

MAY 1991/\$5

AIR FORCE

PUBLISHED BY THE AIR FORCE ASSOCIATION

MAGAZINE

1991 USAF Almanac



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May 1991, Vol. 74, No. 5 PUBLISHED BY THE AIR FORCE ASSOCIATION

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About the cover: This montage represents the many career fields in the Air Force—enlisted and officer, past and present. Special thanks to the many commands and agencies that donated the items. Cover photo by Paul Kennedy.

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AIR FORCE Magazine (ISSN 0730-6784) May 1991 (Vol. 74, No. 5) is published monthly by the Air Force Association, 1501 Lee Highway, Arlington, Va. 22209-1198. Phone (703) 247-5800. Second-class postage paid at Arlington, Va., and additional mailing offices. **Membership Rate:** \$21 per year; \$48 for three-year membership. **Life Membership:** \$300. **Subscription rate:** \$21 per year; \$25 per year additional for postage to foreign addresses (except Canada and Mexico, which are \$8 per year additional). Regular issues \$2 each. Special issues (USAF Almanac issue and Anniversary issue) \$5 each. **Change of address** requires four weeks' notice. Please include mailing label. **POSTMASTER:** Send change of address to Air Force Association, 1501 Lee Highway, Arlington, Va. 22209-1198. Publisher assumes no responsibility for unsolicited material. Trademark registered by Air Force Association. Copyright 1991 by Air Force Association. All rights reserved. Pan-American Copyright Convention.

By John T. Correll, Editor in Chief

The Decision to Fight

LIBERAL soothsayers, stunned temporarily by the success of Operation Desert Storm, have found a new theme. The "Vietnam Syndrome," they now tell us, was a good thing. As they explain it, defeat in Indochina humbled the United States and curbed its urge toward military adventurism. The Gulf War restored our confidence, and that, they say, will lead to reckless or arrogant misuse of power.

This argument reeks of political desperation. No part of it is convincing. If the US acts with greater assurance in foreign policy, that is not necessarily a bad thing, and it does not necessarily mean the recreational invasion of Lower Slobovia.

By no stretch of the imagination did the Gulf War establish a precedent for the irresponsible use of power. In fact, it was the best example in a long time of when and how US troops should be committed to combat. As such, it is worth further consideration.

It is generally understood that a direct attack on the US or its treaty allies will provoke a military response, but in what other circumstances do we go to war? Stated policy is ambiguous. It says we will defend our vital national interests, but they are defined rather vaguely themselves.

For obvious reasons, the policy cannot be totally explicit. That would tell an aggressor exactly how far he could push us without penalty. On the other hand, it is both possible and useful to explore some broad principles that bear on the decision to employ military force.

A good point of departure for such an exploration is the so-called "Weinberger Doctrine" of 1984, in which former Secretary of Defense Caspar W. Weinberger proposed a series of "tests to be applied when we are weighing the use of US combat forces abroad":

Is a vital national interest at stake? Are we willing to commit enough troops and resources to win? Will we sustain that commitment? Are the political and military objectives clearly defined? Is there reasonable expectation that the public and Congress will support the action? Have we tried oth-

er measures to achieve our objectives before sending forces into combat as a last resort?

Unlike Vietnam, the Bay of Pigs, and the Desert One fiasco in Iran, the Persian Gulf War met *all* the condi-

Desert Storm set the right example for when and how US troops should be committed to combat.



tions described in the Weinberger Doctrine. Persian Gulf resources had been defined as vital to the US since January 1980, when President Jimmy Carter pledged we would defend our interests there "by any means necessary, including military force."

The Bush Administration spent almost six agonizing months trying to resolve the Gulf crisis by economic and diplomatic means. In contrast to

the uncertain gradualism that characterized the Vietnam War, US forces began Operation Desert Storm with adequate strength to achieve the clear objectives assigned. The Gulf War not only had the support of public opinion and Congress but also had the backing of the international community.

To his eternal credit, President Bush kept political aides and amateur tacticians at bay and left battlefield decisions to the military professionals. A completely different approach was demonstrated by the Iraqi despot Saddam Hussein, whose mistakes included dressing up in a soldier suit and fantasizing himself as a general.

The Middle East situation was a clear-cut case of justifiable use of military force. Saddam, defiantly occupying Kuwait and looking ahead to his next move, was an unacceptable threat to regional stability and the global economy. If US and coalition forces had held back, Saddam would have been free to consolidate his power, add nuclear weapons, and press on from there.

Was there any alternative to war? Of course. There always is. It requires only that we concede to an aggressor whatever he wants. Those who carelessly subscribe to the "no alternative" standard should understand fully what it implies.

It is impossible to anticipate all the variations of conflict that might occur. Whatever the circumstances of the next crisis are, they will surely be different from those leading to the Persian Gulf War. The decision to commit troops to combat must be made case by case.

Basic principles can be worked out in peacetime, though, and it helps to study the examples of past wars. The President and his advisors were keenly aware of mistakes made in Vietnam and avoided repeating them in Operation Desert Storm. Their actions bespoke planning, not improvisation.

If the Gulf War set a new precedent for the exercise of power, the soothsayers can stop worrying about adventurism or indiscriminate involvements abroad. ■



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AMRAAM's Requirements

"The Next Round for Aerial Combat" [see February 1991 issue, p. 46] provided an excellent overview of the AMRAAM program. The production of the Joint Statement of Operational Requirements (JSOR) for AMRAAM was a frustrating but gratifying experience. Our primary group consisted of six Air Force officers, six Navy officers, and one Marine officer. All of us had extensive operational—including combat—and test experience, and we were led by a very experienced Air Staff Steering Group made up of three Air Force and three Navy officers.

A tremendous effort was put into the AMRAAM requirements definitions. At once pressed for "numbers," the group would not produce required or desired capabilities until after an extensive review of current and projected technologies. The bottom line was that operational requirements were not to be diluted because of a lack of technological progress. More than six months elapsed before we started to put hard numbers to paper. These numbers evolved from the technology overview, past operational and test missile performance, and "gut feel" from experience.

Critics and self-proclaimed experts came out of the woodwork to disprove the JSOR's requirements and claim that AMRAAM was "magic" and not obtainable. . . . Operational experience prevailed. Industry took the challenge. Senior Air Staff officers supported it and fought for funding. No other system was available, or projected, to provide the capabilities that were seen as absolutely necessary for future air-to-air combat.

The naming of Col. Luke Boykin, mentioned in the article, as the first AMRAAM JSPO was our required first step to convince the community that AMRAAM (as we defined it) was sorely needed. Very close association with the JSOR group during SPO organization gave him an excellent insight to drive the program. . . . Another key step was for the JSPO to call in the five contractor teams for individual briefings by the JSOR representatives on

each item of the AMRAAM requirement, detailing each need and the rationale behind it and providing the contractors a forum for their questions. The JSOR team attended each of the subsequent program design reviews, providing guidance to each company's effort to meet the specific requirements.

It appears that it's still an uphill battle to full-rate production of a missile that is sorely needed to replace ancient technology. What sense does it make to develop new (and expensive) fighters without giving them a state-of-the-art missile that takes advantage of the fighters' capabilities?

The AMRAAM development program is one of the most demanding ever seen for a piece of hardware, requiring the missile system to pass tests during FSD that normally occur during Operational Test and Evaluation. However, I can't remember an air-to-air missile program that ever received so much guidance and criticism. This system was defined by the operational community, not the rocket scientists, so there may have been, and still may be, some animosity.

The AMRAAM JSPO, Hughes Missile Systems Group, and Raytheon Missile Division have done a tremendous job to field the weapon.

Lt. Col. Jerry J. Kovach,
USAF, (Ret.)
Las Vegas, Nev.

Missing Missiles

Congratulations to AIR FORCE Magazine for accomplishing in one issue (March 1991) what more than twenty

Do you have a comment about a current issue? Write to "Letters," AIR FORCE Magazine, 1501 Lee Highway, Arlington, VA 22209-1198. Letters should be concise, timely, and preferably typed. We cannot acknowledge receipt of letters. We reserve the right to condense letters as necessary. Unsigned letters are not acceptable. Photographs cannot be used or returned.—THE EDITORS

years of strategic arms negotiations have failed to do—eliminate the USSR's Strategic Rocket Forces from the Soviet aerospace inventory [see "Gallery of Soviet Aerospace Weapons," p. 48]. With those weapons' demise, surely the Soviet hard-liners you fret over in the same issue can pose no threat.

I don't know whether to be amused or appalled by your omission. I can only conjecture that once again the wind blew the silk scarf in front of your editor's goggles. The only serious threat to our national survival is the more than 1,300 Soviet ICBMs that are pointed in this direction, and not the Backfires, Bears, Fulcrums, or Foxhounds that figure so prominently in your almanac.

The backbone of our deterrence still rests with those who drive blue carryalls over the gravel roads of the Dakotas, Montana, Wyoming, and Missouri and whose glory rests not in "slipping the surly bonds" but in preserving our way of life. In this context, some information about the real threat might be helpful instead of more pictures of airplanes.

Capt. Erney S. Edwards,
USAF
March AFB, Calif.

● *Don't be appalled just yet. The Soviet missile data are coming, and there will be more information than before. A new and expanded gallery, this time including Soviet strategic submarine-launched ballistic missiles, will make its debut in the June issue. A tight page budget—and coverage of the Gulf War—have required us to do some reconfiguring of our issue lineup, but we continue to pursue improvements to make the magazine more interesting and useful to readers.—THE EDITORS*

"Unsettled" Baltics

I would like to comment on the excellent, informative article, "The Soviet Hard-Liners Return," by Harriet Fast Scott in the March 1991 issue [see p. 48].

As one who was born and spent his early boyhood in free Latvia, I find the

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Circulation audited by
Business Publication Audit

Letters

term "rebellious Soviet republics" objectionable when used in reference to Lithuania, Latvia, and Estonia. "Soviet-occupied Baltic states" would be a better term. These three countries did not become Soviet republics following free national referendums by their respective populations. Rather, they were forcefully annexed following the Nazi-Soviet non-aggression pact of 1939.

With regard to the "Black Colonel," Victor Alksnis, it should be noted that he was born in the USSR, is a Latvian in name only, and certainly does not represent any Latvian interests.

Freedom's victorious march through the Soviet satellite states seemingly stopped before crossing into the USSR. The author quite correctly refers to the conditions there as "unsettled." It may take more unsettling and turmoil in the process, but only when all nations in the region—including the Baltics, held captive for over fifty years—are free, can there be hope for real, lasting peace. . . .

As long as the Soviets maintain their 4,000,000-strong armed forces and still hold a number of nations captive, let us remain vigilant. Part of that vigilance should be an absolute certainty that our Army, our Navy, and our magnificent Air Force remain second to none.

SMSgt. O. V. Klans,
AFRES
Cleveland, Ohio

List of Forces

Your listing of major units involved in Operations Desert Shield and Desert Storm as of February 1 is incomplete [see *March 1991 issue*, p. 40]. The Reserve's 943d Tactical Airlift Group, March AFB, Calif., should have been included.

An incomplete list of Operation Desert Shield/Storm support includes fifty aircrew, maintenance, and support specialists and a thirty-year-old C-130B to RAF Mildenhall, UK, from early September through February 15 to support MAC's airlift requirements; fourteen aerial port specialists from the 37th Mobile Aerial Port Squadron to an air base in northeastern Saudi Arabia from December 1 to February 8; [and many others]. . . .

As members of the only Air Force Reserve unit scheduled to deactivate, the Reservists volunteered at the first request from the Air Force to support Operation Desert Shield and continue to volunteer to serve the Air Force mission, with two scheduled rotations to Panama for Volant Oak airlift

duty and Modular Airborne Fire Fighting System missions supporting US Forest Service efforts to control wildfires in the drought-plagued western United States.

Capt. Richard Williamson,
AFRES
March AFB, Calif.

● *AIR FORCE Magazine developed its own list of major units that supplied forces to Desert Shield and Desert Storm, using the most current and comprehensive information provided by the Air Force and DoD. We regret the omission of the 943d TAG, which was inadvertently left off these official unit lists.*—THE EDITORS

Salute to MAC

The results of the recent campaign in the Persian Gulf area warrant a congratulatory message to Military Airlift Command.

These people made a tremendous contribution to this effort with a safety record unequaled in the modern sphere of flying action, either civilian or military.

The presence of mind exhibited by all the staff officers, coupled with the judgment, decision, coolness, and skill of the pilots, crews, and supporting teams, contributed greatly to the success of this highly important operational mission. They behaved in the finest tradition of the United States Air Force. I salute them.

Everett R. Jones, Jr.
Dallas, Tex.

Failed Public Relations

As I devoured the editorial by John T. Correll in the February 1991 issue, "The B-2 and Television," I became indignant with those rotten media people picking on "my club." When I finished the article I had a totally different aftertaste. Mr. Correll complains of everyone else's contributions to a poor image of the B-2 bomber, whereas the obvious conclusion to this editorial is that the problem is a failed public relations program.

When Lockheed rolled out the SR-71, no one cared how much it cost. All they wanted to know was what it would do. That was a successful public relations program, and the B-2 is without a doubt a failed public relations program. The media wished only to show the bad side. They have not been informed about the good side, the important side, the mission side, and they have no interest in it.

Probably the primary difficulty with airplanes in the press is that the information is overclassified and not al-

lowed to be used by the public relations people. . . . This problem must be addressed in order to have a viable, vital public relations program that would grab the hearts and minds of the media.

Lt. Col. Frederick Fascenelli,
USAF (Ret.)
Garden Grove, Calif.

Flying the Hump

"Flying the Hump," by C. V. Glines in your March 1991 issue [see p. 102] was very interesting, particularly to one who was there as a flight crew member in 1943. However, the author failed to give credit to two civilian air transport groups who contributed to the overall success of the Hump airlift. Both of those groups were there in the early days: China National Airline and American Airlines.

American Airlines, Air Transport Command Division, was already under contract to USAAF when, on July 18, 1943, Washington ordered AAL to divert ten C-87s and some 200 men from the south Atlantic USAAF ATC route to India to fly the Hump. On August 2, the first American Airlines "Hump" flight was made from Tezpur, India, to Kunming, China. Until December 1, 1943, these flights contin-

ued, delivering 4,584,880 pounds of supplies during 998 crossings with the loss of six men and three aircraft.

There is no doubt that then-Colonel Tunner was a great administrator. However, I feel the author failed to fully acknowledge the fantastic job done during the two years before August 1944—with shortages of manpower, aircraft, and maintenance supplies—by the USAAF and China National and American airlines.

Mr. Glines refers to improved maintenance, training, search-and-rescue, and other improvements correctly attributed to Colonel Tunner but makes relatively little mention of the job previous commanders accomplished without the vital support and the increased interest in the entire project that existed by the time Colonel Tunner took over. There were some legitimate reasons for the previous lack of men and materials.

Another factor contributing to the success of the Hump operation was the allied ground forces' elimination of the Japanese Air Force from northern Burma by recapturing Myitkyina airstrip on May 15, 1944, in ground fighting so fierce it took another seventy-eight days to take the town just a few miles down the road.

The above is not intended in any way to be critical of Colonel Tunner but to emphasize credit due those who preceded him: both commanders and their men.

F. Merrill Adams
Boynton Beach, Fla.

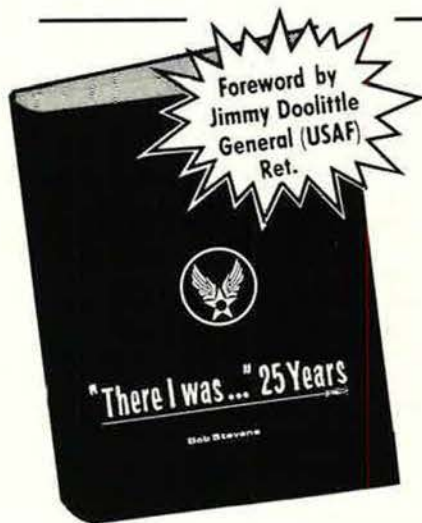
"Flying the Hump" missed an aircraft that flew much of its own mission materiel from India over the Hump to China: the B-29s of the 58th Wing, XX Bomber Command.

Operation Matterhorn was established to initiate bombing of Japan from China. The B-29 was the only plane that could fulfill this operation directed by President Roosevelt. To move a large portion of their operational needs from India to the China theater, the 58th Wing's B-29s flew 968 round-trips over the Hump, carrying 3,091 tons of avgas and 5,061 tons of bombs, ammunition, and spares.

The result was the first B-29 bombing raid on Japan, in June 1944. The target was the Yawata Iron and Steel Works on Kyushu.

The effort exceeded the results, and the 58th Bomb Wing transferred to West Field, Tinian, in March 1945.

Charles A. Harris
Mechanicsburg, Pa.



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I was a B-24 navigator in the 7th Bomb Group, 10th Air Force, in India during World War II. During the monsoon season, when we couldn't bomb Japanese targets in Burma and Thailand, we flew aviation fuel over the Hump to the 14th Air Force in China. Custom-made fuel tanks designed to fit the bomb bays held a lot of gas. We lost some B-24s on these gas runs. I'm sorry that C. V. Glines did not mention our contribution to the Hump operations. His article brought back a lot of memories, and I enjoyed reading it.

Merritt J. Schwan
Sedona, Ariz.

ROTC Defended

I was disturbed to read the letter from Darryll Keeling, USAFA '80, in the February 1991 issue [see "Academy Grads Heard From," p. 7], regarding the cost of the Air Force Academy vs. the cost of ROTC. In defending his alma mater, Mr. Keeling made some very insulting remarks about the other sources of commission.

With regard to the Academy's cost, Mr. Keeling stated, "I have always believed that you get what you pay for. . . ." He went on to say, "Any one of us could have taken the easy way out anytime and become a '\$58,000' ROTC graduate, but we did not. . . ."

I believe that this is a very irresponsible attitude toward ROTC and OTS graduates. It is disappointing to hear such sentiments expressed by a graduate from so fine an institution as the Air Force Academy.

I attended the University of Michigan and enrolled in the college of aerospace engineering and AFROTC Det. 390. I have many friends who chose to attend the Air Force Academy, and although they certainly had trials and demands that were physically, mentally, and academically taxing, I defy anyone to suggest that I took the easy way out.

The program I participated in was no piece of cake, and often my education was more a matter of survival than success. There are few programs with higher attrition rates than [the one I chose]. ROTC was in addition to, not part of, the regular curriculum. While I had the freedom to skip classes in order to attend ROTC training—as often happened—the test scores were based on the mean of my peers who had attended these classes. Many cadets found themselves in academic trouble and were dropped from the ROTC program.

Out of sixty cadets who began the program, eleven were commissioned. Some are now graduating at the top of

their undergraduate pilot training classes, but all were damn proud of their accomplishments and their gold bars. The most dedicated, professional, patriotic, and competent officers that I have ever met graduated alongside me. I would stand those eleven against any Academy, ROTC, or OTS class. At \$46,000 or less a copy for these officers, the Air Force got much more than it paid for.

Professionalism does not depend on the ring an officer wears. I have seen Academy graduates leave work early to visit the Class Six, while others stayed after hours to finish work that needed to be done. I have seen ROTC and OTS graduates volunteer for deployment to Operation Desert Storm while several Academy grads looked on in silence. I do not say this to put down Academy grads, only to inform those graduates who needed a few less courses in military science and a few more courses in humility. Undoubtedly, the Academy commissions many fine officers, and I do not support those who malign it or its graduates. We must remember that Academy, ROTC, and OTS graduates are all in the Air Force to defend the Constitution of the US.

As the Rev. Jesse Jackson told my class during a speech at Ann Arbor, when times are dark we should be careful about striking out. We may hit a friend.

2d Lt. Kurt Lee,
USAF
Dayton, Ohio

Intelligence and Guts

I am confused by Don Zweifel's comment about Curtis LeMay's being the "Father of Low-Level Strategic Daylight Bombing" [see "LeMay's Legacy," March 1991 "Letters," p. 8]. I have not previously heard "low-level" tied to "strategic" bombing.

LeMay's legacy is that he was the first senior AAF officer to recognize the failure of high-level strategic daylight bombing, which Army flyers had advocated for more than a decade. Soon after LeMay arrived in the Marianas in January 1945 to take command of XXI Bomber Command, he realized that that method of air attack had failed. High-level strategic daylight bombing had failed despite use of the B-29 Superfortress equipped with radar—the best bomber in the world—against ineffective enemy air defenses.

LeMay had the intelligence—and guts—to take out most of the heavy defensive armament in the B-29s, remove their gunners, and send the

planes over targets at low level, at night, and in area (not precision) strikes with incendiaries. The first major firebomb raid, against Tokyo on March 9–10, 1945, devastated the city, burning out sixteen square miles. That was effective "strategic" bombing.

That method, not the traditional use of strategic airpower, made him "one of those men most responsible for bringing an early end to World War II."

Norman Polmar
Alexandria, Va.

The Queen of Ugly's History

Bob Stevens's "There I Was . . ." paid tribute to a great, old "ramp weight," the F-89 Scorpion [see February issue, p. 98]. His term, "most unlikely-looking," is a euphemism for "the queen of ugly." In spite of all the comments about its being a FOD vacuum, the F-89 established a unique niche in aerospace history. This grand old bird was the only fighter to participate in the test of a complete, operational US nuclear air-to-air weapon system. In July 1957, the only such weapon to be fired from a USAF fighter was launched at an altitude of 18,000 feet at the Nevada Test Site and detonated above a group of officers from Air Defense Command.

With the awesome airpower capabilities available today, it is difficult to realize the quantum improvement a small, unguided solid rocket coupled with an almost insignificant nuclear weapon provided air defense. . . .

The air-to-air missile, the MB-1 Genie, remained in the active inventory almost thirty years and was mated with a number of different aircraft. This was an inordinately long service life, considering the technological advances during this era.

Cliff Barbee
Houston, Tex.

Repaying Stevens

I think it is time for all of the readers of your fine magazine to get off their duffs and drop a note of encouragement to Bob Stevens. Bob, who has entertained us every month for the past twenty-five years through his funny and enlightening cartoons, has been very ill. Through cards and letters to him, readers will brighten his day.

Just take a minute or two to get a card or write a short note, care of "The Village Press," P. O. Box 1037, Bonsall, CA 92003.

Lt. Col. Ben L. Donahue,
USAF (Ret.)
Mountain View, Calif.



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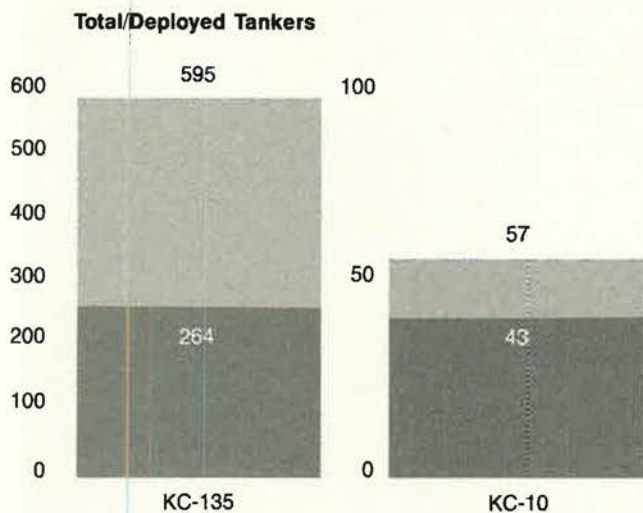
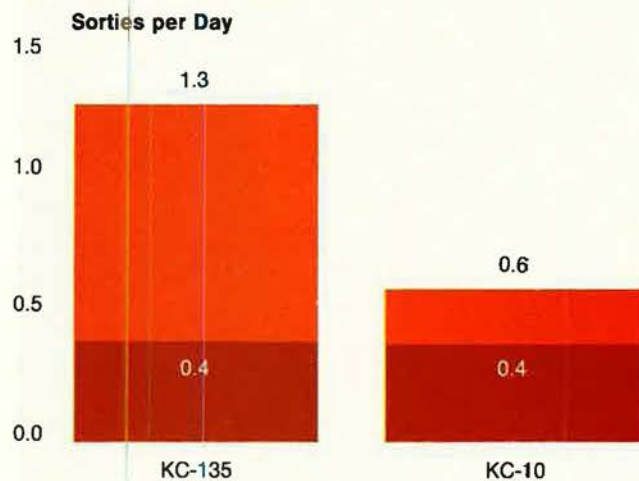
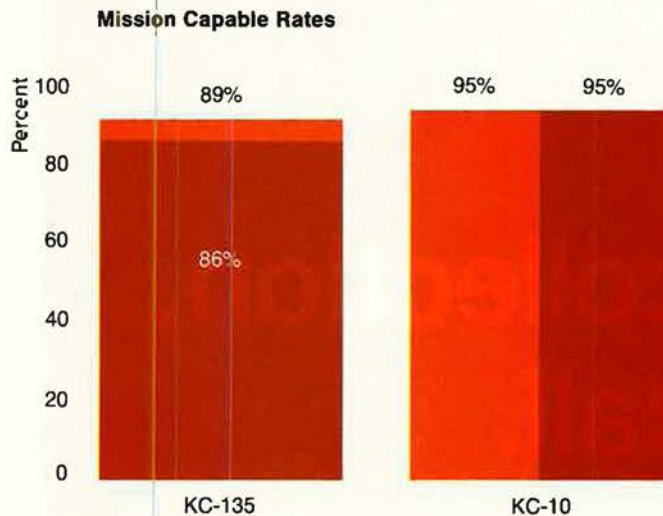
The Chart Page

Edited by Colleen A. Nash, Associate Editor

Desert Storm Logistics

Aerial Refueling

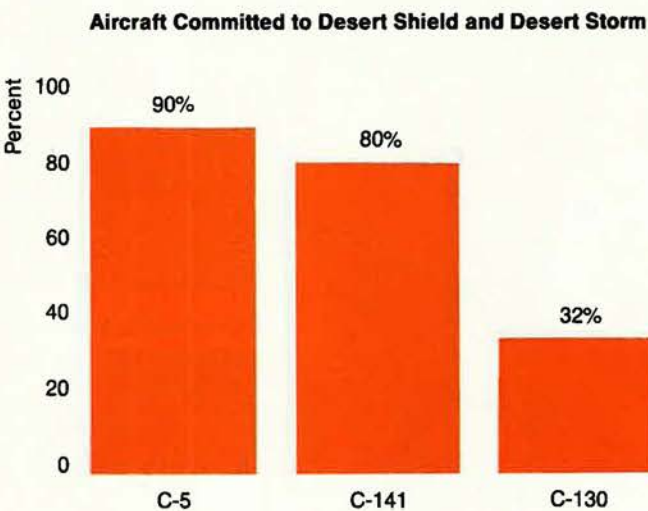
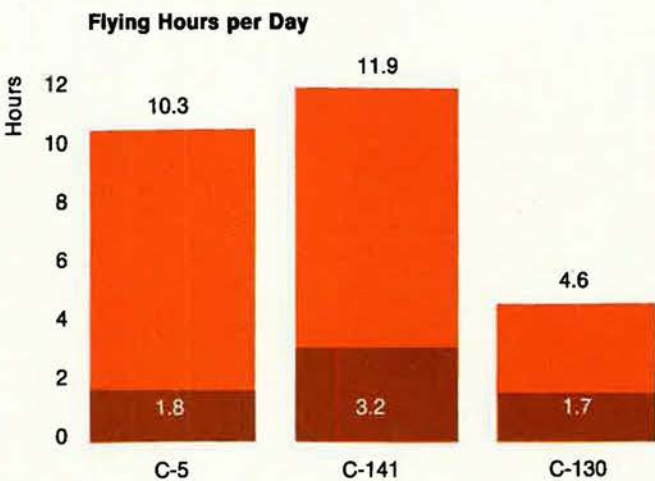
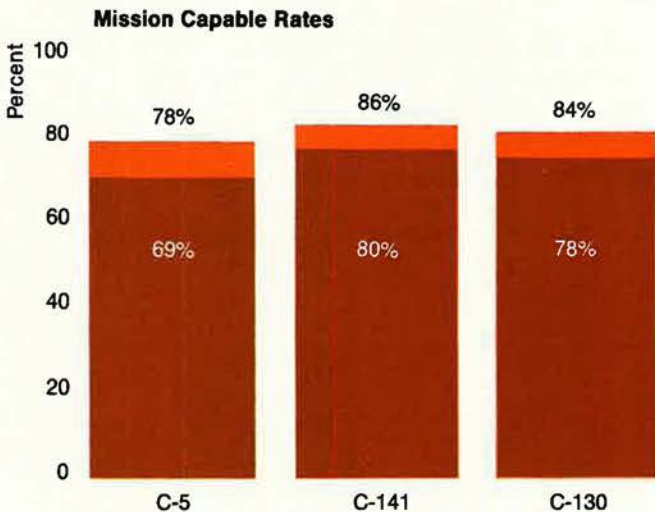
During Operation Desert Storm, KC-135 and KC-10 tankers achieved mission capable rates equal to or better than those they attained in peacetime—and did so while flying many more sorties per day. Equipment is rated mission capable if it can perform at least one of its primary functions.



Source: US Air Force.

Airlifters

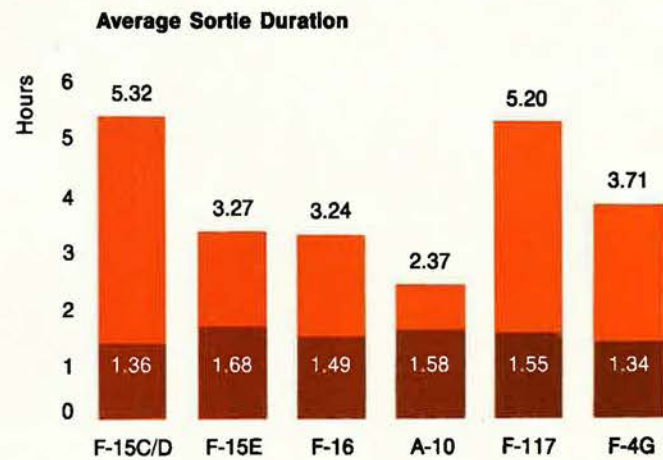
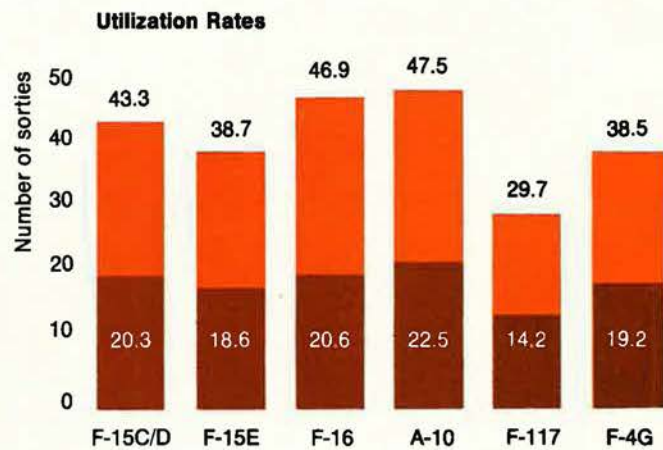
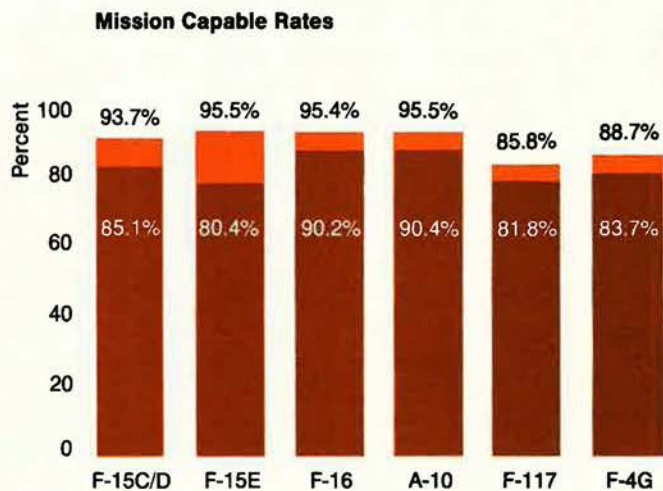
The Air Force's C-5s, C-141s, and C-130s all bested their peacetime mission capable rates. High percentages of all three of these airlifter fleets took part in Operation Desert Storm.



Fighters

During Operation Desert Storm, the Air Force's fighter fleet topped its peacetime mission capable rates and utilization rates. Utilization rate here refers to the average number of sorties flown per aircraft.

War, Jan. 17 through Feb. 22, 1991
Peace, Oct. 1989-July 1990 (for mission capable rates: home station, June-July 1990)



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By Brian Green, Congressional Editor

A Vote for the Troops

Desert Storm prompted a rush of congressional actions to improve compensation and benefits.

In the wake of Operation Desert Storm, enthusiasm for the military produced a rush of congressional proposals to boost compensation for American service members. The House originally proposed adding \$1.4 billion in new benefits, a plan that lawmakers substantially pared, but Congress eventually approved a \$655 million package as part of the supplemental authorization and appropriations bills that provide funds to pay for the Gulf War. The legislation:

- Increases from \$3,000 to \$6,000 the size of the government death gratuity paid to heirs of a service member who died in the Gulf War.
- Raises a service member's family separation allowance from \$60 to \$75 per month.
- Increases imminent danger pay from \$110 to \$150 per month.
- Authorizes special payments to medical doctors who were activated or involuntarily retained during Operation Desert Storm.
- Adds \$50 million in child-care assistance and educational and family support.
- Extends CHAMPUS mental health benefits and delays a planned increase in CHAMPUS deductible amounts.
- Raises the life insurance benefit from \$50,000 to \$100,000 for each service member.
- Funds the cost of counseling, on request, for any veteran who has engaged in combat since 1975.
- Increases monthly educational assistance payments to active-duty members under the GI Bill and to selected reservists.
- Guarantees housing loan benefits for veterans who served on active duty in Desert Storm for more than ninety days.
- Enhances the reemployment rights of Guard and Reserve personnel seeking to return to the jobs they held before they were activated for Desert Storm duty.

The bill includes a nonbinding "sense of the Congress" measure urging the Pentagon to devise a personnel policy that would prohibit the separation of a military mother and a child not yet six months old. This final measure is much less restrictive than several others that would have severely curtailed the services' use of the skills of service members with young children.

Most of the new benefits are scheduled to expire 180 days after the end of the war (the principal exceptions being the GI Bill educational benefits and some of the health benefits) and are limited to Desert Storm personnel (the principal exception being the increased life insurance benefit).

Of the \$655 million provided for additional compensation to Desert Storm soldiers, the authorization bill marks \$400 million for additional active-duty, Guard, and Reserve benefits and \$255 million for increased veterans benefits. Spending is to take place over a five-year period.

The supplemental authorization provides the services relief from planned reductions in active-duty, Guard, Reserve, and civilian end strength, which were to have taken effect by the end of Fiscal 1991. It suspends the imposition of a ceiling on the number of senior NCOs, officers, and general and flag officers that can be retained. The Air Force will retain through Fiscal 1991 an additional 5,500 Desert Storm participants who have critical skills, though they likely will be released before the end of FY 1992. There has been no change in the overall goal of reducing the armed forces by twenty-five percent by 1995, however, and the Air Force is continuing its moves to shrink the force.

Political support for various Desert Storm bills was overwhelming. The scant opposition centered on the belief that compensation was already sufficient. All the benefits in the final package were deemed to be Desert Storm-related and will be completely funded by the pool of allied financial contributions to the war effort. None of the funds spent on the benefits will add to the deficit, nor will they have

any impact on calculations of possible automatic budget cuts that will be triggered if deficit targets negotiated in last year's budget summit are exceeded.

The Peacekeeper Quandary

In an appearance before the House Armed Services Committee, Gen. George L. Butler, the new commander in chief of Strategic Air Command, defended Air Force plans to terminate procurement of the multiwarhead Peacekeeper ICBM, relegate the rail-garrison basing program to research and development status, and defer deployment of the Small ICBM until after 2001.

HASC Chairman Les Aspin (D-Wis.) argued that the Air Force's top priority for the B-2 Stealth bomber—designed to safeguard the viability of the bomber leg of the triad in the late 1990s—is misguided. He maintained that the problem of the vulnerability of the land-based missile force still has not been solved.

General Butler said that the Soviets are more likely to be deterred by the existence of a robust B-2 bomber force than by the Peacekeeper, that the B-2 is more flexible than ICBMs, that the ICBM vulnerability problem can be fixed because the technology to do so is well in hand, and that the B-2 is critical to convince the Soviets that "we're still in the bomber business."

Congressional critics claimed that the Air Force will run out of Peacekeeper test missiles early next century if procurement is terminated, even though annual test launches have been reduced from seven to three. General Butler noted that the test reduction was based on fiscal constraints and the "extraordinary performance of the missile" in testing. He said the reduced testing rate would not meet the requirement of seventy-five percent certainty of detecting a twenty-five percent degradation in performance, but that it would come "close."

In a letter to President Bush, ten senators opposed ending Peacekeeper production. ■



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Washington Watch

By Robert S. Dudley, Executive Editor

McPeak on the War

The Iraqi Air Force was not a featherweight opponent, the Air Force Chief of Staff says. Its misfortune was to be the second-best air force in the battle.



In a recent public assessment of Operation Desert Storm, Gen. Merrill McPeak carefully and repeatedly stated that "all the services made a very important contribution"

to the smashing US victory in the desert. Even so, the Air Force Chief of Staff said plainly that the story of the war "is largely a story about airpower, a success story for US and coalition air forces." In an aside, he noted something else: "My private conviction is that this is the first time in history that a field army has been defeated by airpower."

General McPeak delivered his post-mortem on the war to Pentagon reporters on March 15, only a few weeks after the cease-fire brought the fighting with Iraq to a halt. In addition, the Air Force prepared a number of internal studies documenting various aspects of the war against Iraq. Together they help clarify certain facets of the war and fill in some gaps in the record.

Here, presented largely in his own words, are highlights of the General's presentation.

Critical opening minutes. In General McPeak's view, the most critical period of the Gulf conflict came in its first minutes, on January 17 (Baghdad time), when the allies struck Iraq with stunning ferocity. These opening minutes, he asserted, "dramatically influenced the outcome of the entire war."

The General's explanation: "This was a massive attack in the very beginning moments of the war. We [coalition air forces] attacked all of the strategic targets—the electrical power, communications, air defenses,

and so forth. It was a very heavy attack, very precisely delivered."

At the heart of the attack was the F-117A Stealth fighter, which struck thirty-seven major targets in Iraq and Kuwait on the first night and was never touched by Iraqi air defenses. General McPeak added that, as far as the Air Force can tell, the F-117 was never even tracked by any Iraqi radar. It operated for forty-three days with invulnerability.

"In my judgment, the Iraqi Air Force never recovered from this opening attack," the Air Force leader maintained. "We took the initiative at the beginning, and we held it throughout the rest of the war period."

General McPeak explained that the blows made it possible to destroy rapidly the rest of Iraq's air defense system. "In my judgment," he added, "only the United States Air Force could have disintegrated that air defense system as quickly as we did, with such overwhelming shock power that it totally stunned the Iraqi Air Force."

"In essence, the issue was decided in the first few hours of the engagement."

"Brilliant air deception." The Air Force Chief of Staff disclosed that the opening-night success hinged on more than the superiority of coalition weapons. Old-fashioned trickery played a paramount role.

At H-hour (3:00 a.m. Baghdad time, January 17), Iraqis watching their radar screens would have seen nothing unusual, only US E-3 Airborne Warning and Control System (AWACS) aircraft and several coalition fighters flying combat air patrol (CAP) in Saudi airspace—activity that had been going on routinely since the US Air Force deployed to Saudi Arabia last summer.

"They were seeing a situation that we had been showing them since August," said the General. "These AWACS orbits and these CAP points had been there for months and were something the Iraqis were used to seeing."

At that point, said General McPeak, the coalition pulled off a "brilliant bit

of air deception," formulated by the Army's Gen. H. Norman Schwarzkopf, commander in chief of US Central Command. As H-hour neared, US and allied attack aircraft by the hundreds got airborne, formed up, and topped off their fuel tanks, but they did so "just beyond the radar warning capabilities" of Iraq's air defenses.

Then, in rapid succession, stealthy F-117s, "which these Iraqi radars could not see," jumped into enemy airspace, blinded Iraqi air defenses by knocking out vital radars, and proceeded to work on the rest of the strategic targets.

"Having opened up the gateway then," said General McPeak, "other strike packages [hundreds of planes orbiting in Saudi airspace] rushed through [the holes], and we hit very hard."

The Iraqi air force never knew what was coming.

"Calling audibles." As General McPeak tells it, the US and its allies ran into a few surprises themselves, requiring far more improvisation than heretofore has been acknowledged. The Chief of Staff summed it up in football parlance: "There were some audible calls at the line of scrimmage."

One audible was the unplanned "merging" into a single, gigantic operation of what had been originally cast as three sequential phases of the air campaign.

Initially, said General McPeak, Air Force officers planned to take about a week to ten days to achieve air superiority over Iraq, take one day to destroy the Iraqi field army's mobile air defenses, and then take some three weeks to demolish Iraqi armor, artillery, and other war equipment. Overall, the three phases would occur in sequence over about thirty days.

In the weeks before D-day, however, the air campaign plan changed, with General Schwarzkopf deciding to do all three phases at the same time. Helping to make this possible was the coalition's surfeit of forces. On November 8, President Bush had ordered a near doubling of US aircraft strength in the theater. When it was

completed, said General McPeak, "there was more than enough airpower on the scene to do the phase one job at the beginning, and we simply diverted it" to the other two phases.

