement for "at least 1,500 modern land-based individual RVs." That requirement, Dr. Hicks told Congress, remains fully valid and has the categoric endorsement of the Strategic Air Command. The Administration's original plan was to meet the 1,500-plus warhead requirement with 100 ten-MIRV MX Peacekeepers that in the aggregate would have accounted for a thousand warheads. Over time and in step with the phaseout of older Minuteman missiles, the 100 Peacekeepers were to be augmented with at least 500 single-RV SICBMs.

But congressional concern over the issue of the weapon's survivability in modified Minuteman silos subsequently limited the MX deployment to fifty missiles—unless and until a survivable basing mode can be found. This put the fate of the second fifty MX Peacekeepers in limbo and, by extension, suggested the need to deploy 1,000 SICBMs to take up the slack. The cost of such a force, Dr. Hicks predicted, is likely to range between $80 billion and $90 billion. If, on the other hand, the prohibition against MIRVing SICBMs could be rescinded and if each SICBM carried two or three warheads along with penetration aids, the cost per warhead would go down dramatically without a cut in force effectiveness.

Dr. Hicks also pointed out to Congress that increasing the size and throw-weight might be useful beyond the MIRVing option because it facilitates the use of deep-earth penetrators and multiple Maneuvering RVs (MaRVs). Deep-earth penetrators intrinsically weigh more than regular RVs, but are more effective in handling superhard targets; MaRVs complicate the task of ballistic missile defenses and at the same time can increase accuracy so that smaller warheads achieve the same target kill probability as heavier, not terminally guided, designs.

Support for the Scale-up

While to date there have been no official White House comments concerning the desirability of increasing the size and throw-weight of the SICBM, Dr. Hicks is not the only senior Pentagon official to advocate consideration of such a scale-up. DoD's Assistant Secretary for International Security Policy Richard N. Perle recently told this reporter that the single-warhead approach to the SICBM is "terribly inefficient and expensive," adding that "I can't see any good reason for doing it." He said some experts favor development and deployment of a "heavier missile with three warheads" while others advocate the option of a missile of roughly the congressionally mandated weight but with two warheads.

Either way, he suggested, both the basic systems cost and the cost per survivable warhead would be significantly lower. Ruling out this option, he emphasized, "would be a great mistake. It's an even greater mistake for committees to design the missile . . . because they are incompetent to do it." He added that he did not feel that the Scowcroft Commission was "competent to design the missile either, [and] in fact they didn't. They had the theory that if [the US] were to deploy a single-RV missile, [the Soviets] would follow suit. I think this is a theory without foundation in either logic or experience, and it has been demonstrated so, since the Soviets, subsequent to that report, have gone cheerfully on their way with multiple-warhead, mobile ICBM" programs.

But while espousing the merits of examining the SICBM design in a MIRVed configuration, Secretary Perle, the Pentagon's ranking arms-control expert, vig-

orously defended the Administration's START proposal to ban all mobile ICBMs, whether MIRVed or not. The US, he argued, "would be better off without mobile ICBMs [on either side]. An agreement to eliminate mobile ICBMs would be relatively verifiable because any sign of an infrastructure to support mobile missile deployment would constitute a violation of the agreement. It's hard to hide the massive infrastructure. It's hard to hide a test program and the necessary training, but it's easy to hide the missiles themselves."

Conversely, an arms-control accord that limits but does not rule out mobile ICBMs, he pointed out, would automatically provide justification for whatever infrastructure and test programs are associated with a mobile ICBM system. Once the infrastructure is legitimatized by treaty, it would be "child's play" for the Soviet Union to double, triple, or even quadruple the number of permitted missiles in a clandestine or nonverifiable fashion. Secretary Perle acknowledged, however, that a form of infrastructure for ICBMs already exists in the Soviet Union that can't be eliminated by START: The almost 500 SS-20s counted by US intelligence can be made to perform ICBM functions relatively easily. In their present configuration, these missiles carry three warheads over distances slightly below ICBM ranges. By offloading one or two warheads, the SS-20s in effect become ICBMs.

Congressional Attitudes Are Mixed

Congressional attitudes concerning the benefits of beefing up and MIRVing the SICBM appear to be mixed so far. Sen. Pete Wilson (R-Calif.), who tongue-in-cheek diagnosed the SICBM as a creature of Congress and arms-control politics suffering from anorexia nervosa, seems to have considerable support in his long-standing campaign to resize and MIRV the weapon. House Armed Services Committee Chairman Les Aspin (D-Wis.), on the other hand, probably reflects the views of sizable elements of the House with his contention that, as a single-RV design, the SICBM is "that rare kind of a weapon that should garner support from liberals and conservatives alike." The liberals, he argues, tend to support the SICBM because it is not a first-strike weapon; conservatives should favor the SICBM because it would cost the Soviets from three to seventeen warheads to knock out just one Midgetman warhead—"an exorbitant price that would amount to a Pyrrhic victory."

He acknowledges that there is "little question that we could lower the per-warhead cost of the Midgetman by plunking more warheads on each," but predicted that "we would [not] gain anything. If we put on more warheads, we must have a much bigger missile. And if we have a much bigger missile, the special trucks carrying it will be clumsier and slower and more difficult to disperse [at a time of] crisis." With the trucks dispersed over a smaller area, he claimed, "the Soviets could more confidently attack them with fewer warheads." The bottom line, Chairman Aspin asserted, "is that a multiple-warhead Midgetman would save money—but at a price of less deterrence and less stability, which is hardly what we are aiming for."

Dr. Hicks believes that the sizing decision—in effect the program's Defense Systems Acquisition Review Council (DSARC) meeting that is to settle the essential design details—should be delayed until the end of this year so that questions by Representative Aspin and others can be answered definitively. Because he believes that broadening the scope of the SICBM studies is essential, Dr. Hicks told Congress that he disagrees in part with a Defense Science Board study headed by MIT's Dean of Science John M. Deutch.

That just-completed analysis, Dr. Hicks said, implies that the program was ready for DSARC now, a conclusion he disagreed with. The SICBM program is now in Phase II, which is called pre-full-scale development. Full-scale development is scheduled to begin in the first quarter of FY '87, leading to missile flight testing in early 1989 and IOC in December 1992, which meets the congressionally mandated deadline. Dr. Hicks told Congress that his recommendation to delay the DSARC until the end of this year in order to widen the scope of the current analyses would not affect these deadlines.

How MX Delays Are Driving Up Costs

The Air Force's MX program and the missile's deployment in Minuteman silos, Dr. Hicks reported to Congress, have "been and continue to be a model of success. The program has been on schedule and at cost since its beginning." To date, the trouble-free test-flight program suggests that "the operational missile may be thirty to thirty-five percent more accurate than the original development program goal. No flight-test program in history has come close to this kind of success."

In marked contrast with these successes, Secretary Hicks testified, "the economic aspects of this program leave us little to be pleased about." These flaws, he charged, are the direct result of uneconomic buy rates imposed by Congress that are a "perfect example of what happens when political expediency and fiscal shortsightedness" are substituted for sound economic principles. As submitted to Congress in 1983, the Peacekeeper program was priced at $21.5 billion and involved the acquisition of the 223 test, spare, and operational missiles necessary to sustain the deployment of 100 missiles at economically optimized buy rates. These buy rates, he charged, have been vitiated in each subsequent year by congressional cuts and stretch-outs, with the result that "we may now pay more to deploy fifty missiles than we would have paid to deploy 100 missiles."

The Air Force's research on the Peacekeeper's alternate basing mode yielded unambiguous proof that "we can build silos twenty-five to fifty times harder than current silos. . . . There is no doubt that basing Peacekeepers in [superhard silos at a cost of about $8 billion for fifty missiles] is the cheapest way to improve the survivability of our land-based forces." He added that "for some time to come" the Soviet offensive strategic forces would not be able to credibly threaten a Peacekeeper force deployed in superhard silos.

Nevertheless, the Air Force is examining a range of basing options that can provide survivability over the long term and in the face of assumed drastic increases in Soviet capabilities. In this context, he cited the Deep Underground Program that offers a "viable long-term secure reserve force alternative in the event something unexpected should happen to our sea-based secure reserve force." ■

The first air cargo flight in history carried silk from Dayton to Columbus to promote a dry goods sale.

A Bolt From the Blue

BY C. V. GLINES

THIS year, the airlines of the United States will carry more than 7,000,000,000 ton-miles of cargo. The freight transported will mean more than $4 billion in revenues to the air carriers.

From the beginning of powered flight, it was inevitable that the airplane would eventually be used to carry things as well as passengers. Just a year after their successful flights at Kitty Hawk in 1903, the Wright brothers began to think of the future of their invention. In 1904, Wilbur wrote to Octave Chanute, "It is a question whether or not we are ready to begin considering what we will do with our baby now that we have it." The Wrights believed that the "aeroplane" would first be used for military reconnaissance, then for exploration and speedy transportation of passengers and freight, including mail, and finally for sport.

They were right. In 1907, the US Army proclaimed its interest in aviation by establishing an Aeronautical Division in the Signal Corps. Two years later, the nation purchased its first aircraft after demonstrations at Fort Myer, Va.

To a world full of skeptics, the two bicycle mechanics had proven that flight not only was possible but could be made practical. By 1910, they faced imitators and competitors who continually stirred public interest in airmen and aircraft. It was time for the Wrights to think about the public use of the airplane. "I firmly believe in the future of the aeroplane for commerce, to carry mail, to carry passengers, perhaps express," Orville wrote.

In 1910, Rep. Morris Sheppard (D-Tex.) introduced a bill to investigate the possibilities of using the airplane to carry mail. The editor of the New York *Telegraph* derided the idea: "Love letters will be carried in a rose-pink aeroplane steered with Cupid's wings and operated by perfumed gasoline," he wrote. Other writers also scoffed at the idea, citing the inability of the early planes to lift any significant weight or fly in strong winds.

The Wrights, Glenn Curtiss, and others organized exhibitions to gain public support. In the summer of 1910, one of these air shows featured an "aerial dash" from Sandusky to Cleveland, Ohio. It caught the fancy of Max Morehouse, a Columbus businessman and coowner of the Morehouse-Martens Co., operator of The Home Dry Goods Store. Flight had fascinated Morehouse as early as 1903, when he had invested in an airship company that failed. Undaunted, he continued to follow news accounts of flying and flyers.