He emphasized that "there was no time from day one on that the Iraqi ground forces were not under heavy air attack."

The onset of a highly unusual Middle East weather pattern forced coalition air forces to check off yet again at the line of scrimmage. From almost the beginning of the air war until the cease-fire was declared on February 28, large swaths of Iraq and Kuwait lay hidden by thick cloud cover and heavy rains, creating major, unexpected headaches for fighter pilots sent to drop bombs on enemy ground targets.

"This is, perhaps, the thing that hurt us the worst," said the Air Force chief. "This was certainly the poorest weather in fourteen years in the Baghdad and Kuwait area," or since the Air Force began keeping precise records of climatological data on the region in 1977. Indeed, the General added, the weather was at least twice as bad as the worst-case estimates.

What was the effect? "We lost a lot of Iraqi targets, especially [for] the -117s, where low cloud cover prevented them from acquiring the targets."

Fighter pilots were told to bring their bombs and munitions home rather than risk dropping them on a sensitive site. The weather seems to have forced planners to extend the planned air campaign from thirty to thirty-nine days.

Finally, said General McPeak, the Air Force underwent a major, unplanned, midcourse correction to deal with the political danger caused by Iraq's firing of Scud missiles. "What surprised us," he remarked, "was that we put about three times the effort that we thought we would [into] this job." Air Force documents report that the coalition mounted 2,493 dedicated sorties against Scud missiles. On each of six days early in the war, the coalition flew more than 100 such sorties.

General McPeak says that the big problem was finding and hitting the mobile Scuds. "Mobile Scud launchers operated at night, drove into these launch boxes, and launched, so we had to do a lot of road recce, even with the A-10s," the General said.

Beyond that improvisation, the Air Force cobbled together a new operational tactic linking two previously unused systems—the F-15E fighter

and the Joint STARS (Surveillance and Target Attack Radar System) plane.

"Probably the most effective thing we did was to put F-15Es in airborne CAPs right [above] these Scud launch boxes and then use Joint STARS" to troll for Scuds, said General McPeak. "When we found one that looked suspicious, then these Joint STARS aircraft were able to divert these airborne CAPs and perform on-the-spot, ad-lib attacks."

Scud launches, which averaged five per day for the first ten days, averaged only one per day for the last month.

The various means seemed to have worked. The General says that Scud launches, which averaged five per day for the first ten days, averaged only one per day for the last month.

Iraq no "featherweight." While Iraq's Air Force clearly was outclassed, General McPeak would be the last to denigrate it. "Basically, this was a fairly strong opponent," he observed. "[It had] on the order of 1,000 aircraft, some of them very good aircraft, . . . with a very good infrastructure, widely dispersed around the country, [and] a good offensive capability with their long-range aviation and Scud missiles."

Iraq's air defense setup, said the General, was "state-of-the-art," having 17,000 surface-to-air missiles, 9,000 to 10,000 anti-aircraft artillery pieces, and modern radars, "all lashed together with high-tech equipment," including computer data links, fiber-optic connections, and hardened control nodes buried in concrete bunkers.

The Air Force leader maintained that Iraq's pilots "put up a pretty good fight" for a few days. "We had a fairly good fight on our hands—not real good, but at least some kind of a fight—for the first three days." After that, he added, "this effort really wasn't very good."

Why was the Iraqi air arm defeated so quickly? The General believes simply that no one could stand up to the planes and pilots that the US and its allies deployed.

"They [the Iraqis] just ran into a buzz saw," said General McPeak. "It's not that they were featherweight opponents. It's just that they picked on the wrong guy."

A lost generation. In General McPeak's view, Iraq's Air Force has suffered grievous damage, perhaps even more extensive than is commonly thought. "In my judgment, it will be a generation before the Iraqi Air Force recovers to anything like its previous strength. At least a generation.

"Their infrastructure is heavily damaged. Their airfields, their maintenance facilities, their operational facilities, their aircraft shelters, their aircraft are gone. The ones that are surviving are mostly out of the country. A generation of pilots and crew chiefs and mechanics and air leaders has certainly vanished. I think it will be a long time before they constitute a significant threat again."

Air Force documents note that, at the start of the war, Iraq fielded about 750 fighter/attack aircraft and 200 support aircraft. Now, says General McPeak, the US has confirmed that the Iraqis lost ninety aircraft in combat, six in wartime accidents, sixteen to attacks by coalition ground forces, and 122 that are impounded in Iran, for an overall loss of 234 aircraft.

In reality, says the General, the carnage may yet turn out to have been much worse. The US Air Force attacked most of Iraq's 594 hardened aircraft shelters, destroying or badly damaging at least 375. A conservative estimate is that the shelter-busting drive destroyed another 141 Iraqi aircraft hidden inside, said General McPeak.

Exodus to Iran. One of the more mysterious aspects of the war, at least at the time, was the exodus of Iraqi aircraft to a kind of sanctuary in Iran. General McPeak maintains that this action has a simple explanation.

As he tells it, the coalition demonstrated in the first three days of the war that Iraqi pilots could not survive in the air, and Iraq's Air Force "folded its hand" and decided to ride out the war in shelters. On day seven of the war, however, the US Air Force and others began scoring big against the shelters themselves.

"I think they made a decision that, since they were no longer safe in shelters, they would have to leave," said

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General McPeak. "Then they started out to Iran."

Iraqi support aircraft, mostly transports, went out first. On day nine, the whole Iraqi Air Force seemed to stand down. The next day, the first of two big groups of planes scurried to Iran.

"We put an air CAP along the Iranian border and began intercepting aircraft coming out of Iraqi airspace and into Iran, so they quit going into Iran," he said. After a period of inaction, "we pulled that airborne CAP down because it looked to us as though they had stopped going to Iran, and they went back at it again. They were playing kind of a cat-and-mouse game here."

The US Air Force once again began patrolling the border, and "that was essentially the end of the story." The whole Iraqi Air Force "went brain dead" for the rest of the war, refusing to come out and fly at all.

Huge growth of force. When President Bush gave the order to deploy on August 7, said the General, "we began flying squadrons to the theater immediately.

"The first squadron arrived in-theater in thirty-four hours. Since fifteen of those thirty-four hours were flying hours for this particular squadron, that meant that squadron launched in less than twenty-hours from getting the deployment order" from Washington.

After the initial force arrived in Saudi Arabia, the Air Force and allied air contingent underwent two major growth spurts.

Between November 8, 1990 (when President Bush ordered a major increase in forces), and D-day, January 17, the inventory of fixed-wing aircraft doubled. On D-day, the Air Force had on hand 652 fighter and attack aircraft, eighty-seven other combat aircraft, and 394 support planes.

By the start of the ground war on day thirty-nine, however, USAF's force had grown again. "After the opening of combat operations, some of our coalition partners agreed to allow us to conduct operations" from their territory, explained General McPeak. For instance, Air Force B-52s began to fly from Spain and Britain.

The Air Force built up to where, on the day the ground war started, it had 747 fighter and attack combat aircraft, 10.4 full tactical fighter wing equivalents, in the theater. It had 161 combat aircraft of other types and 463 support aircraft on hand.

The US Air Force provided about fifty percent of all the aircraft deployed by the coalition. According to USAF

documents, a sizable portion of this armada was based in Turkey, north of Iraq. There, at Incirlik AB, a composite wing of USAF aircraft had set up shop under a single commander whose job it was to conduct offensive and defensive air operations and to freeze enemy forces in northern Iraq.

Forces based at Incirlik, says the document, included twenty-four F-16s, twenty-eight F-15Cs, eighteen F-111Es, twenty-six F-4G and F-16C Wild Weasels, six EF-111s, four F-4E

Precision munitions did the most important work. About ninety percent of USAF's laser-guided munitions hit their targets.

Pave Tack fighters, three EC-130s, three E-3 AWACS planes, eight RF-4Cs, and fifteen KC-135 tankers.

Weight of the bombing campaign. The scope and magnitude of the bombing effort were staggering. According to Air Force documents, the US Air Force, Navy, and Marine Corps dropped 210,800 "dumb" bombs—nearly 77,000 tons. They also dropped 15,500 precision-guided munitions—7,400 tons. Allied air forces added to these amounts. USAF aircraft dropped seventy percent of the dumb bombs and eighty-eight percent of the precision weapons.

Though dumb bombs were used in profusion, "it was precision munitions that did the most important work," said General McPeak. He pointed out that the Air Force had delivered virtually all of these. His best estimate is that about ninety percent of all the Air Force's laser-guided munitions hit their targets.

One could see the impact of this bombing, said the General, in the destruction of bridges in Iraq. During the course of the war, the coalition forces identified and attacked fifty-four major bridges crossing the Euphrates and Tigris Rivers. Some were important because they were part of the mobile Scud network. Most were important as supply nodes.

The Air Force did not knock down every bridge, but at the end of the war, said the General, about forty of the fifty-four were "in the water." Most of the rest were badly damaged, though not totally impassable.

When assessing bomb damage and destruction of major pieces of Iraqi army weaponry, the General added, allied estimates were conservative throughout the war, with officials claiming that about fifty percent of tanks, armored vehicles, and artillery tubes were destroyed. "Once we actually did push in on the ground, it was obvious that we had achieved destruction rates well above something like the fifty percent we may have been claiming in all classes of major equipment," said the Air Force Chief of Staff.

An Air Force chart claims the coalition destroyed all but about 400 of Iraq's 4,400 tanks and virtually all the artillery in the Kuwait/southern Iraq theater of operations.

War and morality. In the war's final hours, when coalition forces demolished retreating Iraqi forces, did the allies resort to excessive violence? General McPeak, not surprisingly, says no.

"When enemy armies are defeated, they retreat, often in disorder, and we have what is known as the exploitation phase," he said. "It's during this phase that the true fruits of victory are achieved from combat, when the enemy's disorganized.

"The alternative is that we should never attack a disorganized enemy—we should wait until he is stopped, dug in, and prepared to receive the attack.

"You may recall how disappointed Lincoln was with General Meade when he failed to pursue Lee south after Gettysburg. It certainly prolonged the Civil War, perhaps by a year or so, and many more young northern and southern men were killed as a consequence. All American generals should remember that lesson. If we do not exploit victory, then the President should get himself some new generals."

The big lesson of the Gulf War, suggested General McPeak, is that being Number Two carries a high cost.

He said that the Iraqi Air Force was "a pretty good outfit. They happened to be the second-best air force in the fracas. Having the second-best air force is like having the second-best poker hand. It's often the best strategy to fold early. I think they folded early. The lesson for us is we do not want ever to enter combat with the second-best air force." ■



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will double the mission readiness of the aircraft. What's more, the resulting reduced maintenance, spare part and support equipment costs will help the Air Force realize life cycle savings of \$150 million. And armed with the GBU-15 or our new AGM-130 standoff weapon system, the F-111 will become more effective than ever.

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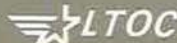
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★ Nearly seven months to the day after they scrambled to Saudi Arabia to form the alliance's first line of defense against Saddam Hussein, elements of the 1st Tactical Fighter Wing returned victorious to Langley AFB, Va. Some 20,000 well-wishers and family members shouted their approval on March 8 as Air Force Secretary Donald B. Rice welcomed this first contingent of US airmen back home.

"You showed a tyrant that the mother of all battles was really the daughter of all delusions," he said. "You turned it into . . . the mother of all defeats."

In addition to pilots and support personnel from the 1st TFW, Strategic Air Command bomber and tanker crews also arrived at Langley and took part in the ceremonies following nonstop flights from Saudi Arabia. Other early returning units included the 42d Bombardment Wing, Loring AFB, Me., and the 55th and 9th Special Operations Squadrons, Eglin AFB, Fla.

Airmen returning through Langley on March 8 were greeted by a group of dignitaries that included Gen. Merrill A. McPeak, Air Force Chief of Staff; Gen. Robert D. Russ, commander of Tactical Air Command; Gen. H. T. John-



On March 10, twenty-one former prisoners of war, eight of them from the Air Force, returned to the US through Andrews AFB, Md. Though they were greeted by Secretary of Defense Dick Cheney, Chairman of the Joint Chiefs of Staff Gen. Colin Powell, and thousands of spectators, first things came first (above).

son, commander in chief of Military Airlift Command; Gen. George L. Butler, commander in chief of Strategic Air Command; and Virginia Sens.

John Warner, a Republican, and Charles Robb, a Democrat.

Two days later, on March 10, twenty-one former US prisoners of war—including eight members of the Air Force—were met at Andrews AFB, Md., by Dick Cheney, the Secretary of Defense; Gen. Colin Powell, the Chairman of the Joint Chiefs of Staff; and several thousand spectators.

Freed Air Force POWs in attendance were Capt. William F. Andrews, Col. David W. Eberly, Lt. Col. Jeffrey D. Fox, Maj. Thomas E. Griffith, Jr., Capt. Harry M. Roberts, Capt. Richard D. Storr, 1st Lt. Robert J. Sweet, and Maj. Jeffrey S. Tice.

"Nothing we say today can erase the loneliness and dread that were your constant companion while prisoners of war," said Secretary Cheney.

According to the Pentagon, Air Force personnel killed in action during Desert Storm were Capt. Douglas L. Bradt, Capt. Paul R. Eichenlaub II, and 1st Lt. Patrick B. Olson. Air Force service members killed in noncombat incidents or accidents during the operation were SrA. Ramono L. Poole,



Pilots and support personnel from the 1st Tactical Fighter Wing are welcomed by their families on their return to Langley AFB, Va., after Operation Desert Storm. Also on hand were Air Force Secretary Donald B. Rice and other dignitaries.



Despite a notice of termination, work continues on the V-22 Osprey (above, sling load testing). Termination of the tilt-rotor aircraft, whose developers won the prestigious Collier Trophy for 1990 (see p. 148), is by no means certain.

1st Lt. Jorge I. Arteaga, Capt. Dale Thomas Cormier, Capt. Jeffrey J. Olson, and 1st Lt. Eric D. Hedeem.

As of March 15th, the following USAF personnel were still listed as missing in action: Lt. Thomas C. Bland, Jr., SSgt. John P. Blessinger, SMSgt. Paul G. Buege, Sgt. Barry M. Clark, Capt. Arthur Galvan, Capt. William D. Grimm, SSgt. Timothy R. Harrison, TSgt. Robert K. Hodges, Maj. Donnie R. Holland, Sgt. Damon V. Kanuha, Maj. Thomas F. Koritz, MSgt. James B. May II, SSgt. John L. Oelschlager, Capt. Stephen Richard Phillips, SSgt. Mark J. Schmauss, Capt. Dixon L. Walters, Jr., and Maj. Paul J. Weaver.

In the aftermath of the cease-fire between the coalition nations and Iraq, more details of the air campaign began to emerge. During forty-one days of hostilities, allied air forces flew approximately 110,000 sorties, at least half of them combat sorties; downed forty-two Iraqi aircraft in air-to-air combat; destroyed scores more on the ground and in bunkers; and maintained a ninety percent operational readiness rate for their aircraft. USAF F-15Cs shot down two more, both Su-22s, in late March, three weeks after the cease-fire took effect.

According to the Defense Department, the alliance lost seventy-three aircraft. Of that number, combat action claimed forty-two (twenty-eight US and nine allied fixed-wing aircraft and five US helicopters), while non-combat causes were responsible for the loss of the remaining thirty-one aircraft (eleven US and two allied fixed-wing aircraft and eighteen US helicopters).

The US Air Force sustained one-third of the allied combat losses. USAF aircraft losses in combat included two F-15E dual-role fighters,

five F-16A fighters, one F-4G Wild Weasel, one AC-130H special operations forces gunship, and five A-10 attack aircraft. Noncombat losses were two F-16C fighters, one EF-111 Raven electronic warfare aircraft, and one B-52 bomber.

Military Airlift Command's transport effort is still under way. As of mid-March, the airlift fleet had transported 439,553 passengers, 2.4 million tons of unit equipment, 4.2 million tons of refined petroleum products, and more than 500,000 tons of food and supplies to the Persian Gulf. US aircraft dropped 84,400 tons of ordnance on Iraq and occupied Kuwait. Of that amount, precision guided munitions accounted for roughly nine percent, or 7,400 tons.

★ Officials of the services and their outside supporters have begun assessing Operation Desert Storm's testing of various weapons and tactics, many of which were used for the first time in extended combat.

Air Force officials lauded the per-

Anniversaries

- **May 22, 1906:** After turning down two previous submissions, the US government issues the Wright brothers the first patent on their flying machine.
- **May 8, 1911:** The first Navy airplane, A-1, an amphibian, is ordered from Glenn Curtiss. This date has been officially proclaimed the birthday of naval aviation.
- **May 10, 1911:** Lt. G. E. M. Kelly becomes the second Army officer killed in an airplane (the first killed while piloting a plane) when he crash-lands his Curtiss pusher at San Antonio.
- **May 13, 1911:** Lts. H. H. Arnold and T. D. Milling complete their flying training at Dayton, Ohio, becoming the first Wright School Army pilots.
- **May 29, 1941:** The Air Corps creates the Ferrying Command to fly aircraft from US factories to Canada and to Atlantic ports for delivery to Great Britain. By the time Japanese forces attack Pearl Harbor six months later, the command will have delivered some 1,350 airplanes for Britain.
- **May 20, 1951:** Capt. James Jabara, an F-86 Sabre pilot of the Air Force's 4th Fighter-Interceptor Wing, becomes the world's first jet ace, shooting down his fifth and sixth MiG-15s in the Korean War.
- **May 21, 1956:** At an altitude of 50,000 feet, Maj. David Cricklow, USAF, in a B-52 jet bomber, drops the first airborne hydrogen bomb, which explodes over Bikini Atoll in the Pacific.
- **May 5, 1961:** Cmdr. Alan B. Shepard, Jr., USN, becomes the first Project Mercury astronaut to cross the space frontier, on a fifteen-minute flight that reaches an altitude of 115 miles, carrying him 302 miles to a landing in the Atlantic after a launch from Cape Canaveral. His maximum speed in the Freedom 7 capsule is 5,100 mph.
- **May 11, 1961:** The first B-52H is officially delivered to SAC's 378th Bomb Wing, Wurtsmith AFB, Mich.
- **May 25, 1961:** President Kennedy, at a joint session of Congress, declares a national space objective: "I believe that this nation should commit itself to achieving the goal, before this decade is out, of landing a man on the moon and returning him safely to Earth."
- **May 3, 1966:** Air Force Capt. Gerald T. Lyverse became the first airman picked up by a Lockheed HC-130H equipped with a Fulton STAR Recovery System.
- **May 30, 1966:** NASA launches the Surveyor 1 lunar probe, which makes the first fully controlled soft landing on the moon on June 2. It transmits 11,150 high-resolution pictures of the lunar surface.
- **May 28, 1986:** At commencement exercises at the Air Force Academy, Lt. Terrie Ann McLaughlin becomes the first woman to be named outstanding cadet of a graduating class.

formance of the F-117A Stealth fighter, claiming that it established the ascendancy of stealth technologies. Testifying before the House Armed Services Committee, Secretary Rice noted that eight F-117s, supported by two KC-135 aerial tankers, could provide the same combat power as seventy-five fighter and support aircraft (thirty-two F-16 fighters, sixteen F-15 air escorts, four EF-111 jammers, eight F-4G defense suppression aircraft, and fifteen KC-135s).

Air Force officials also praised the performance of the two E-8A Joint Surveillance and Target Attack Radar System (Joint STARS) aircraft rushed to the Persian Gulf while still in development. Flying with the Air Force's 4411th Joint STARS squadron, the Grumman-Norden-Cubic systems reportedly logged about fifty missions, accumulating 500 combat hours. The total system comprises a modified Boeing 707 airframe with a twenty-four-foot multimode radar slung under the nose of the aircraft. The Joint STARS aircraft helped to detect moving vehicles at long range and target them. They also worked in tandem with E-3 Airborne Warning and Control System planes to provide data to Scud-hunting fighters.

The political necessity of locating and destroying mobile Scuds proved to be the mother of improvisation. Testifying before the House Armed Services Committee, Air Force Secretary Rice said the LANTIRN (Low-Altitude Navigation and Targeting Infrared for Night) system was also adapted to that job. "No one would have guessed that the LANTIRN targeting pod would show a capability for trolling along highways looking for Scud launchers," Secretary Rice said in response to a question from a congressman. "It has been used in that mode, and it has been effective in that mode."

When it comes to deriving lessons from the war, Air Force officials said they missed what they *didn't* have in the Persian Gulf. USAF general officers, in various forums during and after the war, lamented the lack of full use of the new Advanced Medium-Range Air-to-Air Missile (AMRAAM), highly effective runway-closing munitions, and advanced hard-target munitions.

★ With more than \$8.2 billion worth of prime contracts and other contracts awarded to its various divisions in Fiscal 1990, McDonnell Douglas has retained the top spot in the Department of Defense's annual listing of its top 100 contractors. The company, headquartered in St. Louis, Mo., garnered the top spot for the fourth consecu-

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tive year and has ranked first in six out of the last seven annual listings.

The Pentagon report, released March 22, showed that Fiscal 1990's biggest gainer was Tenneco Inc., a defense contractor that did not make it to the top twenty companies in Fiscal 1989 but rebounded to number ten in the most recent fiscal year. Tenneco's defense contract values rose from a negligible amount to some \$2.4 billion in Fiscal 1990, largely on the strength of increased naval work.

Among the top ten companies, the Fiscal 1989 top three—McDonnell Douglas, General Dynamics Corp., and General Electric Co.—retained their positions. General Motors Corp., Martin Marietta Corp., and Grumman Aerospace Corp. each rose one spot in the rankings. Raytheon Co. and United Technologies each moved down one spot. Boeing Co., which last year was number nine, fell to eleventh in Fiscal 1990, with \$2.2 billion in defense contracts.

The Top Ten of Fiscal 1990

1990 Rank, Firm	Contract Values (000 \$s)	FY 1989 Rank
1. McDonnell Douglas Corp.	\$8,211,427	1
2. General Dynamics Corp.	6,306,093	2
3. General Electric Co.	5,588,964	3
4. General Motors Corp.	4,106,570	5
5. Raytheon Co.	4,070,955	4
6. Lockheed Corp.	3,552,628	6
7. Martin Marietta Corp.	3,491,992	8
8. United Technologies Corp.	2,855,766	7
9. Grumman Corp.	2,696,966	10
10. Tenneco, Inc.	2,409,935	*

*Tenneco was not included in the top ten in Fiscal 1989.

Five of Fiscal 1990's top ten firms did more business (in current dollars) with DoD in Fiscal 1990 than they did in FY 1989. The top ten firms of FY 1990, with dollar value of all contracts awarded to the parent company and its divisions, are shown in the box above.

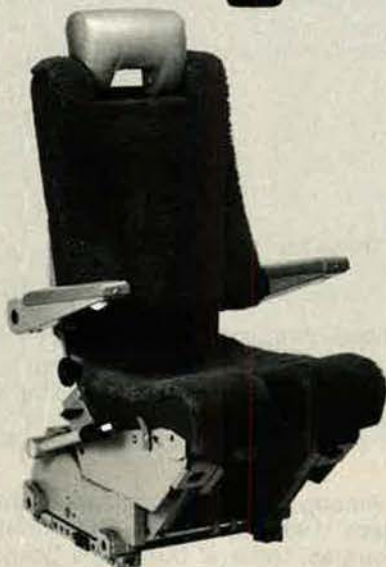
Total value of the FY 1990 DoD contract awards was \$130.8 billion—about the same as the \$130 billion awarded in FY 1989. Of the FY 1990 total, the top 100 firms received contracts worth \$86.7 million—again, about the same as the \$85.6 million awarded to the top 100 in FY 1989.

Twenty-two firms did more than \$1 billion in business with DoD in FY 1990, adding three members to the "billion dollar club" compared to FY 1989. Seventeen firms not listed in the FY 1989 tally made the top 100 of FY 1990. The 100th-ranked company, Ram Systems GmbH, received contracts totaling \$119,328,000.

★ The National Space Council, headed by Vice President Dan Quayle, gave the National Aeronautics and Space Administration the green light on March 20 to proceed with a revised version of its controversial space station. NASA earlier had submitted its congressionally mandated redesign for review by the Council.

Last October, Congress ordered NASA to cut \$6 billion from the program's spending profile through Fiscal Year 1996 and called for a plan to build the facility in stages. The idea was to separate the space station into smaller, self-contained modules that could largely be assembled and tested on the ground, thus requiring fewer shuttle launches. Rather than the

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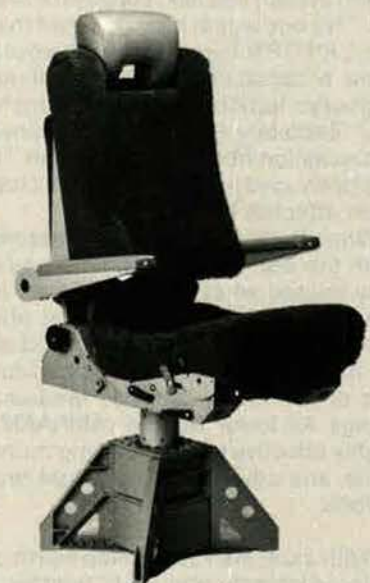
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C-5B Flight Engineer / Navigator / Observer Seat

original forty-four-foot modules, for instance, the redesign will include a preintegrated truss and shortened, twenty-seven-foot laboratory and habitation modules.

Under the redesign proposal, NASA would spend up to \$2.6 billion a year to put the space station's laboratory and habitation modules into orbit by the mid-1990s. Shuttle astronauts would visit periodically, conducting research on the manufacture of better crystals, metals, and other materials in a weightless environment. After the station achieved permanent manned capability near the end of the decade, the focus of its activities would shift to life-science research necessary for further manned exploration of the solar system.

In a March 13 hearing before the House Committee on Science, Space, and Technology, Arnold D. Aldrich, NASA's associate administrator for aeronautics, exploration, and technology, testified that future missions to Mars depend heavily on deployment of the space station because of the long-duration life-support technology it is expected to improve. The proposed new NASA-DoD heavy-lift launch vehicle is needed to boost the required personnel and support equipment into space, he said, "even for meaningful missions back to the moon or for missions beyond the moon or Mars."

The space station redesign received a critical reception at the National Research Council, however. The Council issued a harsh report charging that the redesign "does not meet the basic research requirements" for which it is to be built. The report, conducted by NRC's Space Studies Board, continued, "Neither the quantity nor the quality of research that can be conducted on the proposed station merits the projected investment." The board is chaired by Louis J. Lanzerotti of AT&T Bell Laboratories, and it includes former astronaut Sally Ride.

The Space Studies Board report was viewed as more bad news for NASA, which has been stung by discovery of cracks in the shuttles *Discovery*, *Columbia*, and *Atlantis*. The cracks in *Discovery*, located in hinge lugs that support the umbilical door-closing mechanism, were discovered February 18 during routine launch preparations. On February 28, NASA management overruled engineers who insisted that the cracks did not jeopardize flight safety, scrubbing *Discovery*'s March 9 launch date and grounding the orbiter for at least two months.

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the *Challenger* accident, Associate Administrator for Space Flight William B. Lenoir said, "Prudence calls for us to roll back and fix [the problem]. If we err, we will err on the side of caution." Agency representatives maintained, however, that the cracks found on *Atlantis* were smaller than those found on *Discovery* and *Columbia*, and they argued in favor of launching the shuttle on April 4, as planned.

★ **PURCHASES—Orbital Sciences Corp.** was selected by NASA to negotiate for **commercial launch services in support of the Small Explorer Satellite program.** The total contract, which consists of seven firm launches and three optional launches, is valued at approximately \$80 million. Using its Pegasus Air-Launched Space Booster, Orbital plans to conduct its first launch in 1993, with an expected launch rate of two flights per year. The world's first privately developed and operated Earth-to-space vehicle, the winged Pegasus is air-launched and can place payloads up to 800 pounds into low-Earth orbit. It was developed in a joint venture between Orbital and Hercules Aerospace Co. The Air Force also awarded Orbital a \$6.5 million contract to supply sounding

rocket systems to support high-altitude meteorological observations.

Under a contract option exercised by the US Army Communications and Electronics Command, **Lockheed Sanders Inc.** was awarded \$15.4 million for 640 modification kits to **convert ALQ-144s to the upgraded ALQ-144A(V) 1 and 3 configurations.** The modifications will improve the ALQ-144's ability to protect aircraft against infrared guided missiles. More than 3,000 ALQ-144s are now installed on US Army, Air Force, and Navy platforms, including helicopters and fixed-wing aircraft.

Tracor Aerospace Inc. will produce MJU-23/B infrared flares to protect B-1B bombers from heat-seeking missiles. The two-year, \$6 million contract was awarded by Ogden Air Logistics Center, and the work will be performed by the company's Expendables Technology Center in San Ramon, Calif. Warner Robins Air Logistics Center also awarded the company a \$5.6 million contract for chaff applicable to the ALE-24 Chaff Dispenser System for the B-52 bomber.

McDonnell Douglas Corp. was awarded an \$80 million advance acquisition contract for **long-lead materials** needed to manufacture the Navy's proposed Fiscal 1992 requirement for



Aeronautics Editor Jeff Rhodes (right) checks out an OV-10 cockpit during work for his December 1989 cover story on close air support.

Rhodes Moves On

The staff at AIR FORCE Magazine says goodbye to a valuable asset this month as Aeronautics Editor Jeff Rhodes leaves for a job in the aerospace industry. Since June 1985, when Mr. Rhodes joined the magazine as a staff editor, he has been the man to go to for the official nickname of the UC-78, to distinguish between a C-130E and a C-130H, or to find out when Harpoon missiles entered production.

Mr. Rhodes has written "Aerospace World" since 1986 and has been the resident book reviewer since 1988. Many of his feature articles told of the working Air Force in action. He has written profiles of new aircraft, informed readers of aircraft preservation taking place at Davis-Monthan AFB, Ariz., and described the challenges of a bare-base deployment to Burns Flat, Okla.

Mr. Rhodes has been with us since shortly after his graduation from Clemson University. He returns south with our best wishes.

twenty-six F/A-18C and ten F/A-18D aircraft. The work is expected to be completed in September 1994.

The **Royal Norwegian Air Force** awarded **LTV Missiles and Electronics Group** a \$20 million contract for the **digital avionics upgrade of fifteen Norwegian F-5 aircraft.** The tactical capabilities of Norway's F-5s will be enhanced by the addition of a 1553 Digital Data Bus, head-up display (HUD), laser inertial navigation system, miniature Standard Central Air Data computer, and color video camera and recorder. The upgrade will make cockpit instrumentation similar to that in the F-16, and Norway expects to use the modified F-5s as lead-in trainers to its fleet of F-16s. Noting that there are approximately 2,500 F-5s still in operation around the world, LTV says it is prepared to install similar avionics and radar upgrades under its F-5 Tiger Program for Avionics and Weapon Systems Improvements (PAWS).

★ **MILESTONES**—Engineers at the **Stennis Space Center** conducted the first test of a **new Pratt & Whitney turbopump for the space shuttle's main engine.** The new pump, which operated for 1.5 seconds in the ignition test of a research and development engine, is manufactured with castings instead of sheet metal, a move designed to improve operational life and reduce maintenance. The P&W alternate Turbopump Development Program began in 1986, and the hardware is expected to fly for the first time in 1993.

For the first time ever, the **US Air Force** in the Persian Gulf War approved the **recall of retirees to active duty.** Some 150 retirees were recalled on February 8 to fill medical field vacancies created by the departure of specialists who were sent to serve in Operation Desert Storm. Under federal law, the Air Force Secretary is authorized to mobilize retirees.

The **first Titan IV rocket launched**

from Vandenberg AFB, Calif., lifted off on March 8. The booster carried a classified military payload. The Titan IV is USAF's premier heavy-lift vehicle. Its launch from Vandenberg is significant because it gives the Air Force the ability to launch from both coasts, which the service says is essential to its space-launch strategy. This was the fourth Titan IV launch. The first three were launched from Cape Canaveral AFS, Fla.

Soviet cosmonaut Musa Manarov set a record for accumulated time spent in space on February 22, amassing 447 days in orbit. This broke the previous record of 430 days, set early this year by fellow cosmonaut Yuri Romanenko. Manarov was on the eighty-third day of his Soyuz TM11 mission, working aboard the space station Mir.

★ **DELIVERIES**—**McDonnell Douglas** recently completed a three-year project to install a **full field of view dome (FFVD) flight simulator display system** for the Air Force Human Resources Lab at Williams AFB, Ariz. The system will simulate a variety of flight and combat scenarios for F-15s and F-16s.

Deliveries began in February of the first production order of **Hughes Aircraft Co.'s Santa Barbara Research Center's Dual Spectrum fire sensor,** designed for use on the C-5 transport. Installation of the fire sensors marks the first application of the units aboard an operational aircraft. The sensors were qualified for operation on the C-5 in 1988, and a complete system has been flying since last September in airlifts to the Middle East.

After completing a series of successful flight operations at the Yuma Proving Grounds in Arizona, the **Canadair CL-227 Sentinel** unmanned aerial vehicle (UAV) moved a step closer to deployment aboard the frigate USS *Doyle* in mid-1991. Tests completed in December 1990 verified technical improvements in the system and expansion of the UAV's flight envelope. The UAV Joint Project Office selected the CL-227 Sentinel last May to perform maritime demonstrations of the vertical takeoff and landing (VTOL) vehicle.

★ **NEWS NOTES**—A showdown seemed likely over the Pentagon's unilateral attempts to shut down the **Grumman F-14 remanufacture program.** Secretary of Defense Cheney appears determined to do so, despite the fact that Congress appropriated \$987 million in the current (1991) fis-

cal year to upgrade twelve F-14A versions to the D models, giving them new avionics, radars, and engines.

In February, Secretary Cheney sent Grumman a notice of termination. That followed terminations on two other programs for which Congress appropriated money last year, the V-22 Osprey tilt-rotor aircraft program and a scheduled service-life extension program (SLEP) for the aircraft carrier USS *John F. Kennedy*.

Pro-Grumman lawmakers successfully inserted into the Pentagon's supplemental appropriations bills language demanding that DoD spend the appropriated money. In the wake of that move, a number of members of Congress verbally lashed the Pentagon on the House floor. "The Pentagon's actions establish a serious precedent," said Rep. Tom Downey (D-N. Y.). "We need to know if the Department no longer intends to honor [Congress's budget] report language." House Armed Services Committee Chairman Les Aspin (D-Wis.) added that DoD's action on those programs are "precise examples of how not to do business."

Testifying before the Senate Appropriations Committee's Defense Subcommittee on March 4, Deputy Defense Secretary Donald Atwood defended the decision to terminate the F-14 remanufacture. Mr. Atwood told the lawmakers that DoD owes contractors "a clear signal" of what it intends to buy in coming years.

Though emphasizing that there are no major technical problems with the **new-generation C-17 airlifter**, the Air Force confirmed that there were some rising costs. On March 7, Secretary Rice told the Senate Appropriations Committee's Defense Subcommittee that the Air Force had mandated that McDonnell Douglas reduce the number of workers and the overhead structure on the C-17 program because both had grown faster than funding justified. In a related development, former Air Force Secretary Edward C. Aldridge, now president of McDonnell Douglas Electronic Systems Co., was temporarily assigned to review the company's progress on the C-17.

The Air Force continues to expect the first flight of the C-17 to take place later this year, though there is some doubt that the aircraft would be ready in June as planned. Secretary Rice testified that, despite cost concerns surrounding the program, alternatives to the C-17 would prove more expensive. One alternative frequently cited would be the purchase of a mix of C-5s and modernized C-141s and C-130s. Air Force officials also said that, despite uncertainties over the

C-17 schedule and the tempo of C-141B operations during Desert Shield and Desert Storm, they have no intention of rewinging the C-141 StarLifter fleet.

In budget documents, the Air Force announced a **new initiative to equip all 150 KC-135 tankers with multiple offload points**, allowing them to refuel three aircraft simultaneously. At the same time, the Air Force plans to fit probes on F-15 and F-16 fighters, which will also have boom slots. The first KC-135s equipped with the wingtip pods will be ready around 1994, an Air Force spokesman said. The total program cost is estimated at \$453 million.

The veil of secrecy surrounding the **brigadier general promotion process** has been lifted by a new Air Force regulation. On February 11, Secretary Rice approved regulation 36-9, which establishes clear guidelines for promotion to brigadier general for future selection boards. Previously, the final O-7 selection board re-

viewed Form 706, a "closed" form used to rate colonels. The evaluation was confidential and was unavailable to the colonel being rated.

The new regulation requires O-7 selection boards to rely on the same form now used for promotion to field grades (Form 709), which will be shown to candidates. Saying that he was never comfortable with the system of confidential ratings, Chief of Staff Gen. Merrill A. McPeak added, "We've eliminated any secrecy in the ratings. All officers will receive just one rating, and it's open for their review."

★ **HONORS**—AIR FORCE Magazine's Associate Editor, **Colleen A. Nash**, won two journalism awards from the **Aviation/Space Writers Association** for her work in 1990. "Solar Max," which appeared in the July issue, received an Award of Excellence, and "Stinger Proves Its Point," which appeared in the August issue, earned a Certificate of Merit. ■

Senior Staff Changes

RETIREMENTS: B/G Billy A. Barrett; B/G Dennis D. Doneen; M/G Keith E. Nelson; Gen. Robert D. Russ.

AFRES RETIREMENT: B/G Joseph R. Albi.

PROMOTION: To be General: Michael P. C. Carns.

CHANGES: L/G (Gen. selectee) Michael P. C. Carns, from Dir., Joint Staff, JCS, Washington, D. C., to Vice Chief of Staff, Hq. USAF, Washington, D. C., replacing Gen. John M. Loh . . . B/G Stephen P. Condon, from Assoc. Dep. Ass't Sec'y, Mgmt. Policy and Prgm. Integration; and Acting Director, Science and Technology, Ass't Sec'y of the Air Force (Acquisition), Hq. USAF, Washington, D. C., to Dep. Ass't Sec'y, Mgmt. Policy and Prgm. Integration, Ass't Sec'y of the Air Force (Acquisition), Hq. USAF, Washington, D. C., replacing retired M/G Robert D. Eaglet . . . M/G Eugene H. Fischer, from Ass't DCS/Productivity & Prgms., Hq. USAF, Washington, D. C., to Dir., Manpower & Organization, Hq. USAF, Washington, D. C. . . . M/G James J. LeCleir, from Dep. Dir., Supply, DCS/Logistics, Hq. USAF, Washington, D. C., to Dir., Inter-American Defense College, IADB, Fort McNair, D. C., replacing retiring B/G Richard C. Milnes II . . . L/G Henry Viccellio, Jr., from DCS/Logistics, Hq. USAF, Washington, D. C., to Dir., Joint Staff, JCS, Washington, D. C., replacing L/G (Gen. selectee) Michael P. C. Carns.

SENIOR ENLISTED ADVISOR (SEA) CHANGE: CMSgt. George T. Moriarty, to SEA, Hq. ATC, Randolph AFB, Tex., replacing CMSgt. Bobby G. Renfroe.