Carrying the Freight

Morehouse wondered if the aeroplane could be used to carry freight rather than just to race between two points. He wrote to the Wrights in nearby Dayton on October 14, 1910, and asked if a "bolt of ribbon" could be transported from Dayton to Columbus to help bring attention to the store's annual fall sale. A. Roy Knabenshue, the Wright Co.'s exhibition manager, responded favorably, saying, "We would be very glad to enter into a proposition of this nature, as it would be the first in the history of aviation and would create an enormous amount of publicity in connection therewith."

Instead of carrying a small package, Knabenshue suggested that the flight would have more significance if the package weight could be increased to approximate a man's weight. Morehouse agreed and sent a package weighing more than 100 pounds to Dayton by rail. It contained a bolt of rose-colored silk and nine pieces of various colors. The former was for display and sale in the store; the nine pieces were to be cut into small squares, pasted on postcards, and offered as souvenirs of the history-making flight. The Wrights set the charge for the flight at $5,000 after Morehouse asked that the pilot put on an aerial demonstration after arrival. This was the usual charge for an exhibition.

One request that Knabenshue would not grant was that the pilot, Philip O. Parmalee, take off from a Dayton department store roof and land on the roof of the Home Store. Instead, it was agreed that Parmalee would land at Columbus's Driving Park, a racetrack on the outskirts of the city. He would circle the smokestack of the Ohio State Penitentiary, just as Claude Grahame-White had

On November 7, 1910, Philip O. Parmalee took off in his Wright "B" Flyer from what is now part of Wright-Patterson AFB, Ohio, and flew to Columbus. His cargo: a bolt of silk—the world's first air freight. (Smithsonian Institution Photo)

circled the Statue of Liberty in New York harbor so dramatically during the Belmont Air Meet earlier that year. The Wrights said that they would provide a snack for the pilot in case of a forced landing en route. So far as is known, this was the first flight crew meal.

Morehouse, a shrewd publicist, advertised the forthcoming flight as the "Home Store Aeroplane Express" that would transport the "R&T Pluvett Salome Silk" from Dayton. He persuaded the Columbus Retail Merchants Committee to designate November 7 as "Aviation Day." The committee chairman told Morehouse that "this is the first big event to attract residents of central Ohio towns and rural sections to our city since the settlement of the streetcar strike, and it behooves us as merchants to do our part to bring in the people." He added that a press agent had been engaged to help publicize the event.

Bargains Galore

Morehouse decided that the bolt of silk, containing 541 yards, would be sold at $1.35 per yard. There would be many other bargains at the Home Store to celebrate the momentous occasion. Those wanting to witness the great event at the Driving Park would be charged $1 to enter the landing field area; a reserved seat would cost twenty-five cents extra. Automobile drivers could park their cars at a good viewing distance for $3.

A week before the flight, Morehouse persuaded the telephone company to have subscribers along the line of flight call in Parmalee's progress as he flew overhead. Orville Wright intended to follow the path of the flight on the train as best he could, carrying with him a few replacement parts in case there should be a forced landing. However, Orville was replaced by O. E. Kent on the day of the flight.

On November 7, 1910, Parmalee readied the Wright "B" Flyer at Huffman Prairie near Dayton and tied the package to the passenger's seat beside him. Orville Wright tacked a roadmap on the plane's frame, because Parmalee had said he knew "absolutely nothing" about the route to Columbus. "Watch the map," Orville cautioned, "and do your best."

Parmalee took off at 10:40 a.m. Despite three pairs of socks, puttees, three pairs of trousers, a sweater, sweater vest, a heavy coat, mittens, and a scarf and woolen cap, he was chilled to the bone. He headed a little south of his eastward course for a few minutes to warm up in the sun. "I kept the sun-glint on the right edge of my plane's wings and flew directly east until passing Yellow Springs," he wrote later. He edged back toward the railroad that marked his route from there to Columbus.

As telephone subscribers reported Parmalee's progress, his arrival west of the city sparked a din of bells and sirens. According to one reporter, "It was an awe-inspiring sight! Those who watched that speck west of the grandstand grow to the size and shape of a bird, then larger and larger as it flew swiftly, surely, all were rooted to the ground in wonderment."

Parmalee circled the penitentiary and spotted the landing field where white streamers had been placed to indicate wind direction. He made the approach and a smooth landing. As he climbed down from the pilot's seat, he looked "as fresh and self-possessed as if he had been brought in a hackney coach from a half-mile drive," according to one witness.

A Hush Over the Crowd

"There was a strange hush settled over the crowd," the *Ohio State Journal* recounted the next day. "No one seemed to know what to do. They did not realize that world's records had been made and broken; that one of the finest flights in the brief history of aviation had been made; they only knew that for the first time, they beheld the dream of ages—a craft that successfully disputes with the eagle and the condor for mastery of the air." Parmalee had not only achieved an aviation "first" but had also set an unofficial speed record by covering the sixty-one-mile distance in sixty-three minutes at maximum altitude of 2,500 feet.

Parmalee had a letter for Morehouse that he fished out of his layers of clothing. After a brief lunch, he took off to complete the requirement to put on an "aerial exhibition." Although he lost a race to a motorcycle, he thrilled the crowd as he "negotiated the most dangerous dives and the sharpest turns with superlative ease," the *Journal* reported. In one of his dives, which gave the spectators a "gentle shock," Parmalee would cause the "mysterious" elevators to "veer ever so little, and the monster would mount again, to the intense relief of all concerned." He took several passengers up for short hops, including Max Morehouse.

Within two days, the Home Store had grossed more than $6,000 from the sale of the postcards and yardage from the bolt of silk. The world's first commercial air cargo flight proved an unqualified financial success. ■

C. V. Glines, a retired Air Force colonel, is a free-lance writer, a magazine editor, and the author of numerous books. He is a frequent contributor to this magazine. His by-line has been seen here most recently with "Landing on Microwaves" in the January '86 issue, "The Grand Old Gooney Bird" (December '85), "Doolittle's Greatest Contributions" (September '85), and "The Fabulous Fortress" (July '85).

The Man Who Wouldn't Go Home

Manny Klette's war against Nazism would end only when the Third Reich collapsed.

BY JOHN L. FRISBEE
CONTRIBUTING EDITOR

On April 25, 1945, Lt. Col. Immanuel Klette landed his B-17 at Bassingbourn at the end of a nine-hour mission to Pilsen, Czechoslovakia. It was the last day of the strategic bombing campaign in Europe. Twelve days later, Germany surrendered unconditionally.

Manny Klette didn't know at the time that he had set a record for heavy bomber pilots unlikely ever to be equaled. He had flown ninety-one missions totaling 663 combat hours—twenty more than his closest runner-up and sixty-six beyond the standard twenty-five-mission tour. Thirteen of his early missions were penetrations of German airspace before there were long-range escort fighters, when, statistically, the chances of completing a combat tour were zero.

In March 1943, Klette began his remarkable combat career as a second lieutenant with the 306th Bomb Group based at Thurleigh. For him, the war was a crusade against the evils of a totalitarian government headed by a megalomaniacal racist—a conviction Klette had inherited from his father, a clergyman who emigrated from Germany before World War I.

During his twenty-one missions as copilot, Manny Klette learned the B-17's systems, characteristics, and capabilities as few pilots knew them. That typical thoroughness paid off many times. On one mission while climbing through clouds at near stalling speed, Klette had to make a sharp turn to avoid another bomber. His plane went into a spin from which he recovered—the first B-17 pilot to pull out of a spin with a full bomb load.

Another time, he brought his bomber back across the Channel with its two right engines out. Over England, another engine had to be shut down. With supreme airmanship, Klette landed on one faltering engine and with a flat tire. That, too, had not been done before.

Flying as a copilot, he studied German fighter tactics and our own losses, concluding that two keys to survival were crew experience and holding extremely close formation. When he completed his twenty-five-mission tour, which included the bloody Schweinfurt raid of August 17, 1943, Klette was confident he could survive another tour. His group commander approved only five additional missions.

Klette's twenty-eighth mission on September 23 came close to being his last. With two engines knocked out by flak, a perforated fuel tank that wouldn't seal, and a leg wound, he was forced, after a third engine quit, to crash at night under instrument conditions in woods near an RAF base. All of the crew survived, but Klette spent five months in hospitals with fractures of the pelvis and upper legs. The doctors said he would never fly again, or even walk normally. Manny Klette didn't agree. He asked for a ground assignment in the UK until he could return to operations. As a briefing officer in Gen. Tooey Spaatz's USSTAF headquarters, he made a thorough study of Eighth Air Force operational strengths and weaknesses, German targets, Luftwaffe tactics, and an analysis of when and how the Germans changed their flak dispositions.

Klette finally won his battle with the flight surgeons. On July 30, 1944, he was given command of the 324th Squadron, 91st Bomb Group at Bassingbourn. During his next sixty-three missions to most of the toughest targets in Germany, Klette's work at USSTAF led to tactical innovations that improved bombing accuracy and saved the lives of many crews that he led.

On November 21, 1944, Klette led the entire Eighth Air Force—1,291 bombers and 954 fighters—in a raid on oil refineries at Merseburg-Leuna, the most heavily defended target in Germany. In rapidly deteriorating weather, he made an on-the-spot decision to take the bombers down from 27,000 feet to visual bombing weather at 17,000, resulting in the war's most destructive strike on the refineries. A recommendation that Klette be awarded the DSC for that mission was lost, not to surface until thirty-seven years later, after his retirement.

Why did Manny Klette continue to lead so frequently despite his group commander's objections? There was, of course, his impassioned belief that Nazism must be destroyed. Then, as Klette puts it, there was faith that God was his pilot, and he only a copilot. Finally, confidence, his and that of others, in his ability as one of the most experienced combat leaders of the war. In his early days at Bassingbourn, the 324th, led by a less seasoned officer, had lost three planes. After that, Klette resolved to lead the squadron on every difficult mission, and he did.

Nothing in Colonel Klette's unique combat career gives him more satisfaction than the fact that in thirty missions as either group, combat wing, division, task force, or Eighth Air Force lead, only two 91st Bomb Group aircraft were lost.

Manny Klette's war against the Third Reich is a study in both valor and combat leadership. His record merits more than these 800-odd words. It deserves a book. ■

This photo was taken at Bassingbourn, where, on July 30, 1944, Lt. Col. Manny Klette became commanding officer of the 91st Bomb Group's 324th Bomb Squadron.

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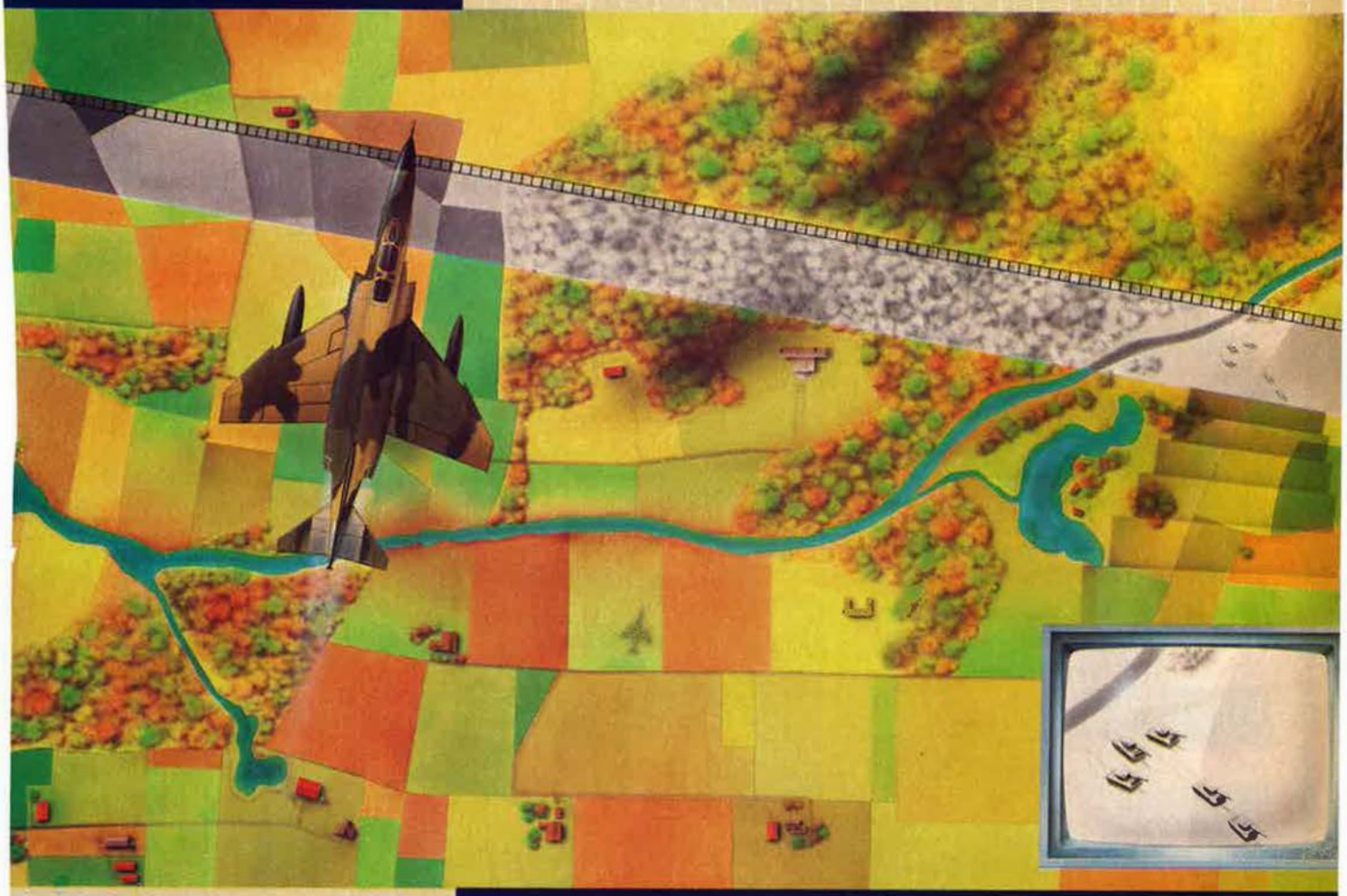

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AFA INTERCOM

By Robin L. Whittle, AFA DIRECTOR OF COMMUNICATIONS

Wichita Falls Chapter Hosts Senator Gramm

Sen. Phil Gramm (R-Tex.), one of the architects of the Gramm-Rudman-Hollings balanced-budget act, addressed AFA's Wichita Falls Chapter in February, reports Chapter Communications Director Bob Arnold.

More than 200 people turned out to hear the Senator and to honor the winners of the Chapter's Earle North Parker essay contest, "America's Freedom Isn't Free." Top winner was Cameron C. John of Rider High School who received $300. Runners-up were Elizabeth Phillips of Burkburnett High School and Karen Nelson of Hirschi High School, who each won $100. The annual contest is open to all high school seniors in the Wichita Falls area. This year's judges were Lois A. Barnes, assistant director of education for Sheppard AFB; Nancy Scott, professor at Midwestern State University; and Don James, an executive editor with the Times Publishing Co.

"The program I want for the American people is not the school lunch program, and it is not food stamps," Senator Gramm told the crowd regarding proposed cuts in nutrition programs. "It's a job." The American nutrition program that has worked miracles here and all over the world "is people going to work, earning a living, taking their paycheck to the grocer to buy food, and putting those groceries on the kitchen table," he said.

Senator Gramm said that the promise was made to rebuild national defense, "and we have." He noted that in 1980 the percentage of inductees who were high school graduates was the lowest since the post-World War II era. "In 1980, the lowest IQ level in history was recorded. Our planes didn't fly and our ships didn't sail because we didn't have the mechanics or spare parts, and our weapons were older than the people using them." The Soviet Union had grown in power, and, in two decades of neglect, the balance of power to preserve peace was in a very dangerous situation, the Senator recalled.

"All that's changed. We have rebuilt national defense. We have modernized the strategic triad. We have built new weapons, and we have recruited and are retaining the finest young men and women who have ever worn the uniform of this country. They wear that uniform with pride here tonight in Wichita Falls and all over the world," he told the crowd of military and civilian guests.

"Everywhere citizen soldiers stand on guard for freedom and democracy tonight; they stand on guard with the finest weapons any soldiers have ever had. As a result, peace is more secure today than it was five years ago."

Regarding the possibility of successful arms reductions, Senator Gramm noted that the Soviets' return to the bargaining table didn't occur because the US was weak or because America had made concessions, neither of which was the case. "They came back to the bargaining table because we were strong. It's from that position of strength that I believe that, for the first time in a long time, the realistic opportunity exists to negotiate arms reductions with the Soviet Union that will lessen world tensions."

Senator Gramm said that he strongly supported pay increases for civil servants and military personnel. "I do so because I think that freezing pay to save money is not a smart policy. What happens is that you lose the good people and the bad people stay."

Senator Gramm said that this meant hard choices ahead, "but I think there are a lot of clear choices. If I have to choose between national defense and legal services, that is not a difficult choice. If I have to choose

The three finalists in AFA's Wichita Falls (Tex.) Chapter essay contest were honored at a dinner in February. Here, from left, are Maj. Gen. Richard W. Phillips and runner-up Karen Nelson, Sen. Phil Gramm (R-Tex.) and runner-up Elizabeth Phillips, and winner Cameron C. John and Rep. Beau Boulter (R-Tex.). Chapter President Bob Haley is at the right. (Photo by Gaines Arnold)

between providing funding for drug enforcement and providing funding for Amtrak, that to me is a very clear choice.

"We know something about setting priorities in American business, in American households, and in American churches. We do it every day. Only the government refuses to set priorities. I believe those priorities can and should be set."

Regarding the Gramm-Rudman-Hollings targets, Senator Gramm said that he had no doubts that they would be met without an across-the-board cut in October.

"I believe members of Congress, knowing they are going to face election in a month, are not going to be eager to go home and say, 'Well, we had an across-the-board cut because, quite frankly, I didn't have the courage to stand up to all the special interest groups,' " the Senator said.

INTERCOM

lacked the intestinal fortitude to stand against the increasing debt by drawing the line on federal programs.

"As we move through 1986 and the years ahead to 1991, this legislation will beat up on several sacred cows, and that is when the American people will have to stand up and be counted," he told banquet attendees. Attempts will be made to derail Gramm-Rudman and return to the old days of borrowing and producing more deficit spending. Representative Ray said that this practice created a debt from the time of George Washington to Jimmy Carter of $925 billion. The amount has now reached $2 trillion.

At the Southeast Regional Workshop (from left to right), AFA National Vice President H. Lake Hamrick, Rep. Richard Ray (D-Ga.), the evening's dinner speaker, Georgia AFA Vice President Homer Childs, and AFA Assistant Executive Director Dave Noerr had this informal chat. (Daily Sun photo by Kim Craft)

Rep. Ray Addresses Southeast Region

Rep. Richard Ray (D-Ga.) addressed a dinner banquet held in conjunction with the Southeast regional workshop in January. The event attracted leaders from Georgia, North Carolina, South Carolina, and Florida. Hosted by AFA's Carl Vinson Chapter and Georgia AFA (led by Wilbur Keck), the session was held in Warner Robins, Ga., reports Maj. P. J. Johnson, Carl Vinson Chapter Communications Director.

While the Gramm-Rudman-Hollings balanced-budget act isn't perfect, Representative Ray told AFA that he strongly supports it. Congress has

Michael W. Pannell, staff writer for the Warner Robins *Daily Sun*, reported that the AFA crowd "hotly pressed" Representative Ray on such sensitive issues as the inequities between military and civil service retirees. Representative Ray, who advocates a strong national defense, said that he had sympathy for those complaints as well as the ones he has heard from persons representing Medicare and the many others who feel that they are being treated unfairly under Gramm-Rudman. But the Representative said that he thinks getting the deficit spending problem in hand is the most important consideration. Regarding the Strategic Defense Initiative (SDI), he said that it was gaining support across the United States.

Prior to the banquet, AFA leaders attended a workshop on improving chapter operations, conducted by Assistant Executive Director for Field Organizations Dave Noerr.

Tucson Chamber/AFA Cite Davis-Monthan Importance

In January, the Tucson Chamber of Commerce, led by Board Chairman E. D. Jewett, a longtime AFA leader and publisher of Tucson's *Daily Territorial* newspaper, adopted a resolution expressing strong support and appreciation for the existence of Davis-Monthan AFB. A plaque was presented to Brig. Gen. Ronald Fogleman, then Commander of the 836th Air Division, and Col. Don Lyon, 836th Combat Support Group Commander, on January 9.