SENIOR EXECUTIVE SERVICE (SES) CHANGES: Maurice LeBlanc, from Dep. Dir., Maintenance, San Antonio ALC, AFLC, Kelly AFB, Tex., to Dir., Propulsion Systems, San Antonio ALC, AFLC, Kelly AFB, Tex. . . . Clinton Lewis, from Dep. Dir., Maintenance, Warner Robins ALC, AFLC, Robins AFB, Ga., to Dir., Technology & Industrial Support, Warner Robins ALC, AFLC, Robins AFB, Ga. . . . Thomas L. Miner, from Dep. Dir., Maintenance, Oklahoma City ALC, AFLC, Tinker AFB, Okla., to Dir., Commodities Mgmt., Oklahoma City ALC, AFLC, Tinker AFB, Okla. . . . Gene L. Mortensen, from Dep. Dir., Maintenance, Ogden ALC, AFLC, Hill AFB, Utah, to Dir., Financial Mgmt., Ogden ALC, AFLC, Hill AFB, Utah. Ronald L. Orr, from Dep. Dir., Materiel Mgmt., Ogden ALC, AFLC, Hill AFB, Utah, to Dir., Technology & Industrial Support, Ogden ALC, AFLC, Hill AFB, Utah . . . Edward Riojas, Jr., from Dep. Dir., Materiel Mgmt., Sacramento ALC, AFLC, McClellan AFB, Calif., to Dir., Technology & Industrial Support, Sacramento ALC, AFLC, McClellan AFB, Calif. . . . Eva C. Ugarkovich, from Dep. Dir., Maintenance, Sacramento ALC, AFLC, McClellan AFB, Calif., to Dir., Financial Mgmt., Sacramento ALC, AFLC, McClellan AFB, Calif. . . . James C. Wallin, from Dep. Dir., Materiel Mgmt., San Antonio ALC, AFLC, Kelly AFB, Tex., to Dir., Financial Mgmt., San Antonio ALC, AFLC, Kelly AFB, Tex. ■

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*Air Force Computer Acquisition Center Project 308

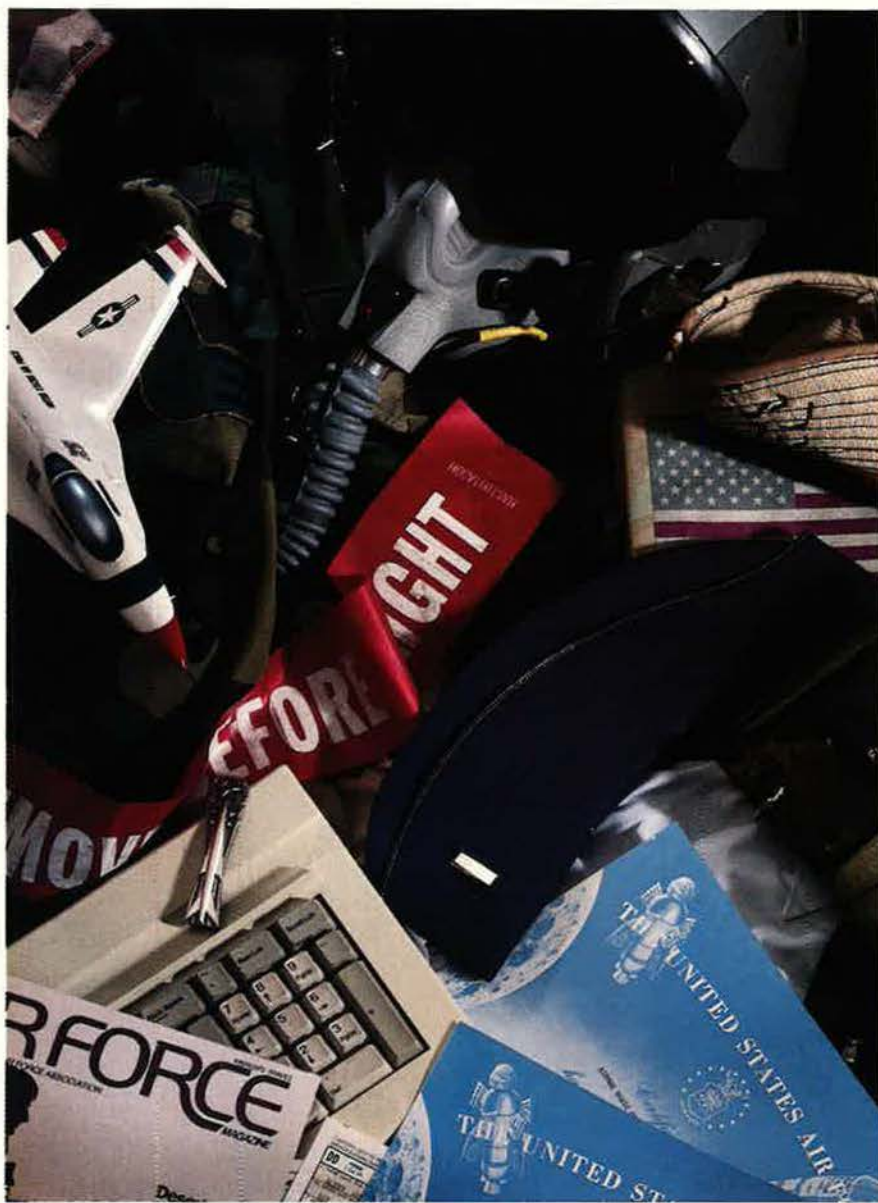
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The US Air Force in Facts and Figures

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, field operating agency, and direct reporting unit reports or in the "Guide to Major USAF Installations Worldwide") because of different cut-off dates, rounding, 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



—Photo by Paul Kennedy

USAF—EVOLUTION OF THE NAME AND THE SERVICE'S LEADERS¹

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	Mar. 5, 1913	July 18, 1914
Aviation Section, US Signal Corps	July 18, 1914	May 20, 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
Air Service	May 20, 1918	July 2, 1926	Maj. Gen. William L. Kenly	Director, Div. of Military Aeronautics	May 20, 1918	Aug. 28, 1918
			John D. Ryan	Director of Air Service	Aug. 28, 1918	Nov. 27, 1918
			Maj. Gen. Charles T. Menoher	Director of Air Service	Jan. 2, 1919	June 4, 1920
			Maj. Gen. Charles T. Menoher	Chief of Air Service	June 4, 1920	Oct. 4, 1921
			Maj. Gen. Mason M. Patrick	Chief of Air Service	Oct. 5, 1921	July 2, 1926
			Maj. Gen. Mason M. Patrick	Chief of Air Corps	July 2, 1926	Dec. 13, 1927
Air Corps	July 2, 1926	June 20, 1941	Maj. Gen. James E. Fechet	Chief of Air Corps	Dec. 14, 1927	Dec. 19, 1931
			Maj. Gen. Benjamin D. Foulois	Chief of Air Corps	Dec. 20, 1931	Dec. 21, 1935
			Maj. Gen. Oscar Westover	Chief of Air Corps	Dec. 22, 1935	Sept. 21, 1938
			Maj. Gen. Henry H. Arnold	Chief of Air Corps	Sept. 29, 1938	June 20, 1941
			Lt. Gen. Henry H. Arnold	Chief, Army Air Forces	June 20, 1941	Mar. 9, 1942
			Gen. of the Army ² Henry H. Arnold	Commanding General, AAF	Mar. 9, 1942	Feb. 9, 1946
Army Air Forces	June 20, 1941	Sept. 18, 1947	Gen. Carl A. Spaatz	Commanding General, AAF	Feb. 9, 1946	Sept. 26, 1947
			Gen. Carl A. Spaatz	Chief of Staff, ³ USAF	Sept. 26, 1947	Apr. 29, 1948
United States Air Force	Sept. 18, 1947					

¹For USAF leaders since 1948, see "USAF Leaders Through the Years."

²Changed to "General of the Air Force" by Act of Congress, May 7, 1949.

³DoD approved Army-Air Force Transfer Order establishing position of Chief of Staff not issued until Sept. 26, 1947.

UNITED STATES AIR FORCE PERSONNEL STRENGTH—1907 THROUGH 1992

YEAR	STRENGTH	YEAR	STRENGTH
1907	3	1951	788,381
1908	13	1952	973,474
1909	27	1953	977,593
1910	11	1954	947,918
1911	23	1955	959,946
1912	51	1956	909,958
1913	114	1957	919,835
1914	122	1958	871,156
1915	208	1959	840,028
1916	311	1960	814,213
1917	1,218	1961	820,490
1918	195,023	1962	883,330
1919	25,603	1963	868,644
1920	9,050	1964	855,802
1921	11,649	1965	823,633
1922	9,642	1966	886,350
1923	9,441	1967	897,426
1924	10,547	1968	904,759
1925	9,670	1969	862,062
1926	9,674	1970	791,078
1927	10,078	1971	755,107
1928	10,549	1972	725,635
1929	12,131	1973	690,999
1930	13,531	1974	643,795
1931	14,780	1975	612,551
1932	15,028	1976	585,207
1933	15,099	1977	570,479
1934	15,861	1978	569,491
1935	16,247	1979	559,450
1936	17,233	1980	557,969
1937	19,147	1981	570,302
1938	21,089	1982	582,845
1939	23,455	1983	592,044
1940	51,165	1984	597,125
1941	152,125	1985	601,515
1942	764,415	1986	608,199
1943	2,197,114	1987	607,035
1944	2,372,292	1988	576,446
1945	2,282,259	1989	570,880
1946	455,515	1990	535,233
1947	305,827	1991	508,558
1948	387,730	1992	486,819 ¹
1949	419,347		
1950	411,277		

¹Programmed

USAF TOTAL ACTIVE-DUTY STRENGTH BY GRADE

(As of September 30, 1990)

OFFICERS

GRADE	NUMBER
General	12
Lieutenant General	36
Major General	117
Brigadier General	168
Colonel	5,061
Lieutenant Colonel	12,502
Major	19,159
Captain	43,528
First Lieutenant	10,898
Second Lieutenant	8,564
TOTAL	100,045

AIRMEN

GRADE	NUMBER
Chief Master Sergeant	4,598
Senior Master Sergeant	9,189
Master Sergeant	38,654
Technical Sergeant	57,693
Staff Sergeant	109,921
Sergeant/Senior Airman	117,712
Airman First Class	56,396
Airman	23,931
Airman Basic	12,724
TOTAL	430,818
TOTAL STRENGTH	535,233

AIR FORCE MILITARY PERSONNEL DISTRIBUTION BY GEOGRAPHIC AREA

(As of September 30, 1990; not including
Operation Desert Shield deployments)

TOTAL MILITARY PERSONNEL	535,233
US TERRITORY AND SPECIAL LOCATIONS	418,014
TOTAL IN FOREIGN COUNTRIES	117,219

Western and southern Europe	69,280
Major concentrations in	
Germany	29,898
UK	22,037
Italy	3,906
Spain	2,913
Turkey	3,408
East Asia and Pacific	33,571
Major concentrations in	
Japan/Okinawa	15,036
South Korea	10,333
Philippines	7,844
Africa, Near East, south Asia	376
Major concentrations in	
Saudi Arabia	199
Egypt	44
Western hemisphere	2,356
Major concentrations in	
Panama	2,144
Canada	124
Eastern Europe	16

INSTALLATIONS OF THE US AIR FORCE

Major installations, including Air Force Bases, Air Bases, Air Reserves Bases, and Air Guard Bases, are self-supporting centers of operations for actions of importance to Air Force combat, combat support, or training. Each is operated by an active, Reserve, or Guard unit of group size or larger with all land, facilities, and organic support needed to accomplish the unit mission. A major installation must have real property accountability through ownership, lease, permit, or other written agreement for all real estate and facilities. Agreements with foreign governments giving USAF jurisdiction over real property meet this requirement. Shared-use agreements (as opposed to joint-use agreements, wherein USAF owns the runway), do not meet this requirement. **Minor installations** (Air Force Stations, Air Stations, Air Reserve Stations, and Air Guard Stations) are operated by active, Reserve, or Guard units of at least squadron size but do not otherwise satisfy the criteria for a major installation. Examples: Reserve and Guard flying operations located at civilian-owned airports. **Support sites** are facilities operated by active, Reserve, or Guard units that provide general support to the Air Force mission and do not satisfy the criteria for a major or minor installation. Examples: missile tracking sites; radar bomb scoring sites; USAF-owned, contractor-operated plants; radio relay sites. **Other activities** include USAF units or activities that have little or no real property accountability for the real estate they occupy. Examples: active-duty, Guard, or Reserve Air Force units located on installations belonging to other services; leased office space supporting recruiting detachments or Civil Air Patrol.

Major Installations	
US and Possessions ¹	102
Foreign	38
Worldwide	140
Minor Installations	
US and Possessions ¹	105
Foreign	14
Worldwide	119
Support Sites	
US and Possessions ¹	141
Foreign	115
Worldwide	256
Other Activities	
US and Possessions ²	411
Foreign	403
Worldwide	814

¹Includes Air Force Reserve and Air National Guard.

²Includes USAF presence at non-USAF installations and other sites.

DoD BUDGET AUTHORITY BY COMPONENT FOR FYs 1990-93

(Current \$)

COMPONENT	FY 1990		FY 1991		FY 1992 ¹		FY 1993 ¹	
	\$ BILLION	% SHARE	\$ BILLION	% SHARE	\$ BILLION	% SHARE	\$ BILLION	% SHARE
Army	78.5	26.8	72.4	26.5	71.1	25.6	67.7	24.3
Navy/Marine Corps	100.0	34.1	92.2	33.8	91.6	32.9	92.5	33.3
Air Force	92.9	31.7	82.7	30.3	86.5	31.1	91.4	32.9
Defense Agencies, Defense-wide	21.7	7.4	25.7	9.4	29.1	10.4	26.3	9.5
TOTAL	293.0		273.0		278.3		277.9	

¹Budgets proposed by President Bush.















NOTE: Numbers are rounded and may not sum to totals.

USAF Grades and Insignia

Officer

					
Second Lieutenant (O-1)	First Lieutenant (O-2)	Captain (O-3)	Major (O-4)	Lieutenant Colonel (O-5)	Colonel (O-6)
					
Brigadier General (O-7)	Major General (O-8)	Lieutenant General (O-9)	General (O-10)		

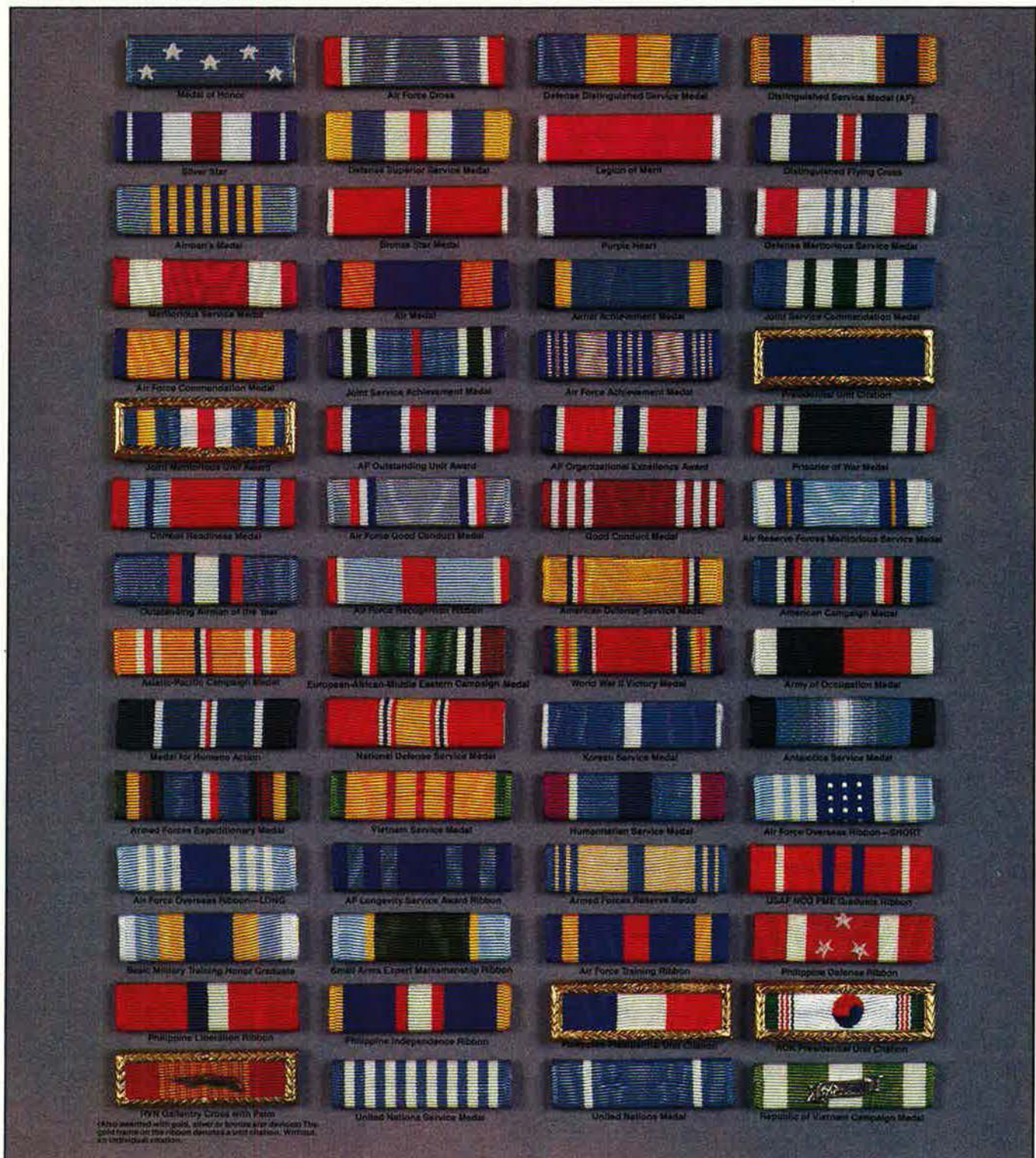
Enlisted

						
No Insignia Airman Basic (E-1)	Airman (E-2)	Airman First Class (E-3)	Senior Airman (E-4)	Sergeant* (E-4)	Staff Sergeant (E-5)	Technical Sergeant (E-6)
						
Master Sergeant (E-7)	First Sergeant (E-7)	Senior Master Sergeant (E-8)	First Sergeant (E-8)	Chief Master Sergeant (E-9)	First Sergeant (E-9)	Chief Master Sergeant of the Air Force (There is only one.)

*Noncommissioned Officer (NCO) grades begin with E-4 Sergeant.

Awards and Decorations

This display represents in correct order of precedence, ribbons and devices most likely to be worn by members of today's Air Force. For information regarding ribbons or devices not depicted, refer to AFR 35-10 and AFR 900-46.



Also awarded with gold, silver or bronze star devices. The gold frame on the ribbon denotes a unit citation. Without an individual citation.



BRONZE STAR
The bronze five pointed star represents participation in campaigns or operations, multiple qualification, or an additional award to any of the various ribbons on which it is authorized.



BRONZE/SILVER CLUSTERS
Silver oak leaf clusters are worn to the wearer's right of all bronze oak leaf clusters on the same ribbons.



SILVER STAR
The silver star is worn in the same manner as the bronze star, but each silver star is worn in lieu of five bronze service stars.



THE VALOR DEVICE
The "V" device represents valor and does not denote an additional award. Only one may be worn on any ribbon.



BRONZE & SILVER STARS
When worn together on a single ribbon, the silver star or stars will be worn to the wearer's right of any bronze star or stars.



VALOR DEVICE & CLUSTERS
The "V" device, when worn on the same ribbon with clusters, is worn to the wearer's right of such clusters.



BRONZE OAK LEAF CLUSTER
The bronze oak leaf cluster represents second and subsequent entitlements or awards.



BRONZE, SILVER & GOLD CLASPS
Bronze, silver, or gold clasps are authorized for successive periods of service on any of several ribbons.



SILVER OAK LEAF CLUSTER
A silver oak leaf cluster is worn to the sixth, seventh, etc., entitlements or in lieu of five bronze oak leaf clusters.



HOURLASS DEVICE
Hourglass device represents each succeeding award of the Armed Forces Reserve Medal.

MONTHLY MILITARY BASIC RATES OF PAY

(Effective January 1, 1991)

PAY GRADE	YEARS OF SERVICE													
	UNDER 2	2	3	4	6	8	10	12	14	16	18	20	22	26
COMMISSIONED OFFICERS¹														
O-10	\$6,159	\$6,376	\$6,376	\$6,376	\$6,376	\$6,620	\$6,620	\$6,987	\$6,987	\$7,487	\$7,487	\$7,988	\$7,988	\$8,442
O-9	5,459	5,601	5,721	5,721	5,721	5,866	5,866	6,110	6,110	6,620	6,620	6,987	6,987	7,487
O-8	4,944	5,092	5,213	5,213	5,213	5,601	5,601	5,866	5,866	6,110	6,376	6,620	6,783	6,783
O-7	4,108	4,387	4,387	4,387	4,584	4,584	4,850	4,850	5,092	5,601	5,987	5,987	5,987	5,987
O-6	3,045	3,345	3,565	3,565	3,565	3,565	3,565	3,565	3,686	4,268	4,486	4,584	4,850	5,260
O-5	2,435	2,859	3,057	3,057	3,057	3,057	3,149	3,319	3,542	3,807	4,025	4,147	4,292	4,292
O-4	2,053	2,500	2,666	2,666	2,716	2,836	3,029	3,199	3,345	3,492	3,589	3,589	3,589	3,589
O-3 ²	1,907	2,133	2,280	2,523	2,643	2,738	2,886	3,029	3,104	3,104	3,104	3,104	3,104	3,104
O-2 ²	1,663	1,817	2,183	2,256	2,303	2,303	2,303	2,303	2,303	2,303	2,303	2,303	2,303	2,303
O-1 ²	1,444	1,503	1,817	1,817	1,817	1,817	1,817	1,817	1,817	1,817	1,817	1,817	1,817	1,817
COMMISSIONED OFFICERS WITH MORE THAN 4 YEARS OF ACTIVE ENLISTED OR WARRANT OFFICER SERVICE														
O-3E	-	-	-	2,523	2,643	2,738	2,886	3,029	3,149	3,149	3,149	3,149	3,149	3,149
O-2E	-	-	-	2,256	2,303	2,376	2,500	2,595	2,666	2,666	2,666	2,666	2,666	2,666
O-1E	-	-	-	1,817	1,941	2,012	2,085	2,158	2,256	2,256	2,256	2,256	2,256	2,256
ENLISTED MEMBERS														
E-9	-	-	-	-	-	-	2,261	2,312	2,364	2,418	2,472	2,520	2,653	2,911
E-8	-	-	-	-	-	1,896	1,950	2,002	2,054	2,108	2,156	2,209	2,339	2,599
E-7	1,324	1,429	1,482	1,534	1,586	1,637	1,689	1,742	1,820	1,872	1,924	1,949	2,080	2,339
E-6	1,139	1,241	1,293	1,348	1,398	1,449	1,502	1,580	1,629	1,682	1,707	1,707	1,707	1,707
E-5	999	1,088	1,141	1,190	1,268	1,320	1,373	1,423	1,449	1,449	1,449	1,449	1,449	1,449
E-4	932	984	1,042	1,123	1,167	1,167	1,167	1,167	1,167	1,167	1,167	1,167	1,167	1,167
E-3	878	926	963	1,001	1,001	1,001	1,001	1,001	1,001	1,001	1,001	1,001	1,001	1,001
E-2	845	845	845	845	845	845	845	845	845	845	845	845	845	845
E-1 ³	754	754	754	754	754	754	754	754	754	754	754	754	754	754

NOTES: Amounts have been rounded to the nearest dollar.

Basic pay while serving as Chairman of the Joint Chiefs of Staff or as Chief of Staff of the Air Force is \$9,363.30, regardless of cumulative years of service.

Basic pay while serving as Chief Master Sergeant of the Air Force is \$3,537.90, regardless of cumulative years of service.

¹Basic pay is limited to \$8,441.70, regardless of cumulative years of service.

²Does not apply to commissioned officers who have been credited with more than four years' active service as an enlisted member or warrant officer.

³Basic pay for E-1s with less than four months of service is \$697.20.

HAZARDOUS DUTY INCENTIVE PAY (HDIP)¹

PAY GRADE	MONTHLY RATE	PAT GRADE	MONTHLY RATE
O-10	\$110	E-9	\$200
O-9	110	E-8	200
O-8	110	E-7	200
O-7	110	E-6	175
O-6	250	E-5	150
O-5	250	E-4	125
O-4	225	E-3	110
O-3	175	E-2	110
O-2	150	E-1	110
O-1	125		

NOTE: Hazardous duty incentive pay for noncrew members is \$110 a month.

¹Excepting AWACS crew members.

BASIC ALLOWANCE FOR SUBSISTENCE (BAS)

Officers (Monthly)	Enlisted (Daily)		
	Separate Rations	Rations in Kind Not Available	Emergency Rations
\$129.00	\$6.15 5.68 ¹	\$6.94 6.41 ¹	\$9.20 8.50 ¹

¹Applies to E-1s with less than four months of active-duty service.

AIR FORCE CIVILIAN PERSONNEL AVERAGE AGE AND LENGTH OF SERVICE

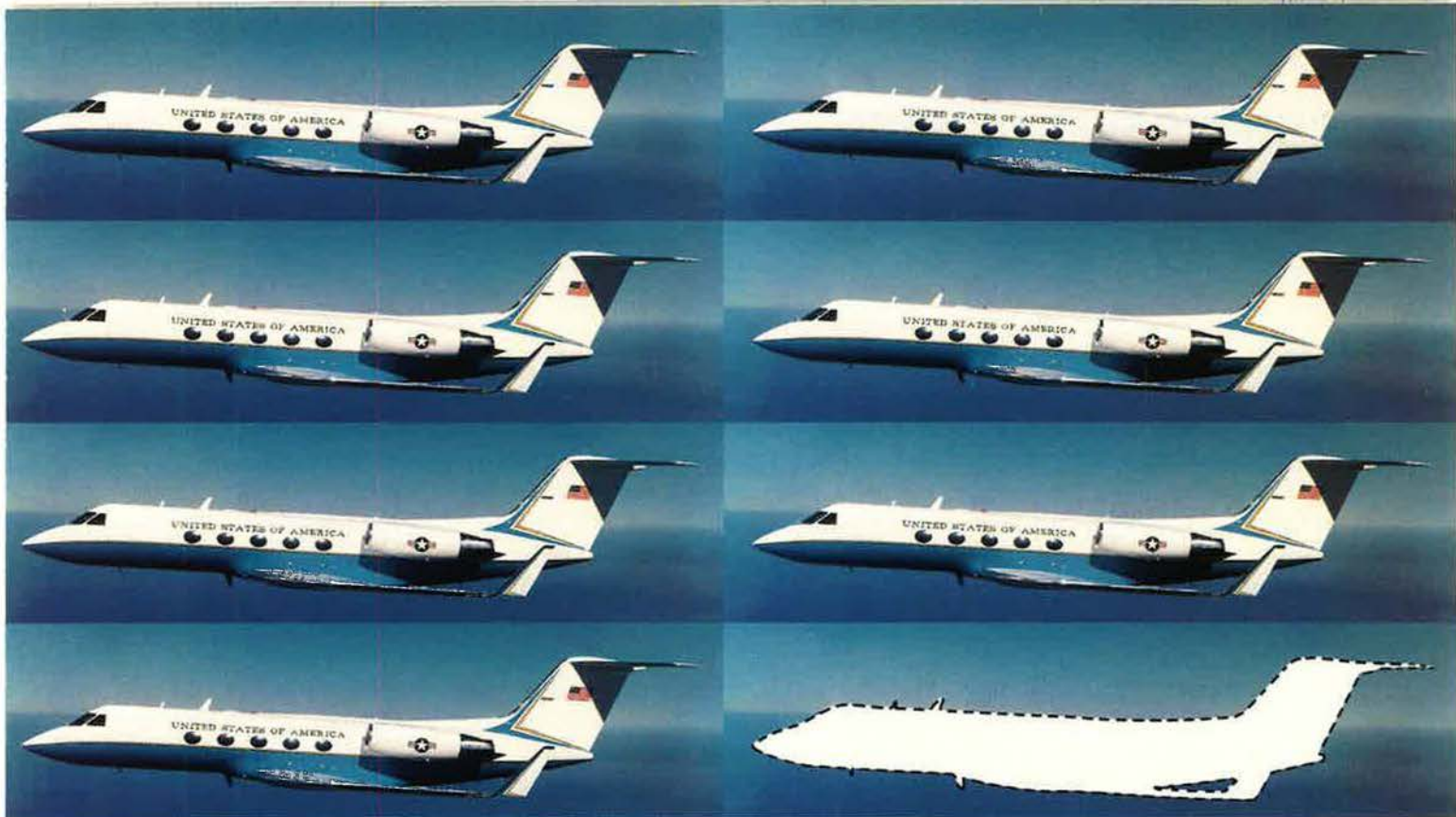
(As of September 30, 1990)

Average age	43 years
Average length of service (overall)	14 years
General Schedule	14 years
Federal Wage System	14 years

AVERAGE AGES OF MILITARY PERSONNEL

(As of September 30, 1990)

Officers	Average 34.6 years of age
Airmen	Average 28 years of age



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Far more versatile than large 4-engine aircraft, the C-20 Gulfstreams give SAM greater flexibility in flight planning, crew scheduling and utilization of aircraft types. They also cost less to operate and maintain. In short, they mean a more responsive, more cost-effective operation for the 89th Military Airlift Wing at Andrews Air Force Base.

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This remarkable executive aircraft can fly non-stop nearly 5,000 statute miles in about 9.5 hours. It has the most advanced technology in its computerized flight management and information systems. It has a new generation of Rolls-Royce engines also chosen to power airliners. And even with all of its capabilities, it has proven to be surprisingly cost-effective in operation.

In every respect, C-20F Gulfstreams would complement the present C-20 Gulfstreams perfectly, right down to maintenance procedures, spares supply and support programs.

The role of Special Air Missions in the years ahead can only become more important, and it will need the most versatile, most productive, most modern transport aircraft available to it.

The way we see it, we're right in tune with SAM.



The C-20F Gulfstream.

*Uncommonly versatile,
uncommonly productive.*

For information about maximizing Gulfstream jet aircraft in military applications, contact: Douglass G. Wood, Vice President, Military Marketing, Gulfstream Aerospace Corporation, 1000 Wilson Boulevard, Suite 2701, Arlington, Virginia 22209 U.S.A. Telephone: (703) 276-9500.



Advanced, high-frequency semiconductors may make expendable jammers more common on tactical fighter aircraft. These jammers may be one result of research being conducted for the U.S. Air Force by Hughes Aircraft Company as part of the Department of Defense's Microwave/Millimeter Wave Monolithic Integrated Circuits (MIMIC) Program. Using MIMIC technology all circuit elements, including transistors, passive components, and transmission lines, for an expendable jammer could be placed on a single chip. The result would be a smaller, more reliable, easier and less costly to manufacture jammer, which would allow more jammers to be carried on more aircraft. In addition to electronic warfare, MIMIC technology will form the building blocks of advanced radar, communications, and "smart" weapons systems.

PC boards and hybrids can now be electronically trimmed and configured, thanks to a new family of nonvolatile, serially programmable (NSP) integrated circuits developed by Hughes. These NSP circuits enable designers to electronically calibrate PC boards and hybrids with test stations and computers. This automated procedure is a tremendous advantage over mechanical methods, which are less reliable and often difficult to perform. Presently, the new Hughes NSP family consists of nine types of devices. They all feature low-power consumption and redundant circuit techniques to ensure reliable operation and long life.

A rescued communications satellite is seeing space service once again. Westar VI, recovered in 1984 by American astronauts, was refurbished by Hughes to serve new markets in Asia. The satellite was restored to flight condition for Asia Satellite Telecommunications Co., Ltd. (AsiaSat) and renamed AsiaSat I. It is providing domestic telecommunications for China, Thailand, Pakistan, and other Asian countries. Hughes has also refurbished another recovered satellite, Palapa-B2R, for use by Indonesia. Both refurbished spacecraft were successfully launched in April, 1990.

An automatic visual inspection system will verify the quality of solder joints in radar sub-assemblies. The system, under development at Hughes, is comprised of a special light source, a video camera, and a computer. The system verifies the quality of each solder joint flow and sends the results to a touch-up workstation where a human operator can correct any defects. Hughes currently creates about 100 million solder joints per year and expects to achieve a significant reduction in manpower requirements and an improvement in product reliability.

A specially-equipped van serves as a lab on wheels to test a variety of new automotive sensors. The Hughes-designed mobile testbed, called the Automotive Sensor Instrumentation System, incorporates various sensors, computer-controlled signal conditioning circuits, and monitoring and data-recording equipment. An extensive array of sensors is mounted on a platform attached to the front bumper of the van. A video camera and an infrared camera, also mounted on the front of the van, show what's ahead, while a radar and laser rangefinder provide range and range rate data. Hughes is using the van to study and evaluate various technologies for potential use in advanced automotive sensing systems.

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

HUGHES

Subsidiary of GM Hughes Electronics

MONTHLY BASIC ALLOWANCE FOR QUARTERS (BAQ)

(Effective January 1, 1991)

PAY GRADE	WITHOUT DEPENDENTS		WITH DEPENDENTS
	FULL ¹	PARTIAL ²	
O-10	\$661.50	\$50.70	\$813.90
O-9	661.50	50.70	813.90
O-8	661.50	50.70	813.90
O-7	661.50	50.70	813.90
O-6	606.90	39.60	733.20
O-5	584.40	33.00	706.50
O-4	541.50	26.70	623.10
O-3	434.10	22.20	515.70
O-2	344.40	17.70	440.10
O-1	289.80	13.20	393.30
E-9	401.40	18.60	528.90
E-8	368.70	15.30	487.50
E-7	314.70	12.00	453.00
E-6	284.70	9.90	418.50
E-5	262.50	8.70	376.20
E-4	228.60	8.10	327.30
E-3	224.40	7.80	304.50
E-2	182.40	7.20	289.80
E-1	162.00	6.90	289.80

¹Payment of the full rate of basic allowance for quarters at these rates to members of the uniformed services without dependents is authorized by 37 USC 403 and Part IV of Executive Order 12622, as amended.

²Payment of the partial rate of basic allowance for quarters at these rates to members of the uniformed services without dependents who, under 37 USC 403(b) or 403(c), are not entitled to the full rate of basic allowance for quarters is authorized by 37 USC 1009(c)(2) and Part IV of Executive Order 11157, as amended.

AVIATION CAREER INCENTIVE PAY RATES¹

PHASE I

MONTHLY RATE	YEARS OF AVIATION SERVICE AS AN OFFICER ²
\$125	2 or less
156	more than 2
188	more than 3
206	more than 4
650	more than 6

PHASE II

\$585	more than 18
495	more than 20
385	more than 22
280	more than 24
250	more than 25 ³

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.

¹For rated officers, flight surgeons, and other designated medical officers, except as noted.

²Including flight training.

³O-6 and below.

FEDERAL CIVILIAN PAY SCALE

(Effective January 1, 1991)

GRADE	General Schedule									
	1	2	3	4	5	6	7	8	9	10
GS-1	\$11,015	\$11,383	\$11,749	\$12,114	\$12,482	\$12,697	\$13,058	\$13,422	\$13,439	\$13,776
GS-2	12,385	12,679	13,090	13,439	13,590	13,990	14,390	14,790	15,190	15,590
GS-3	13,515	13,966	14,417	14,868	15,319	15,770	16,221	16,672	17,123	17,574
GS-4	15,171	15,677	16,183	16,689	17,195	17,701	18,207	18,713	19,219	19,725
GS-5	16,973	17,539	18,105	18,671	19,237	19,803	20,369	20,935	21,501	22,067
GS-6	18,919	19,550	20,181	20,812	21,443	22,074	22,705	23,336	23,967	24,598
GS-7	21,023	21,724	22,425	23,126	23,827	24,528	25,229	25,930	26,631	27,332
GS-8	23,284	24,060	24,836	25,612	26,388	27,164	27,940	28,716	29,492	30,268
GS-9	25,717	26,574	27,431	28,288	29,145	30,002	30,859	31,716	32,573	33,430
GS-10	28,322	29,266	30,210	31,154	32,098	33,042	33,986	34,930	35,874	36,818
GS-11	31,116	32,153	33,190	34,227	35,264	36,301	37,338	38,375	39,412	40,449
GS-12	37,294	38,537	39,780	41,023	42,266	43,509	44,752	45,995	47,238	48,481
GS-13	44,348	45,826	47,304	48,782	50,260	51,738	53,216	54,694	56,172	57,650
GS-14	52,406	54,153	55,900	57,647	59,394	61,141	62,888	64,635	66,382	68,129
GS-15	61,643	63,698	65,753	67,808	69,863	71,918	73,973	76,028	78,083	80,138
GS-16	72,298	74,708	77,118	79,528	81,936	82,697	85,060	87,424	89,787	
GS-17	83,032	85,800	88,568	91,336	94,104					
GS-18	97,317									

Senior Executive Service

LEVEL	1	2	3	4	5	6
	\$87,000	\$91,200	\$95,300	\$100,500	\$104,600	\$108,300

AIR FORCE FULL-TIME CIVILIAN EMPLOYMENT BY GRADE

(As of September 30, 1990)

GENERAL SCHEDULE/ OTHER		WAGE GRADE POSITIONS		WAGE GRADE LEADER POSITIONS		WAGE GRADE SUPERVISORY POSITIONS	
GRADE	POPULATION	GRADE	POPULATION	GRADE	POPULATION	GRADE	POPULATION
1	27	1	125	1	0	1	28
2	174	2	901	2	27	2	51
3	2,485	3	617	3	1	3	113
4	11,957	4	846	4	46	4	191
5	20,850	5	4,156	5	58	5	269
6	9,631	6	3,229	6	40	6	450
7	13,809	7	5,409	7	106	7	720
8	1,979	8	6,927	8	124	8	863
9	18,639	9	6,155	9	291	9	1,207
10	1,053	10	18,417	10	822	10	1,737
11	19,500	11	5,225	11	134	11	604
12	21,958	12	2,291	12	44	12	334
13	9,592	13	363	13	1	13	228
14	3,912	14	154	14	0	14	327
15	1,319	15	5	15	0	15	203
16	1					16	121
17	0					17	53
18	1					18	10
ST	12						
SES	192						
TOTAL	137,091		54,820		1,694		7,509

NOTE: Table does not include ANG technicians, local national employees, or nonappropriated fund employees.
 ST = Scientific and Professional
 SES = Senior Executive Service

USAF AND AIR RESERVE FORCES PERSONNEL BY CATEGORIES

CATEGORY	FY 1986	FY 1987	FY 1988	FY 1989	FY 1990	FY 1991 ¹	FY 1992 ¹
AIR FORCE MILITARY							
Officers	109,000	107,300	105,100	103,700	100,000	96,700	92,000
Airmen	494,700	495,200	466,900	462,800	430,800	407,500	390,500
Cadets	4,500	4,500	4,500	4,400	4,400	4,300	4,300
TOTAL, AIR FORCE MILITARY	608,200	607,000	576,500	570,900	535,200	508,500	486,800
Career reenlistments (second term)	38,900	41,400	51,500	39,400	44,600	36,300	38,800
Rate	88%	87%	86%	87%	82%	85%	85%
First-term reenlistments	23,500	25,600	26,500	18,100	23,600	20,700	17,900
Rate	58%	62%	50%	59%	51%	55%	55%
CIVILIAN PERSONNEL							
Direct hire (including technicians)	249,604	251,771	241,120	248,666	237,844	227,732	214,505
Indirect hire—foreign nationals	13,644	12,559	12,041	11,909	11,031	11,397	9,653
TOTAL, CIVILIAN PERSONNEL	263,248	264,330	253,161	260,575	248,875	239,129	224,158
TOTAL, MILITARY AND CIVILIAN²	871,448	871,230	829,607	831,455	784,075	747,629	710,958
Technicians (included above as direct-hire civilians)							
AFRES technicians	8,348	8,772	9,111	10,061	9,596	10,316	10,343
ANG technicians	22,497	23,221	23,409	23,644	24,119	23,521	24,639
AIR RESERVE FORCES							
Air National Guard, Selected Reserve	112,592	114,600	115,221	114,975	117,786	116,610	118,100
Air Force Reserve, paid	78,519	80,415	82,116	83,214	83,814	85,591	81,200
Air Force Reserve, nonpaid ³	44,568	43,783	51,658	49,553	68,714	65,296	65,746
TOTAL, READY RESERVE³	235,679	238,798	248,995	247,742	270,314	267,497	265,046
Standby	25,823	24,479	21,772	17,299	15,369	17,075	17,075
TOTAL, AIR RESERVE FORCES⁴	261,502	263,277	270,767	265,041	285,683	284,572	282,121

¹President's budget request.

²FYs 1986-90 are actual figures; FYs 1991-92 are estimates; excludes nonchargeable personnel.

³Excludes training/pay categories J, K, and L.

⁴Excludes retired Air Force Reserve.

NOTE: Numbers are rounded and may not sum to totals.

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ORDER FORM

ACTIVE-DUTY MILITARY PERSONNEL, RESERVE COMPONENT MILITARY PERSONNEL, AND DIRECT-HIRE CIVILIAN PERSONNEL STRENGTH

(Figures in thousands)

	FY 1985	FY 1986	FY 1987	FY 1988	FY 1989	FY 1990 ¹	FY 1991 ²	FY 1992 ²
ACTIVE-DUTY MILITARY								
Army	781	781	781	772	770	751	702	660
Navy	571	581	587	593	593	583	570	551
Marine Corps	198	199	200	197	197	197	194	188
Air Force	602	608	607	576	571	539	509	487
TOTAL	2,151	2,169	2,174	2,138	2,130	2,069	1,974	1,886
RESERVE COMPONENTS (SELECTED RESERVE)								
Army National Guard	440	446	453	455	457	437	457	411
Army Reserve	292	310	319	313	319	299	319	283
Naval Reserve	130	142	149	149	152	149	153	135
Marine Corps Reserve	42	42	43	44	44	45	44	41
Air National Guard	109	113	113	115	116	117	117	118
Air Force Reserve	75	79	80	82	83	81	86	81
TOTAL	1,088	1,130	1,157	1,158	1,171	1,128	1,176	1,068
DIRECT-HIRE CIVILIAN								
Army ³	359	353	358	336	347	327	313	288
Navy	343	332	343	337	343	330	320	299
Air Force ³	250	250	252	241	249	238	228	213
Defense Agencies	91	92	96	96	98	102	118	137
TOTAL³	1,043	1,027	1,049	1,010	1,037	997	979	938

¹Includes 25,652 Selected Reserve called to active duty under 10 USC 673B for Operation Desert Shield.

²Programmed manpower.

³Includes Army and Air National Guard Technicians, who were converted from state to federal employees in FY 1989.

NOTE: Numbers are rounded and may not sum to totals.

USAF PERSONNEL BY GRADE, RACE, AND SEX

(As of September 30, 1990)

GRADE	FORCE	BLACK ¹	OTHER ²	WOMEN ³
OFFICERS				
General	333	3	1	3
Colonel	5,061	105	88	130
Lieutenant Colonel	12,502	335	199	660
Major	19,159	1,168	350	2,191
Captain	43,528	3,898	1,129	6,465
First Lieutenant	10,898	660	474	2,283
Second Lieutenant	8,564	474	436	1,579
TOTAL	100,045	5,643	2,677	13,331
AIRMEN				
Chief Master Sergeant	4,598	614	72	53
Senior Master Sergeant	9,189	1,476	180	385
Master Sergeant	38,654	7,322	1,109	2,422
Technical Sergeant	57,693	10,826	2,041	5,979
Staff Sergeant	109,921	21,280	4,544	14,247
Sergeant/Senior Airman	117,712	22,386	6,172	19,262
Airman First Class	56,396	7,908	2,615	10,885
Airman	23,931	3,024	901	4,645
Airman Basic	12,724	1,515	413	2,372
TOTAL	430,818	76,348	18,107	60,250
TOTAL USAF PERSONNEL	530,863⁴	81,991	20,784	73,581

¹Includes 14,603 women.

²Includes 2,674 women.

³Includes women from "Black" and "Other" categories.

⁴Does not include 4,370 Academy cadets.

EDUCATIONAL LEVELS—USAF ENLISTED FORCE

(As of September 30, 1990)

LEVEL	NUMBER	PERCENT
Below high school	155	0.04
High school	126,184	29.30
Some college (less than two years)	211,765	49.20
AA/AS degree	32,568	7.60
Two to three years of college	44,735	10.40
Baccalaureate, no master's	13,828	3.20
Master's or higher	1,583	0.40
TOTAL	430,818	100.00

EDUCATIONAL LEVELS—USAF LINE OFFICERS

(As of September 30, 1990)

LEVEL	NUMBER	PERCENT
Below baccalaureate/unknown	22	0.03
Baccalaureate, no master's degree	43,147	52.10
Master's degree, no doctorate	38,200	46.20
Doctoral and professional degrees	1,373	1.66
TOTAL	82,742	100.00

NUMBER OF ENLISTED IN EACH MAJOR CAREER FIELD

CODE	CAREER FIELD TITLE	ASSIGNED
10	First Sergeant	1,759
11	Aircrew Operations	8,641
12	Aircrew Protection	2,731
20	Intelligence	12,517
22	Geodetic	106
23	Visual Information	2,413
24	Safety	1,352
25	Weather	3,121
27	Command Control Systems Operations	15,458
30	Communications-Electronics Systems	20,730
31	Instrumentation	523
32	Precision Measurement	2,404
34	Training Devices	97
36	Wire Communications Systems Maintenance	4,096
39	Maintenance Management Systems	2,769
40	Intricate Equipment Maintenance	257
41	Missile Systems Maintenance	3,471
45	Manned Aerospace Maintenance	97,887
46	Munitions & Weapons	23,759
47	Vehicle Maintenance	5,273
49	Communications-Computer Systems	19,918
54	Mechanical/Electrical	9,368
55	Structural/Pavements	11,318
56	Sanitation	1,598
57	Fire Protection	5,822
59	Marine	40
60	Transportation	12,580
61	Commissary Services	1,002
62	Services	5,838
63	Fuels	6,491
64	Supply	22,719
65	Contracting	1,722
66	Logistics Plans	994
67	Financial	5,369
70	Information Management	19,856
73	Personnel	13,079
74	Morale, Welfare, & Recreation	1,577
75	Education & Training	3,466
79	Public Affairs	1,225
81	Security Police	34,023
82	Special Investigations	1,010
87	Band	1,122
88	Paralegal	866
89	Chaplain Management	698
90-92	Medical	26,114
98	Dental	3,657
99	Miscellaneous (Special Duty, Patients, Unclassified, etc.)	9,983

NUMBER OF OFFICERS IN EACH MAJOR CAREER FIELD¹

CODE	UTILIZATION FIELD TITLE	ASSIGNED
00 ²	Commanders and Directors	2,748
02	International-Politico-Military Affairs	289
05	Disaster Preparedness	160
09 ²	Special Duty	1,745
10-14	Pilot	19,241
15, 22	Navigator	8,080
16	Air Traffic Control	372
17	Air Weapons Director	2,079
18	Missile Operations	2,532
19	Operations Management	1,232
20	Space Operations	1,469
23	Visual Information	93
25	Weather	1,247
26	Scientific	1,426
27	Acquisition Program Management	2,603
28	Development Engineering	5,434
31	Missile Maintenance	319
40	Aircraft Maintenance & Munitions	3,338
49	Communications-Computer Systems	6,059
55	Civil Engineering	2,103
60	Transportation	930
62	Services	408
64	Supply Management	1,058
65	Acquisition Contracting/Manufacturing	1,482
66	Logistics Plans & Programs	971
67	Financial	1,330
70	Information Management	1,964
73	Personnel	1,319
74	Manpower Management	462
75	Education & Training	372
76	Mission Support	100
79	Public Affairs	498
80	Intelligence	3,127
81	Security Police	1,042
82	Special Investigations	574
87	Band	27
88	Legal	1,365
89	Chaplain	812
90	Health Services Management	1,276
91, 92, 99	Biomedical Sciences	2,551
93-96	Physician	4,138
97	Nurse	5,364
98	Dental	1,473

¹These figures do not include general officers or UPT/UNT/medical/law students.

²Includes specialties in various career fields, e.g., operations, logistics, programming, etc.

USAF'S AIRCRAFT—HOW MANY, HOW OLD?

(Current as of September 30, 1990)

	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 (YRS.)
A-7	—	—	1	1	—	1	8	3	—	14	18.1
OA/A-10	—	—	150	194	96	—	—	—	—	440	10.0
A-37	—	—	—	—	9	4	1	1	—	15	15.6
B-1	31	65	—	—	—	—	—	—	—	96	3.3
B-2	1	—	—	—	—	—	—	—	—	1	1.1
B-52	—	—	—	—	—	—	—	—	230	230	29.9
FB-111	—	—	—	—	—	—	37	2	—	39	20.0
C-5	31	19	—	—	—	13	20	—	—	83	9.0
C-9	—	—	—	—	—	3	12	8	—	23	19.5
C-10 (KC-10)	3	32	19	5	—	—	—	—	—	59	5.7
C-12	—	15	30	1	25	2	—	—	—	73	9.2
C-18 ¹	—	—	7	—	—	—	—	—	—	7	8.4
C-20	—	10	3	—	—	—	—	—	—	13	4.1
C-21	—	52	27	—	—	—	—	—	—	79	5.7
C-22	—	1	—	—	—	—	—	—	—	1	6.6
C-23	—	18	—	—	—	—	—	—	—	18	5.4
C-25	1	—	—	—	—	—	—	—	—	1	0.0
C-29	5	—	—	—	—	—	—	—	—	5	0.3
C-130 ²	8	14	—	1	31	40	39	25	178	336	21.3
C-131	—	—	—	—	—	—	—	—	1	1	35.5
C-135 ³	—	—	—	—	—	—	—	—	584	584	29.2
C-137	—	2	—	—	—	1	—	—	4	7	21.3
C-141	—	—	—	—	—	—	—	127	127	254	24.0
E-3	—	—	9	11	14	—	—	—	—	34	10.9
E-4	—	—	—	—	—	4	—	—	—	4	16.3
F-4 ⁴	—	—	—	—	48	47	145	77	13	330	19.4
F-15	128	113	125	236	153	10	—	—	—	765	8.2
F-16	521	382	84	36	4	—	—	—	—	1,027	3.3
F-100	—	—	—	—	—	—	—	—	3	3	32.9
F-106	—	—	—	—	—	—	—	—	1	1	31.8
F-111	—	—	2	—	9	53	192	71	—	327	19.3
G-3	2	—	—	—	—	—	—	—	—	2	0.5
G-4	1	—	1	3	5	—	—	—	—	10	10.0
G-7	4	—	5	—	—	—	—	—	—	9	5.0
G-9	—	4	—	—	—	—	—	—	—	4	3.6
H-1	—	—	—	—	—	22	71	—	—	93	19.1
H-3	—	—	—	—	—	—	8	15	3	26	22.1
H-53	9	—	—	—	—	3	25	13	—	50	17.0
H-60	33	—	10	—	—	—	—	—	—	43	3.0
T-33	—	—	—	—	—	—	—	—	1	1	38.9
T-37	—	—	—	—	—	—	8	142	452	602	28.3
T-38	—	—	—	—	—	—	75	218	511	804	24.5
T-39	—	—	—	—	—	—	—	—	11	11	28.9
T-41	2	—	—	—	—	—	6	72	22	102	22.8
T-43	—	—	—	—	—	15	—	—	—	15	16.6
U-6	—	—	—	1	—	—	—	—	—	1	10.0
U-26	—	—	1	—	—	—	—	—	—	1	7.0
V-10	—	2	—	—	—	—	—	75	—	77	21.5
V-18	1	—	—	—	2	—	—	—	—	3	9.6
TOTAL	781	728	475	489	396	218	647	849	2,141	6,724	17.0
PERCENTS⁵	11	11	7	7	6	3	10	13	32	100	

NOTE: ARF and 89 aircraft with no age data not included in calendar age.
 Less than 9 years old: 1,984 aircraft (29%).
 More than 9 years old: 4,740 aircraft (71%).

¹Includes EC-18

²Includes AC/DC/EC/HC/MC/NC/WC-130

³Includes EC/KC/NC/RC/TC/WC-135

⁴Includes RF-4

⁵Percentages have been rounded.

COUNTDOWN TO FIRST FLIGHT

History in the making:



Ground Vibration Tests—February-March, 1991

C-17: Meeting the tests.

As the days count down to the first flight of the C-17 airlifter, an extensive test program to confirm flight readiness continues. Testing prior to flight is an essential part of every aircraft development—that was true for the C-47 and it's still true today for the C-17.

The dedicated team that is designing, building and testing the C-17 is demonstrating it can do the job. The comprehensive testing will make sure the C-17 will do its job—to carry the full range of cargo anywhere in the world that it's needed.

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AIR NATIONAL GUARD AIRCRAFT—HOW MANY, HOW OLD?

(Current as of September 30, 1990)

	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 (YRS.)
A-7D/K	—	1	15	11	23	107	164	—	—	321	17.1
A-10A	—	—	14	86	2	—	—	—	—	102	10.4
OA-37	—	—	—	—	6	18	14	2	—	40	17.5
C-5A	—	—	—	—	—	1	11	—	—	12	19.5
C-12	6	7	—	—	—	—	—	—	—	13	3.9
C-21A	—	4	—	—	—	—	—	—	—	4	3.0
C-22A	—	4	—	—	—	—	—	—	—	4	5.7
C-130	22	31	15	19	—	—	—	3	131	221	19.3
HO-60	8	—	—	—	—	—	—	—	—	8	1.6
KC-135	—	—	—	—	—	—	—	—	116	116	31.3
C-141B	—	—	—	—	—	—	—	4	4	8	24.3
F-4	—	—	—	—	—	—	30	126	100	256	23.1
F-15A/B	—	—	—	—	107	18	—	—	—	125	13.9
F-16A/B	—	3	309	167	1	—	—	—	—	480	8.5
H-3	—	—	—	—	—	—	—	1	5	6	24.4
C-26A	11	—	—	—	—	—	—	—	—	11	1.1
T-43A	—	—	—	—	—	4	—	—	—	4	16.5
TOTALS	47	50	353	283	139	148	219	136	356	1,731	16.0
PERCENT¹	3	3	20	16	8	8	13	8	21	100	

NOTE: Less than 9 years old: 450 aircraft (26%).
More than 9 years old: 1,281 aircraft (74%).

¹Percentages have been rounded.

AIR FORCE RESERVE AIRCRAFT—HOW MANY, HOW OLD?

(Current as of November 30, 1990)

	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 (YRS.)
A-10	—	—	—	68	29	—	—	—	—	97	12.0
AC-130A	—	—	—	—	—	—	—	—	10	10	35.3
C-130A	—	—	—	—	—	—	—	—	2	2	33.5
C-130B	—	—	—	—	—	—	—	—	35	35	30.0
C-130E	—	—	—	—	—	—	—	—	49	49	27.2
C-130H	19	18	6	—	—	—	—	—	—	43	4.2
HC-130H ¹	—	—	—	—	—	—	—	—	3	3	25.7
HC-130N	—	—	—	—	—	—	4	—	—	4	21.0
HC-130P	—	—	—	—	—	—	—	—	7	7	25.9
WC-130E	—	—	—	—	—	—	—	—	2	2	29.0
WC-130H	—	—	—	—	—	—	—	—	2	2	25.5
C-141B	—	—	—	—	—	—	—	—	8	8	25.1
KC-135E	—	—	—	—	—	—	—	—	30	30	31.9
F-4E	—	—	—	—	—	19	—	22	—	41	19.7
F-16	—	25	20	72	—	—	—	—	—	117	9.1
UH-1	—	—	—	—	—	—	5	—	—	5	20.0
H-3E	—	—	—	—	—	—	0	14	3	17	23.1
C-5A	—	—	—	—	—	—	15	17	—	32	21.8
TOTAL	19	43	26	140	29	19	24	53	151	504	23.3
PERCENT²	4	8	5	28	6	4	5	10	30	100	

NOTE: Less than 9 years old: 88 aircraft (17%).
More than 9 years old: 416 aircraft (83%).

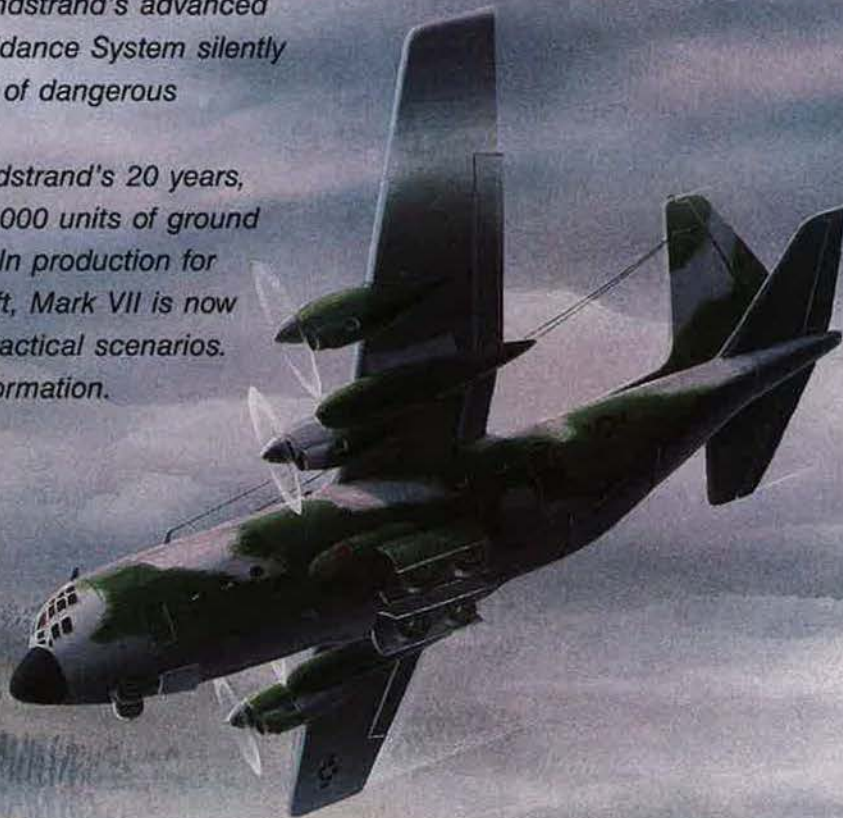
¹Two HC-130Hs (not included here) are being reconfigured and will be assigned back to AFRES as HC-130Ps.

²Percentages have been rounded.

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NUMBER OF AIRCRAFT PER ACTIVE-DUTY USAF SQUADRON

(End FY 1990)

AIRCRAFT TYPE	NUMBER ¹
A-10A	18 or 24
B-1B	11, 15, 16, or 17
B-52	10, 13, 14, or 19
C-5	11 to 18 ²
C-9A	3 or 11
C-130	8, 10, 13, 14, 16, or 18
AC-130	10
KC-10A	9 or 10
KC-135	11 to 21
C-141B	12 to 17
E-3	4 or 9
F-4	18 or 24
RF-4	18
F-15	15, 18, or 24
F-16	18 or 24
F-111	12, 18, or 24
FB-111A	4, 10, or 11
F-117A	18

¹For 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.

²Reflects ongoing transfer of assets to Air Reserve Forces.

USAF FLYING SQUADRONS BY MISSION TYPE¹

ACTIVE FORCES	FY 1986	FY 1987	FY 1988	FY 1989	FY 1990	FY 1991
Strategic Bomber	21	24	25	24	21	18
Air Refueling	36	36	35	35	35	35
Strategic Command and Control	6	6	6	6	6	6
Intelligence	3	3	3	3	3	3
Strategic Reconnaissance	1	1	1	1	0	0
Strategic Interceptor	4	3	2	2	1	0
Fighter	78	81	79	79	79	70
Tactical Reconnaissance	8	7	5	5	5	1
Tactical Electronic Warfare	3	4	4	4	4	2
Special Operations Forces	5	5	10	11	11	11
Tactical Air Command Control Systems ²	3	3	3	3	3	3
Tactical Air Control Systems ²	7	7	7	7	7	7
Weather	2	2	1	1	1	1
Rescue	9	9	6	7	7	7
Tactical Airlift	14	13	13	12	12	12
Strategic Airlift	17	17	19	20	21	21
Special Mission	1	1	1	1	2	2
Aeromedical Airlift	3	3	3	3	3	3
GLCM ³	2	6	5	3	2	0
ICBM	22	20	20	20	20	20
TOTAL	247	251	248	247	243	222
RESERVE FORCES						
ANG Selected Reserve	91	91	91	91	91	92
Air Force Reserve ⁴	57	57	58	58	58	58
TOTAL	148	148	149	149	149	150
GRAND TOTAL	395	399	397	396	392	372

¹Excludes training, support, and OT&E units.

²Includes consolidation of certain functional groups.

³GLCM Tactical Missile Wings. GLCMs are assigned by flights, not by squadrons.

⁴Includes Associate Squadrons.

NUMBER OF ACTIVE AIRCRAFT AND FLYING HOURS

TYPE OF AIRCRAFT	FY 1984	FY 1985	FY 1986	FY 1987	FY 1988	FY 1989	FY 1990
Bomber, Strategic	328	330	346	393	422	412	366
Tanker	556	559	572	576	567	578	555
Fighter/Interceptor/Attack	3,019	3,057	3,046	3,033	3,027	2,896	2,798
Reconnaissance/Electronic Warfare	404	418	394	432	424	416	346
Cargo/Transport	863	859	855	848	859	825	824
Search & Rescue (Fixed Wing)	35	37	37	35	33	35	36
Helicopter (includes Rescue)	237	234	232	191	200	205	212
Trainer	1,622	1,613	1,643	1,595	1,543	1,540	1,535
Utility/Observation/Other	191	180	120	110	120	140	141
TOTAL, USAF	7,255	7,287	7,245	7,213	7,195	7,047	6,813
Air National Guard total	1,688	1,688	1,782	1,732	1,730	1,735	1,719
Air Force Reserve total	458	468	467	502	491	497	500
TOTAL, ACTIVE AIRCRAFT, USAF, ANG, AFRES	9,401	9,443	9,494	9,447	9,416	9,279	9,032
Active aircraft including foreign-government owned	9,489	9,529	9,578	9,501	9,500	9,355	9,130
FLYING HOURS (000)							
USAF	2,888	2,914	2,905	2,883	2,752	2,830	2,760
Air National Guard	417	423	408	431	437	427	442
Air Force Reserve	136	140	143	149	151	155	164
TOTAL FLYING HOURS	3,441	3,477	3,456	3,463	3,340	3,412	3,366

USAF AIRCRAFT TAIL MARKINGS

CODE	AIRCRAFT	UNIT, LOCATION, AND COMMAND	CODE	AIRCRAFT	UNIT, LOCATION, AND COMMAND	CODE	AIRCRAFT	UNIT, LOCATION, AND COMMAND
AK	F-15C/D	21st TFW, Elmendorf AFB, Alaska (PACAF)	HM	AT-38B	479th TTW, Holloman AFB, N. M. (TAC)	PA	QA-10A	111th TASG, Willow Grove ARFF, Pa. (ANG)
AK	A-10A, OA-10A	343d TFW, Eielson AFB, Alaska (PACAF)	HO	F-15A/B	49th TFW, Holloman AFB, N. M. (TAC)	PA	EC-130H	193d SOG, Harrisburg IAP, Pa. (ANG)
AL	F-16A/B	187th TFG, Dannelly Field, Ala. (ANG)	HR	F-16C/D	50th TFW, Hahn AB, West Germany (USAFE)	PN	F-4E/G	3d TFW, Clark AB, Philippines (PACAF)
AR	A-10A	10th TFW, RAF Alconbury, UK (USAFE)	HS	F-16C/D	31st TTW, Homestead AFB, Fla. (TAC)	PR	A-7D	156th TFG, Puerto Rico IAP, Puerto Rico (ANG)
AZ	A-7D, F-16A/B	162d TFG, Tucson IAP, Ariz. (ANG)	IA	A-7D	132d TFW, Des Moines MAP, Iowa (ANG)	PT	A-7D	112th TFG, Greater Pittsburgh IAP, Pa. (ANG)
BA	RF-4C	67th TRW, Bergstrom AFB, Tex. (TAC)	IL	QA-37B	182d TASG, Greater Peoria Airport, Ill. (ANG)	RG	F-15B	Warner Robins ALC, Robins AFB, Ga. (AFLC)
BC	QA-37B	110th TASG, Battle Creek ANGB, Mich. (ANG)	IN	A-10A	930th TFG, Grissom AFB, Ind. (AFRES)	RS	F-16C/D	86th TFW, Ramstein AB, West Germany (USAFE)
BD	A-10A	917th TFG, Barksdale AFB, La. (AFRES)	IS	F-15C/D	57th FIS, NAS Keflavik, Iceland (TAC)	SA	F-16A/B	149th TFG, Kelly AFB, Tex. (ANG)
BH	RF-4C	117th TRW, Birmingham MAP, Ala. (ANG)	KC	A-10A	442d TFW, Richards-Gebaur AFB, Mo. (AFRES)	SB	EC-130H	66th ECW, Sembach AB, West Germany (USAFE)
BT	F-15C/D	36th TFW, Bitburg AB, West Germany (USAFE)	KE	RF-4C	186th TRG, Key Field, Miss. (ANG)	SD	A-7D	114th TFG, Joe Foss Field, S. D. (ANG)
CC	F-111D/G	27th TFW, Cannon AFB, N. M. (TAC)	KS	EC-130E	7th ACCS, Keesler AFB, Miss. (TAC)	SH	F-16A/B	507th TFG, Tinker AFB, Okla. (AFRES)
CO	A-7D	140th TFW, Buckley ANGB, Colo. (ANG)	LA	F-15A/B/C/D/E	405th TTW, Luke AFB, Ariz. (TAC)	SI	F-16A/B	183d TFG, Springfield Airport, Ill. (ANG)
CR	F-15C/D	32d TFG, Soesterberg AB, Netherlands (USAFE)	LF	F-16A/B/C/D	58th TFW, Luke AFB, Ariz. (TAC)	SJ	F-15E	4th TFW, Seymour Johnson AFB, N. C. (TAC)
CT	A-10A	103d TFG, Bradley ANGB, Conn. (ANG)	LN	F-111F	48th TFW, RAF Lakenheath, UK (USAFE)	SL	F-4E	131st TFW, Bridgeton, Mo. (ANG)
DC	F-16A/B	113th TFW, Andrews AFB, Md. (ANG)	LR	F-16C/D	944th TFG, Luke AFB, Ariz. (AFRES)	SP	F-4G, F-16C/D	52d TFW, Spangdahlem AB, West Germany (USAFE)
DM	A-10A	355th TTW, Davis-Monthan AFB, Ariz. (TAC)	LY	F-15A/B	48th FIS, Langley AFB, Va. (TAC)	SR	OV-10A	507th TACW, Shaw AFB, S. C. (TAC)
DM	EC-130H	41st ECS, Davis-Monthan AFB, Ariz. (TAC)	MA	A-10A	104th TFG, Barnes MAP, Mass. (ANG)	SU	QA-10A	5th TACG, Suwon AB, Korea (PACAF)
DO	F-16A/B	906th TFG, Wright-Patterson AFB, Ohio (AFRES)	MB	A-10A	354th TFW, Myrtle Beach AFB, S. C. (TAC)	SW	F-16C/D	363d TFW, Shaw AFB, S. C. (TAC)
ED	Various	Air Force Flight Test Center, Edwards AFB, Calif. (AFSC)	MC	F-16A/B/C/D	56th TFW, MacDill AFB, Fla. (TAC)	TF	F-16C/D	301st TFW, Carswell AFB, Tex. (AFRES)
EG	F-15C/D	33d TFW, Eglin AFB, Fla. (TAC)	MD	A-10A	175th TFG, Martin Airport, Md. (ANG)	TJ	F-16C/D	401st TFW, Torrejon AB, Spain (USAFE)
EL	A-10A	23d TFW, England AFB, La. (TAC)	MI	F-16A/B	127th TFW, Selfridge ANGB, Mich. (ANG)	TR	F-117A, AT-38B	37th TFW, Tonopah Test Range, Nev. (TAC)
ET	Various	3246th Test Wing, Eglin AFB, Fla. (AFSC)	MJ	F-16C/D	432d TFW, Misawa AB, Japan (PACAF)	TX	F-16A/B	924th TFG, Bergstrom AFB, Tex. (AFRES)
FF	F-15C/D	1st TFW, Langley AFB, Va. (TAC)	MO	F-111A, EF-111A	366th TFW, Mountain Home AFB, Idaho (TAC)	TY	F-15A/B	325th TTW, Tyndall AFB, Fla. (TAC)
FM	F-16A/B	482d TFW, Homestead AFB, Fla. (AFRES)	MY	F-16C/D	347th TFW, Moody AFB, Ga. (TAC)	UH	F-111E, EF-111A	20th TFW, RAF Upper Heyford, UK (USAFE)
FS	F-16A/B	188th TFW, Fort Smith MAP, Ark. (ANG)	NF	QA-10A	602d TACW, Davis-Monthan AFB, Ariz. (TAC)	VA	A-7D	192d TFG, Byrd Field, Va. (ANG)
FW	F-4E	122d TFW, Fort Wayne MAP, Ind. (ANG)	NJ	F-4E	108th TFW, McGuire AFB, N. J. (ANG)	VT	F-16A/B	158th FIG, Burlington IAP, Vt. (ANG)
GA	F-4E	35th TFW, George AFB, Calif. (TAC)	NM	A-7D	150th TFG, Kirtland AFB, N. M. (ANG)	WA	Various	TFWC, Nellis AFB, Nev. (TAC)
GU	RF-4C	460th TRG, Taegu AB, Korea (PACAF)	NO	A-10A	926th TFG, NAS New Orleans, La. (AFRES)	WI	A-10A	128th TFW, Trux Field, Wis. (ANG)
HA	A-7D	185th TFG, Sioux City, Iowa (ANG)	NT	T-43A	323d TFW, Mather AFB, Calif. (ATC)	WP	F-16C/D	8th TFW, Kunsan AB, Korea (PACAF)
HAFB	F-16A, F-4E	Ogden ALC, Hill AFB, Utah (AFLC)	NY	F-16A/B	174th TFW, Hancock Field, N. Y. (ANG)	WR	A-10A	81st TFW, RAF Bentwaters, UK (USAFE)
HF	F-4E	181st TFG, Hulman RAP, Ind. (ANG)	OH	A-7D	121st TFW, Rickenbacker ANGB; 178th TFG, Springfield; 180th TFG, Toledo, Ohio (ANG)	WW	F-4E/G	35th TFW, George AFB, Calif. (TAC)
HI	F-16A/B/C/D	419th TFW, Hill AFB, Utah (AFRES)	OK	A-7D	138th TFG, Tulsa IAP, Okla. (ANG)	ZR	RF-4C	26th TRW, Zweibrücken AB, West Germany (USAFE)
HL	F-16C/D	388th TFW, Hill AFB, Utah (TAC)	OS	F-16C/D	51st TFW, Osan AB, Korea (PACAF)	ZZ	F-15C/D	18th TFW, Kadena AB, Okinawa (PACAF)
			OT	Various	TAWC, Eglin AFB, Fla. (TAC)			

AIR DEFENSE UNIT FIN FLASHES

COLOR CODE	AIRCRAFT	UNIT AND LOCATION
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AIR NATIONAL GUARD UNITS

Minuteman over Massachusetts	F-15A/B	102d FIW, Otis ANGB, Mass.
Stylized waterfall	F-16A/B	107th FIG, Niagara Falls IAP, N. Y.
Red stripe with "Happy Hooligans" logo	F-16A/B	119th FIG, Hector Field, N. D.
Blue triangle and two blue stripes bearing "Montana" and "Big Sky Country" logos	F-16A/B	120th FIG, Great Falls IAP, Mont.
Red hawk	F-15A/B	123d FIS (142d FIG), Portland IAP, Ore.
Blue/white lightning bolt	F-16A/B	125th FIG, Jacksonville IAP, Fla.
Blue stripe with "California" logo	F-16A/B	144th FIW, Fresno Air Terminal, Calif.
Texas star on red/white jagged stripes	F-16A/B	147th FIG, Ellington Field, Tex.
Stars of Little Dipper constellation	F-16A/B	148th FIG, Duluth IAP, Minn.
Black falcon with "Vermont" on gold stripe	F-16A/B	158th FIG, Burlington, Vt.
Red delta	F-16A/B	177th FIG, Atlantic City Airport, N. J.
Yellow and black checkerboard	F-4D, F-16A/B	191st FIG, Selfridge ANGB, Mich.

AIR DEFENSE TRAINING UNITS (ANG)

Black hawk	F-16A/B	114th TFTS (142d FIG), Kingsley Field, Ore.
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Understanding the Designation System

"Wright 1909 Military Flyer" was the only designation assigned the first Army Signal Corps aircraft. Because there were so few airplanes in the early days and because aircraft were used only for observation, all aircraft procured for the next eleven years were identified only by manufacturer's names and model numbers, even after the US went to war.

The first standardized letter and number designation system for the Army Air Service appeared in 1920. It was a modified version of the one used by Germany in World War I. The system was revised in 1924 and 1948.

The Navy developed its own system, which was complete but difficult to understand, in 1922. That system was the third the Navy had tried since 1911. Army aircraft and helicopters were identified under a separate system implemented in 1956.

In 1962, the Department of Defense introduced the current system. All DoD aerospace vehicles are assigned designations according to the mission design and series (MDS) system, and the use of these letters and numbers is standard across all services.

The easiest way to decipher an aircraft designation is to begin at the hyphen and work outward. The following definitions, paraphrased from DoD's Publication 4120.15-L, "Model Designation of Military Aerospace Vehicles," explain each part.

Basic mission. This letter identifies an aircraft's primary function or capability. It appears to the immediate left of the design number, separated by a hyphen. Every aircraft has one basic mission identifier.

Vehicle type. Additional letter designators are required only for rotary wing, vertical and/or short takeoff and landing (VTOL/STOL), and glider aircraft. These must be accompanied by a mission identifier. The pair of identifiers appears to the left of the hyphen.

Modified mission. This letter is used only when needed to identify modifications to the basic mission of an aircraft. Only one modified mission identifier can be used in any one MDS. This letter appears to the immediate left of the basic mission identifier.

The NAIM-120A designation on the noses of these missiles at Eglin AFB, Fla., identifies them as training variants of the AIM-120A Advanced Medium-Range Air-to-Air Missile (AMRAAM), now in production for US fighters. The designation system for US military aerospace vehicles was set up in 1962.



—Staff photo by Guy Aceto

Status prefix. This letter is used only when needed to indicate that an aerospace vehicle is not standard because of its test, modification, experimental, or prototype design. This identifier appears to the immediate left of the modified mission identifier or the basic mission identifier.

Design number. This number identifies different aircraft within each category. Design numbers run consecutively (usually), beginning with "1" for each category. The design number appears to the immediate right of the hyphen.

Series. This letter identifies the first production model of a particular design and later models representing major modifications. Series identifiers are consecutive, beginning with "A." To avoid confusion with the numerals "1" and "0," the letters "I" and "O" are not used. This identifier appears to the immediate right of the design number.

Block number. This number identifies a group of identically configured aircraft within a particular design series. The numbers begin with 01 and are assigned in multiples of five (05, 10, etc.). Intermediate block numbers are reserved for field modifications and are applied by the using military department.

Manufacturer identification. This two-letter combination identifies the vehicle's manufacturer and the site where the vehicle was built. It appears to the immediate right of the block number. This identifier dates to World War II, when several different manufacturers built the same model of aircraft or a particular company might have had more than one assembly line.

The table on the facing page lists the identifiers used in aircraft MDS designations.

The designation system for rockets, missiles, and space systems differs



The military aircraft designation block is normally stenciled on the left side of the fuselage just below the canopy window, as on this B-1B bomber. Designations are based on missions, designs, and vehicle types.

slightly from the aircraft designation system. Again, begin with the hyphen. To the left of the hyphen is the **vehicle type**. This letter identifies the kind of unmanned vehicle.

Basic mission. This letter identifies the basic function or capability of the

rocket, missile, or space system. It appears to the immediate left of the vehicle type identifier.

Launch environment. This letter identifies the launch environment or launch platform parameters. It appears to the immediate left of the mis-

sion identifier. Only one of these is used in any one MDS.

A status prefix can appear to the left of the launch environment letter. The design number and series identifier for missiles, rockets, and spacecraft are the same as for aircraft.

One final difference between aircraft and rockets and missiles is the **configuration number**. This number is used only when denoting configuration changes affecting performance or tactics. It appears to the immediate right of the series identifier, separated by another hyphen.

The first table on p. 60 lists the identifiers used for guided missiles, rockets, and spacecraft.

Electronic equipment is designated in much the same way. Each piece of equipment that has been accepted for military use and is carried by or in a platform (such as a radar in an aircraft or on a truck or a ship, or an electronic countermeasures pod carried on an aircraft) is first assigned an "AN" ("Army/Navy") designator.

The AN is followed by a slash, then the platform designator, equipment type designator, purpose designator, a hyphen, and the series designator.

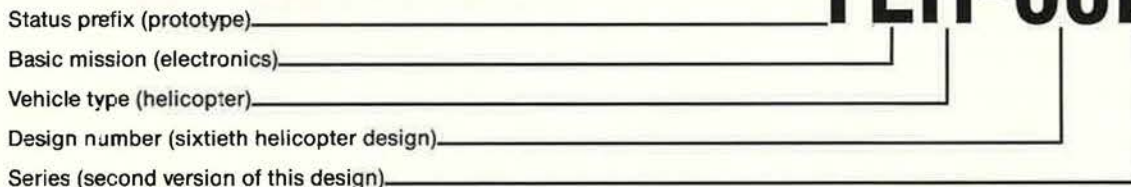
The second table on p. 60 lists the electronic equipment designators. ■

Aerospace Vehicle MDS Designators for Aircraft

Status Prefix	Modified Mission	Basic Mission	Vehicle Type
G Permanently grounded	A Attack	A Attack	G Glider
J Special test (temporary)	C Transport	B Bomber	H Helicopter
N Special test (permanent)	D Director	C Transport	S Spaceplane
X Experimental	E Special electronic installation	E Special electronic installation	V VTOL/STOL
Y Prototype	F Fighter	F Fighter	Z Lighter-than-air vehicle
Z Planning	H Search and rescue	O Observation	
	K Tanker	P Patrol	
	L Cold weather	R Reconnaissance	
	M Multimission	S Antisubmarine	
	O Observation	T Trainer	
	P Patrol	U Utility	
	Q Drone	X Research	
	R Reconnaissance		
	S Antisubmarine		
	T Trainer		
	U Utility		
	V Staff		
	W Weather		

This is the designation for a prototype "Quick Fix" helicopter for the Army.

YEH-60B



Aerospace Vehicle MDS Designators for Guided Missiles, Rockets, Probes, Boosters, and Satellites

Status Prefix	Launch Environment	Basic Mission	Vehicle Type
C Captive	A Air	C Transport	B Booster
D Dummy	B Multiple	D Decoy	M Guided missile or drone
J Special test (temporary)	C Coffin	E Electronic/communications	N Probe
M Maintenance	F Individual	G Surface attack	R Rocket
N Special test (permanent)	G Runway	I Aerial/space intercept	S Satellite
X Experimental	H Silo stored	L Launch detection/surveillance	
Y Prototype	L Silo launched	M Scientific/calibration	
Z Planning	M Mobile	N Navigation	
	P Soft pad	Q Drone	
	R Ship	S Space support	
	S Space	T Training	
	U Underwater	U Underwater attack	
		W Weather	

This is the designation for the Peacekeeper ICBM.

LGM-118A

Launch environment (silo) _____

Basic mission (surface attack) _____

Vehicle type (guided missile) _____

Design number (118th missile design) _____

Series (first version of this design) _____

MDS Designators for Electronic Equipment

Platform/Installation	Equipment Type	Purpose
A Airborne	A Infrared	A Auxiliary assemblies
B Underwater mobile (submarine)	B Pigeon	B Bombing
C Air transportable	C Carrier (wire)	C Communications
D Pilotless carrier	D Radiac	D Direction finding, reconnaissance, and/or surveillance
F Fixed (ground)	E Nupac	E Ejection and/or release
G General ground use	F Photographic	G Fire control or light directing
K Amphibious	G Telegraph or teletype	H Recording or reproducing
M Ground (mobile)	I Interphone and public address	K Computing
P Portable	J Electromechanical or inertial wire covered	M Maintenance and/or test assemblies
S Water	K Telemetering	N Navigational aids
T Ground transportable	L Countermeasures	Q Special or combinations of purposes
U General utility assemblies	M Meteorological	R Receiving, passive detecting
W Water surface	N Sound in air	S Detecting and/or range and bearing, search
Z Piloted-pilotless airborne vehicle combination	P Radar	T Transmitting
	Q Sonar	W Automatic flight or remote control
	R Radio	X Identification and recognition
	S Special or combinations of types	Y Surveillance and control
	T Telephone (wire)	
	V Visual and visible light	
	W Armament	
	X Facsimile or television	
	Y Data processing	

This is the designation for the Martin Marietta Low-Altitude Navigation and Targeting Infrared for Night (LANTIRN) navigation pod.

AN/AAQ-13

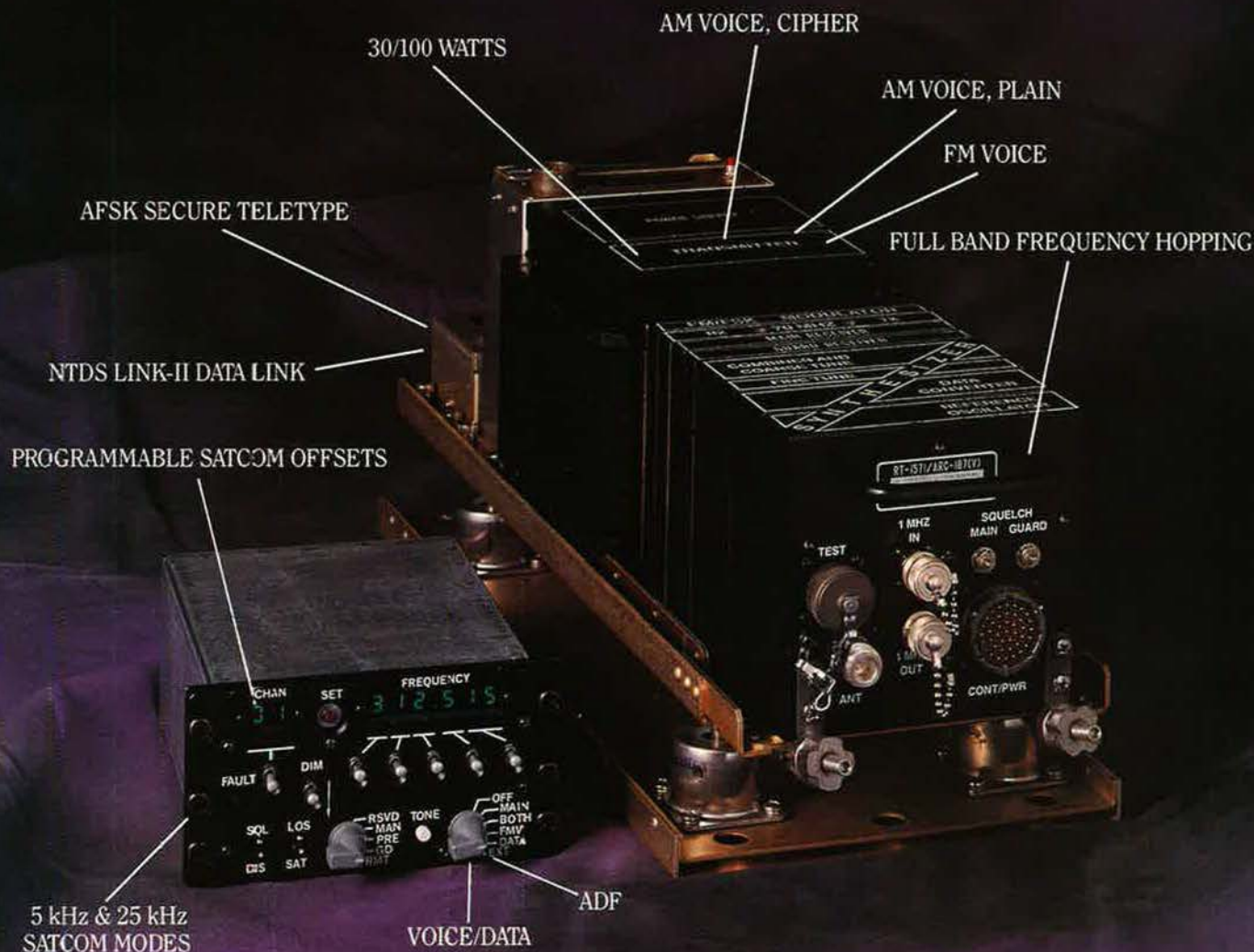
Approved for joint service _____

Installation (airborne) _____

Equipment (infrared) _____

Purpose (combination) _____

Series (thirteenth version of this type) _____



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sight and satellite voice/data link transmissions.

The AN/ARC-187 is lightweight, compact, and compatible with Have Quick II ECCM operation. It's capable of 5 kHz channel spacing and, when installed with the new MXF-227 control, offers unparalleled flexibility for SATCOM users.