During the presentation, Jewett noted that Tucson and Davis-Monthan grew up together for more than forty-six years, fostering a close, mutually beneficial relationship. Citing an example, Jewett noted that the Civilian Aviation Committee of the Chamber was instrumental in securing the location of the air base in Tucson in 1940.

Jewett added that the base generated $370 million in salaries and expenditures during the past year, which included $60 million in local contracts and construction projects. Jewett acknowledged the tremendous amount of time and energy that Davis-Monthan personnel and their families contribute to the community in countless meaningful ways.

On the Scene

American military history would have fewer blemishes if the armed forces had been smarter and exploited space systems sooner, Navy **Vice Adm. William E. Ramsey** recently told AFA's **Lance Sijan/Colorado Springs Chapter.** He cited the 1975 seizure of the US merchant ship *Mayaguez*, the 1968 capture of the USS *Pueblo* by North Korea, and the 1941 attack on Pearl Harbor as events that would never have happened if today's space capabilities had been available.

Admiral Ramsey is Deputy Commander in Chief of US Space Command. In his first public address since arriving in Colorado Springs, he told the AFA audience that recent military successes were due to quick decisions based on rapid transmission of information by satellite. He cited the shoot-down of two Libyan jets by two F-14 fighters after the Libyans had

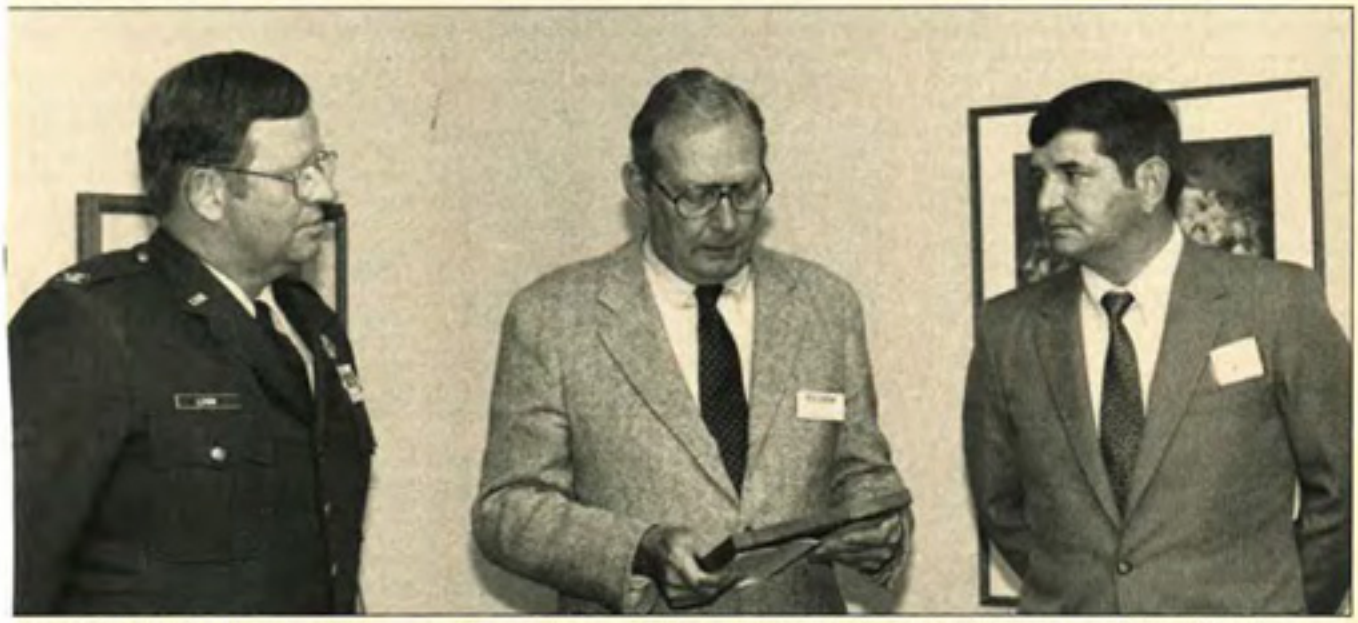
fired first—effectively deposing the Marxist regime and rescuing Americans in Grenada—and the success of the British in the Falklands.

"All Navy ships today have terminals to receive information from weather, navigation, and communication satellites," he said. The information they provide reduces miscalculations and the chance of mischief by adversaries. "Space systems are fundamental to our strategic deterrence," he added. One problem that the unified command can address, Admiral Ramsey said, is the differences between systems used by the Navy, Army, and Air Force.

AFA's **Ladwig-Shine Memorial Chapter** in Myrtle Beach, S. C., sponsored its seventh annual AFA-Royal Canadian Air Force Association banquet at the Myrtle Beach AFB Officers' Club on March 15, reports Chapter President **Bill Gemmill.** The guest speaker was **Rep. Robin Tallon** (D-S. C.).

Texas AFA President **Ollie Crawford** presented an AFA Life Membership to **Rep. J. J. Pickle** (D-Tex.) at an AFA luncheon in Austin on February 12, reports **George Weinbrenner,** Texas AFA leader . . . "I personally believe, but don't know, that some American prisoners are being held in Southeast Asia," said **Lt. Gen. John Flynn,** the highest ranking POW during the Vietnam War and active AFA leader. He said it was a breakthrough that the Vietnamese government now acknowledges that missing Americans may be living in remote areas of Vietnam. "I also believe that if they are there, the Vietnamese will attempt to use them as bargaining chips in order to get reconstruction aid for their failed economy—they are in dire straits," Flynn said. General Flynn was a prisoner for five and one-half years before his release in 1973.

AFA Board Chairman **Edward A. Stearn,** AFA Treasurer **George Chabbott,** and former AFA Treasurer **Jack B. Gross** attended an Arnold Air Society Tri-Area Conclave at Penn State University in State College, Pa. The guest speaker was **Brig. Gen. Charles M. Duke, USAFR,** assigned as mobi-



Tucson (Ariz.) Metro Chamber of Commerce board chairman E. D. Jewett (center) reads the Chamber's resolution citing the importance of Davis-Monthan AFB to the Tucson community. Col. Don Lyon, 836th CSG Commander (left), and Brig. Gen. Ronald R. Fogleman, then-Commander of the 836th Air Division at the base, represented Davis-Monthan during the ceremony.

Gen. Richard Lawson, Deputy CINC-USAFE, was the featured speaker at the Gateway to Freedom Chapter's ball in Berlin. (Photo by Angela Baldeli)

Participants in the Tri-Area Conclave at Penn State University included, from left, Mrs. Patricia Thompson; Brig. Gen. Charles M. Duke, USAFR, the guest speaker; Victoria Lockwood, Penn State AFROTC cadet; and Pennsylvania AFA President Jack Flaig.

Southeast Region—A Team That Works!

AFA's Southeast Region uses teamwork to do the job. This year we were greatly saddened by the untimely death of Brig. Gen. Morgan S. "Tim" Tyler, Jr., AFA's 1985 National Vice President for this region. Despite our great loss, we will continue to work as a team. Remembering Tim and his hopes and dreams, we are resoundingly committed to accomplish the far-reaching goals he established and to continue our strong support of AFA's objectives as an effective part of the AFA team. This region consists of Florida, Georgia, North Carolina, South Carolina, and Puerto Rico. We are a team of 20,839 members in forty-six chapters working together in support of a strong national defense and public awareness of the effective, critical role aerospace power plays in the protection of our land and of our precious freedoms.

—H. Lake Hamrick, National Vice President for the Southeast Region.

Florida

Florida AFA has completed a smooth presidential transition to Don Beck from H. Lake Hamrick. Mr. Hamrick resigned when he was elected National Vice President of the Southeast Region. Two new chapters were formed in 1985: Beaches of Jacksonville and Miami. Florida is now composed of 10,014 members in twenty-four chapters: Morgan S. Tyler, Gainesville, Florida Gulf Coast, Florida Highlands, Naples Marco, Central Florida, Cape Canaveral, Jerry Waterman, Miami, Gold Coast, Panama City, Air Commando, Eglin, Brandon, West Palm Beach, Citrus Belt, Homestead, General James R. McCarthy, Florida Suncoast, Jacksonville, Beaches of Jacksonville, John C. Meyer, Southwest Florida, and Tallahassee.

Florida AFA sponsored a full slate of activities this year. The annual convention was held in Orlando, July 26–28. The featured speaker was Maj. Gen. Thomas S. Swalm, Commander of the Tactical Air Warfare Center at Eglin AFB, Fla., who formerly served as commander of the Thunderbirds, USAF's Aerial Demonstration Squadron. AFA National President Martin H. Harris addressed the awards luncheon, and David Noerr, AFA Assistant Executive Director for Field Organizations, conducted a workshop.

Florida AFA's top award winners were Rep. Bill Nelson (D-Fla.) and General Swalm. Representative Nelson earned the highest honor awarded a civilian—the General Lewis H. Brereton Award—for his strong support of aerospace power. General Swalm was honored with the state AFA's Jerry Waterman Award—the highest honor Florida bestows on an active-duty Air Force member.

Other award winners were Robert P. Reynolds, Cape Canaveral Chapter, who was cited as Florida AFA "Member of the Year" for the single most outstanding contribution to the state organization. Norman Abramson, Central Florida Chapter, won state "Man of the Year" for his dedication to AFA and his leadership ability.

The Florida Highlands Chapter was nationally recognized as AFA's outstanding small chapter of the year for 1985. Florida's Cape Canaveral Chapter was honored with national AFA's Donald W. Steele Sr. Memorial Award, naming it "Chapter of the Year" for 1985 from among AFA's 340 nationwide chapters.

Outstanding events sponsored by Florida chapters included the Cape Canaveral Chapter's first "Astronaut Night," which attracted more than 325 business, civic, and military leaders. A Jimmy Doolittle Fellowship of AFA's Aerospace Education Foundation was presented to Dr. Edwin "Buzz" Aldrin at the 1985 event.

The Eglin Chapter hosted the Bob Hope Show in support of the Air Force Enlisted Men's Widows and Dependents Home Foundation. The Chapter, which won the State President's Award for its support of this event, netted more than $28,000 for the Foundation. This Chapter annually sponsors the Eglin Golf extravaganza, hosting 244 players for two days of golf and more than 500 guests for the awards banquet. More than $8,300 was raised for Eglin's scholarship funds, which support AFJROTC and CAP scholarships. Each year more than $10,000 is given to outstanding cadets.

A scholarship fund has been set up to posthumously honor Brig. Gen. Morgan S. "Tim" Tyler, Jr. Established by the Chapter named in his honor, the scholarship fund will recognize outstanding AFJROTC and CAP cadets.

The Central Florida Chapter played host to the annual Florida Gala, which is held in conjunction with national AFA's Tactical Air Warfare Symposium. Money raised from the annual event supports AFA's Aerospace Education Foundation and its Doolittle Fellowship program as well as AFROTC, AFJROTC, and CAP scholarships.

During 1985, the Jacksonville Chapter hosted the first Southeast Region workshop with the support of the Florida Air National Guard 125th Fighter Interceptor Group.

During the year, Florida AFA honored a representative from the Royal Australian Air Force Association's Victoria Division with two plaques, AFA lapel pins, and AFA ties as a goodwill gesture in the "Hand Across the Sea" program.

Georgia

Wilbur Keck leads Georgia AFA, and membership in the state stands at 5,181. Active chapters include: Athens, Atlanta, Carl Vinson Memorial, Chattahoochee Valley, Coosa Valley, Dobbins, Savannah, South Georgia, and Southeast Georgia.

Georgia chapters are concentrating on recruiting business and community support through the Community Partner Program in addition to regular membership drives. Chapters support awards for Air Force personnel and Air Force support groups as well as for AFROTC, AFJROTC, and CAP units.

Chapters have sponsored a variety of programs ranging from an annual Air Force anniversary dinner dance, cosponsored by the Dobbins Chapter and other local military-oriented organizations, to participation in Armed Forces Day ceremonies, support for AFROTC cadets, and holding AFA golf tournaments.

The Georgia State Convention was host

Thornton Rose (right) was named North Carolina AFA "Man of the Year" at that state's convention. Here North Carolina AFA President Bobby Suggs presents the plaque to Mr. Rose.

ed by the Savannah Chapter. Opening night featured the "Great Savannah Exposition." The major awards banquet was held the next evening with Gen. Thomas R. Ryan, Jr., then-CINCMAC, as guest speaker.

Georgia AFA's Carl Vinson Chapter was recognized with national AFA's Exceptional Service Award for the outstanding contribution in communications during the year. Each month, the Chapter was featured in a newspaper column in the local Warner Robins *Daily Sun*. Chapter officials also regularly published a newsletter for members. Vinson Chapter officials chose "The Year of the Museum" as their theme and worked hard to raise $20,000 for the Museum of Aviation at Robins AFB. A golf tournament and auction raised the needed funds. The Chapter also reached 106 percent of its membership goal and obtained twenty-four Community Partners. Georgia AFA named the Chapter "Georgia Chapter of the Year" at the state convention.

The Athens Chapter has coordinated the refurbishing of an F-84, which is now on display in a local park. The fighter was obtained several years ago, but was only recently repainted with authentic markings. Athens has also supported the Clark County Veterans Council in erecting a veterans memorial to honor veterans from World War II, Korea, and Vietnam.

Ben L. Patterson, Jr., is the president of AFA's Atlanta Chapter. This Chapter sponsored a table at the Armed Forces luncheon in 1985. Chapter officials were also involved in the introduction of the Georgia Air Guard F-15s to the Dobbins area.

AFA's Dobbins Chapter President is Richard O. Robinson. Dobbins officials sponsored an "AFJROTC Cross Talk" program that introduced AFROTC to local high school students. Dobbins also sponsored an Air Force Anniversary Dinner on September 7, 1985, with Rep. George W. Darden (D-Ga.) as a special guest. The Chapter also cosponsored a luncheon with the Cobb County Civic Leaders Group to hear the National Security Briefing Team from the Air University at Maxwell AFB. Award ceremonies were held for AFJROTC, and AFA medals were presented to outstanding cadets from Sprayberry, Wheeler, Riverdale, and Marrow High Schools.

North Carolina

Bobby Suggs leads North Carolina AFA and its seven chapters and 3,861 members. The state includes the Scott Berkeley, Tarheel, Triad, Piedmont, Pope, Blue Ridge, and Kitty Hawk chapters.

AFA's Blue Ridge Chapter president is Hugh D. Randal. Chapter leaders presented awards to T. C. Robertson High School AFJROTC cadets at a banquet.

AFA's Piedmont Chapter President is Alvin K. Johnson. This Chapter has presented AFA awards to AFJROTC cadets locally.

The North Carolina State Convention was held in Fayetteville in October. AFA's Pope Chapter, led by Bobby G. Suggs, hosted the convention banquet. During the banquet, Thornton Rose was named North Carolina AFA "Man of the Year," marking the first presentation of this honor.

Pope Chapter officials also presented savings bonds to outstanding Air Force officers from Pope AFB during the quarter. The Chapter presents scholarship awards to AFJROTC cadets in the Fayetteville and Cumberland County areas.

AFA's Scott Berkeley Chapter, led by Rose M. Sweesy, sponsors several awards programs to honor outstanding junior and senior ROTC cadets.

In Florida, Cadet Capt. Bryan Batt (second from left) was named one of the area's outstanding cadets during the John C. Meyer Chapter's AFJROTC awards dinner. Also present were, from left, Lt. Col. Lee LeBlanc, Aerospace Education Instructor, chapter charter member John J. O'Hara, and Chapter President A. J. Martha.

Gilbert M. Slack leads the Tarheel Chapter, which has established a program based on suggestions made by the National Security Briefing Team from Air University at Maxwell AFB. The objective of the program is to make knowledgeable chapter leaders available to discuss defense issues locally.

AFA's Triad Chapter President is A. J. Foster. The Chapter supports AFROTC units at North Carolina State University, Southern High School in Graham, James B. Dudley Senior High and Ben L. Smith Senior High Schools in Greensboro, and North Forsyth Senior High School in Winston-Salem.

AFA's Kitty Hawk Chapter annually hosts the December North Carolina AFA quarterly meeting. The meeting is held in conjunction with the "Man Will Never Fly" Society dinner and First Flight luncheon, which commemorates the first flight of the Wright brothers. More than 300 people attended these functions last year, which are held on the Outer Banks.

South Carolina

South Carolina recently underwent a smooth presidential transition from James "Doug" Catington to Harry E. Lavin. South Carolina has five chapters and 2,793 members. These chapters—Charleston, Clemson, Columbia, Ladwig-Shine Memorial, and Swamp Fox—are small but growing.

South Carolina achieved ninety-nine percent of its total membership goal in 1985. Chapters continued to strive to surpass this achievement as 1986 dawned. Chapter programs featured such guest speakers as Astronaut Bob Overmeyer and Rep. John Spratt (D-S. C.).

AFA's Charleston Chapter is led by James N. Benton. The Chapter sponsored an awards banquet for AFROTC cadets and has initiated other awards programs.

AFA's Clemson Chapter is led by Dr. Don C. Garrison, former president of AFA's Aerospace Education Foundation. Dr. Garrison has expanded the Chapter Executive Council to include enthusiastic chapter officers. Recent speakers include Maj. Gen. William J. Mall, Director of Personnel Plans, Hq. USAF, and former test pilot A. Scott Crossfield. The Chapter is working hard—supporting ROTC and expanding membership through the Community Partner Program.

AFA's Columbia Chapter is led by Wesley H. Davis. Chapter officials sponsored Rep. Floyd Spence (R-S. C.) as a guest at a banquet.

The Ladwig-Shine Memorial Chapter is involved with the AFROTC and CAP cadet programs. Chapter officials have sponsored AFJROTC awards dinners.

The Swamp Fox Chapter is led by Chapter President Charles W. Meyers and works closely with AFROTC and CAP units.

Puerto Rico

San Juan Chapter Pres dent Fred Brown and his Executive Council schedule four events annually for the membership and in support of the Puerto Rico Air National Guard. Members are encouraged to bring guests to these events.

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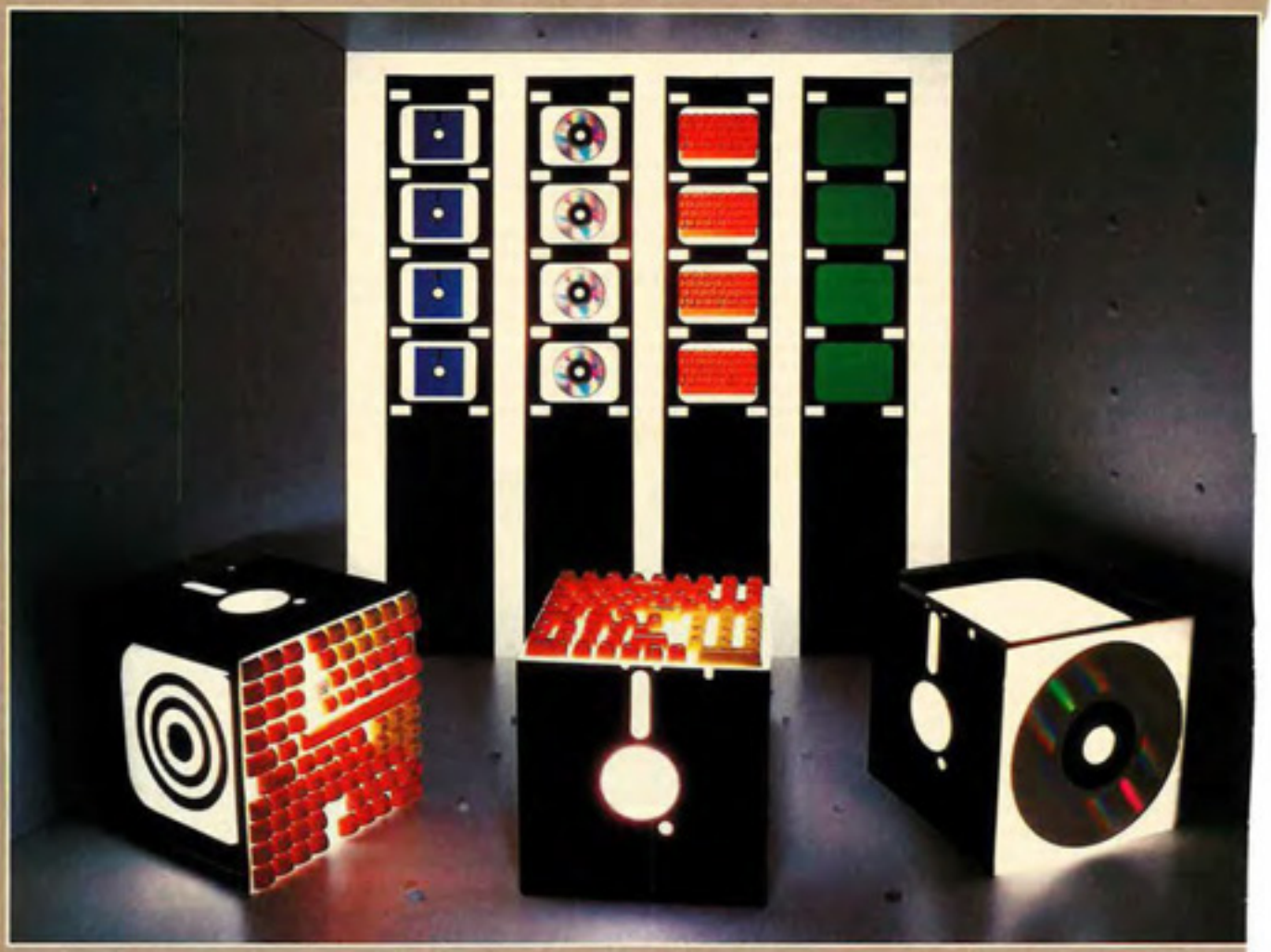