And, because it's from Magnavox, nobody can match its standard features.



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Electronics Company

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 (acting)	May 15, 1973	July 18, 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 (acting)	May 18, 1979	July 26, 1979
Hans Mark	July 26, 1979	Feb. 9, 1981
Verne Orr	Feb. 9, 1981	Nov. 30, 1985
Russell A. Rourke	Dec. 9, 1985	Apr. 7, 1986
Edward C. Aldridge, Jr. (acting)	Apr. 8, 1986	June 8, 1986
Edward C. Aldridge, Jr.	June 9, 1986	Dec. 16, 1988
James F. McGovern (acting)	Dec. 16, 1988	Apr. 29, 1989
John J. Welch, Jr. (acting)	Apr. 29, 1989	May 21, 1989
Donald B. Rice	May 22, 1989	

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	June 30, 1986
Gen. Larry D. Welch	July 1, 1986	June 30, 1990
Gen. Michael J. Dugan	July 1, 1990	Sept. 18, 1990
Gen. Merrill A. McPeak	Nov. 7, 1990	

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. Kislring	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	June 30, 1986
CMSAF James C. Binnicker	July 1, 1986	July 31, 1990
CMSAF Gary R. Pflingston	Aug. 1, 1990	

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	Aug. 28, 1986
Maj. Gen. John T. Stihl	Aug. 28, 1986	Mar. 29, 1988
Maj. Gen. James S. Cassity, Jr.	Mar. 29, 1988	May 16, 1989
Maj. Gen. Robert H. Ludwig	May 16, 1989	Nov. 9, 1990
Maj. Gen. John S. Fairfield	Nov. 9, 1990	

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. Bracley, Jr.	July 1, 1962	July 31, 1965
Gen. Kenneth B. Hobson	Aug. 1, 1965	July 31, 1967
Gen. Thomas P. Garrity	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	July 31, 1987
Gen. Alfred G. Hansen	July 31, 1987	Oct. 31, 1989
Gen. Charles C. McDonald	Oct. 31, 1989	

Formerly Air Materiel Command.
Redesignated Air Force Logistics Command Apr. 1, 1961.

AIR FORCE SPACE COMMAND

Gen. James V. Hartinger	Sept. 1, 1982	July 30, 1984
Gen. Robert T. Herres	July 30, 1984	Oct. 1, 1986
Maj. Gen. Maurice C. Padden	Oct. 1, 1986	Oct. 29, 1987
Lt. Gen. Donald J. Kutyna	Oct. 29, 1987	Mar. 29, 1990
Lt. Gen. Thomas S. Moorman, Jr.	Mar. 29, 1990	

AIR FORCE SPECIAL OPERATIONS COMMAND

Maj. Gen. Thomas E. Eggers	May 22, 1990	
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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	July 17, 1987
Gen. Bernard P. Flandolph	July 17, 1987	Apr. 1, 1990
Gen. Ronald W. Yates	Apr. 1, 1990	

Formerly Air Research and Development Command.
Redesignated 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 D. 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	Aug. 28, 1986
Gen. John A. Shaud	Aug. 28, 1986	June 6, 1988
Lt. Gen. Robert C. Oaks	June 6, 1988	June 25, 1990
Lt. Gen. Joseph W. Ashy	June 25, 1990	

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

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 CONTROL DATA

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	Nov. 6, 1986
Lt. Gen. Truman Spangrud	Nov. 6, 1986	July 12, 1988
Lt. Gen. Ralph E. Havens	July 12, 1988	Oct. 6, 1989
Maj. Gen. David C. Reed	Oct. 6, 1989	Jan. 4, 1990
Lt. Gen. Charles G. Boyd	Jan. 4, 1990	

Air University was part of Air Training Command between May 1978 and July 1983.

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	Aug. 14, 1989
Maj. Gen. Gary W. O'Shaughnessy	Aug. 15, 1989	

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	Sept. 20, 1989
Gen. H. T. Johnson	Sept. 20, 1989	

Formerly Military Air Transport Service.

Redesignated 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	Dec. 16, 1986
Gen. Jack I. Gregory	Dec. 16, 1986	July 22, 1988
Gen. Merrill A. McPeak	July 22, 1988	Nov. 5, 1990
Lt. Gen. James B. Davis	Nov. 5, 1990	Feb. 19, 1991
Gen. Jimmie V. Adams	Feb. 19, 1991	

Formerly Far East Air Forces.

Redesignated Pacific Air Forces July 1, 1957.

STRATEGIC AIR COMMAND

Gen. George C. Kenney	Mar. 21, 1946	Oct. 18, 1948
Gen. Curtis E. LeMay	Oct. 19, 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 28, 1968

Gen. Bruce K. Holloway	July 29, 1968	Apr. 30, 1972
Gen. John C. Meyer	May 1, 1972	July 31, 1974
Gen. Russell E. Dcougherty	Aug. 1, 1974	July 31, 1977
Gen. Richard H. Ellis	Aug. 1, 1977	July 31, 1981
Gen. B. L. Davis	Aug. 1, 1981	July 31, 1985
Gen. Larry D. Welch	Aug. 1, 1985	June 30, 1986
Gen. John T. Chain	July 1, 1986	Jan. 31, 1991
Gen. George L. Butler	Feb. 1, 1991	

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	Mar. 26, 1991
Gen. John Michael Loh	Mar. 27, 1991	

US AIR FORCES IN EUROPE

Brig. Gen. John F. McBlain	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, 1980
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	May 1, 1987
Gen. William L. Kirk	May 1, 1987	Apr. 12, 1989
Gen. Michael J. Dugan	Apr. 12, 1989	June 26, 1990
Gen. Robert C. Oaks	June 26, 1990	

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 9, 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	June 27, 1977
Lt. Gen. Kenneth L. Tallman	June 28, 1977	June 15, 1981
Maj. Gen. Robert E. Kelley	June 16, 1981	June 15, 1983
Lt. Gen. Winfield W. Scott, Jr.	June 16, 1983	June 25, 1987
Lt. Gen. Charles R. Hamm	June 26, 1987	

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	Oct. 31, 1986
Maj. Gen. Roger P. Scheer	Nov. 1, 1986	Oct. 31, 1990
Maj. Gen. John J. Closner	Nov. 1, 1990	

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 Hq. 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	Nov. 1, 1988
Maj. Gen. Philip G. Killey	Nov. 1, 1988	

The head of the Air National Guard 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.

UNITED STATES AIR FORCE MEDAL OF HONOR RECIPIENTS

**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.
Goettler, 2d Lt. Harold E.
Luke, 2d Lt. Frank, Jr.
Rickenbacker, Capt. Edward V.

Wichita, Kan.
Chicago, Ill.
Phoenix, Ariz.
Columbus, Ohio

Oct. 6, 1918, Binarville, France
Oct. 6, 1918, Binarville, France
Sept. 29, 1918, Murvaux, France
Sept. 25, 1918, Billy, France

KIA, Oct. 6, 1918
KIA, Oct. 6, 1918
KIA, Sept. 29, 1918
Died, July 23, 1973

WORLD WAR II

Baker, Lt. Col. Addison E.
Bong, Maj. Richard I.
Carswell, Maj. Horace S., Jr.
Castle, Brig. Gen. Frederick W.
Cheli, Maj. Ralph
Crow, Col. Demas T.
Doolittle, Lt. Col. James H.
Erwin, SSgt. Henry E.
Femoyer, 2d Lt. Robert E.
Gott, 1st Lt. Donald J.
Hamilton, Maj. Pierpont M.
Howard, Lt. Col. James H.
Hughes, 2d Lt. Lloyd H.
Jerstad, Maj. John L.
Johnson, Col. Leon W.
Kane, Col. John R.
Kearby, Col. Neel E.
Kingsley, 2d Lt. David R.
Knight, 1st Lt. Raymond L.
Lawley, 1st Lt. William R., Jr.
Lindsey, Capt. Darrell R.
Mathies, SSgt. Archibald
Mathis, 1st Lt. Jack W.
McGuire, Maj. Thomas B., Jr.
Metzger, 2d Lt. William E., Jr.
Michael, 1st Lt. Edward S.
Morgan, 2d Lt. John C.
Pease, Capt. Harl, Jr.
Pucket, 1st Lt. Donald D.
Sarnoski, 2d Lt. Joseph R.
Shomo, Maj. William A.
Smith, Sgt. Maynard H.
Truemper, 2d Lt. Walter E.
Vance, Lt. Col. Leon R., Jr.
Voster, TSgt. Forrest L.
Walker, Brig. Gen. Kenneth N.
Wilkins, Maj. Raymond H.
Zeamer, Maj. Jay, Jr.

Chicago, Ill.
Poplar, Wis.
Fort Worth, Tex.
Manila, P. I.
San Francisco, Calif.
Traverse City, Mich.
Alameda, Calif.
Adamsville, Ala.
Huntington, W. Va.
Arnett, Okla.
Tuxedo Park, N. Y.
Canton, China
Alexandria, La.
Racine, Wis.
Columbia, Mo.
McGregor, Tex.
Wichita Falls, Tex.
Portland, Ore.
Houston, Tex.
Leeds, Ala.
Jefferson, Iowa
Scotland
San Angelo, Tex.
Ridgewood, N. J.
Lima, Ohio
Chicago, Ill.
Vernon, Tex.
Plymouth, N. H.
Longmont, Colo.
Simpson, Pa.
Jeannette, Pa.
Caro, Mich.
Aurora, Ill.
Enid, Okla.
Lyndonville, N. Y.
Cerrillos, N. M.
Portsmouth, Va.
Carlisle, Pa.

Aug. 1, 1943, Ploesti, Romania
Oct. 10–Nov. 15, 1944, Southwest Pacific
Oct. 26, 1944, South China Sea
Dec. 24, 1944, Liège, Belgium
Aug. 18, 1943, Wewak, New Guinea
Nov. 8, 1942, Port Lyautey, French Morocco
Apr. 18, 1942, Tokyo, Japan
Apr. 12, 1945, Koriyama, Japan
Nov. 2, 1944, Merseburg, Germany
Nov. 9, 1944, Saarbrücken, Germany
Nov. 8, 1942, Port Lyautey, French Morocco
Jan. 11, 1944, Oschersleben, Germany
Aug. 1, 1943, Ploesti, Romania
Aug. 1, 1943, Ploesti, Romania
Aug. 1, 1943, Ploesti, Romania
Oct. 11, 1943, Wewak, New Guinea
June 23, 1944, Ploesti, Romania
Apr. 25, 1945, Po Valley, Italy
Feb. 20, 1944, Leipzig, Germany
Aug. 9, 1944, Pontoise, France
Feb. 20, 1944, Leipzig, Germany
Mar. 18, 1943, Vegesack, Germany
Dec. 25–26, 1944, Luzon, P. I.
Nov. 9, 1944, Saarbrücken, Germany
Apr. 11, 1944, Brunswick, Germany
July 28, 1943, Kiel, Germany
Aug. 7, 1942, Rabaul, New Britain
July 9, 1944, Ploesti, Romania
June 16, 1943, Buka, Solomon Is.
Jan. 11, 1945, Luzon, P. I.
May 1, 1943, St. Nazaire, France
Feb. 20, 1944, Leipzig, Germany
June 5, 1944, Wimereaux, France
Dec. 20, 1943, Bremen, Germany
Jan. 5, 1943, Rabaul, New Britain
Nov. 2, 1943, Rabaul, New Britain
June 16, 1943, Buka, Solomon Is.

KIA, Aug. 1, 1943
Killed, Aug. 6, 1945, Burbank, Calif.
KIA, Oct. 26, 1944
KIA, Dec. 24, 1944
Died as POW, Mar. 6, 1944
KIA, Nov. 8, 1942
Carmel, Calif. (Ret. Gen.)
Leeds, Ala.
KIA, Nov. 2, 1944
KIA, Nov. 9, 1944
Died, Mar. 4, 1982
Belleair Bluffs, Fla. (Ret. Brig. Gen.)
KIA, Aug. 1, 1943
KIA, Aug. 1, 1943
McLean, Va. (Ret. Gen.)
Chester, Pa. (Ret. Col.)
KIA, Mar. 5, 1944, Wewak, New Guinea
KIA, June 23, 1944
KIA, Apr. 25, 1945
Montgomery, Ala. (Ret. Col.)
KIA, Aug. 9, 1944
KIA, Feb. 20, 1944
KIA, Mar. 18, 1943
KIA, Jan. 7, 1945, Negros, P. I.
KIA, Nov. 9, 1944
Fairfield, Calif. (Ret. Lt. Col.)
Died, Jan. 17, 1991
KIA, Aug. 7, 1942
KIA, July 9, 1944
KIA, June 16, 1943
Died, June 25, 1990
Died, May 11, 1984
KIA, Feb. 20, 1944
Killed, July 26, 1944, near Iceland
Memphis, N. Y.
KIA, Jan. 5, 1943
KIA, Nov. 2, 1943
Stoneham, Mass. (Ret. Lt. Col.)

KOREA

Davis, Maj. George A., Jr.
Loring, Maj. Charles J., Jr.
Sebillie, Maj. Louis J.
Walmsley, Capt. John S., Jr.

Dublin, Tex.
Portland, Me.
Harbor Beach, Mich.
Baltimore, Md.

Feb. 10, 1952, Sinuiju-Yalu River, N. Korea
Nov. 22, 1952, Sniper Ridge, N. Korea
Aug. 5, 1950, Hamch'ang, S. Korea
Sept. 14, 1951, Yangdok, N. Korea

KIA, Feb. 10, 1952
KIA, Nov. 22, 1952
KIA, Aug. 5, 1950
KIA, Sept. 14, 1951

VIETNAM

Bennett, Capt. Steven L.
Day, Col. George E.
Dethlefsen, Maj. Merlyn H.
Fisher, Maj. Bernard F.
Fleming, 1st Lt. James P.
Jackson, Lt. Col. Joe M.
Jones, Col. William A. III
Levitow, A1C John L.
Sijan, Capt. Lance P.
Thorsness, Lt. Col. Leo K.
Wilbanks, Capt. Hilliard A.
Young, Capt. Gerald O.

Palestine, Tex.
Sioux City, Iowa
Greenville, Iowa
San Bernardino, Calif.
Sedalia, Mo.
Newnan, Ga.
Warsaw, Va.
South Windsor, Conn.
Milwaukee, Wis.
Seattle, Wash.
Cornelia, Ga.
Anacortes, Wash.

June 29, 1972, Quang Tri, S. Vietnam
Conspicuous gallantry while POW
Mar. 10, 1967, Thai Nguyen, N. Vietnam
Mar. 10, 1966, A Shau Valley, S. Vietnam
Nov. 26, 1968, Duc Co, S. Vietnam
May 12, 1968, Kham Duc, S. Vietnam
Sept. 1, 1968, Dong Hoi, N. Vietnam
Feb. 24, 1969, Long Binh, S. Vietnam
Conspicuous gallantry while POW
Apr. 19, 1967, N. Vietnam
Feb. 24, 1967, Dalat, S. Vietnam
Nov. 9, 1967, Da Nang area, S. Vietnam

KIA, June 29, 1972
Shalimar, Fla. (Ret. Col.)
Died, Dec. 14, 1987
Kuna, Idaho (Ret. Col.)
Active duty, Col. McGuire AFB, N. J.
Kent, Wash. (Ret. Col.)
Killed, Nov. 15, 1969, Woodbridge, Va.
South Windsor, Conn.
Died while POW, Jan. 1968
Seattle, Wash. (Ret. Col.)
KIA, Feb. 24, 1967
Died, June 6, 1990

AIR FORCE Magazine's Guide to Aces

In compiling this list of aces who flew with the US Air Force and its predecessor organizations (the Air Service and the Army Air Forces), AIR FORCE Magazine has relied on USAF's official accounting of aerial victory credits, which is the responsibility of the US Air Force Historical Research Center at Maxwell AFB, Ala.

Air Force historians have kept the official records of aerial victories by USAF pilots and crew members since 1957. A few foreign pilots are also listed. Most aerial victory credits have been earned by fighter pilots who

have destroyed enemy aircraft in the air. The Office of Air Force History had previously published four separate listings—one for each of the major wars (World War I, World War II, Korea, and Vietnam). The four volumes have been corrected, updated, and combined into one comprehensive volume.

The US Air Force Historical Research Center is not authorized, nor has it ever attempted, to verify aerial victories claimed by Americans who flew with the air forces of other nations. Therefore, this list no longer contains World War I victory credits

for Americans serving in the Lafayette Escadrille, French Flying Corps, Royal Flying Corps, or Royal Navy. Similarly, it no longer contains World War II victory credits for Americans in the Eagle Squadrons or the Flying Tigers (American Volunteer Group). However, victories were awarded to members of the Army Air Service if they were flying with British or French units when they shot down enemy aircraft. Some World War I pilots (notably Frank Luke) were credited with victories for destroying balloons.

—THE EDITORS



Capt. Edward V. Rickenbacker

AMERICAN ACES OF WORLD WAR I

Rickenbacker, Capt. Edward V.	24.35	Wright, 1st Lt. Chester E.	6.33
Luke, 2d Lt. Frank, Jr.	15.83	Jones, 2d Lt. Clinton	6.16
Kindley, 1st Lt. Field E.	11.00	Burdick, 2d Lt. Howard	6.00
Springs, 1st Lt. Elliott W.	10.75	Chambers, 1st Lt. Reed M.	6.00
Landis, 1st Lt. Reed G.	10.00	Creech, 1st Lt. Jesse O.	6.00
Vaughn, 1st Lt. George A.	9.50	Putnam, 1st Lt. David E.	6.00
Swabb, 1st Lt. Jacques M.	8.50	Cook, 1st Lt. Harvey W.	5.66
Donaldson, 2d Lt. John O.	8.00	Meissner, Capt. James A.	5.66
Baer, 1st Lt. Paul P.	7.75	Coolidge, Capt. Hamilton	5.58
Clay, 1st Lt. Henry R., Jr.	7.00	Campbell, 1st Lt. Douglas	5.50
Hamilton, 1st Lt. Lloyd A.	6.83	Knotts, 2d Lt. Howard C.	5.50
White, 2d Lt. Wilbert W.	6.66	Rummell, 1st Lt. Leslie J.	5.16
Cassady, 1st Lt. Thomas G.	6.63	Bissell, 1st Lt. Clayton L.	5.00
Holden, 1st Lt. Lansing C.	6.50	Luff, 1st Lt. Frederick E.	5.00
Hunter, 1st Lt. Frank O'D.	6.50	Ponder, 2d Lt. William T.	5.00
Stenseth, 1st Lt. Martinus	6.47		

SOME FAMOUS US FIGHTER FIRSTS

May 30, 1918	First US-trained AEF Ace: Capt. Edward V. Rickenbacker.
Dec. 7, 1941	First AAF Victories of WW II: Six pilots at Pearl Harbor.
Dec. 16, 1941	First AAF Ace of WW II: 1st Lt. Boyd D. Wagner.
June 27, 1950	First USAF Victories in the Korean War.
Nov. 8, 1950	First Jet-to-Jet Victory of the Korean War.
May 20, 1951	First USAF Ace of the Korean War: Capt. James Jabara.
Nov. 30, 1951	First USAF Ace of Two Wars (WW II and Korea): Maj. George A. Davis, Jr. (7 in WW II and 14 in Korea).
Jan. 2, 1967	First (and Only) USAF Ace with Victories in WW II and Vietnam: Col. Robin Olds (12 in WW II and 4 in Vietnam).



50 METERS. OR 50 KILOMETERS.

The Fighting Falcon has long been recognized as the world champion of the close-in fight. Now with Beyond-Visual-Range (BVR) missiles, you can set your sights on targets that are completely out of sight.

No matter what the mission, air-to-air, air-to-ground. No matter what the weather, day or night. The F-16 is the premier dogfighter.

Even when the fight is 50 kilometers away.

GENERAL DYNAMICS

A Strong Company For A Strong Country

LEADING ARMY AIR FORCES ACES OF WORLD WAR II

(Fourteen and a half or more victories)

Bong, Maj. Richard I.	40	Lynch, Lt. Col. Thomas J.	20	Anderson, Capt. Lawrence E., Jr.	16.25
McGuire, Maj. Thomas B., Jr.	38	Westbrook, Lt. Col. Robert B.	20	Dunham, Lt. Col. William D.	16
Gabreski, Lt. Col. Francis S.	28*	Gentile, Capt. Donald S.	19.83	Harris, Lt. Col. Bill	16
Johnson, Capt. Robert S.	27	Duncan, Col. Glenn E.	19.50	Welch, Capt. George S.	16
MacDonald, Col. Charles H.	27	Carson, Capt. Leonard K.	18.50	Beerbower, Capt. Donald M.	15.50
Preddy, Maj. George E.	26.83	Eagleston, Maj. Glenn T.	18.50*	Brown, Maj. Samuel J.	15.50
Meyer, Lt. Col. John C.	24*	Beckham, Maj. Walter C.	18	Peterson, Capt. Richard A.	15.50
Schilling, Col. David C.	22.50	Green, Maj. Herschel H.	18	Whisner, Capt. William T., Jr.	15.50*
Johnson, Lt. Col. Gerald R.	22	Herbst, Lt. Col. John C.	18	Bradley, Lt. Col. Jack T.	15
Kearby, Col. Neel E.	22	Zemke, Lt. Col. Hubert	17.75	Cragg, Maj. Edward	15
Robbins, Maj. Jay T.	22	England, Maj. John B.	17.50	Foy, Maj. Robert W.	15
Christensen, Capt. Fred J.	21.50	Beeson, Capt. Duane W.	17.33	Hofer, 2d Lt. Ralph K.	15
Wetmore, Capt. Ray S.	21.25	Thornell, 1st Lt. John F., Jr.	17.25	Homer, Capt. Cyril F.	15
Voll, Capt. John J.	21	Varnell, Capt. James S., Jr.	17	Landers, Lt. Col. John D.	14.50
Mahurin, Maj. Walker M.	20.75*	Johnson, Maj. Gerald W.	16.50	Powers, Capt. Joe H., Jr.	14.50
		Godfrey, Capt. John T.	16.33		

*Aces who added to these scores by victories in the Korean War.
Ranks are as of last victory in World War II.

SOME FAMOUS FIRSTS AMONG US BOMBARDMENT UNITS

June 12, 1918	First AEF bombing mission of WW I: 6 Breguet 14s of the 96th Aero Sqdn., led by Maj. Harry M. Brown, flying from Amanty, attacked railyards at Dommary-Baroncourt, France.
Dec. 10, 1941	First AAF bombing mission of WW II: 5 B-17s of the 93d Bomb Sqdn., 19th Bomb Group, led by Maj. Cecil Combs, flying from Clark Field, attacked Japanese ships near Vigan in the Philippines.
Apr. 18, 1942	First AAF bombing of Japan: 16 B-25s and crews picked from the 17th Bomb Gp. and the 89th Recon Sqdn., led by Lt. Col. James H. Doolittle, launched from the carrier <i>Hornet</i> , attacked targets in the Tokyo area.
June 12, 1942	First AAF bombing mission against a European target: 12 B-24s of the HALPRO Detachment, led by Col. Harry A. Halverson, flying from Fayid, Egypt, attacked oil refineries at Ploesti, Romania.
Jan. 27, 1943	First AAF bombing of Germany: 55 B-17s from 4 groups (91st, 303d, 305th, and 306th) of the 1st Bomb Wing (Eighth Air Force), flying from England, attacked naval targets at Wilhelmshaven and Emden.
June 28, 1950	First USAF bombing mission of the Korean War: 12 B-26s of the 13th Bomb Sqdn., 3d Bomb Gp., flying from Ashiya, Japan, attacked rail and road targets at Munsan.
Dec. 26, 1961	First USAF bombing mission of the Vietnam War: 2 T-28s of the Farm Gate Detachment (4400th Combat Crew Training Sqdn.), flying from Tan Son Nhut in support of 2 Vietnamese AD-6s, attacked Viet Cong facilities north of Saigon.
Jun. 18, 1965	First USAF heavy bombing mission of the Vietnam War: 27 B-52s (Arc Light) of the 7th and 320th Bomb Wgs., flying from Andersen AFB, Guam, attacked a Viet Cong base at Ben Cat.

Maj. Richard I. Bong



LEADING AIR SERVICE/AAF/USAF ACES OF ALL WARS

Bong, Maj. Richard I.	40	WW II
McGuire, Maj. Thomas B., Jr.	38	WW II
Gabreski, Col. Francis S.	34.50	WW II, Korea
Johnson, Lt. Col. Robert S.	27	WW II
MacDonald, Col. Charles H.	27	WW II
Preddy, Maj. George E.	26.83	WW II
Meyer, Col. John C.	26	WW II, Korea
Rickenbacker, Capt. Edward V.	24.33	WW I
Mahurin, Col. Walker M.	24.25	WW II, Korea
Schilling, Col. David C.	22.50	WW II
Johnson, Lt. Col. Gerald R.	22	WW II
Kearby, Col. Neel E.	22	WW II
Robbins, Maj. Jay T.	22	WW II
Christensen, Capt. Fred J.	21.50	WW II
Wetmore, Capt. Ray S.	21.25	WW II
Davis, Maj. George A., Jr.	21	WW II, Korea
Voll, Capt. John J.	21	WW II
Whisner, Capt. William T., Jr.	21	WW II, Korea
Eagleston, Col. Glenn T.	20.50	WW II, Korea
Lynch, Lt. Col. Thomas J.	20	WW II
Westbrook, Lt. Col. Robert B.	20	WW II
Gentile, Capt. Donald S.	19.83	WW II



Capt. Joseph McConnell, Jr.

USAF ACES OF THE KOREAN WAR

McConnell, Capt. Joseph, Jr.	16	Adams, Maj. Donald E.	6.50
Jabara, Maj. James	15*	Gabreski, Col. Francis S.	6.50*
Fernandez, Capt. Manuel J.	14.50	Jones, Lt. Col. George L.	6.50
Davis, Maj. George A., Jr.	14*	Marshal, Maj. Winton W.	6.50
Baker, Col. Royal N.	13*	Kasler, 1st Lt. James H.	6
Blesse, Maj. Frederick C.	10	Love, Capt. Robert J.	6
Fischer, 1st Lt. Harold E.	10	Whisner, Maj. William T., Jr.	5.50*
Garrison, Lt. Col. Vermont	10*	Baldwin, Col. Robert P.	5
Johnson, Col. James K.	10*	Becker, Capt. Richard S.	5
Moore, Capt. Lonnie R.	10	Bettinger, Maj. Stephen L.	5
Parr, Capt. Ralph S., Jr.	10	Creighton, Maj. Richard D.	5*
Foster, Capt. Cecil G.	9	Curtin, Capt. Clyde A.	5
Low, 1st Lt. James F.	9	Gibson, Capt. Ralph D.	5
Hagerstrom, Maj. James P.	8.50*	Kincheloe, Capt. Iven C., Jr.	5
Risner, Capt. Robinson	8	Latshaw, Capt. Robert T., Jr.	5
Ruddell, Lt. Col. George I.	8*	Moore, Capt. Robert H.	5
Buttleman, 1st Lt. Henry	7	Overton, Capt. Dolphin D., III	5
Jolley, Capt. Clifford D.	7	Thyng, Col. Harrison R.	5*
Lilley, Capt. Leonard W.	7	Westcott, Maj. William H.	5

*These are in addition to World War II victories.



Cpts. Charles B. DeBellevue and Richard S. Ritchie

AAF/USAF ACES OF WORLD WAR II AND LATER WARS

	WW II	KOREA	TOTAL
Gabreski, Col. Francis S.	28	6.50	34.50
Meyer, Col. John C.	24	2	26
Mahurin, Col. Walker M.	20.75	3.50	24.25
Davis, Maj. George A., Jr.	7	14	21
Whisner, Maj. William T., Jr.	15.50	5.50	21
Eagleston, Col. Glenn T.	18.50	2	20.50
Garrison, Lt. Col. Vermont	7.33	10	17.33
Baker, Col. Royal N.	3.50	13	16.50
Jabara, Maj. James	1.50	15	16.50
Olds, Col. Robin	12	4*	16
Mitchell, Col. John W.	11	4	15
Brueland, Maj. Lowell K.	12.50	2	14.50
Hagerstrom, Maj. James P.	6	8.50	14.50
Hovde, Lt. Col. William J.	10.50	1	11.50
Johnson, Col. James K.	1	10	11
Ruddell, Lt. Col. George I.	2.50	8	10.50
Thyng, Col. Harrison R.	5	5	10
Colman, Capt. Philip E.	5	4	9
Heller, Lt. Col. Edwin L.	5.50	3.50	9
Chandler, Maj. Van E.	5	3	8
Hockery, Maj. John J.	7	1	8
Creighton, Maj. Richard D.	2	5	7
Emmert, Lt. Col. Benjamin H., Jr.	6	1	7
Bettinger, Maj. Stephen L.	1	5	6
Visscher, Maj. Herman W.	5	1	6
Liles, Capt. Brooks J.	1	4	5
Mattson, Capt. Conrad E.	1	4	5
Shaeffer, Maj. William F.	2	3	5

*Colonel Olds' 4 additional victories came during the Vietnam War.

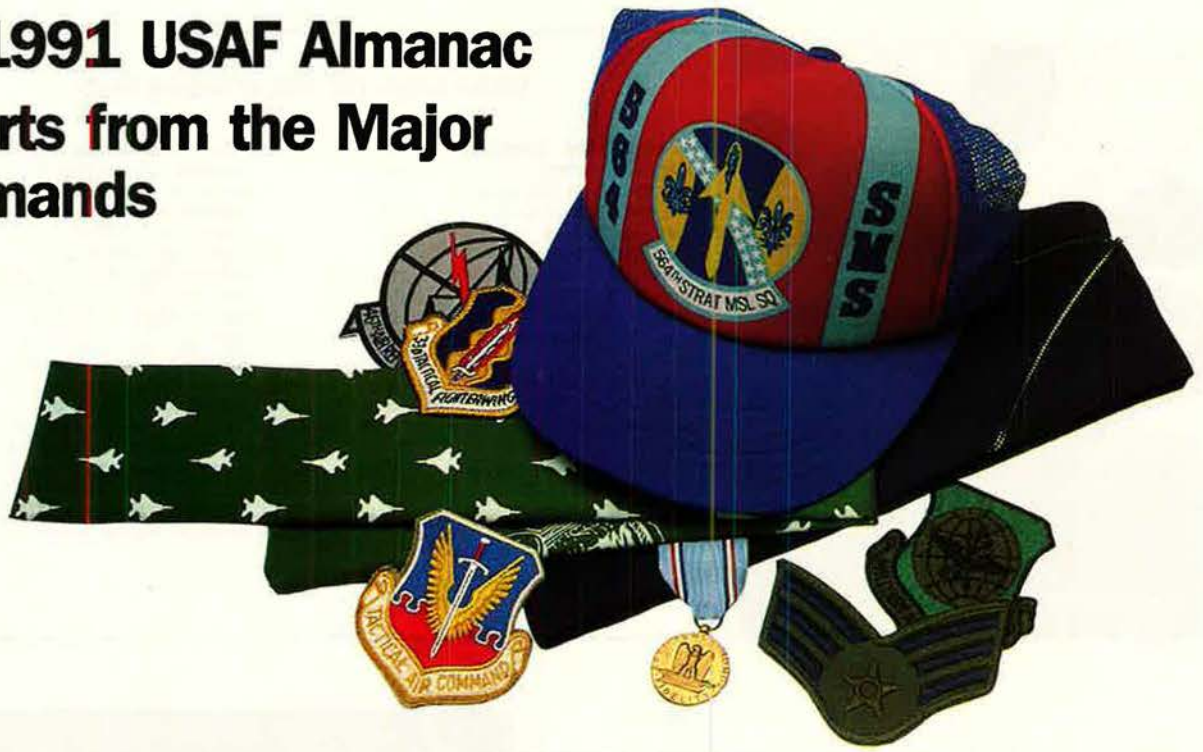
USAF ACES OF THE VIETNAM WAR

DeBellevue, Capt. Charles B. (USAF)	6
Feinstein, Capt. Jeffrey S. (USAF)	5
Ritchie, Capt. Richard S. (USAF)	5

GULF WAR VICTORIES

As of April 9, the Air Force had announced a total of thirty-three aerial victories in the Gulf War. The names of the pilots have not been disclosed, and no other information is available at this time.

The 1991 USAF Almanac Reports from the Major Commands



Air Force Communications Command

Air Force Communications Command (AFCC), with its headquarters at Scott AFB, Ill., began a new era on October 1, 1990.

In response to the Defense Management Review, AFCC streamlined its integration and interoperability functions. These initiatives eliminated 2,350 manpower spaces and saved \$415 million. In DMR II, the command took further cuts, and base-level communications units were turned over to the major commands they served. This reduced AFCC from 55,000 to little more than 8,600 people. No other command responded to the DMR with greater reductions and organizational changes.

The Air Force will redesignate AFCC the Air Force Communications Agency later this year. AFCC will shrink by 220 positions as it becomes AFCA, a field operating agency responsible to the Deputy Chief of Staff of the Air Force for C⁴ (Command, Control, Communications, and Computers).

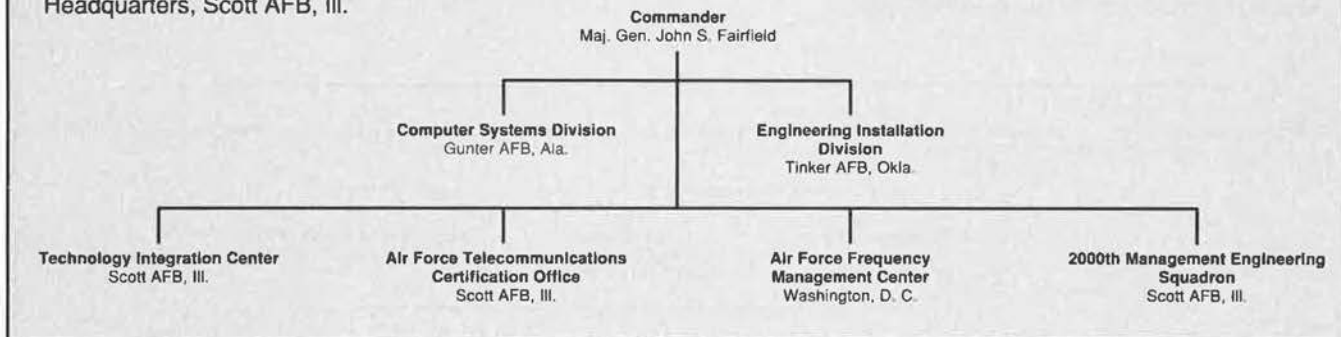
The communications, computer, and air traffic control systems now in place will carry the Air Force through the 1990s, and the command's projec-

At right, an Engineering and Installation Division technician makes vital connections. Part of Air Force Communications Command, EID is responsible for the engineering and installation of USAF's air traffic control systems around the world. Its specialists work at 100 sites in twenty-two countries.



Air Force Communications Command

Headquarters, Scott AFB, Ill.



tions of future Air Force needs will help shape the Air Force well into the twenty-first century.

To meet this challenge, the command acquires standard communications and computer systems, develops guidelines for their use, and ensures the integration and interoperation of these systems. The command is the life-cycle manager for USAF-wide standard systems, including both computer hardware and software, and manages the standard contracts for off-the-shelf products.

In addition, AFCC is the Air Force's manager for engineering, installation, removal, and relocation of communications and air traffic control systems equipment. It works closely with the Federal Aviation Administration to develop standards and procedures that the Air Force needs to operate the largest military air traffic control system in the free world.

AFCC's Computer Systems Division

at Gunter AFB, Ala., is the primary Air Force organization for the development, acquisition, and life-cycle support of standard computer systems. CSD manages nearly 200 programs, including the Desktop III contract, the Standard Multiuser Small Computer Requirements contract, the Air Force Command and Control System modification, the Core Automated Maintenance System, the Wing Command and Control System, and the Combat Ammunition System.

AFCC's Engineering and Installation Division (EID) at Tinker AFB, Okla., remains the Air Force's single manager for engineering and installing communications and air traffic control systems and facilities around the world.

The BIDDs (Base Information Data Distribution System) program, managed by EID's Communications Systems Program Office at Scott AFB, is replacing outdated telephone switch-

ing systems and base distribution systems. Scope Command is a replacement program to upgrade high-frequency radio systems throughout the Air Force.

The newest AFCC organization, the Technology Integration Center (TIC) at Scott AFB, provides a focus for integration, systems engineering, and operational testing for communications and computer systems throughout the Air Force.

One of the TIC's first projects is to evaluate a new, electronic base visual information support center concept. Using existing equipment, TIC specialists are working with the Aerospace Audiovisual Service to combine computer and video capability to produce photographic and briefing materials electronically rather than chemically. Big payoffs should result in computer utilization, reduced manpower, and reduced environmental waste. ■

Air Force Logistics Command

AIR Force Logistics Command (AFLC), with headquarters at Wright-Patterson AFB, Ohio, has undertaken several initiatives, including a command-wide restructuring, with a single, ever-present goal: customer satisfaction.

As the command's 80,000 civilians and 11,500 military members buy, supply, maintain, and repair the things needed to keep the Air Force combat-ready, they are always mindful of their commitment to their customers, the operational commands (such as Strategic Air Command, Tactical Air Command, and Military Airlift Command) and some eighty-one nations.

AFLC's foremost initiative is an organizational restructuring, which is

maximizing resources while providing better logistics support to the command's customers. Department of Defense streamlining initiatives, budget reductions, projected force structure changes, and related reductions in manpower caused AFLC to look for a better way to structure its five large industrial hubs, the air logistics centers (ALCs).

The restructuring is a significant new approach to the way an ALC does business. The centers now operate through "product" and "service" directorates instead of being organized along functional lines.

AFLC's customers benefit by being able to deal directly with a specific product directorate. For example, if

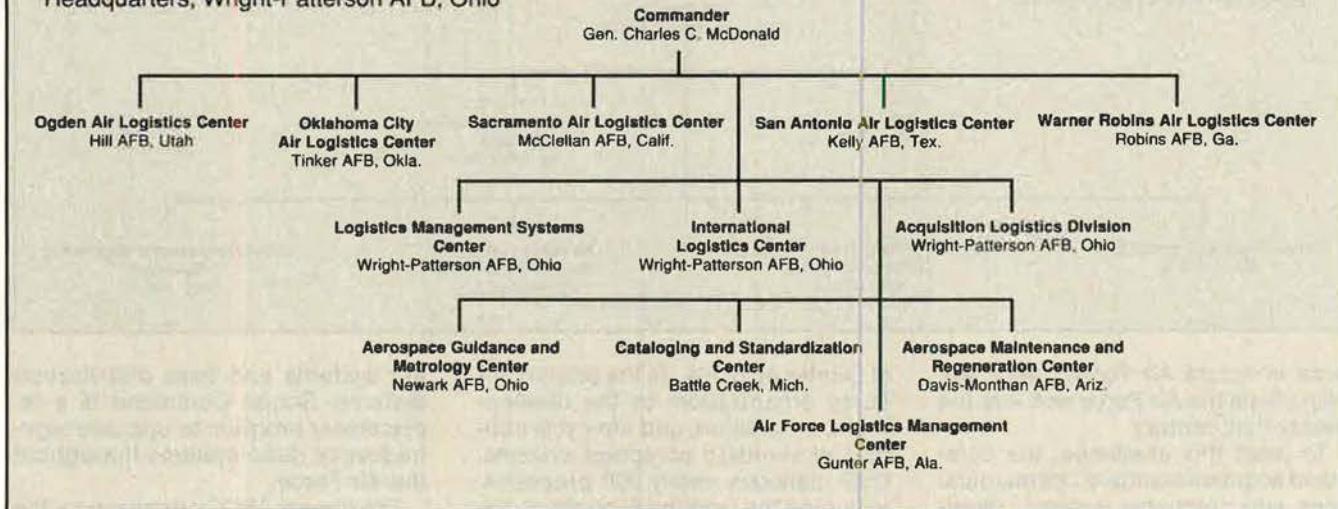
someone at SAC has a question concerning a missile, that person will deal directly with his or her counterpart in the missiles management directorate. In the past, the question might have passed through several layers of management before the customer received an answer.

The centerpiece of AFLC's reorganization is its continuing commitment to high quality. The command, which manages \$50 billion annually and has capital assets worth \$158 billion, is relying on its people, processes, and products to provide the best possible customer support.

Air Force Logistics Command and Air Force Systems Command will be integrated into a single new com-

Air Force Logistics Command

Headquarters, Wright-Patterson AFB, Ohio



mand, Air Force Materiel Command, effective July 1, 1992. The new command will be headquartered at Wright-Patterson AFB. [For more details, see "Aerospace World," March 1990 issue, p. 26.]

A direct follow-on to AFLC's quality philosophy is a more comprehensive training program for the command's 38,000 civilian specialists in aircraft and missile maintenance. This re-emphasis on training includes an analysis of occupations, recertification of workers' skills, and long-term training programs.

AFLC's customers are also benefiting from command efforts to exploit the latest computer technology. The command is in the midst of a ten-year, \$1.7 billion modernization of its com-

puter information systems. The modernization, scheduled for completion in 1994, allows AFLC to improve vastly the way it carries out its day-to-day business.

Each ALC is extending the command's philosophy of quality and commitment to customer satisfaction through a variety of initiatives that keep Air Force aircraft flying.

Warner Robins ALC, Robins AFB, Ga., is spearheading two programs to extend the service life of the C-141. One involves replacing the fleet's center wing boxes following the discovery of cracks in the center wing panels. The program will continue through 1996 and will extend the life of the C-141 to 45,000 flying hours. The second program is aimed at elim-

inating microscopic cracks around fasteners that hold wing panels together. Some 500 fastener holes on each wing will be reworked to strengthen the wing structure.

Sacramento ALC, McClellan AFB, Calif., is also helping to extend the service life of aircraft. The center uses two of the world's largest gantry robotic arms to X-ray whole aircraft. The X-ray system can detect minute cracks and early corrosion. By spotting these potential problems early, AFLC reduces the risk of accidents and lowers maintenance costs.

F-15s and F-16s will get a boost from a ten-year engine modification planned at San Antonio ALC, Kelly AFB, Tex. The center will convert the F-15's F100-PW-100 engine and the F-16's F100-PW-200 engine to a more powerful -220E model that will be less costly to maintain. Work is scheduled to begin in October, and the 2,600 engines to be upgraded are used in Air Force Reserve and Air National Guard aircraft.

AFLC customers will get more shipments of needed parts and supplies more quickly, thanks to a new cargo distribution system at Oklahoma City ALC, Tinker AFB, Okla. In terms of tonnage processed, the new system is expected to make the Tinker Aerial Port of Embarkation second only to the busy aerial port at Dover AFB, Del.

Ogden ALC, Hill AFB, Utah, improved the way it ships parts and supplies by being the first ALC to convert its main supply computer system completely to the command's Stock Control and Distribution system. SC&D is one of the command's nine modernized computer systems and gives AFLC more speed and flexibility in making sure the right part is at the right place at the right time. ■



Above, chemists at Oklahoma City Air Logistics Center clean and plate engine parts. The center is one of two Air Force Logistics Command facilities responsible for depot repair and maintenance of aircraft engines.

—USAF photo by Ken Hackman

Air Force Space Command

DURING the past year, Air Force Space Command (AFSPACECOM) gained an additional mission, acquired three more installations, and more than doubled its work force.

Established in September 1982 as the Air Force's operational command for space, AFSPACECOM now has a fourfold mission: to provide warning of a ballistic missile attack, track man-made space objects, provide command and control for military satellites, and launch Department of Defense satellites.

AFSPACECOM last October began taking over responsibility and facilities for launching DoD satellites into orbit. Its commander, Lt. Gen. Thomas S. Moorman, Jr., termed this the most significant event in the command since its formation.

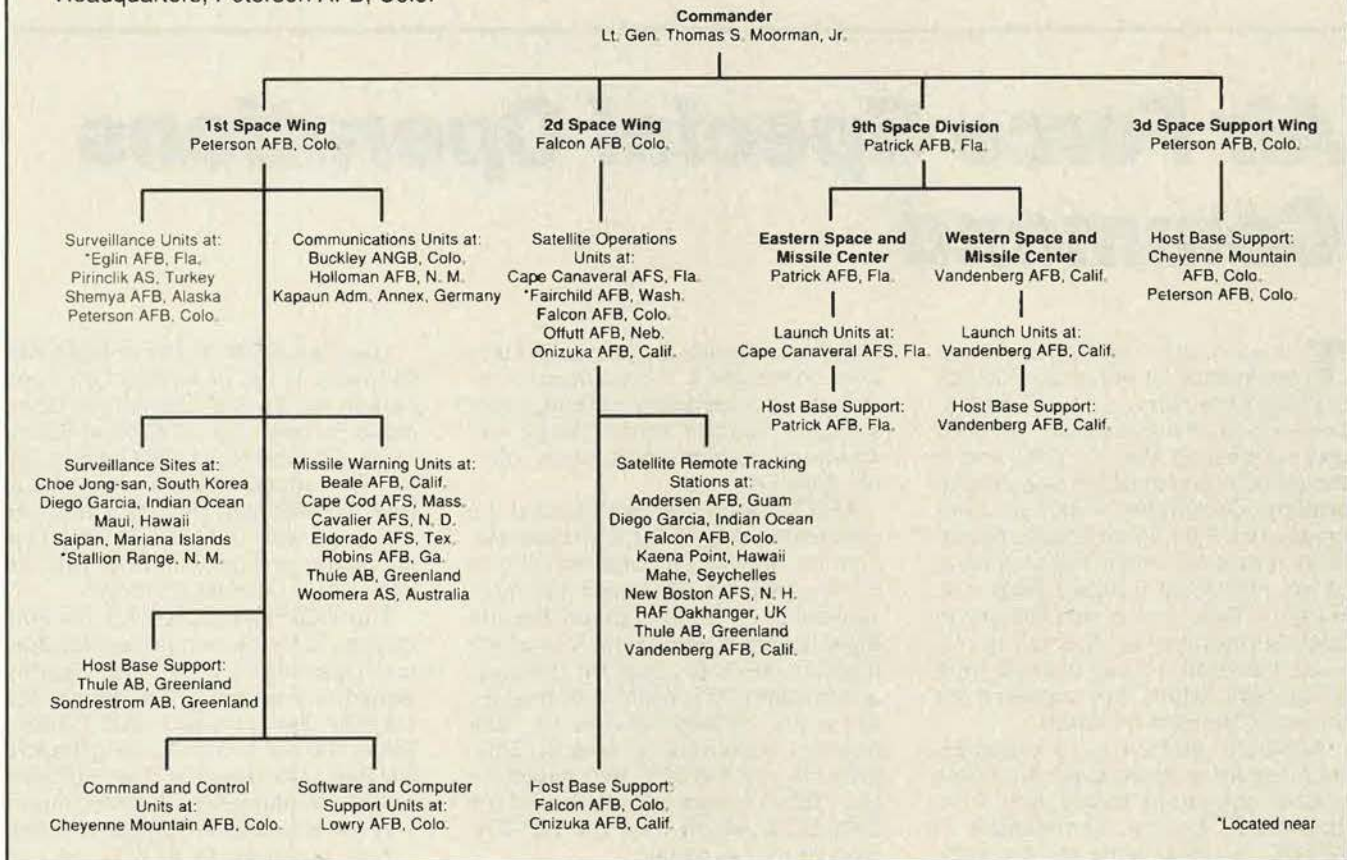
The gained resources, transferred from Air Force Systems Command, included the Eastern Space and Missile Center and Eastern Test Range,



MSgt. Eddie Lewis, Maj. Andy Kraska, and 1st Lt. Brad Houser, left to right, of Air Force Space Command's 1st Space Launch Squadron compare notes prior to Delta II launch at Cape Canaveral AFS, Fla. AFSPACECOM now has the space-launch mission.

Air Force Space Command

Headquarters, Peterson AFB, Colo.



headquartered at Patrick AFB, Fla., and the Western Space and Missile Center and Western Test Range at Vandenberg AFB, Calif., as well as Patrick AFB and Cape Canaveral AFS.

At the same time, Air Force Space Command established three new organizations: the 9th Space Division at Patrick to oversee launch operations on both the east and west coasts, the 1st Space Launch Squadron at Patrick to operate the Delta II booster, and the 2d Space Launch Squadron, which uses the Atlas E booster at Vandenberg AFB. Vandenberg was transferred from Strategic Air Command, becoming part of AFSPACECOM in January 1991.

The launch transfer process will continue over several years. Atlas II and Titan operations on both coasts will become AFSPACECOM responsibilities as those systems reach full operational status. As newer, more sophisticated systems are developed, they too will be transferred to AFSPACECOM as they become operational.

AFSPACECOM now employs 15,850 Air Force military and civilian men and women, plus some 14,250 contractor personnel. They operate ballistic missile warning, space surveillance, satellite control, space-launch, and communications sites around the world.

A global network of missile warning

and space surveillance sensors is operated by the 1st Space Wing, headquartered at Peterson AFB, Colo. It includes phased-array radars, the Defense Support Program satellite system, optical sensors, and some mechanical radars. These assets are designed to provide tactical warning and attack assessment of sea-launched and intercontinental ballistic missile attacks and to track man-made objects in space.

The ballistic missile warning sensors, whose data are relayed to command centers at AFSPACECOM's Cheyenne Mountain AFB, Colo., would provide the first indication of an attack aimed at North America.

The 1st Space Wing also operates the space-surveillance system for launch detection, tracking, and cataloging of space objects.

Headquartered at Falcon AFB, Colo., the 2d Space Wing provides command and control from its Space Operations Center at Falcon and various locations around the world for more than seventy DoD satellites orbiting the Earth. The wing also manages the Air Force Satellite Control Network, which has nine tracking stations around the world to track, command, and receive data from orbiting satellites. Satellites supported by the 2d Space Wing provide navigation, weather, and communications infor-

mation to military forces worldwide.

The 3d Space Support Wing is the host wing for both Peterson and Cheyenne Mountain AFBs. It provides operating support to the Peterson Complex, which includes the headquarters of North American Aerospace Defense Command, United States Space Command, Air Force Space Command, Army Space Command, and the 1st Space Wing.

The 9th Space Division at Patrick AFB is the only intermediate headquarters in AFSPACECOM and the only division-level organization in the Air Force dedicated solely to space operations.

Its Eastern Space and Missile Center provides launch and tracking facilities for a wide variety of users. In addition to launch operations and management for DoD space programs, the center provides launch and tracking facilities for NASA, foreign governments, the European Space Agency, and various private contractors. The center also operates Patrick AFB and Cape Canaveral AFS.

The Western Space and Missile Center conducts polar-orbiting space launches and supports research and development tests for DoD's, the Air Force's, and NASA's space, ballistic missile, and aeronautical systems. The center also operates Vandenberg AFB. ■

Air Force Special Operations Command

THE MOTTO of the Air Force's newest command, Air Force Special Operations Command, is "Air Commandos—Quiet Professionals." AFSOC was established May 22, 1990, and is the air component of US Special Operations Command, a unified command. All US Air Force special operations forces are under the command of Hq. AFSOC at Hurlburt Field, Fla. Hurlburt Field has a rich history in special operations. Special operations personnel have trained here since 1942, when they prepared for the Doolittle Raid on Tokyo.

AFSOC's mission is to organize, train, equip, and educate Air Force special operations forces. Maj. Gen. Thomas E. Eggers, commander of AFSOC, is responsible for the com-

mand's worldwide support to the unified commands. This support includes unconventional warfare, direct actions, special reconnaissance, counterterrorism, and foreign internal defense.

AFSOC wings have epitomized the composite wing concept for decades. The 1st Special Operations Wing at Hurlburt Field is the oldest and most seasoned. Its units include the 8th Special Operations Squadron, which flies the AC-130H Spectre gunship, and the 20th SOS, which flies the MH-53J and H helicopters. The 1st SOW has two squadrons at nearby Eglin AFB, Fla.: the 9th SOS, which flies the HC-130N/P Combat Shadow, and the 55th SOS, which flies the MH-53G Pave Hawk helicopter.

The 39th SOW at Rhein-Main AB, Germany, is the designated air component for Special Operations Command Europe. The 7th SOS, at Rhein-Main, flies the MC-130E Combat Talon. Two squadrons are stationed at RAF Woodbridge, UK: the 21st SOS, equipped with the MH-53J Pave Low helicopter, and the 67th SOS, with the HC-130N/P Combat Shadow.

The 353d SOW at Clark AB, the Philippines, is the air component for Special Operations Command Pacific. Squadrons assigned to Clark are the 1st SOS, flying the MC-130E Combat Talon, and the 31st SOS, flying the MH-53J Pave Low helicopter. The 17th SOS, based at Kadena AB, Okinawa, Japan, flies the HC-130N/P Combat Shadow.

Also assigned to AFSOC are the

Air Force Special Operations Command

Headquarters, Hurlburt Field, Fla.



USAF Special Operations School, the 1720th Special Tactics Group, and the Special Operational Test and Evaluation Center.

The USAF Special Operations School educates personnel from the four services and the Coast Guard, governmental agencies, and allied nations. Subjects covered in the school's thirteen courses range from regional affairs and cross-cultural communications to antiterrorism awareness, revolutionary warfare, and psychological operations.

The 1720th Special Tactics Group has units strategically located in the US, Europe, and the Pacific. The group comprises special operations combat control teams and pararescue forces. Their mission includes air traffic control, tactical communications equipment to control drop zones, forward air guide service, and navigational aids and target designa-



Above, a gunner operates a 7.62-mm Minigun in the aft section of an Air Force Special Operations Command MH-53 aircraft. AFSOC was established one year ago at Hurlburt Field, Fla., as the air component of US Special Operations Command.

tion equipment for close air support strike aircraft and gunship missions.

The Special Missions Operational Test and Evaluation Center provides expertise to improve the capabilities of special operations and combat rescue forces worldwide. Testing includes operational and maintenance suitability factors. Many of these tests are joint command and joint service projects.

Two component forces are gained by AFSOC: the 919th Special Operations Group (AFRES) at Duke Field, Fla., flying the AC-130 Spectre, and its subordinate unit, the 71st SOS at Davis-Monthan AFB, Ariz.; and the 193d SOG (ANG) at Harrisburg Airport, Pa., flying the EC-130E Volant Solo. ■

Air Force Systems Command

HEADQUARTERED at Andrews AFB, Md., Air Force Systems Command (AFSC) made major changes in its operations, improving the technology development and acquisition support that keeps the US Air Force number one in the world.

AFSC's stewardship of peacetime investment in research and technology is fulfilling the Air Force's "Global Reach, Global Power" philosophy in the Persian Gulf. Command, control, communications, and intelligence (C³I) technologies developed by AFSC were contributing in-theater within the first few days of Operation Desert Shield.

Tactical digital facsimile machines provided consistently high-quality imagery products to deployed units. The first two airborne battlefield command and control centers were deployed along with AWACS upgrades and Joint STARS, furnishing valuable real-time data on air and ground targets.

As in Operation Just Cause, space assets became a critical element of defense capabilities in terms of weather monitoring, navigation aids, communications, and surveillance. The AFSC-developed Navstar Global Positioning System gave US ground forces precise time, velocity, and position determinations. Precision tar-



—Photo by J. Gaffney

Air Force Systems Command's Flight Test Center at Edwards AFB, Calif., flies all manner of aircraft, such as this A-7D on the ramp. AFSC and Air Force Logistics Command will merge to form Air Force Materiel Command. The new command is scheduled to be established on July 1, 1992, at Wright-Patterson AFB, Ohio.

geting and stealth technology were ably demonstrated by the F-117A.

Continuing to provide technological innovation in step with a rapidly changing world and Air Force, AFSC has streamlined, modified, and improved its acquisition processes.

The command successfully transferred space-launch operations to Air Force Space Command, transferred contract management responsibilities to the Defense Logistics Agency, streamlined its product divisions from six to four, and moved from management of major weapon systems to providing support to the newly created Program Executive Officers.

AFSC also restructured its laboratories from fourteen independent centers of expertise to four integrated "superlabs," implemented a vision for science and technology for the Air Force into the next century, and began a major reduction in its headquarters and acquisition work force of approximately 9,300 officers, 12,600 enlisted personnel, and 25,000 civilians.

The next step in the command's evolution is to bring logistics into the equation. AFSC's acquisition functions are being integrated with the logistics operations of Air Force Logistics Command (AFLC) into an entirely new organization, to be established officially July 1, 1992. Air Force Materiel Command (AFMC) will combine AFSC's expertise in science, technology, research, development, and testing with AFLC's expertise in life-cycle acquisition and supportability to cre-





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2 Enhanced Dynamics. Other hand-held GPS systems lose lock on the GPS signal when they're moved. And that can result in inaccurate position measurements. The TRIMPACK's new three-channel design, working with its second-generation software, keeps it locked-on and tracking at speeds up to 600 knots, even under severe accelerations. You get precise position and velocity fixes once a second. Every second. No excuses.



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Max range	760 NM



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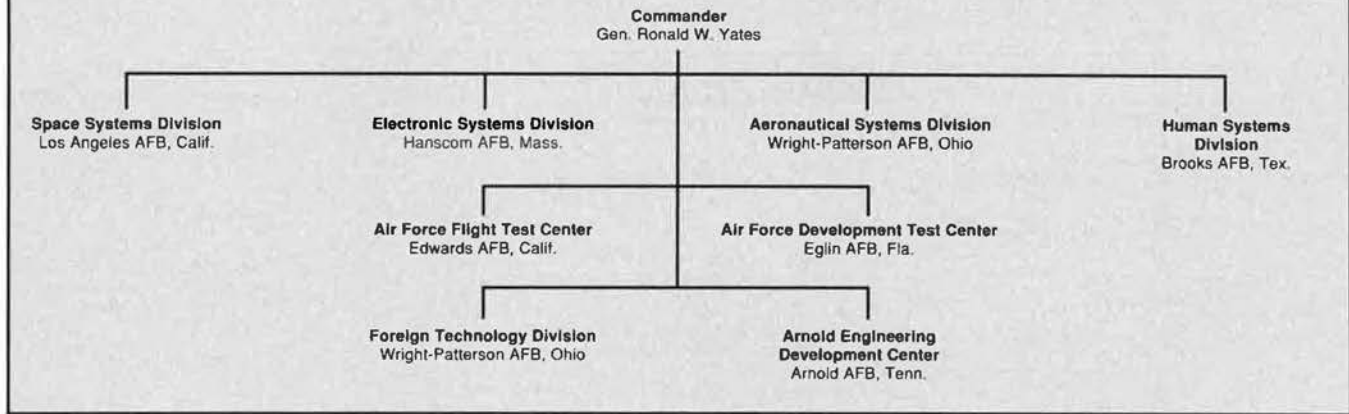
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Air Force Systems Command

Headquarters, Andrews AFB, Md.



ate one organization for weapon systems management.

The new command will enable the Air Force to field a modern, high-quality force while giving operational commands a single point of contact for everything from new requirements to readiness and sustainability. Using the combined knowledge of both functional and mission requirements,

strengths from both commands are being molded into a new, integrated, functional structure tailored to support the AFMC mission.

An integrated weapon systems management process is also being created to incorporate logistics early in the research and development planning cycle. This "cradle to grave" philosophy will enhance support to

the operational commands and eliminate confusion about where system development and production ends and logistics support begins.

Built and thriving upon change, Air Force Systems Command remains committed to satisfying customer needs, maintaining acquisition excellence, and enhancing technological superiority. ■

Air Training Command

THE missions of Air Training Command (ATC) are to recruit, train, and commission the men and women of the US Air Force. ATC accomplishes its missions through selective recruiting, initial military training, comprehensive technical training, and flying training.

The Air Force Recruiting Service continued to recruit high-quality people in 1990. Ninety-nine percent of the more than 36,000 active-duty enlistees held high school diplomas. Recruiting Service brought in 273 physicians in FY 1990, which is the highest number since the draft ended.

ATC provided initial military training for more than 45,800 men and women. The "Gateway to the Air Force," Lackland AFB, Tex., graduated more than 43,000 active-duty, Guard, and Reserve enlistees from Basic Military Training in FY 1990. ATC commissioned more than 2,800 officers through the 149 Air Force ROTC units nationwide and the Officer Training School at Lackland.

ATC provides the formal technical training needed to accomplish the Air Force's mission. Each year ATC trains approximately 270,000 people in more than 2,000 courses covering some 300 technical specialties. ATC's six technical training centers, the 3588th Flight Training Squadron, the survival schools of the 3636th Combat Crew Training Wing, and the ninety detachments of the 3785th Field Training Wing around the world constitute one of the largest technical training systems in existence.

The command works with other military services through the Interservice Training Review Organization (ITRO) to increase training efficiency through joint training opportunities. Current side-by-side training areas available to soldiers, sailors, Marines, and airmen include intelligence, law enforcement, and fire fighting. Additional opportunities are being explored.

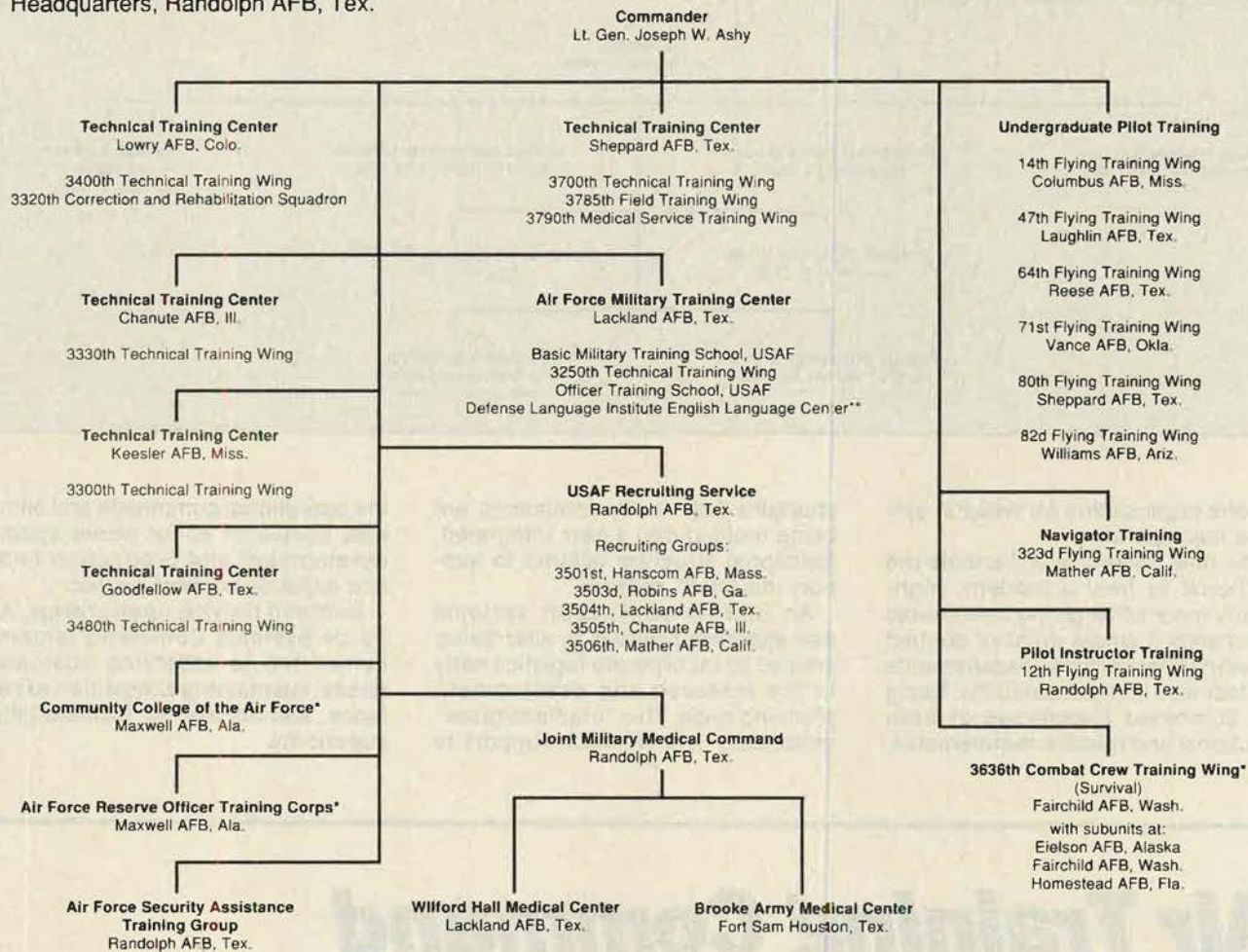
ATC's flying training programs graduated more than 1,900 fixed-wing and rotary-wing pilots and 690

navigators from undergraduate flying training in 1990. The Euro-NATO Joint Jet Pilot Training Program at Sheppard AFB, Tex., trained approximately 130 foreign military pilots last year. ATC's Aviation Leadership Program also offers T-37 training to Latin American pilots and other international student pilots.

The Department of Defense Trainer Master Plan developed by ATC is the roadmap for Air Force pilot training requirements into the twenty-first century. Beginning in early 1992, ATC will implement Specialized Undergraduate Pilot Training (SUPT), which will tailor pilot training to the operational aircraft that students will fly after graduation. SUPT will include a common core of fundamental flying training in the T-37, followed by specialized training in either of two tracks: Tanker-Transport, which will be performed in the T-1A Jayhawk, and Bomber-Fighter, in the T-38. The new T-1A Jayhawk will provide students with training in areas unique to flight-deck-configured aircraft.

Air Training Command

Headquarters, Randolph AFB, Tex.



*Tenant unit
**DoD Executive Agent

—USAF photo by SMSgt. Bob Wickley



Capt. Karen Smith, an instructor with Air Training Command's 452d Flying Training Squadron at Mather AFB, Calif., teaches navigator trainees how to use the stars. Each year, ATC trains approximately 270,000 students in more than 2,000 courses covering some 300 technical specialties.

Reese AFB, Tex., is scheduled to receive the first T-1A Jayhawk late this year.

ATC is the only command to have nearly all its aircraft maintenance accomplished by civilians. All aircraft maintenance functions, excluding T-37 and T-38 maintenance at Randolph AFB, Tex., are performed by civilian contractors or by Air Force civil service employees. Last year, maintenance people helped ATC fly nearly 522,000 sorties and more than 644,000 flying hours.

ATC is also responsible for a number of other missions, including medical services, security assistance

training, and the Community College of the Air Force (CCAF).

More than 12,700 physicians, nurses, dentists, technicians, and other health professionals completed medical courses at the 3970th Medical Services Training Wing or at technical training centers last year. ATC has the two largest medical centers in the Air Force, providing ninety-five percent of the Air Force's graduate dental education, eighty-one percent of its enlisted medical training, and sixty percent of its graduate medical education.

As the executive agent for the Air Force's security assistance training,

ATC manages the language, technical, and flying training of some 5,000 international students from more than 100 countries. Last year, more than 1,700 international students, both military and civilian, graduated from the Defense Language Institute's English Language Center at Lackland AFB.

CCAF integrates on-duty technical education with off-duty education at civilian institutions, leading to a two-year associate's degree in applied science. Beginning this year, ATC will automatically enroll all airmen in CCAF upon their graduation from Basic Military Training. ■

Air University

AIR University (AU), with headquarters at Maxwell AFB, Ala., is responsible for providing professional military education (PME) and degree-granting professional continuing education (PCE) for officers, NCOs, and DoD civilians.

Nearly 2,800 military and 1,800 civilian personnel are permanently assigned to AU. Close to 25,000 military and civilian students completed resident AU classes last year, and thousands more completed courses through nonresident programs. All AU schools operate under the Air Force's education philosophy, "The right PME at the right time with the right focus."

The Air War College (AWC), located at Maxwell AFB, is the Air Force's premier PME school. Its mission is to enhance the Air Force's warfighting capability by emphasizing the unique skills, perspectives, knowledge, and analytical thinking required of senior officers through a curriculum emphasizing joint and combined operations. The school's Air University National Security Briefing Team gave more than 300 presentations in twenty states during 1990, its eighth year of operation.

Air Command and Staff College (ACSC) at Maxwell provides intermediate professional military education. Its mission is to broaden the knowledge and increase the professional qualifications of future commanders and staff officers, with an emphasis on combat and combat-support operations. The school has incorporated joint-service specialties into its curriculum and emphasizes the employ-



Air University students tackle a field problem under time pressure in Project X, part of the Squadron Officer School field leadership program. Nearly 25,000 military and civilian students completed resident AU courses last year at Maxwell AFB, Ala.

ment of aerospace forces in joint operations.

At Squadron Officer School (SOS), captains build the foundations for their careers in leadership, officership, communicative skills, and force employment. SOS emphasizes individual leadership and teamwork. Officers develop skills, techniques, and attitudes to serve as better leaders and mid-level supervisors.

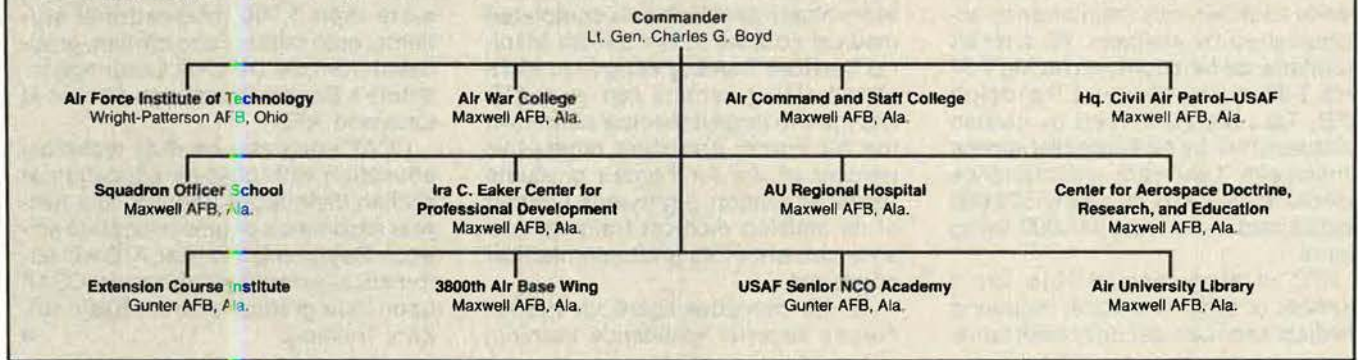
The Senior Noncommissioned Officer Academy, located at Gunter AFB, Ala., is the capstone of enlisted PME. Its curriculum focuses on leadership and management, commu-

nicative skills, and military studies. The academy conducts six seven-week courses each year, with 250 students in each class, for an annual enrollment of 1,500. The number of students will increase to 2,000 next year and to 3,000 in 1993.

The Ira C. Eaker Center for Professional Development at Maxwell provides professional continuing education through eight schools with sixty-two courses of study. Last year, approximately 5,000 students graduated from such courses as academic instructor, international officer, comptroller, judge advocate, chaplain,

Air University

Headquarters, Maxwell AFB, Ala.



technology management, manpower and personnel management, and commander professional development. The center also provides resource material for Air Force chapel programs worldwide through the USAF Chaplain Service Resource Board.

The Center for Aerospace Doctrine, Research, and Education (CADRE) at Maxwell conducts several courses, including the Joint Flag Officer Warfighting Course, the Combined Air Warfare Course, and the Contingency Wartime Planning Course, designed to provide students with unique, operational, combat-oriented experiences to enhance their understanding of wartime operations in a joint context. The Air Force Wargaming Center supports Air Force PME, Joint PME, and operational wargaming while serving as the focal point for USAF wargaming efforts. The Airpower Research Institute publishes *Airpower Journal*, performs research

on the employment of airpower, and develops USAF doctrine. The AU Press supports the research, writing, and PME missions of the service. CADRE also directs the newly established School of Advanced Airpower Studies.

The Air Force Institute of Technology (AFIT) at Wright-Patterson AFB, Ohio, provides graduate-level education in support of Air Force and DoD requirements by providing accredited resident degree and PCE programs in its School of Engineering and Services and its School of Systems and Logistics. AFIT saves the government approximately \$29 million a year through student and faculty research projects.

The Extension Course Institute at Gunter is the center for the Air Force's distance education programs. It serves more than 263,000 students enrolled in career development, specialized, and professional military education courses.

The Air University Library at Maxwell is the most comprehensive library devoted to military science and research in the Western world. It has upgraded and extended automated access to its 2.5 million books, documents, newspapers, periodicals, and microforms. The Integrated Library System, which provides access to all books and most documents, became available to remote dial-in customers during the past year.

Also active under the AU umbrella is Headquarters Civil Air Patrol-USAF (CAP-USAF), the Air Force organization that advises and assists the Civil Air Patrol with its primary missions of emergency services and aerospace education and with a youth cadet program. For the past five years, the US Customs Service, Drug Enforcement Agency, and US Forest Service have used Civil Air Patrol aircraft and aircrews to support the antidrug effort through passive, aerial reconnaissance. ■

Electronic Security Command

ELECTRONIC Security Command (ESC) is an Air Force major command with headquarters at Kelly AFB, Tex. ESC has an all-source intelligence function and provides electronic combat support and operations security (OPSEC) support to Air Force units.

ESC units provide rapid radio relay, computer security (COMPUSEC), communications security (COMSEC), and command, control, and communications countermeasures (C³CM) support to US and allied forces worldwide.

The command plays an important role in developing Air Force electronic combat (EC) and C³CM capabilities, techniques, and systems. By providing C³CM training to operational support elements during exercises, the command helps prepare the Air Force for combat operations in hostile electromagnetic environments. To help combat commanders satisfy their C³CM requirements, ESC develops, maintains, updates, and disseminates the Air Force C³CM support database, Constant Web.

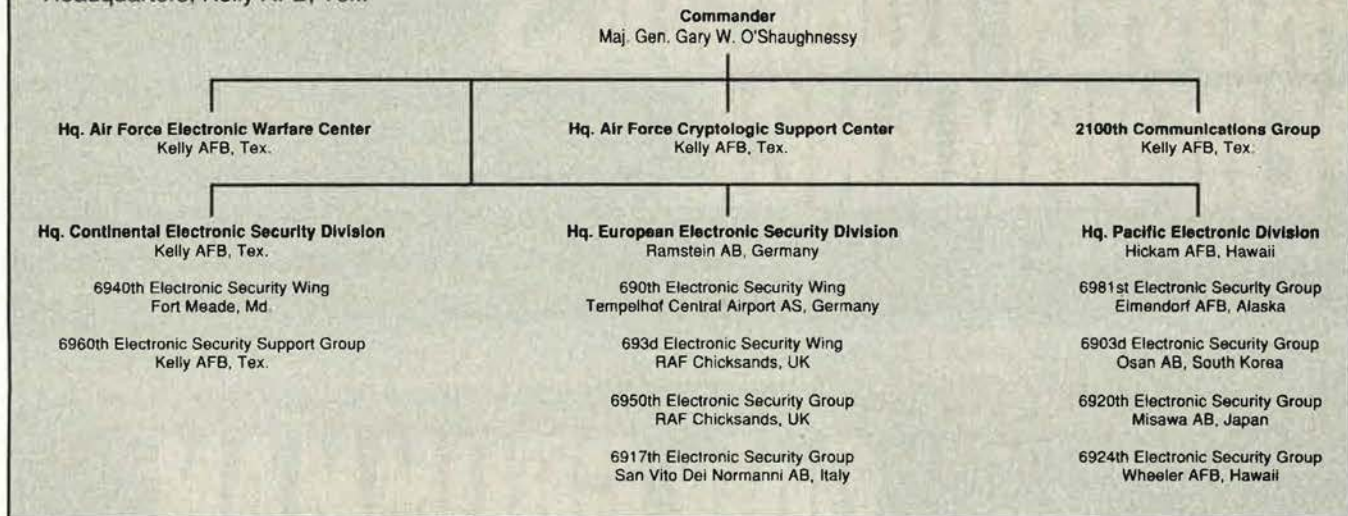
To fulfill mission requirements, ESC

formulates all-source intelligence systems to ensure connectivity with national databases. The command also provides database support and services to the multiservice Joint Electronic Warfare Center, which is collocated with Hq. ESC. As part of the all-source intelligence function, the command prepares threat assessments to support Air Force and ESC mission systems and develops and disseminates unique information on the tactics and capabilities of potential adversaries.

Closely supporting the efforts of

Electronic Security Command

Headquarters, Kelly AFB, Tex.



ESC field units are the Air Force Electronic Warfare Center (AFEWC) and the Air Force Cryptologic Support Center (AFCSC).

The AFEWC is a primary source of EC and C³CM analysis. The massive EC-related databases maintained by the AFEWC assist strategic and tactical commanders in making combat decisions. The center also performs analyses to support the planning, development, testing, acquisition, and use of EC equipment.

The AFCSC is responsible for the Air Force's communications and computer systems security programs, including COMSEC and emanations security. The center provides analytical and engineering services in support of these programs to Air Force activities worldwide. It manages and accounts for cryptologic devices, codes, call signs, and documents that protect Air Force communications and computer systems and performs depot-level maintenance and life-cycle support of cryptologic equipment and systems.

The AFCSC is also the executive agent for the Air Force's operations security program, with the responsibility of strengthening and supporting the OPSEC program for the entire Air Force.

ESC is dedicated to supporting other Air Force commands, sister services, Department of Defense agencies, and allied military forces in accomplishing their missions.

Combat elements depend heavily on ESC support during exercises and real-world operations. ESC forces

participate as adversaries in more than 100 exercises annually around the world, including Red Flag, Green Flag, Team Spirit, Reforger, Global Shield, Bright Star, and Cope Thunder. To train aircrews, ESC personnel disrupt transmissions and issue false information to determine whether information of value is being exposed.

Looking toward the twenty-first century, plans for ESC's missions will address such changes as technology, arms control and treaty monitoring, troop reductions, diminishing overseas access, and the changing di-

mensions of the threat. ESC will develop methods and forums to demonstrate its intelligence, security, and electronic combat missions and enhance its ability to provide the full range of vulnerability services to the Air Force operations. The command will explore ways to expand its involvement in space operations and to prepare for its potential role in the counternarcotics war. In achieving these goals, ESC will continue to adapt to the changing world, living up to its motto, "Freedom Through Vigilance." ■



A direction-finding operator with the 6917th Electronic Security Group at San Vito Dei Normanni AB, Italy, homes in on radio signals received by the unit. Electronic Security Command provides USAF units with communications and computer security and plays a major role in developing electronic combat systems and techniques.

—USAF photo by MSgt. Tyra Ohlenkamp

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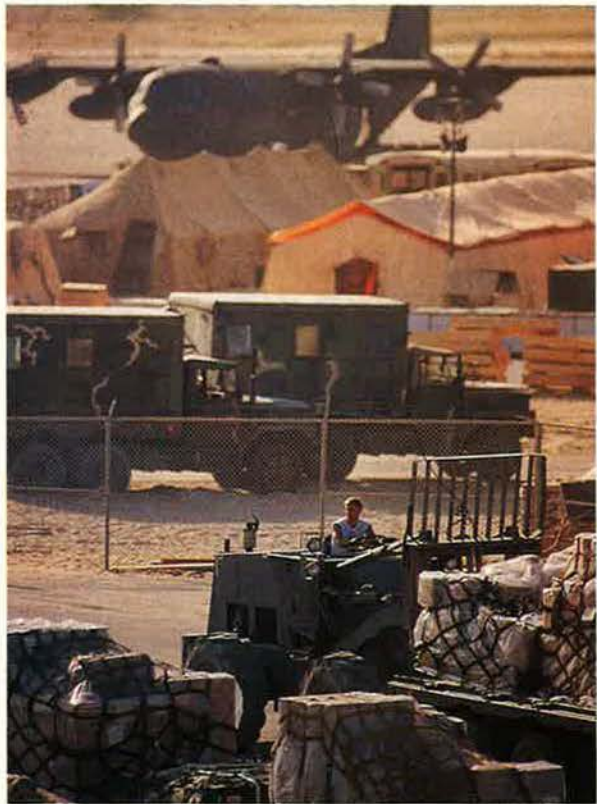
Military Airlift Command

MILITARY Airlift Command (MAC) crews and their support people will long remember 1990 for the role they played in two of the most difficult and demanding military transportation operations of all time.

At the start of Operation Just Cause, which began in December 1989 and continued into early 1990, the command airlifted 9,500 soldiers to Panama and in just thirty-six hours completed the largest combat air drop since the D-Day invasion in 1944. However, this was just a warm-up for the tasks required eight months later.

During the first few weeks of Operation Desert Shield, almost everything arriving in the Persian Gulf region got there via a 7,000-mile airbridge from the United States. Never before had any nation airlifted so many tons over so many miles as MAC did during the first two months of Desert Shield. At the peak of the operation, more than 100 aircraft a day, including active-duty, Air Force Reserve, and Air National Guard aircraft and commercial charters, were arriving in the Persian Gulf region. By the end of 1990, the command had flown more than

A Military Airlift Command C-130 delivers the goods to the faraway combat zone. In the first weeks of Operation Desert Shield, MAC airlifters logged seventy trips a day, totaling more than 1,500 tons of cargo and 2,000-plus passengers, over the 7,000 miles from the US to Persian Gulf environs.



—USAF photo by MSGt. Kit Thompson



8,000 missions, airlifting more than 544,000,000 pounds of cargo and more than 252,000 passengers to the region in support of Desert Shield.

MAC's global missions are accomplished through an airlift system comprising some 78,000 people and 800 aircraft at more than 300 locations in twenty-five countries. The command relies heavily on Air National Guard and Air Force Reserve forces, which add an additional 68,000 people and 400 aircraft to the active MAC forces.

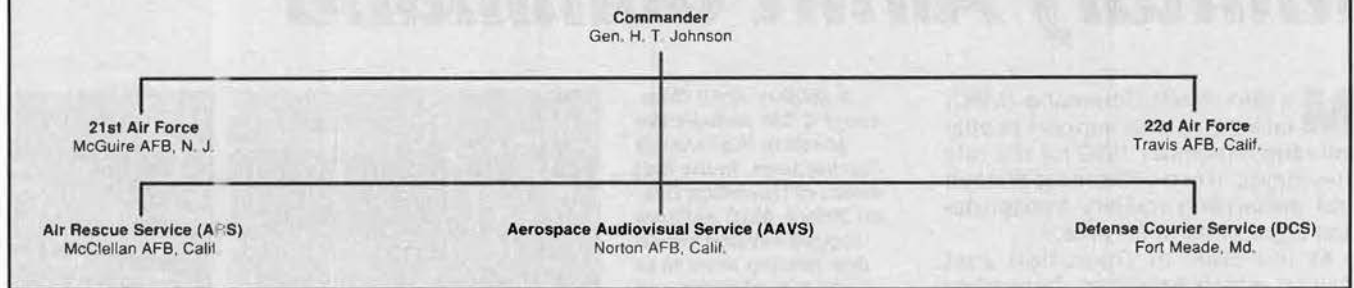
To support its worldwide commitments, MAC operates thirteen bases in the US and controls facilities at Lajes Field in the Azores and at Rhein-Main AB, Germany. The command has assets valued at more than \$32 billion and an annual operating budget of \$3.3 billion.