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lization augmentee to the Commander of the Air Force Recruiting Service at Randolph AFB, Tex. General Duke was the lunar module pilot of Apollo-16, logging 265 hours and fifty-one minutes in space.

Supreme Court Justice **Harry A. Blackmun** was invested as a Gen. Jimmy Doolittle Fellow of AFA's Aerospace Education Foundation in Justice Blackmun's chambers by **Hugh Enyart,** National Vice President of AFA's Great Lakes Region. Foundation President **George D. Hardy** attended the investiture, which was sponsored by the Air Force Ball of Mid-America, founded and chaired by Mr. Enyart. Also recently invested as a Doolittle Fellow was **Lt. Gen. Thomas P. Stafford,** who flew on the Gemini-6, Gemini-9, Apollo-10, and Apollo-Soyuz missions. He was honored at the Cape Canaveral Chapter's annual "Astronaut Tribute Night," held February 7 and attended by 360 civic, business, and military leaders, reports Chapter President **William J. Holden.**

AFA's **Southern Indiana Chapter** is sponsoring two Project Warrior awards to be presented to AFROTC cadets at Indiana University who demonstrate an in-depth awareness of key Air Force leaders, significant Air Force events, and who exhibit a good understanding of future mission challenges, says Chapter President **Mark Oliphant.** The awards will be accompanied by copies of the book *Wings.*

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Lt. Gen. Thomas P. Stafford, USAF (Ret.), center, was the honoree at the Cape Canaveral, Fla., Chapter's "Astronaut Tribute Night." With General Stafford are Gen. Robert T. Herres, CINCUSSPACECOM, and AFA National President Martin H. Harris.

Lt. Gen. William E. Thurman, Vice Commander of AFSC, was honored as the H. H. Arnold AFA Chapter's "Man of the Year" at a banquet held March 14 at the Huntington Town House in New York City, reports **Ruth D. Miller,** Chapter Vice President for Public Affairs.

"Women in Aviation" was the theme of the Mobile AFA Chapter's February 28 meeting. Guest speaker was **Col. Karen Branter,** an instructor at the Air War College at Maxwell AFB, Ala. Also scheduled to appear in a roundtable format were five women from the Ninety-Nines, the International Organization of Women Pilots—**Virginia Midgette, Mary Herndon, Betsy Hopson,** and **Geraldine Siegel.** The roundtable moderator was **Ramona Young.** In April, the Mobile Chapter, in cooperation with the city and Chamber Military Affairs Committee, sponsored the annual Brookley Air Show with the Thunderbirds.

Coming Events

May 9–10, **Alabama State Convention,** Huntsville . . . May 16–17, **Oregon State Convention,** Portland . . . May 16–18, **South Dakota State Convention** Sioux Falls . . . June 6–7, **Alaska State Convention,** Fairbanks . . . June 6–7, **Tennessee State Convention,** Tullahoma . . . June 13–14, **Idaho State Convention,** Boise . . . June 13–14, **New Hampshire State Convention,** Pease AFB . . . June 20–22, **Florida State Convention,** Cocoa Beach . . . June 20–22, **Ohio State Convention,** Cincinnati . . . June 21, **Louisiana State Convention,** Barksdale AFB . . . June 26–27, **Massachusetts State Convention,** Boston . . . June 26–27, **New Jersey State Convention,** Cape May . . . June 27–28, **Mississippi State Convention,** Columbus . . . June 28–29, **Georgia State Convention,** Atlanta . . . July 18–20, **Pennsylvania State Convention,** Wilkes-Barre . . . July 25–26, **Indiana State Convention,** Fort Wayne . . . July 25–26, **Texas State Convention,** Wichita Falls . . . August 1–2, **Colorado State Convention,** Colorado Springs . . . August 1–3, **New York State Convention,** Rome . . . August 8–9, **North Carolina State Convention,** Seymour Johnson AFB . . . August 9–10, **Arkansas State Convention,** Fort Smith . . . August 21–23, **California State Convention,** Riverside . . . September 15–18, **AFA National Convention and Aerospace Development Briefings & Displays,** Washington, D. C. . . . September 19–20, **Washington State Convention,** Tacoma.

INTERCOM

"The Gramm-Rudman-Hollings Act answered a public outcry to cut federal spending," **Rep. Tom Lewis** (R-Fla.) recently wrote to Florida Highlands Chapter President **Roy P. Whitton** in response to Whitton's letter opposing the elimination of cost-of-living adjustments (COLA) for military retirees. Representative Lewis said that in response to many letters, phone calls, and conversations, "and in the interest of equity," he cosponsored a bill to guarantee a COLA increase for military retirees in 1987. "Our country's economic future depends on the success of today's deficit-reduction measures. However, in the process of financial reform, we must not be afraid to fine-tune our efforts," he told the AFA leader.

Gen. Larry D. Welch, CINCSAC, addressed AFA's **Snake River Valley Chapter** in Idaho on the status of America's strategic modernization program and did an outstanding job, says Chapter President **Chester A. "Soapy" Walborn. Gen. Richard Lawson,** Deputy Commander in Chief, Hq. USAFE, addressed AFA's **Gateway to Freedom Chapter** in Berlin, Germany, at the Chapter's first Air Force Ball. Some 150 people attended, reports **Lt. Col. Johnnie B. Kump,** Chapter Vice President. ■

UNIT REUNIONS

H. H. Arnold High School
Former students who attended the H. H. Arnold High School in Wiesbaden, Germany, between 1968–77 will hold a reunion in July 1986 in Washington, D. C. **Contact:** Carol D. Ellis, 7405 Ilminster Ave., Fort Washington, Md. 20744. Phone: (301) 899-7765.

Atlantic City "Camp Boardwalk"
A fortieth-year anniversary reunion is planned for November 2–4, 1986, for personnel of all branches of the armed forces who were stationed in Atlantic City, N. J., during World War II. Those invited to attend include all permanent party personnel, trainees from the basic training center, and members of the Army Air Forces who were processed through the Redistribution Center after returning from overseas duty. Also invited are medical staff, volunteers, and patients hospitalized in the Thomas England General Hospital (now the Resorts International Hotel and Casino). **Contact:** Lt. Col. Norman Shamberg, USAF (Ret.), 29 N. Gladstone Ave., Margate, N. J. 08402. Phone: (609) 822-8861.

Bombardiers Alumni Ass'n
World War II bombardiers will hold their reunion on September 10–14, 1986, in Clearwater Beach, Fla. **Contact:** Mrs. Dorothea Burmester, 485 E. Lincoln Ave., Mount Vernon, N. Y. 10552.

CBI Hump Pilots Ass'n, Inc.
The China-Burma-India Hump Pilots and support personnel will hold their annual reunion on September 24–28, 1986, at the Excelsior Hotel in Little Rock, Ark. **Contact:** Mrs. Jan Thies, 808 Lester St., Poplar Bluff, Mo. 63901. Phone: (314) 785-2420.

DCANG
The District of Columbia Air National Guard will hold a reunion on October 1–4, 1986, at the Ocean Dunes Resort/Villas in Myrtle Beach, S. C. **Contact:** Irv Taylor, 2505 Kayhill Lane, Bowie, Md. 20715. Phone: (301) 262-1855.

Glider Pilots Ass'n
World War II glider pilots will hold their reunion on September 17–22, 1986, at the Henry VIII Inn and Lodge in St. Louis, Mo. **Contact:** Mrs. Virginia B. Randolph, 136 W. Main St., Freehold, N. J. 07728.

SDANG
The South Dakota Air National Guard will hold a reunion on August 8–10, 1986, at Joe Foss Field, S. D. **Contact:** Larry D. Erickson or Daniel M. Hacking, P. O. Box 5044, Sioux Falls, S. D. 57117-5044. Phone: (605) 336-0670, ext. 276 or 218.

1st Staff Squadron
The 1st Staff Squadron stationed at Bolling Field, D. C., during World War II will hold a reunion on October 3–5, 1986, near Andrews AFB, Md. **Contact:** William Fahr, 34 Weather Oak Hill, New Windsor, N. Y. 12550. Phone: (914) 564-7523.

1st Strategic Air Depot Ass'n
The 1st Strategic Air Depot will hold a reunion on September 18–21, 1986, in San Francisco, Calif. **Contact:** Warren L. Stanley, 3207 Myles Ct., #3, San Jose, Calif. 95117.

10th Fighter Squadron
Members of the 10th Fighter Squadron will hold a reunion in October 1986 in San Antonio, Tex. **Contact:** B. B. Morrison, 1462 Ester Ct., P. O. Box 1258, Riverdale, Ga. 30274. Phone: (404) 996-7253.