MAC is the Air Force component of US Transportation Command, and Gen. H. T. Johnson serves as commander in chief of both organizations, with headquarters at Scott AFB, Ill.

The command provides a number of specialized services that support Air Force and DoD operations. The Air

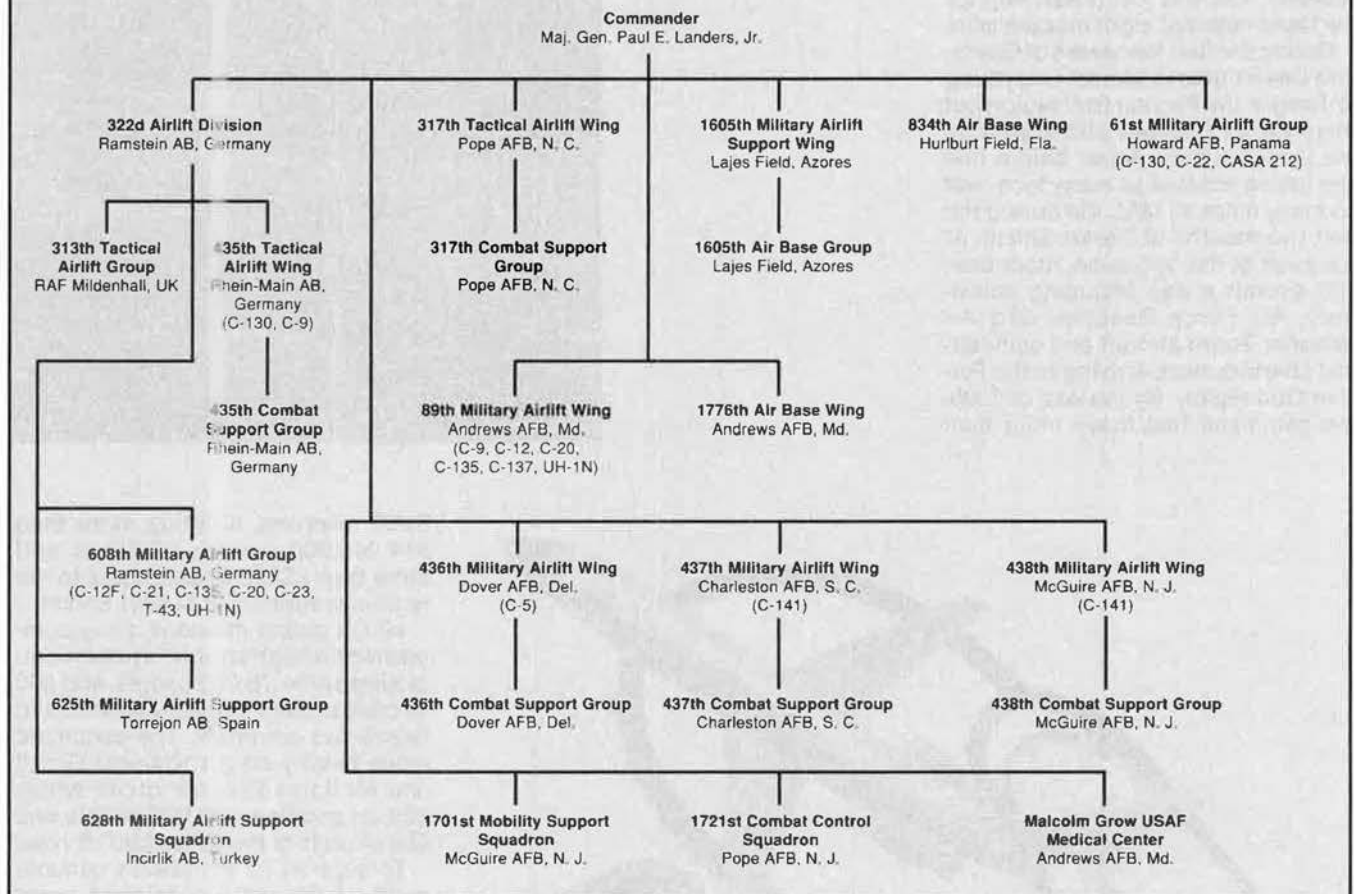
Military Airlift Command

Headquarters, Scott AFB, Ill.



21st Air Force (MAC)

Headquarters, McGuire AFB, N. J.



Rescue Service provides worldwide combat rescue forces and humanitarian assistance when called on by civilian agencies. The Aerospace Audiovisual Service is the Air Force's single manager for combat, operational, and technical audiovisual documentation. The Defense Courier Service transports and escorts time-sensitive, highly classified, national security material worldwide.

Another vital MAC mission, aeromedical airlift, was realigned during the past year. Medevac units were

placed under the control of their host wings. Highly trained medical technicians, flight nurses, and aircrews moved nearly 80,000 DoD patients on some 4,500 C-9, C-141, and C-130 missions during 1990. These figures include patients from both Just Cause and Desert Shield, as well as routine and emergency transport.

The Civil Reserve Air Fleet (CRAF) is a partnership between MAC and US commercial air carriers, providing more than 500 passenger and cargo aircraft for military missions. CRAF

aircraft augment MAC capabilities on a daily basis by flying contract missions to move DoD cargo and personnel. During contingencies or wartime, this peacetime airlift augmentation can be expanded through activation of the CRAF. During Operation Desert Shield, General Johnson activated the first stage of the CRAF for the first time. In this stage, sixteen civilian carriers provide up to thirty-eight aircraft. At year's end these carriers were still supporting operations in the Persian Gulf.



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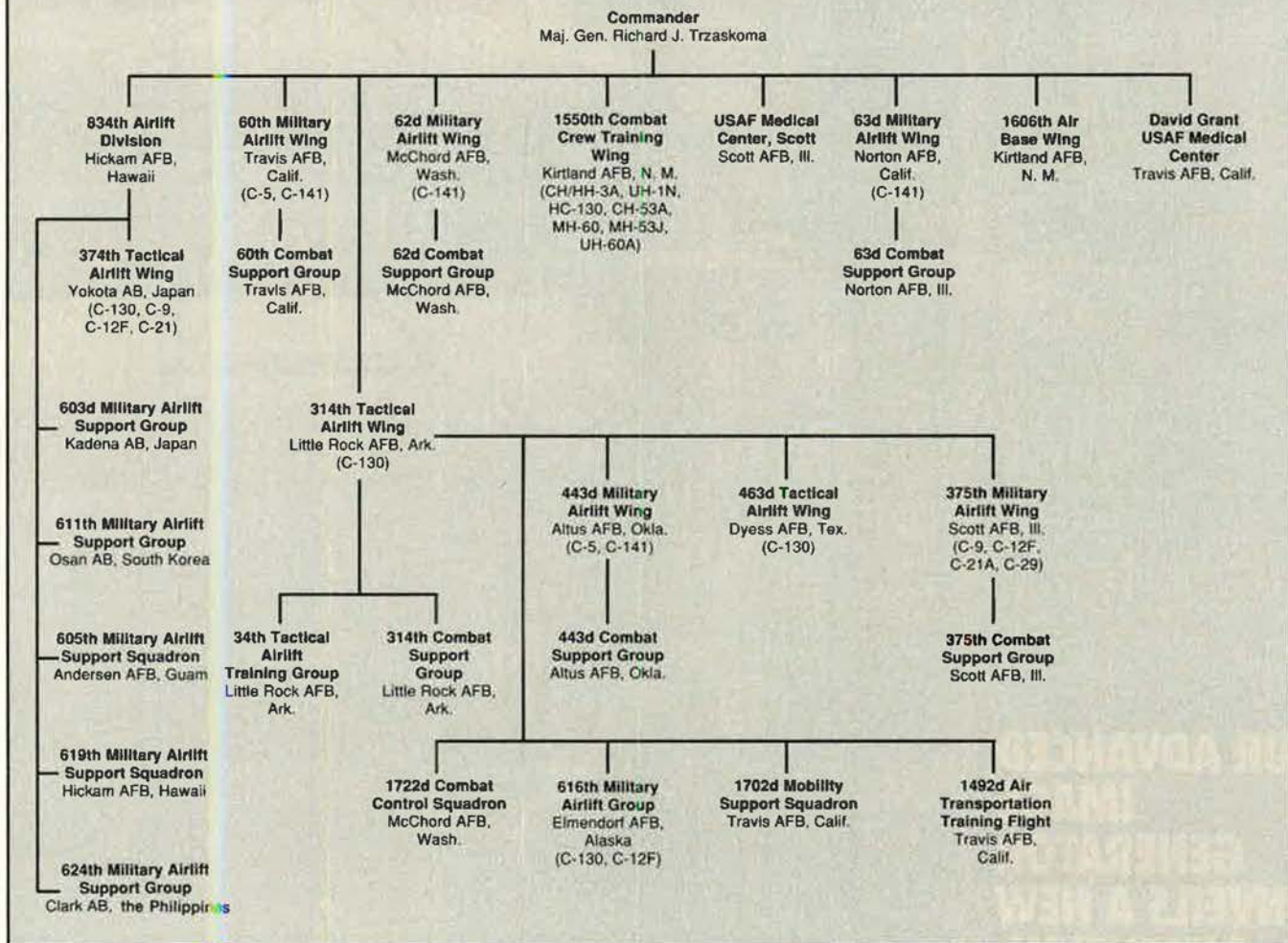
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Tel: 801-582-5847, Ext. 6521,
Fax: 801-582-5848

22d Air Force (MAC)

Headquarters, Travis AFB, Calif.



—USAF photo by SrA. Michael Eyer



Above, MAC's mammoth C-5 airlifters stand ready at Rhein-Main AB, Germany, to transport heavy equipment to the Middle East during Operation Desert Shield. Besides controlling facilities at Rhein-Main and at Lajes Field in the Azores, MAC operates thirteen bases in the US. MAC's airlift system is sustained by 800 aircraft at more than 300 locations in twenty-five nations.

A new aircraft, the C-17, scheduled to replace the aging C-141 StarLifter, is now in production at the McDonnell Douglas plant in Long Beach, Calif. First flight is scheduled for June 1991, and the first operational model is scheduled to be delivered to Charleston AFB, S. C., in 1992.

The C-17's ability to deliver outsize cargo directly to forward areas in both airland and airdrop roles will significantly increase the command's airlift flexibility. Present plans call for MAC to receive 120 C-17s.

While airlift crews were busy carrying out the command's operational taskings, MAC's headquarters staff was busy with plans to restructure the command. This will streamline management and reduce headquarters staff by some thirty-nine percent over the next four years. Under the new structure, several staff agencies are being combined and the MAC Inspector General function is being redesignated as the Deputy Chief of Staff, Quality Support and Readiness. ■

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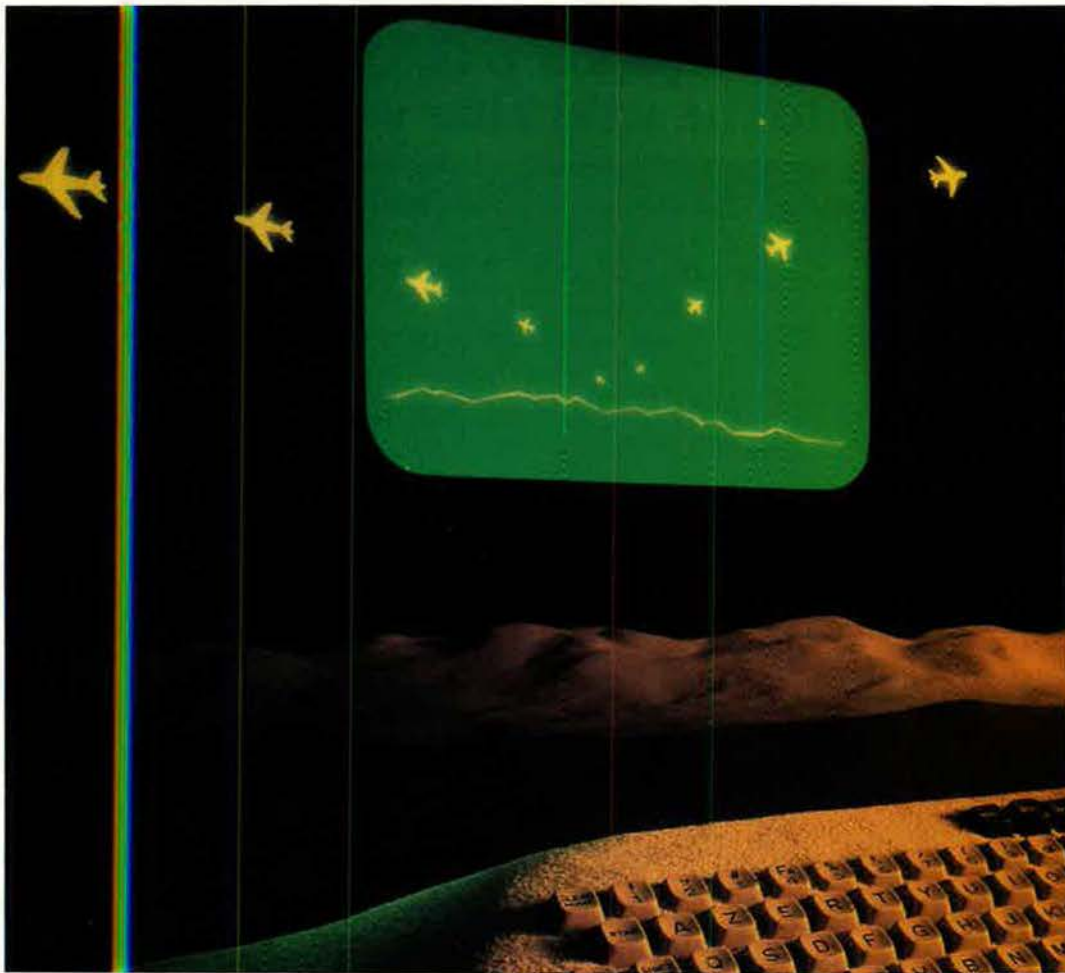
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Pacific Air Forces

WITH headquarters at Hickam AFB, Hawaii, Pacific Air Forces (PACAF) is the principal air arm of US Pacific Command. PACAF's primary mission is to plan, conduct, and coordinate offensive and defensive air operations in an area extending from the west coast of the Americas to the east coast of Africa and from the Arctic to the Antarctic.

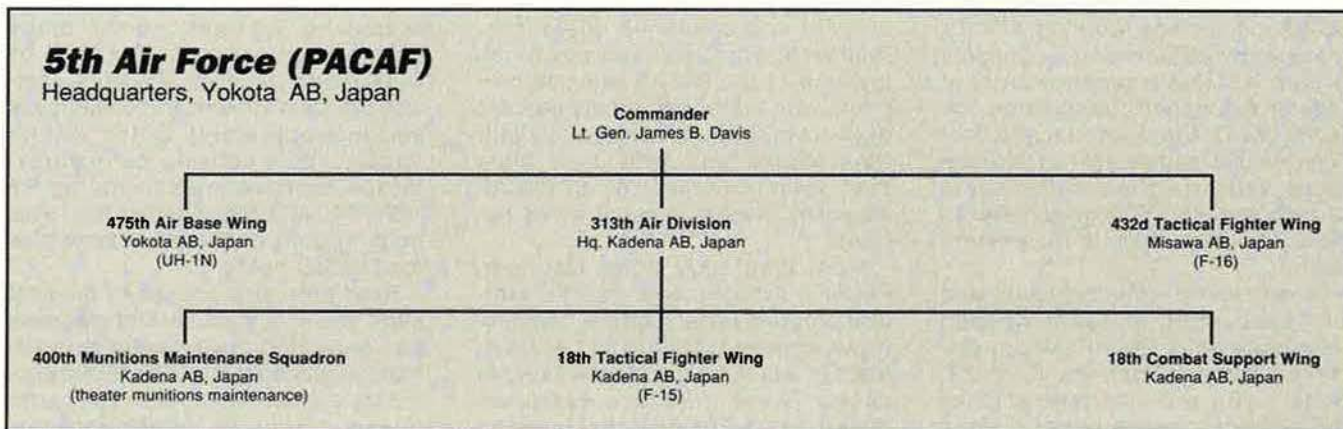
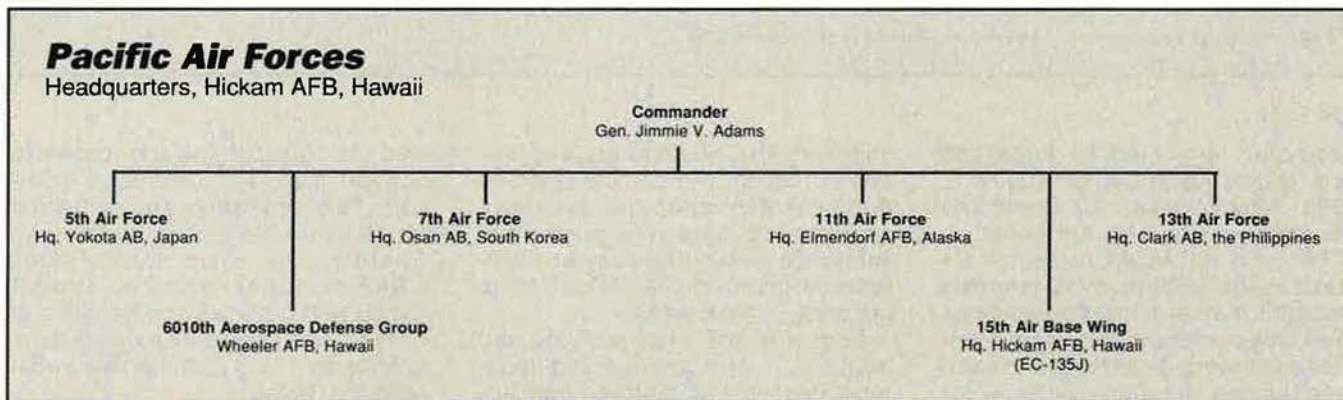
To maintain security in the vast Pacific region, PACAF has approximately 300 aircraft, including air-superiority F-15C/Ds, multirole F-16s, OA-10s, and air surveillance E-3s. F-15Es will be based in the theater soon. Aircraft from MAC and SAC provide crucial support.

The commander in chief of Pacific Air Forces commands nearly 51,000 Air Force military and civilian people in the Pacific. Along with some 40,000 family members, this force is distributed among twelve major and many smaller installations, primarily in Hawaii, Alaska, Japan, Guam, the Republic of Korea, and the Republic of the Philippines. PACAF gained an



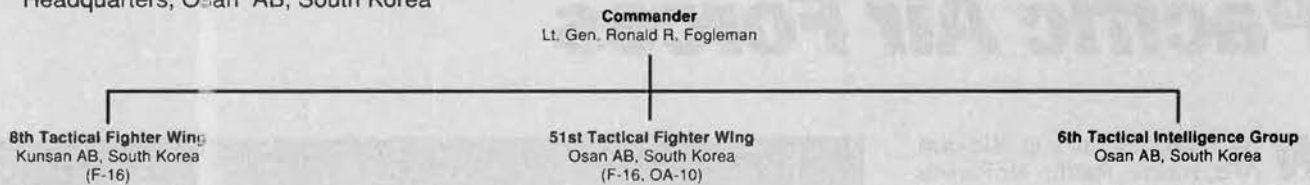
—USAF photo by MSgt. Ed Boyce

An F-15 from the 21st Tactical Fighter Wing escorts a Soviet Su-27 through Alaskan airspace. Last August, Alaskan Air Command became part of Pacific Air Forces as 11th Air Force. In the process, PACAF, headquartered at Hickam AFB, Hawaii, gained two tactical fighter wings, giving it 300 combat aircraft all told. PACAF is responsible for a vast region extending from the west coast of the Americas to the east coast of Africa and from the Arctic to the Antarctic.



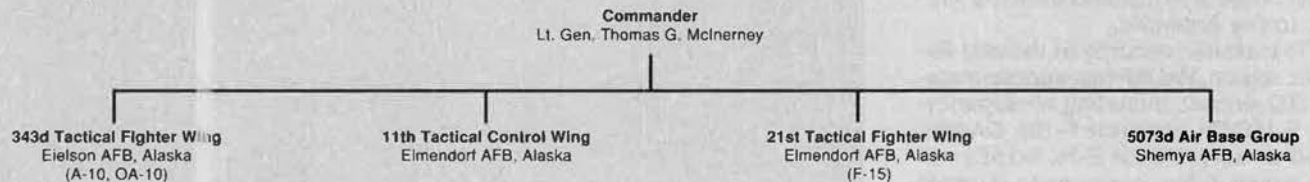
7th Air Force (PACAF)

Headquarters, Osan AB, South Korea



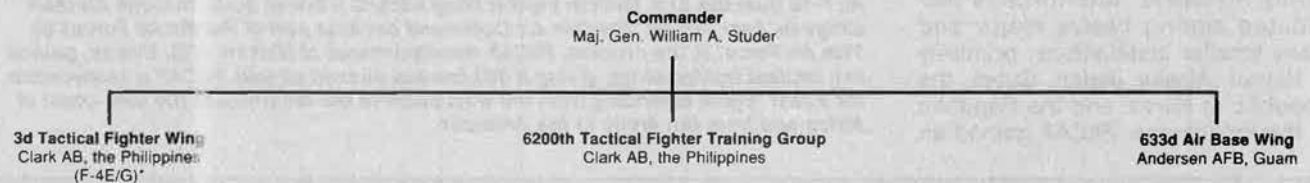
11th Air Force (PACAF)

Headquarters, Elmendorf AFB, Alaska



13th Air Force (PACAF)

Headquarters, Clark AB, the Philippines



*All fighter aircraft are scheduled to be removed from Clark AB by September 16, 1991.

additional numbered air force and two tactical fighter wings August 9, 1990, when Alaskan Air Command was redesignated 11th Air Force.

PACAF's military professionals stand ready to defend US interests and fulfill mutual defense agreements in an area containing thirty-nine countries and covering half the world's surface, posing a major challenge for PACAF's war planners.

To help overcome long supply lines, PACAF logisticians, working with Air Force Logistics Command, opened a forward wholesale supply activity at Kadena AB, Japan. Designated the Pacific Parts Store, the facility provides 40,000 square feet of storage space and brings essential spare parts more than 7,000 miles closer to those who need them in the western Pacific.

Organizational improvements and the introduction of newer weapon systems optimize PACAF's widely dispersed forces. The new C and D model F-16s, with improved engines and avionics, operate out of Kunsan

and Osan ABs, South Korea, and Misawa AB, Japan. The Combat Oriented Supply Organization has expanded operations to support jet-engine and aerospace ground equipment maintenance, improving PACAF's ability to generate combat sorties.

Even with the most sophisticated weapons, highly trained and motivated people, and improved logistics systems, PACAF's planners realize that their success ultimately depends on joint and combined operations. Teamwork with sister services forms the core of the PACAF exercise program, with more than ninety percent of all exercises conducted jointly with Navy, Marine, and Army units. More than seventy percent of all PACAF exercises involve regional allied nations.

More than sixty times last year, PACAF's dynamic and realistic exercise program tested combat capability in the same locations and environment in which hostilities are likely to occur. These on-scene exercises demonstrate PACAF's theater-wide

warfighting capability and resolve to support allies and defend US interests. This dedication was embodied in last year's Team Spirit exercise in South Korea, when some 14,000 USAF personnel and 700 aircraft joined with other US and Republic of Korea forces to provide a visible demonstration of US commitment to defend the region.

Whether sharpening pilot skills at Cope Thunder in the Philippines or exercising regional defense plans during Cobra Gold in Thailand or Cope North in Japan, PACAF's exercise program ensures force readiness and interoperability in the Pacific theater. While carrying out their extensive exercise mission during FY 1990, PACAF's pilots honed their warfighting skills by flying 84,028 sorties for 116,050 hours.

Readiness also applies to medical care. PACAF's medical preparedness has been rigorously tested through rapid response to the USS *Midway* accident and disaster relief for earthquake victims in the Philippines,

while maintaining unimpeded access to high-quality health care.

PACAF's leaders continue to recognize the links among readiness, retention, and family well-being. Of special importance are programs that continue to modernize working and living conditions at overseas bases. One such program will expand host na-

tions' burden-sharing responsibilities to help pay for new housing and other quality-of-life facilities. This concern for its people's welfare paid PACAF big dividends in higher enlisted retention rates. About sixty-five percent of eligible PACAF first-termers reenlisted in FY 1990, a rate well above the Air Force average.

A combination of state-of-the-art equipment, highly trained and motivated men and women, and adequate parts and supplies to keep its aircraft flying makes PACAF a formidable force helping to stabilize the Pacific region, able to deter conflict, and, should deterrence fail, ready to fight and win. ■

Strategic Air Command

STRATEGIC Air Command (SAC) is the US Air Force's largest command. For more than forty years, SAC's nuclear and conventional capabilities have deterred aggression against this nation and its allies. SAC has also supported conventional operations in Korea, Vietnam, Panama, and the Middle East—especially the 1991 Persian Gulf War.

US nuclear capability consists of a triad of strategic forces: intercontinental ballistic missiles, long-range bombers, and submarine-launched ballistic missiles. In addition to maintaining two legs of the triad, SAC supports worldwide conventional power projection with its bombers and tankers. SAC's warfighting capability is strengthened by reconnaissance, refueling, and command and control systems.

More than 114,000 dedicated officers, enlisted personnel, and civilians, as well as the 17,280 SAC-gained Reservists and Guardsmen, make up the command.

More than 300 bombers—B-1Bs, B-52s, and FB-111s—are ready to fly, fight, and win. Peacekeeper and Minuteman intercontinental ballistic missiles (numbering 1,000) constitute SAC's hardened, quick-response retaliatory force. Many advances in SAC's bomber force have occurred



—USAF photo by S/A Chris Putman

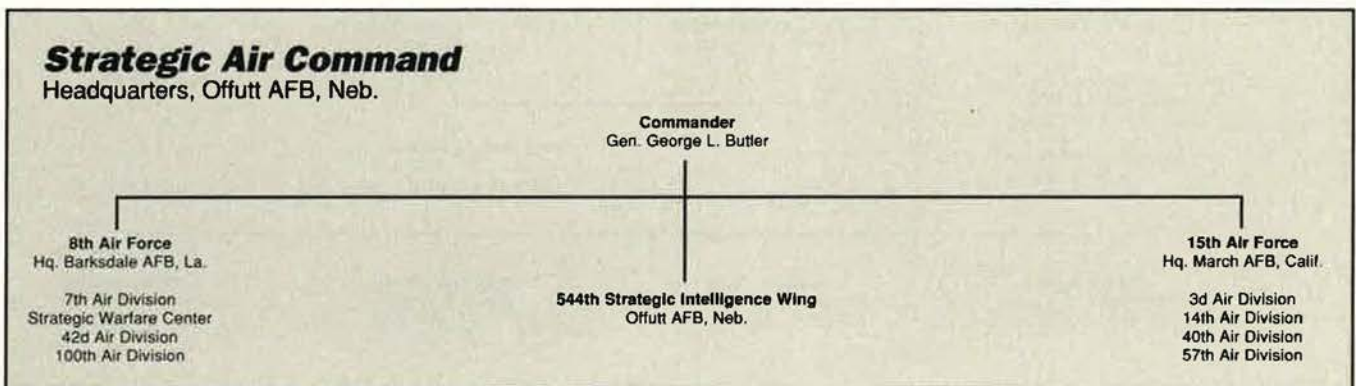
Ground crews tend to Strategic Air Command B-52 bombers between attacks on Iraqi ground forces during Desert Storm. All B-52 crews train to deliver both nuclear and nonnuclear weapons. SAC has taken part in several recent nonnuclear operations.

this past decade. The B-1B fleet became fully operational. Modifications to the thirty-year-old B-52 maintain its vitality. The B-2 bomber continues to expand its operational performance with every test flight.

The B-1B Lancer is the best operational bomber in the world. It flies low,

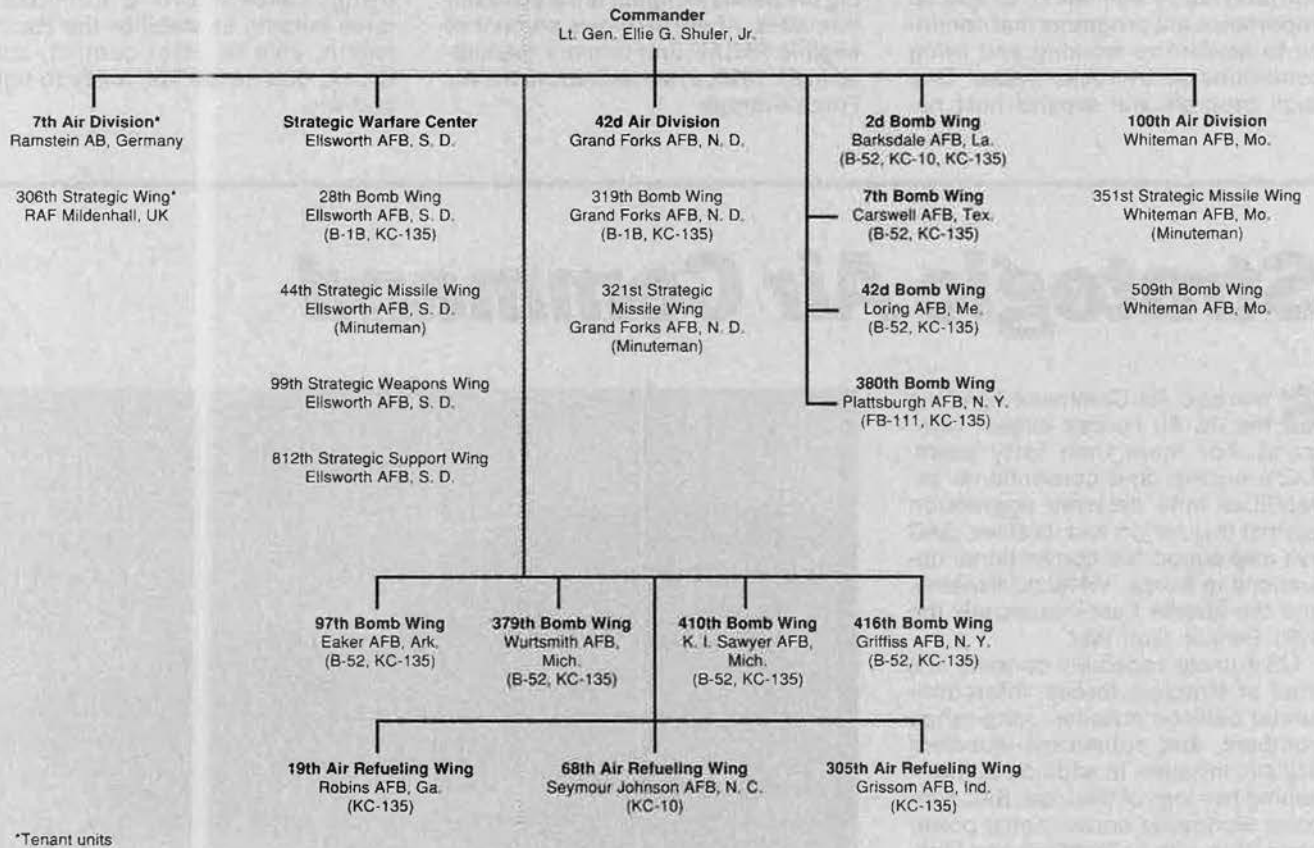
fast, and far and puts its weapons precisely on target. These capabilities ensure the bomber's critical mission of deterrence is met.

The B-52 is the command's cruise missile carrier. The integration of a proven aircraft and modern weapons presents a formidable threat to any



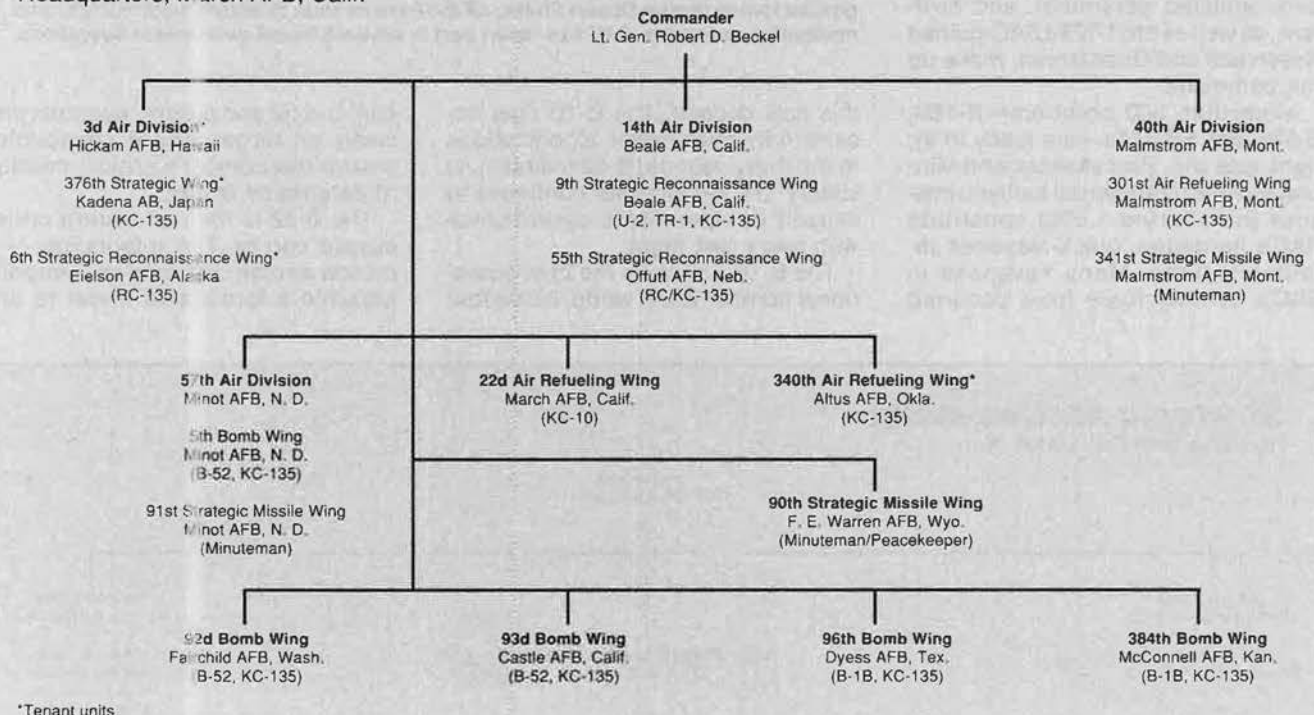
8th Air Force (SAC)

Headquarters, Barksdale AFB, La.



15th Air Force (SAC)

Headquarters, March AFB, Calif.



enemy. The advanced cruise missile, now in production, offers great range and makes use of low-observable, or stealth, technology. This would enable B-52s to strike heavily defended targets from ranges outside enemy territory.

Its worldwide range, heavy payload, and rapid response capabilities make the B-52 an important conventional warfare asset as well. All B-52 crews train to deliver both nuclear and non-nuclear weapons. By dedicating B-52s to conventional operations, SAC guarantees theater commanders a force of heavy bombers available at all times.

The B-52's heavy payload capability includes a variety of weapons that can be used against many types of targets. These include both overflight weapons and standoff missiles. The B-52 can attack deep into an enemy's territory, striking war-sustaining forces.

The B-52's long range makes it well suited to naval operations, such as surveillance of the open seas. The bomber's payload enables it to carry many sea mines to control harbors and shipping lanes. With the Harpoon missile, a B-52 can fire at and destroy surface vessels from well outside their self-defense zones.

The B-2 Stealth bomber will enhance SAC's ability to protect the nation and its allies. Well into the next century, the B-2 will be able to deliver a wide variety of weapons, both nuclear and conventional, employing several advanced tactics.

The Peacekeeper ICBM has been fully operational for more than two years. It has consistently exceeded



Members of a KC-135 Stratotanker crew tend to business on a nighttime air refueling mission during Desert Storm. SAC's fleet of more than 600 tankers is indispensable to the Air Force's ability to project power around the world on short notice.

design standards for accuracy during flight tests. By holding at risk hardened facilities and warfighting assets that an enemy would value most, the Peacekeeper greatly enhances deterrence.

SAC's fleet of more than 600 tankers is vital to extending the range of US and allied fighter, bomber, and airlift aircraft, contributing to their ability to project power globally. SAC's KC-135s and KC-10s, including those of the Air Force Reserve and Air National Guard, proved their worth in the earliest stages of Operation Desert Shield. In the first four months, they flew more than 10,000 sorties,

logged nearly 46,000 flying hours, performed more than 17,000 refuelings, and delivered more than 43,000,000 gallons of fuel. Tankers also transported nearly 10,000 people and 7,000,000 pounds of cargo to the theater.

The command's reconnaissance aircraft provide specialized support for theater commanders. The U-2, TR-1, and RC-135 use the latest technology to gather and relay timely intelligence data.

Reliable, secure command-and-control systems enhance a fighting force's effectiveness. The EC-135 and E-4B Command and Control System aircraft are survivable means of keeping our nation's leaders in touch with warfighters throughout the spectrum of conflict.

SAC's new underground command center is the latest in command-and-control technology and provides fast, secure communications. Fully computerized and hardened against the effects of electromagnetic pulse radiation, the new command center uses the Defense Satellite Communications System, the Milstar satellites, the Air Force Satellite Communications System, and the Ground Wave Emergency Network to ensure worldwide communications.

SAC warriors' skills are finely honed through routine and specialized training. The Strategic Warfare Center at Ellsworth AFB, S. D., offers the world's best bomber crews a high-quality "graduate school." Advanced aircrew training is accomplished through improved tactics and evaluation. ■



SSgt. Mike Brant and SrA. Rod Bush are debriefed after a training exercise for fire fighters at Wurtsmith AFB, Mich., home of B-52s and KC-135s. SAC possesses more than 300 bombers—B-1Bs, B-52s, and FB-111s—and awaits the stealthy B-2s.

—USAF photo by SSgt. Vern McQueen



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Tactical Air Command

WHEN elements of the 1st Tactical Fighter Wing from Langley AFB, Va., deployed to Saudi Arabia within eighteen hours of the execute order for Operation Desert Shield, they exemplified the mission of Tactical Air Command (TAC).

That mission is to organize, train, equip, and maintain combat-ready forces for rapid deployment and employment and to ensure that strategic air defensive forces are ready to meet the challenges of peacetime air sovereignty and wartime air defense. As TAC supplied US Central Command with fighter aircraft and support forces needed for Operation Desert Shield, its strategic air defense forces were maintaining vigilance over the US and participating in antidrug operations.

When mobilized, more than 78,000 members of the Air National Guard and Air Force Reserve, along with their 1,400 aircraft, are assigned to TAC. In total, TAC and these TAC-gained units consist of more than 4,000 aircraft and 186,142 people (21,152 officers, 151,803 enlisted personnel, and 13,187 civilians).

TAC's forces are organized under three numbered air forces and three major direct reporting units (see chart). The TAC commander is also Commander in Chief, US Air Forces Atlantic.

Headquartered at Langley AFB, Va., 1st Air Force performs a daily operational mission as the Continental US (CONUS) North American Aerospace Defense Command (NORAD) Region. The 1st Air Force commander, as the region commander, reports directly to



An F-15C of the 27th Tactical Fighter Squadron, 1st Tactical Fighter Wing, flies combat air patrol high over Iraq at the height of the war. Elements of the 1st TFW led TAC's swift deployments to Operation Desert Shield.

—USAF photo by TSgt. David McLeod

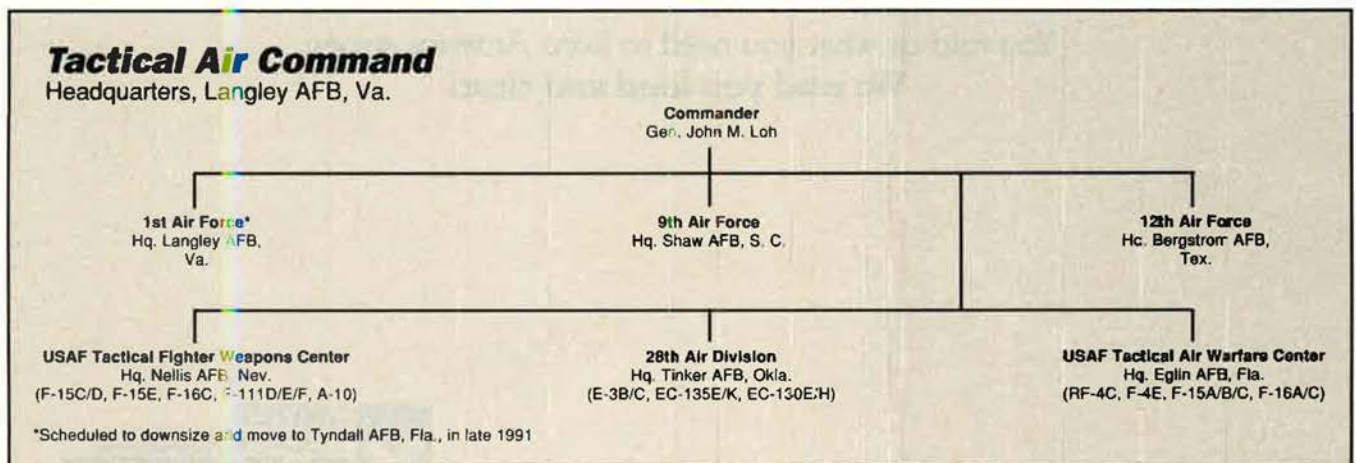
CINCNOAD for air defense of the CONUS. Four air defense sectors, included in 1st Air Force, are responsible for the air defense of their respective quadrants of the CONUS, using aircraft on around-the-clock alert.