10th Tactical Recon Wing
Members of the 10th Tactical Reconnaissance Wing, RAF Alconbury Officers' Club (1960–68), will hold a reunion on September 26–28, 1986, in Colorado Springs, Colo. **Contact:** Cris Cristofori, 568 Conifer

St., West Melbourne, Fla. 32904. Phone: (305) 725-0494.

F-15 Eagle
The fifteenth-year anniversary reunion to celebrate the first flight of the F-15 Eagle will be held on July 16–19, 1987, in Dayton, Ohio. **Contact:** GOE, Pratt & Whitney, P. O. Box 2691 (MS 703-21), West Palm Beach, Fla. 33402.

29th Fighter Interceptor Squadron
The 29th Fighter Interceptor Squadron will hold a reunion on August 15–17, 1986, at the Officers' Club at Malmstrom AFB, Mont. **Contact:** Harold A. Donovan, 2912 Fifth Ave., Great Falls, Mont. 59405. Phone: (406) 453-5681.

33d Troop Carrier Squadron
Members of the 33d Troop Carrier Squadron will hold a reunion on May 22–25, 1986, at the Hilton Inn in Austin, Tex. **Contact:** Forrest D. Bruce or Richard N. Spradley, 3103 Stardust Dr., Austin, Tex. 71757.

34th Air Depot Group
The 34th Air Depot Group will hold a reunion on September 3–6, 1986, in Orlando, Fla. **Contact:** Ed Maynard, 6021 Dahlia Dr., Orlando, Fla. 32807. Phone: (305) 277-4619. Joe Myers, 2729 Ostrom Ave., Long Beach, Calif. 90815. Phone: (213) 421-2166.

34th Bomb Group
Members of the 34th Bomb Group will hold a reunion on September 11–14, 1986, in Colorado Springs, Colo. **Contact:** Ray L. Summa, 2910 Bittersweet Lane, Anderson, Ind. 46011. Phone: (317) 644-6027.

P-40 Warhawk Pilots Ass'n
The P-40 Warhawk Pilots will hold a reunion on August 28–31, 1986, at the Holiday Inn in Cleveland, Ohio. **Contact:** Maj. Charles Steris, USAFR, 1174 Wildwood Dr., Amherst, Ohio 44001. Phone: (216) 984-2121.

P-47 Thunderbolt Pilots Ass'n
P-47 Thunderbolt Pilots will hold a reunion on May 23–25, 1986, at the Stouffer's Hotel in Dayton, Ohio. **Contact:** Leslie E. Smithhart, 337 Corona Ave., Dayton, Ohio 45419. Phone: (513) 278-6572 (office) or (513) 293-2750 (home).

P-51 Mustang Pilots Ass'n
P-51 Mustang Pilots will hold a reunion on August 14–16, 1986, at the Sheraton Inn Coliseum in Hampton, Va. **Contact:** Lt. Col. John G. Corley II, USAF (Ret.), Rte. 1, Box 198-B, Gloucester, Va. 23061. Phone: (804) 693-6328.

58th Bomb Wing
Members of the 58th Bomb Wing are planning to hold a reunion on September 23–28, 1986, at the Radisson Inn in Atlanta, Ga. **Contact:** Herbert A. Bush, 4367 Redwood St., Atlanta, Ga. 30360. Phone: (404) 449-6262.

63d Station Complement Squadron
The 63d Station Complement Squadron, Ninth Air Force, will hold a reunion on June 6–8, 1986, at the Holiday Inn at Atlantic Beach, N. C. **Contact:** Lt. Col. J. T. Gilmore, USAF (Ret.), 24 Wedge Way, Littleton, Colo. 80123.

64th Troop Carrier Squadron
The 64th Troop Carrier Squadron will hold its reunion on October 10–12, 1986, at the Marriott Hotel in Greensboro, N. C. **Contact:** Lt. Col. James E. Filipski, USAF (Ret.), 1717 Trosper Rd., Greensboro, N. C. 27405. Phone: (919) 288-4498.

78th Fighter Squadron and Other VII Fighter Command Units
The 78th Fighter Squadron and other VII Fighter Command units will hold a reunion on December 4–6, 1986, in Honolulu, Hawaii. **Contact:** Clyde Mortensen, P. O. Box 82, Hartland, Wis. 53029. Phone: (414) 367-5628.

80th Fighter Squadron
Members of the 80th Fighter Squadron will hold a reunion in October 1986. **Con-**

INTERCOM

tact: M. F. Kirby, Box 368, Lampasas, Tex. 76550.

90th Bomb Group
Members of the 90th Bomb Group, the "Jolly Rogers," will hold a reunion on September 24–28, 1986, in Scottsdale, Ariz., and a minireunion in May 1986 at the Strasburg Inn near Lancaster, Pa. **Contact:** Tom Keyworth, 38 Crestlyn Dr. East, York, Pa. 17402. Phone: (717) 741-3998.

91st Bomb Group
The 91st Bomb Group "Wray's Ragged Irregulars" and supporting units that served at Station 121 in Bassingbourn, England, will hold a reunion on September 10–14, 1986, in Tampa, Fla. **Contact:** MSgt. George W. Parks, USAF (Ret.), 109 Wilshire Ave., Vallejo, Calif. 94591.

95th Bomb Group Ass'n
The 95th Bomb Group will hold a reunion at Valley Forge, Pa., on September 2–6, 1986. **Contact:** Ellis B. Scripture, 1277 Wiltshire Rd., York, Pa. 17403.

98th ARS
Members of the 98th ARS will hold a reunion on June 20–22, 1986, in Lincoln, Neb. **Contact:** Bob Klapperich, Box 5801, Lincoln, Neb. 68505. Phone: (402) 464-2392.

103d Observation Squadron
The 103d Observation Squadron will hold a reunion with the 111th Tactical Air Support Group (PaANG) on November 7–9, 1986. **Contact:** Norm Pinney, 435 Honeysuckle Ct., Montgomery, Ala. 36109. Phone: (205) 272-0274.

301st Troop Carrier Squadron
Members of the 301st Troop Carrier Squadron will hold a reunion on September 25–29, 1986, in Omaha, Neb. **Contact:** Keith Vinton, 2145 Colfax, Blair, Neb. 68008. Phone: (402) 426-2554.

305th Bomb Group
The 305th Bomb Group will hold a reunion on September 4–7, 1986, in Anaheim, Calif. **Contact:** Abe Millar, P. O. Box 757, Sanger, Tex. 76266. Phone: (817) 458-3516.

308th Airdrome Squadron
The 308th Airdrome Squadron will hold a reunion on June 5–8, 1986, at the Conley Inn/Best Western Motel in Pittsburgh, Pa. **Contact:** Sam M. Duncan, 3520 Grandview Ave., Louisville, Ky. 40207. Phone: (502) 896-0490.

310th Bomb Wing
The 310th Bomb Wing will hold its reunion on September 25–27, 1986, at the Green Oaks Motel in Fort Worth, Tex. **Contact:**

Bob Norton, 4204 Plantation Dr., Fort Worth, Tex. 76116. Phone: (817) 244-3328.

312th Bomb Group
Members of the 312th Bomb Group will hold a reunion on August 1–3, 1986, at the Ramada Inn in Savannah, Ga. **Contact:** Charles S. Riggs, 7 Woodhull Rd., Savannah, Ga. 31404. Phone: (912) 236-2127.

318th Troop Carrier Squadron
The 318th Troop Carrier Squadron, 3d Air Commando Group, will hold a reunion on October 2–5, 1986, in Santa Barbara, Calif. **Contact:** James C. Gorman, 1885 Millsboro Rd., Mansfield, Ohio 44906.

325th Photo Recon Wing
The 325th Photo Reconnaissance Wing will hold a reunion along with the 7th Photo Group on July 3–6, 1986, at the Antlers Hotel in Colorado Springs, Colo. **Contact:** Claude Murray, 1933 Marshall, Phoenix, Ariz. 85016. Eric Hawkinson, P. O. Box 1351, Vallejo, Calif. 94590.

438th Troop Carrier Group
The 438th Troop Carrier Group will hold its reunion on September 26–28, 1986, in Fort Walton Beach, Fla. **Contact:** Ronald H. Morrell, 419 S. 4th St., DeKalb, Ill. 60115.

452d Bomb Group
Members of the 452d Bomb Group, which was stationed in England during World War II, will hold their reunion on September 11–14, 1986, in Boston, Mass. **Contact:** Tom Blaylock, P. O. Box 2526, New Bern, N. C. 28561.

452d Bomb Wing
Veterans of the 452d Bomb Wing who served in Korea will hold a reunion on August 9, 1986, at the Rocker Club at the Reserve Center in Los Alamitos, Calif. **Contact:** 452d Reunion Committee, P. O. Box 3785, Long Beach, Calif. 90803.

454th Bomb Group
Members of the 454th Bomb Group who served in Italy during World War II will hold a reunion on October 2–5, 1986, in Dayton, Ohio. **Contact:** Ralph Branstetter, P. O. Box 678, Wheat Ridge, Colo. 80034.

454th Bomb Squadron
The 454th Bomb Squadron will hold a reunion on August 13–17, 1986, in Oshkosh, Wis. **Contact:** Joe Havrilla, 1208 Margaret St., Munhall, Pa. 15120. Phone: (412) 461-5373.

455th Bomb Squadron
The 455th Bomb Squadron "Whitetail Marauders" will hold a reunion in September 1986 in Dayton, Ohio. **Contact:** Art Duncan, 1003 Greenwood Way, Cocoa Beach, Fla. 32922. Phone: (305) 636-0753.

456th Bomb Squadron
The 456th Bomb Squadron will hold its annual reunion on October 8–13, 1986, in Sacramento, Calif. **Contact:** Thomas J. Curtin, 116-13 103d Ave., Richmond Hill, N. Y. 11419. Phone: (718) 849-7596.

485th Bomb Group
The 485th Bomb Group will hold its reunion on September 25–28, 1986, in Nashville, Tenn. **Contact:** Robert S. Deeds, 4643 286th St., Toledo, Ohio 43611. Phone: (419) 726-0650.

487th Bomb Group
Members of 487th Bomb Group and the 836th, 837th, 838th, and 839th Bomb Squadrons will hold a reunion on September 10–14, 1986, in Scottsdale, Ariz. **Contact:** Vernon L. Gibbons, 6018 W. Marlette Ave., Glendale, Ariz. 85301.

504th Bomb Group
The 504th Bomb Group will hold its reunion on July 23–27, 1986, at the Red Lion Inn in Omaha, Neb. **Contact:** Art Tomes, 2409 Oakwood Dr., Burnsville, Minn. 55337. Phone: (612) 435-5406.

509th Composite Group
The 509th Composite Group (atomic bomb group) will hold a reunion on October 16–19, 1986, in St. Louis, Mo., and would like to hear from former members. **Contact:** Stanley H. Zahn, P. O. Box 31301, St. Louis, Mo. 63131. Phone: (314) 227-7418.

585th Bomb Squadron
The 585th Bomb Squadron will hold a reunion in October 1986 in Tampa, Fla. **Contact:** Charles T. Bray, 15224 Champaign, Allen Park, Mich. 48101.

780th Bomb Squadron
The 780th Bomb Squadron will hold a reunion on September 11–14, 1986, at the Radisson Inn in Atlanta, Ga. **Contact:** Fred Boling, Box 94, Ball Ground, Ga. 30107. Phone: (404) 735-2983. Don White, Rte. 1, Box M-11-B, Jesup, Ga. 31545. Phone: (912) 427-8934.

781st Bomb Squadron
Members of the 781st Bomb Squadron, 465th Bomb Group, will hold a reunion on September 11–15, 1986, at the Sheraton Inn in Colorado Springs, Colo. **Contact:** James C. Althoff, 2 Mount Vernon Lane, Atherton, Calif. 94025. Phone: (415) 325-8356. James M. Snyder, 1226 Royal Oak Dr., Winter Springs, Fla. 32708. Phone: (305) 365-7938.

781st Troop Carrier Wing
Members of the 781st Troop Carrier Wing who served at Donaldson AB, France (1953–57), are sponsoring a 465th Troop Carrier Wing reunion on September 26–28, 1986. **Contact:** Lt. Col. Gerald E. Teachout, USAF (Ret.), Piedmont Rte., Box 766, Piedmont, S. D. 57769.

782d Bomb Squadron
The 782d Bomb Squadron will hold its reunion during the "Airsho '86" of the Confederate Air Force in October 1986 in Harlingen, Tex. **Contact:** William F. Bruce, Jr., 1683 Eggert Rd., Eggertsville, N. Y. 14226. Chester J. Milczarek, 529 Fairfield Dr., Corpus Christi, Tex. 78412. Phone: (512) 991-6136.

Operation Green Turnip
I would like to hear from anyone who was a part of Operation Green Turnip and

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who served in Korea or Japan in 1954.
For more information, please contact the address below.

William R. Novak
RR1
Lost Springs, Kan. 66859

24th Combat Mapping Squadron

A reunion is in the planning stages for members of the 24th Combat Mapping Squadron.

Contact this address for details.

Howard Fleischer
5749 Palm Beach Blvd., #247
Fort Myers, Fla. 33905

8th Statistical Control Unit

I am trying to locate former members of the 26th Statistical Control Unit, which was attached to the Fifteenth Air Force in Pari, Italy (1944–45), for the purpose of holding a reunion.

Please contact the address below.

Richard Helting
1509 S. Locust Ave., Apt. 1
Marshfield, Wis. 54449
Phone: (715) 387-3691

P-38 Convention

Plans are under way to organize the first national P-38 Lightning Convention, to be held in the Los Angeles area in either August 1986 or May 1987.

Please contact the addresses listed below for additional information.

Gil Cefaratt
P. O. Box 727
Sun Valley, Calif. 91353-0727
or
Joe Kuhn
25511 La Costa Pl.
Valencia, Calif. 91355
Phone: (818) 847-8412 (Cefaratt)
Phone: (805) 255-6618 (Kuhn)

320th Strategic Recon Squadron

I would like to hear from former members of the 320th Strategic Reconnaissance Squadron, 90th Strategic Reconnaissance Wing (SAC), based at Forbes AFB, Kan., during the 1950s. We are planning a reunion.

Please contact the address below.

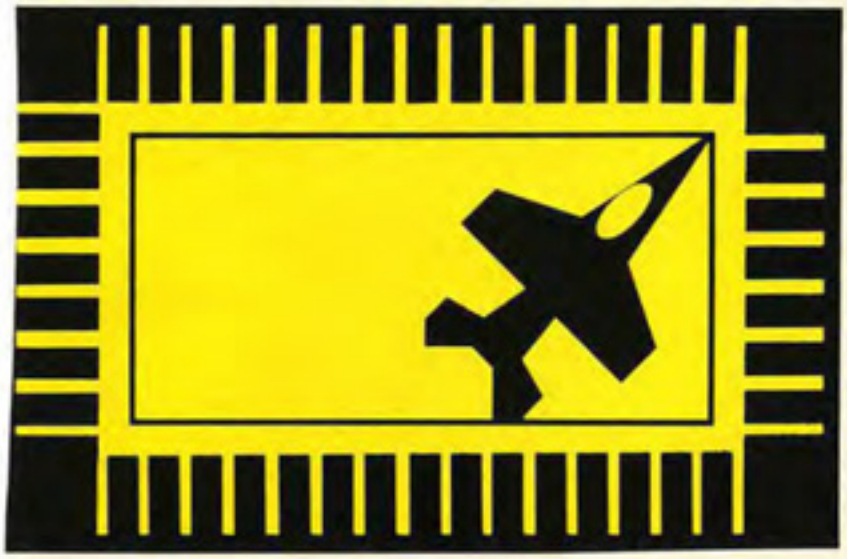
Lt. Col. A. D. Scott, USAF (Ret.)
719 Emerald Bay
Laguna Beach, Calif. 92651
Phone: (714) 494-5184

461st Bomb Group

Reunion plans are in the works for former members of the 461st Bomb Group.

Please contact the address listed below for further information.

Bill Harrison
6681 N. W. 6th Ct.
Margate, Fla. 33063



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WHO: National AFA, in conjunction with Air Force Systems Command and Electronic Systems Division.

WHAT: An in-depth look at the major electronic requirements and at developments and capabilities in electronics, C^3, and electronic warfare.

WHEN: June 26, 1986—9:00 a.m., through a dinner session with Assistant Secretary of Defense Donald C. Latham—terminating at 10:00 p.m.

WHERE: Boston area—near Hanscom AFB. Marriott Boston Newton Hotel, 2345 Commonwealth Ave., Newton, Mass. 02166 (Route 128/Interstate 95 and intersection of the Mass Turnpike/Interstate 90).

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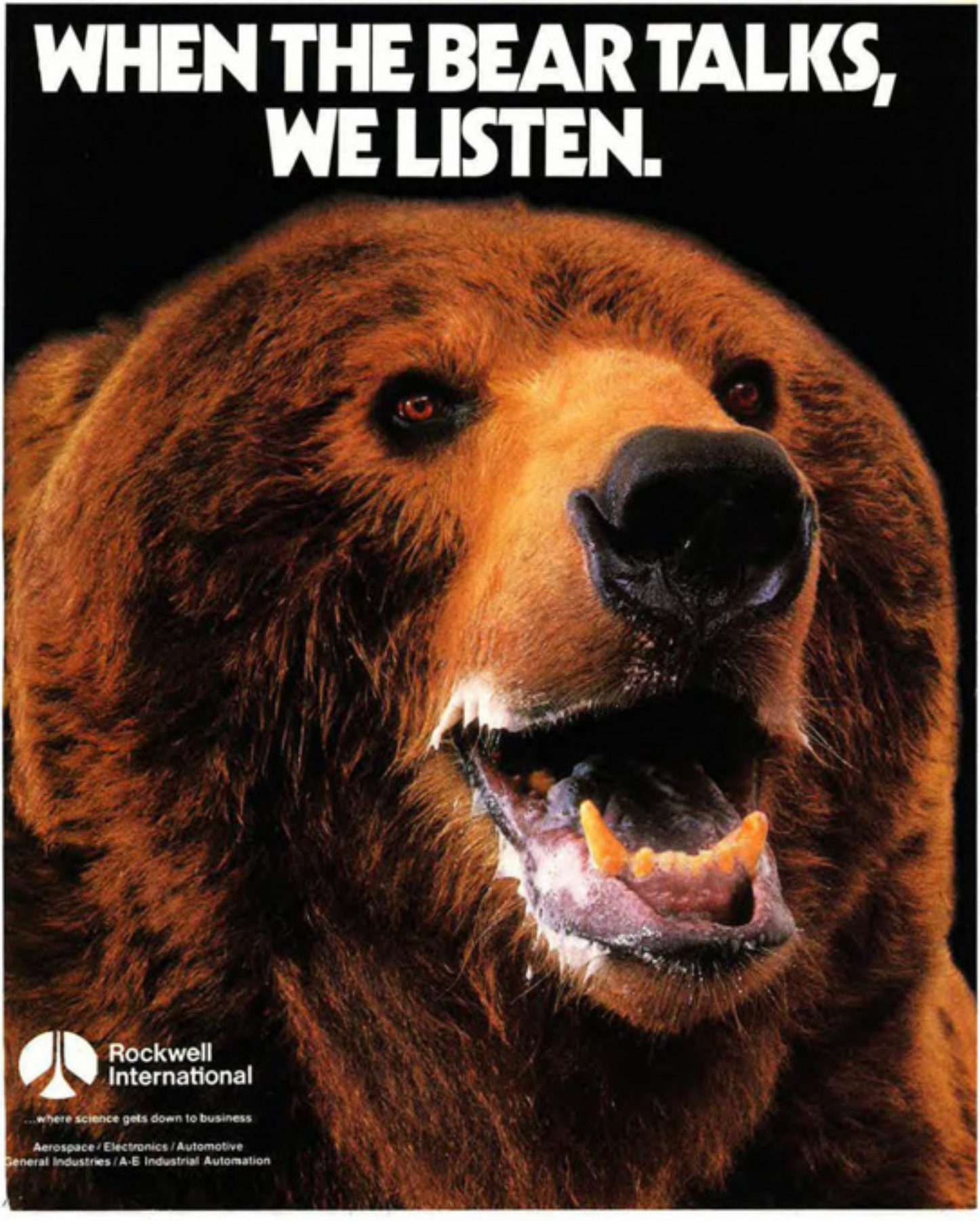

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