The 1st Air Force plays a key role in the nation's war on drugs. In close coordination with the US Coast Guard and the US Customs Service, air defense units monitor and intercept illegal air traffic attempting to penetrate US airspace.

The 1st Air Force (scheduled to reduce in size and move to Tyndall AFB,

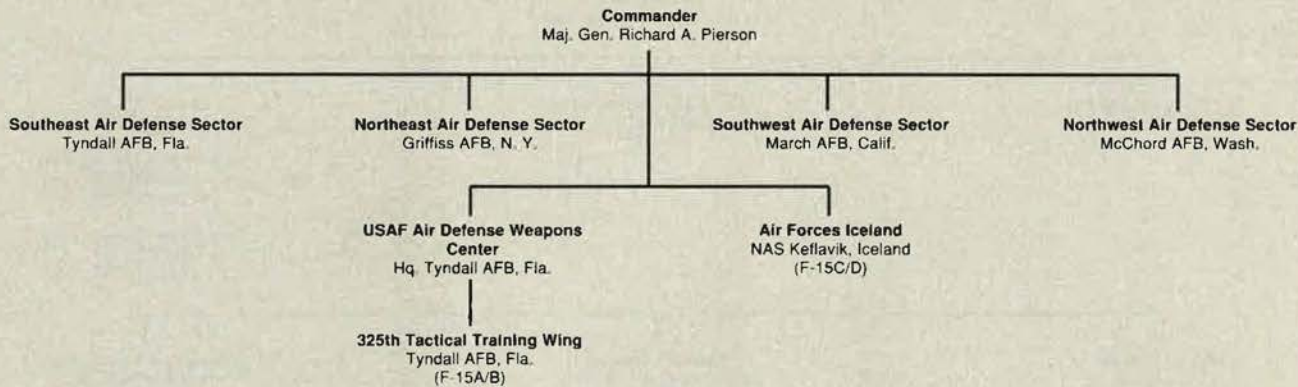
Fla., late in 1991) also commands the USAF Air Defense Weapons Center, Tyndall AFB, Fla., which provides aircrew training and specialized training for strategic air defense radar systems personnel. Air Forces Iceland at NAS Keflavik, under the operational control of the Commander in Chief, US Atlantic Command, provides a combat force for the air defense of Iceland and air surveillance data in support of the NORAD mission.

At Shaw AFB, S. C., 9th Air Force has ten wings performing tactical fighter operations, training, and tac-



1st Air Force (TAC)*

Headquarters, Langley AFB, Va.



*Scheduled to downsize and move to Tyndall AFB, Fla., in late 1991

9th Air Force (TAC)

Headquarters, Shaw AFB, S. C.



tical air control. It comprises 41,099 people and 750 aircraft.

As part of its dual-role responsibilities, 9th Air Force becomes US Central Air Forces (USCENTAF), the air component of US Central Command. Operation Desert Shield deployed the USCENTAF staff to the southwest Asian theater, operationally controlling joint and multinational air forces. USCENTAF active-duty and reserve forces train regularly with Army, Navy, and Marine Corps units in realistic joint training exercises to prepare for this mission.

At Bergstrom AFB, Tex., 12th Air Force operates combat-ready forces and equipment for air superiority, interdiction, reconnaissance, and close air support. In addition, 12th Air Force is the air component of US Southern Command, which played a key role in Operation Just Cause. Nearly 41,000 people and nearly 1,000 aircraft are assigned to 12th Air Force. The com-

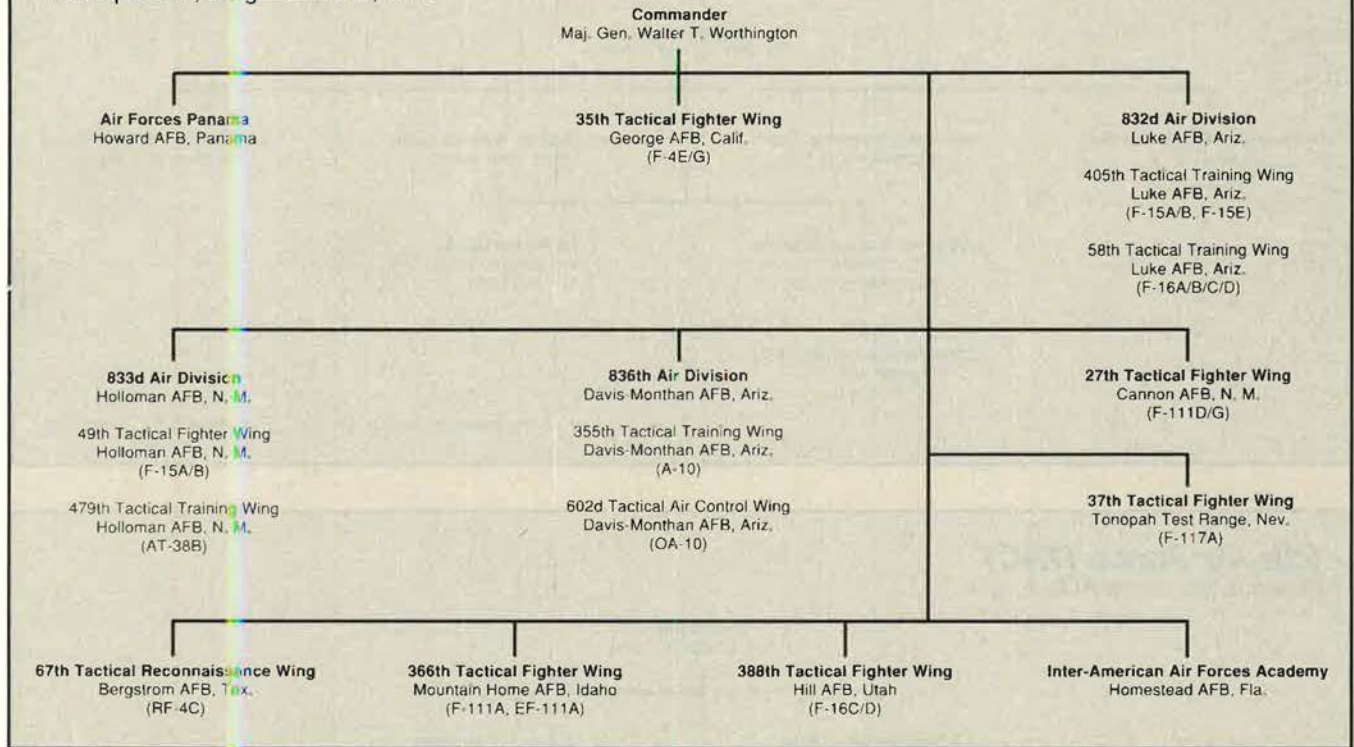


All gassed up, a TAC A-10 from England AFB, La., heads for a war-zone runway and another demanding mission in close support of allied ground forces. TAC supplied US Central Command with fighter forces for Desert Shield and Desert Storm.

—USAF photo by Sgt. Greg Ford

12th Air Force (TAC)

Headquarters, Bergstrom AFB, Tex.



mand operates three air divisions. These air divisions and twelve wings perform tactical fighter operations and training, reconnaissance, tactical air control, and a wide range of electronic combat tasks. Additionally, Air Forces Panama at Howard AFB has responsibility for air defense and tactical air operations in the Panama area, provides logistics support for air force units under its jurisdiction, and provides area support for other service elements.

In April 1990, at Nellis AFB, Nev., TAC unveiled to the public the F-117A, the world's first aircraft designed to exploit low-observable, or stealth, technology. Flown by the 37th Tactical Fighter Wing from Tonopah Test Range, Nev., these aircraft are designed to penetrate dense threat environments and attack targets with pinpoint accuracy.

TAC's combat capability continued to improve during 1990. The F-16 Low-Altitude Navigation and Targeting Infrared for Night (LANTIRN) training program continued at Luke AFB, Ariz. The multirole F-15E Eagle, TAC's all-weather, dual-role fighter, capable of air-to-ground and air-to-air missions, continued its beddown at the 4th Tactical Fighter Wing, Seymour Johnson AFB, N. C.

TAC hosted its biennial tactical worldwide Reconnaissance Air Meet, RAM '90, in August. Eleven teams

from the US (active-duty Air Force and Navy, Air National Guard, and Air Force Reserve), and teams from the Air Forces of Australia, Germany, and Great Britain competed.

An Air Force F-4G Wild Weasel from George AFB, Calif., gets gas from a KC-10 en route to a run against Iraqi radars during Desert Storm. George AFB belongs to 12th Air Force, which operates three air divisions and twelve wings for a wide variety of tactical missions.



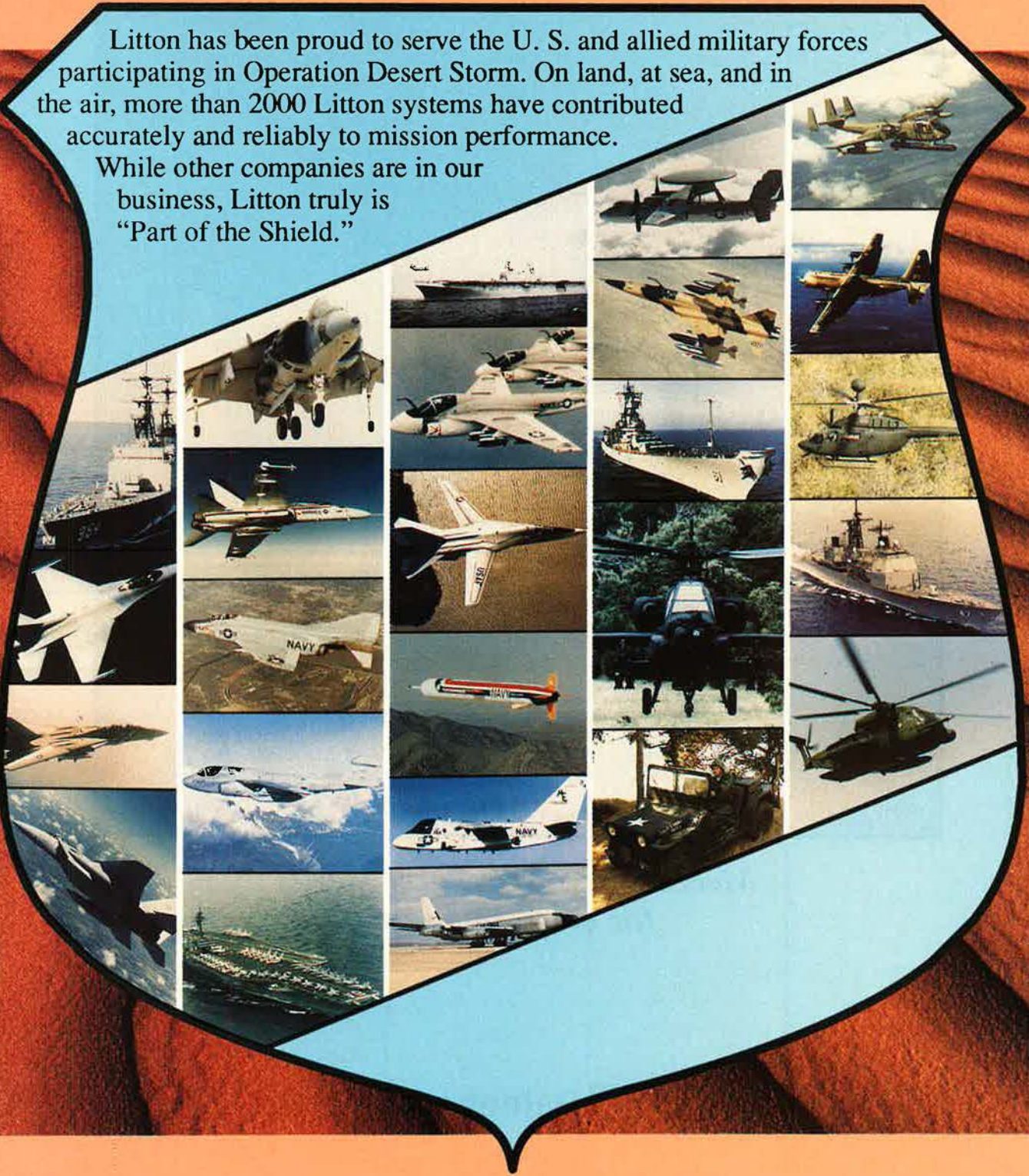
—USAF photo by TSgt. Rose Reynolds

The USAF Air Demonstration Squadron, the Thunderbirds, flew sixty-eight shows throughout the US before more than 12,000,000 spectators.

Litton – Part of the Shield

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From Top, clockwise: Ten unarmed TDS-developed reentry vehicles during successful Peacekeeper flight tests; Peacekeeper missile lifting off; TDS Skeet projectiles defeat a column of target vehicles; F-16 dropping the Sensor Fuzed Weapon CBU-97/B.

US Air Forces in Europe

FOR THE US Air Forces in Europe (USAFE), 1990 was a landmark year. The command witnessed firsthand the awakening of democracy in eastern Europe and demonstrated the vital importance of overseas bases to the success of Operation Desert Storm.

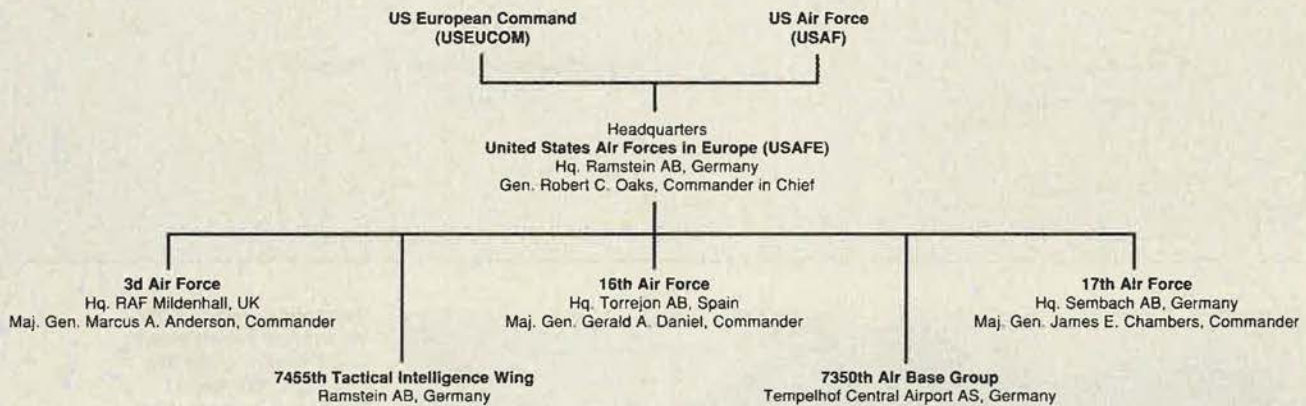
USAFE is the air component of US European Command and a key element of the North Atlantic Treaty Organization. USAFE consists of 3d Air Force in England, 16th Air Force in the southern region, and 17th Air Force in central Europe.

The USAFE commander in chief is also the commander of Allied Air Forces, Central Europe. Air resources are provided by Belgium, Canada, Germany, the Netherlands, the United Kingdom, and the United States. COMAAFCE controls approximately



US Air Forces in Europe

Headquarters, Ramstein AB, Germany

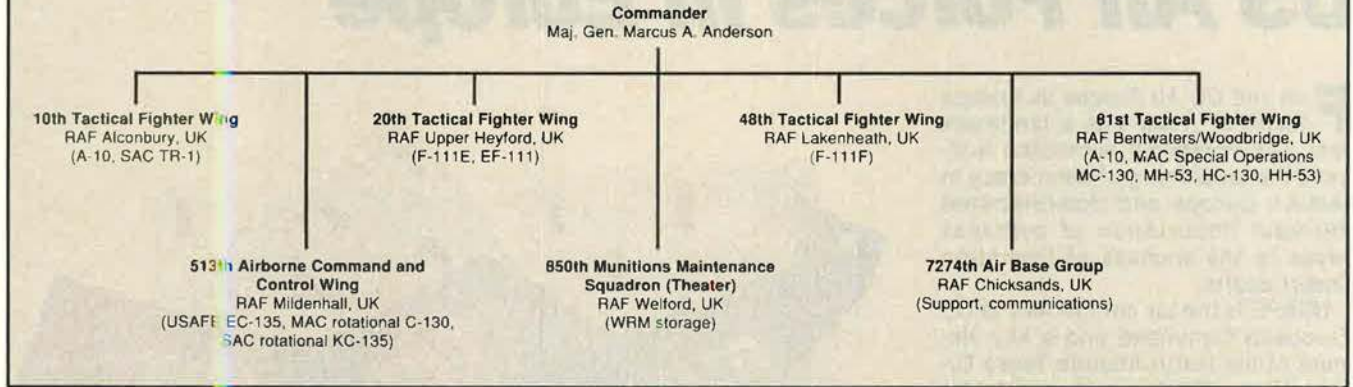


The USAFE organizational chart above shows peacetime lines of command. The chart below shows the NATO wartime command lines of authority.



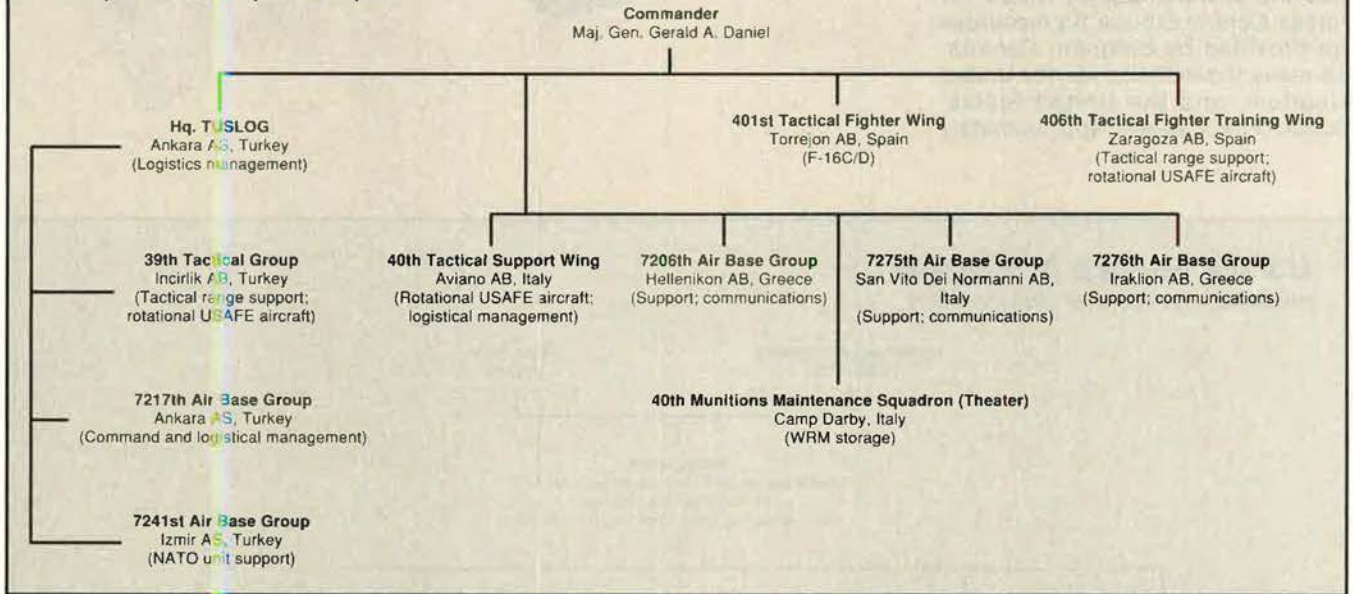
3d Air Force (USAFE)

Headquarters, RAF Mildenhall, United Kingdom



16th Air Force (USAFE)

Headquarters, Torrejon AB, Spain



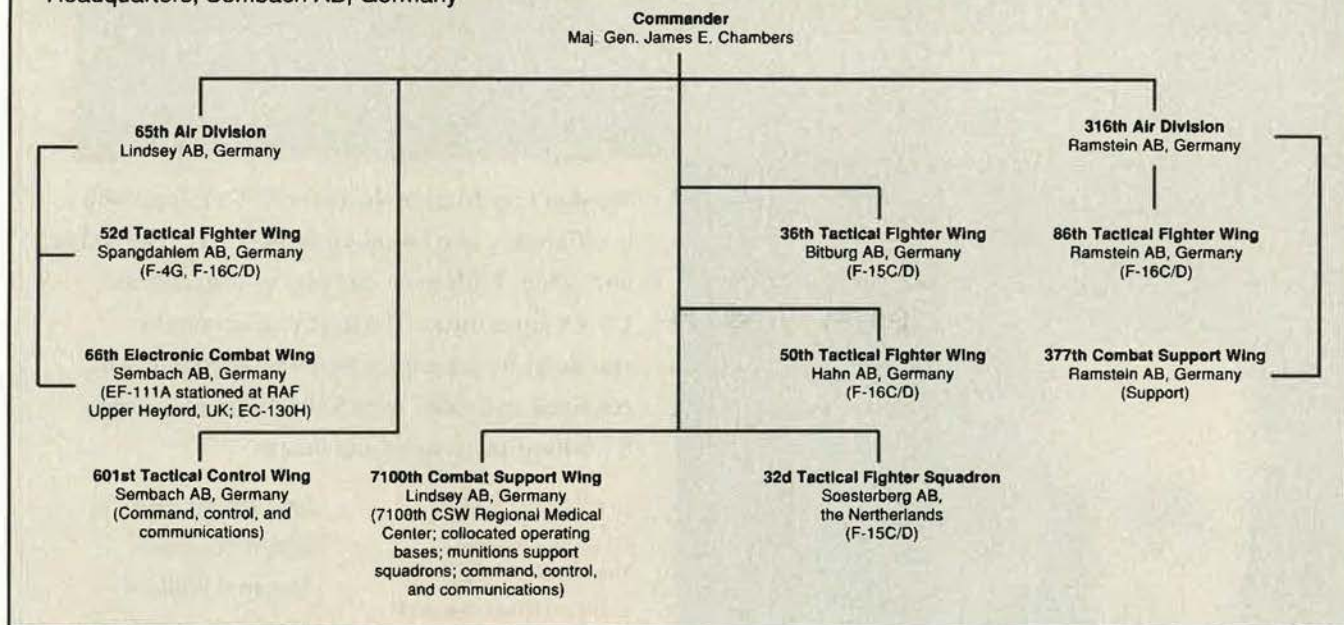
—USAF photo by TSgt. Rose Reynolds



Navigation weapon control system technicians SrA. Timothy J. Shanks and SSgt. Bradley L. Brustuaen remove and replace an F-111's radar receiver. In deploying to the Gulf, USAFE units demonstrated the importance of overseas bases to USAF's "global reach, global power."

17th Air Force (USAFE)

Headquarters, Sembach AB, Germany



2,000 tactical aircraft through 2d and 4th Allied Tactical Air Forces. AAFCE is augmented in wartime by tactical forces deploying from Stateside bases to approximately seventy collocated operating bases in Europe.

USAFE aircraft flew 222,925 hours in 1990. This was a slight decrease from 225,538 hours flown in 1989. The reduction was caused by budget cuts and squadron inactivations. USAF plans to fly slightly less than 200,000 hours in Fiscal 1991.

Closely related to tactical flying is the Tactical Air Control System (TACS). The defensive TACS supplements fixed radar with mobile, ground-based, command, control, and surveillance radar and provides ground-control intercept capabilities. The offensive TACS provides air liaison to US V and VII Corps for planning and executing offensive air support missions for Army units.

As a result of budget constraints and political transformations in Europe, USAF underwent many changes in 1990. Several installations were returned to host-nation control, and many were scheduled for return in the future.

Another unit change occurred when the European Communications Division (ECD) became a direct reporting unit to Hq. USAF. The ECD is instrumental to USAF operations. In 1990, it supported two dozen exercises and more than sixty emergency missions with contingency communications. These included missions in Beirut, Liberia, and Chad, Operations



A USAF F-16 from Hahn AB, Germany, having deployed with the 363d Tactical Fighter Wing from Shaw AFB, S. C., flies over Iraq on a bombing mission. USAF sent units to the Gulf and supported the flow of personnel and materiel to bases there.

Desert Shield and Desert Storm, and hostage relief operations. The ECD performed more than 600 air traffic control procedural updates and several thousand transatlantic crossings. The ECD also activated several satellite links in Turkey to replace the existing Defense Communications System, significantly modernizing communications.

While Intermediate Nuclear Forces Treaty implementations and troop reductions in Europe have forced many changes throughout the command, one constant has been USAF's com-

mitment to its military and civilian employees and their family members. In 1990, USAF successfully faced its most challenging year in caring for the more than 62,000 men and women assigned throughout the command. In the midst of drawdowns of theater strength under Defense Management Review, headquarters staff reductions, and budgetary constraints, there were simultaneous temporary duty increases as USAF sent units and supported the flow of people and materiel on their way to Operations Desert Shield and Desert Storm. ■

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The 1991 USAF Almanac

Reports from the FOAs

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 managerial responsibilities (financial, operational, and support). Reports of audit evaluate the effectiveness, efficiency, and economy of Air Force program management.

The Auditor General of the Air Force, John W. Boddie, reports directly to the Secretary of the Air Force. This enables AFAA to assess independently the activities and functions it audits.

The Auditor General, the Deputy Auditor General, and the staff directorates—Operations (AFAA/DO) and Resource Management (AFAA/RM)—are located at Norton AFB, Calif. The Auditor General communicates with Hq. USAF and other governmental agencies in the Washington, D. C., area through an Associate Auditor General in the Pentagon (SAF/AGA).

AFAA's line operations are accomplished through three directorates.

The Acquisition and Logistics Audit Directorate (AFAA/QL), located at Wright-Patterson AFB, Ohio, directs the development and management of multisite audits related to acquisition, weapon systems, supply, maintenance, transportation, foreign military sales, and AFLC/AFSC computer systems. AFAA/QL is also responsible for the Systems Audit Region (AFAA/QLQ) at Andrews AFB, Md., and the Logistics Audit Region (AFAA/QLL) at Wright-Patterson.

The Financial and Support Audit Directorate (AFAA/FS), located at Norton AFB, directs the development and management of multisite audits related to financial management; personnel; support services; command, control, communications, and computer systems; and morale, welfare, and recreation. Its Finance and Security Assistance Systems Division is located at Lowry AFB, Colo.

The Field Activities Directorate (AFAA/FD), located at Norton AFB, manages installation-level audit work at fifty-four area audit offices (AAOs). Supervision of the AAOs is exercised through six regions established along major command organizational lines: the Tactical Audit Region, Langley AFB, Va.; the Strategic Audit Region, Offutt AFB, Neb.; the Airlift Audit Region, Scott AFB, Ill.; the European Audit Region, Ramstein AB, Germany; the Pacific Audit Region, Hickam AFB, Hawaii; and the Training Audit Region, Randolph AFB, Tex.

AFAA employs approximately 950 people and has a civilian-to-military ratio of three to one. Of the 817 auditors, ninety-nine percent have at least one college degree and thirty-eight percent have graduate degrees. Twenty-four percent of the agency's auditors are also certified public accountants, certified internal auditors, and/or certified information system auditors. ■

Air Force Center for Studies and Analyses

THE Air Force Center for Studies and Analyses (AFCSA) is an analytical organization that aids Air Force decision-making through timely evaluations of proposals, plans, and programs and explores new concepts for developing and employing aerospace power. AFCSA also advises the Secretary of the Air Force and the Air Force Chief of Staff on responses to congressional inquiries and requests for testimony.

With an organizational legacy dating back to an operational research office established in 1947, AFCSA became a direct reporting unit in 1984 and is now a field operating agency.

AFCSA reports to the Air Staff Director of Programs and Evaluation.

The AFCSA work force includes officers, enlisted personnel, and civilians with backgrounds in operational career fields and scientific and technical areas. Ninety-three percent of the officers and thirty-four percent of the civilians have masters degrees; fourteen percent of the officers and ten percent of the civilians also have doctoral degrees.

During 1990, AFCSA completed forty-four major studies in such varied mission areas as tactical reconnaissance, electronic combat, airlift, strategic command and control,

space systems, intercontinental ballistic missile force structure subject to arms control, and the manned penetrating bomber.

A landmark AFCSA effort, with far-reaching potential, was the development of a methodology for assessing the Air Force's success in accomplishing its mission of "Global Reach, Global Power." This new methodology bridges the gap between qualitative and quantitative analyses. Its incisive scenario assessment, rigorous quantitative methods, and compelling presentation make it a tool for the future in support of Air Staff and Major Command decision-makers. ■

Air Force Civilian Personnel Management Center

THE mission of the Air Force Civilian Personnel Management Center (AFCPMC), Randolph AFB, Tex., is to manage, operate, and support Air Force civilian personnel programs and systems. These affect more than 250,000 civilian employees, including foreign nationals, at Air Force installations worldwide.

AFCPMC, formerly the Office of Civilian Personnel Operations, was established in 1986. It is organized into two divisions: Integrated Systems Management and Career Management. Each plays an integral role in the personnel life-cycle management of the civilian resource.

The Integrated Systems Management Division is the Air Force's focal point for civilian personnel systems management. It provides systems support to civilian personnel by determining requirements and ensuring that requirements are met, either by developing systems in-house or by arranging for their development and maintenance by other organizations. The division also oversees Air Force civilian personnel systems management staff worldwide. It keeps abreast

of changing technology to plan and improve civilian personnel management support.

The Career Management Division helps identify civilian executive positions that need to be managed centrally for job referral and training. It provides a pool of career employees with strong skills in professional, technical, management, and administrative fields.

In addition to managing the white-collar employee pool through career programs, the Career Management Division formulates and administers three recruiting programs to develop future civilian leaders in the Air Force. The Palace Acquire program recruits and trains recent college graduates with degrees in a variety of technical or managerial disciplines for duty in most occupations used by the Air Force. The Palace Knight program recruits and trains scientists and engineers capable of assuming research and development leadership roles in the increasingly technical Air Force of the twenty-first century. The Copper Cap program recruits and trains individuals for contract management and

oversight roles in the procurement process.

The Career Management Division acts as liaison with the Air Staff in developing and administering Air Force civilian education and training budgets. It helps civilian personnel managers find the right school or course for employees' educational needs.

Nineteen career programs are now in effect, including Comptroller; Engineering and Services and Commissary; Historian; Public Affairs; Logistics; Manpower and Personnel, which includes education, technical training, and morale, welfare, and recreation; Contracting and Manufacturing; Information Systems; Safety, Security, and Special Investigations; Information Management; Scientist and Engineer; and Acquisition Program Management. Civilians involved in the programs can receive a combination of government, academic, and industry training. They have the opportunity to attend armed forces college programs and to participate in courses in executive development and may be selected for Education With Industry assignments. ■

Air Force Combat Operations Staff

THE mission of the Combat Operations Staff (AFCOS) is to provide a readiness-oriented, combat-related staff structure to support the Chief of Staff of the Air Force in his role as a member of the Joint Chiefs of Staff. The Deputy Chief of Staff, Plans and Operations (AF/XO), is the AFCOS commander and, in his role as Air Force Operations Deputy, represents the Air Force Chief of Staff and the Air Staff to the JCS and Joint Staff.

AFCOS serves as the permanent nucleus of a centralized, highly responsive, and integrated combat support structure. It monitors and reports the day-to-day readiness status of Air Force combat and combat support forces to the JCS. It is responsible for providing facilities, procedures, and staffing for support of unified and

specified command operations during crises, contingencies, and exercises.

The peacetime AFCOS manager is the Director of Plans (AF/XOX). The Deputy Director for Contingency Operations and Exercises (AF/XOXO) provides the AFCOS peacetime crisis and contingency watch, situation and readiness reports capability, and management of AFCOS policy, facilities, equipment, training, and publications. Contingency Operations and Exercises provides a twenty-four-hour world situation watch via the Air Force Operations Center (AFOC). The AFOC communicates with the JCS National Military Command Center and the Air Force major commands and field operating agencies. The AFCOS crisis and counterterrorist

watch is provided by the Contingency Operations Division. This division serves as the standing core of the AFCOS Contingency Support Staff (CSS), the response team assembled during major crises and conflicts involving US forces.

A total of 282 personnel in eight AFCOS staff functions can be called on in peacetime or wartime to meet the Air Force Chief of Staff's support requirements. These offices are headed by the AFCOS Directors of Plans, Operations, Logistics, Manpower and Personnel, Antiterrorism, and Information Systems Management. The Chiefs of the Medical Readiness Division and the Chaplain Response Forces are also members of AFCOS. AFCOS personnel are under the day-to-day operational control of the

AFCOS directors in their respective functional areas.

During periods of crisis or hostility, the Air Force Chief of Staff, AF/XO, or AF/XOX can direct the CSS to be fully or partially staffed by AFCOS personnel.

The CSS operates around the clock, providing rapid reaction staffing of Air Force Chief of Staff taskings

and requests by major commands that are providing forces for unified or specified command operations. The CSS is functionally organized, with principal combat and combat support functions physically present; other functions support the CSS from their functional areas. The Air Force Reserve and Air National Guard are also represented.

The CSS operates from the Air Force Command Center in the Pentagon. In the event of imminent attack on the United States, AFCOS and the CSS would move to alternate sites for survivability and continuity of essential headquarters functions. The CSS was activated for Desert Shield for the first time since the Nickel Grass logistical resupply of Israel in 1973. ■

Air Force Commissary Service

BETWEEN now and October 1, 1991, the Air Force Commissary Service (AFCOMS) will continue to manage and operate commissary stores at all Air Force bases. At the same time, the people who run these stores will be completing the transition to the Defense Commissary Agency (DeCA).

DeCA will consolidate all commissary operations for the Department of Defense under one agency. This will eliminate redundant overhead positions, cut unnecessary support functions at all headquarters levels, and allow commissary resources to be concentrated at the store level. The transition from AFCOMS to DeCA is being accomplished in such a way that customers will see no change in the level of savings or service they receive.

In 1991, AFCOMS continued to provide its customers an average savings of twenty-five percent off the prices they would pay at commercial supermarkets. On sales of \$2.9 billion in 1990, that put more than \$900 million in real dollars back into customers' pockets. Add the money that customers saved using cents-off coupons—more than \$83 million—and the savings Air Force commissary customers enjoyed totaled almost \$1 billion in Fiscal Year 1990 alone.



Air Force troops shop in a commissary tent during Operation Desert Storm. Men and women of the Air Force Commissary Service went to the Gulf with the first wave of troops to set up dining facilities and to staff tactical field exchanges.

Commissary customers funded the construction of seven new stores in 1990 through their five percent surcharge. In 1991, new or completely renovated stores are being constructed at nine locations.

During Desert Storm, AFCOMS's wartime mission took precedence. When the first Air Force troops deployed to the Persian Gulf, AFCOMS

men and women went with them to provide food and dining facilities and to staff tactical field exchanges.

During the Gulf crisis, AFCOMS people shipped, warehoused, and distributed \$55.1 million worth of food into the theater of operations. That includes MREs (Meals, Ready to Eat) and B rations, or fresh perishable foods. ■

Air Force Cost Center

THE Air Force Cost Center (AFCSTC) was established in 1986 to analyze, estimate, and validate the cost of executing the Air Force's total program. Since then, it

has become a recognized "center of excellence" for cost analysis.

AFCSTC develops the cost and planning factors used to estimate the cost of operating and supporting

forces and to formulate the Air Force budget, leads the Air Force cost analysis program for all major Air Force acquisition programs, and provides cost expertise to the Assistant Secre-

tary of the Air Force for Financial Management, Air Force Cost Analysis Improvement Group, Air Force System Acquisition Review Council, and Air Staff. The center also develops and validates new cost-analysis tools and methods for use USAF-wide.

AFCSTC employs seventy-three civilian and military personnel in three divisions: Acquisition, Operations and Support, and Information Systems.

The Acquisition Division has become the principal lead in the Air Force's Independent Cost Analysis Program for major weapon systems. Every major command and Air Force activity involved in these major systems receives guidance and support from the Acquisition Division. This division deals with the cost issues associated with the research, development, and production of new weapon systems. It is concerned with improving the Air Force's ability to estimate the costs of future weapon systems in an environment that is rapidly changing with the emergence of new and advanced technologies coupled with significant fiscal constraints. The Acquisition Division is also the financial management focal point for Selected Acquisition Reports to Congress, contract performance report analysis, Defense Acquisition Executive Summaries, and the Air Force Statistical Digest.

The Operations and Support Division's analysts perform cost studies to support the Air Staff. These studies include operating and support cost estimates for major weapon system acquisition or modification pro-



Gwen Sutton and Maj. Keith Bowman of the Air Force Cost Center's Information Systems Division monitor the Defense Data Network, ISD's vehicle for providing cost consulting services and distributing cost information throughout the service.

grams, force-mix studies, and base-realignment studies. The division develops and publishes Air Force Cost and Planning Factors that affect more than thirty percent of the Air Force's annual budget. It also manages the Air Force portion of DoD's Visibility and Management of Operations and Support Costs (VAMOSC) program. In addition, the division updates, maintains, and enhances O&S cost models for use by the Air Staff, major commands, and other USAF units. An example is the Systematic Approach to Better Long-Range Estimating (SABLE) model, a critical analytical tool used by program managers to

forecast the price impact of proposed force structure alternatives.

The Information Systems Division provides worldwide connectivity through the Cost Bulletin Board and Defense Data Network (DDN) host interface. Worldwide connectivity allows the center to provide on-line cost consulting services and facilitates the rapid flow of cost information throughout the Air Force. The division is also responsible for cost issues associated with major automated information systems, computer-based training development, and overall computer and communications support to the center. ■

Air Force Engineering and Services Center

THE Air Force Engineering and Services Center (AFESC), headquartered at Tyndall AFB, Fla., is an extension of the Air Staff and a focal point for many of the Air Force's engineering and services responsibilities. It provides professional and technical assistance to customers at major commands, bases, and other federal agencies in fire protection, readiness and contingency operations, facility energy issues, facility operations and maintenance, unaccompanied transient and permanent party housing, food service, mortuary affairs, and utility rates management.

AFESC is the focal point for the information management systems used by all civil engineering and services activities. In addition, the center manages a number of long-range programs: a large research, development, and acquisition effort in environmental quality, fire suppression, aerospace facilities, and rapid runway repair; construction cost management of facilities; and the Air Force privatization program.

In 1990, AFESC accomplished the following:

- Activated the Engineering and Services Readiness Center to support

Operation Desert Shield and deployed personnel to augment Central Air Forces staffs. AFESC directed Civil Engineering Maintenance, Inspection, Repair, and Training (CEMIRT) teams to fabricate thirty-five power-distribution centers rapidly for Operation Desert Shield. The center prepared beddown plans for air bases in several locations, using newly established combat air base performance planning principles.

- Established an acquisition team to obtain engineering and services products to support Operation Desert Shield.

- Completed development of folded fiberglass mats and awarded two contracts for production of more than 900 mat systems for crater cover in rapid runway repair. Initial deliveries of the mat systems were diverted to support air bases in Operation Desert Shield.

- Developed a one-of-a-kind, air-transportable, contingency airfield evaluation vehicle. This state-of-the-art van is equipped to perform on-site and lab testing of soil and pavements. A computer on board the van can provide immediate airfield strength analysis.

- Tested and began USAF-wide implementation of Project Prime Knight, a customer service initiative designed to enhance billeting, transportation,

and food service support for transient aircrews.

- Published a report on the analysis and results of fourteen explosive tests conducted on a full-scale, reinforced concrete, semihardened NATO facility.

- Developed and validated a mobile chemical warfare protection shelter designed for use by Air Force fire fighters wearing their protective proximity ensembles and self-contained breathing apparatuses.

- Developed a microorganism that readily destroys complex pollutant mixtures, converting them to harmless materials such as water, carbon dioxide, and chlorides.

- Developed a new metal spray casting technique to plate aircraft

parts. The procedure sprays hot metal directly on the part, leaving no hazardous waste by-products such as those associated with conventional electroplating.

- Conducted thirty weeks of base recovery after attack and force-bed-down training at the Air Base Combat Support Training Complex, Detachment 2, AFESC, Eglin AFB, Fla. This instruction provided the only integrated wartime training in the continental US to 8,400 engineering, services, explosive ordnance disposal, disaster preparedness, combat support group, and commissary personnel. It also provided specialized training on equipment used in Operation Desert Shield for 575 personnel who deployed. ■

Air Force Inspection and Safety Center

THE Air Force Inspection and Safety Center (AFISC), headquartered at Norton AFB, Calif., is responsible for USAF-wide management of readiness, resources, and safety. Maj. Gen. Alexander K. Davidson commands AFISC and is also the USAF Deputy Inspector General for Inspection and Safety.

Later this year, AFISC will become two separate field operating agencies, the Air Force Inspection Center and the Air Force Safety Center. Both will be located at Norton AFB.

AFISC comprises a command section and four directorates. The command section provides legal, computer, manpower, personnel, budget, supply, administrative, historical, graphics, and public affairs support. Two Air Reserve Forces advisors on the commander's staff represent the Air National Guard and the Air Force Reserve. The Flight Records Management Branch is USAF's custodian for active-duty, Air National Guard, and Air Force Reserve individual flight records dating from 1911.

The Directorate of Inspection assists the Inspector General of the Air Force in inquiring into and reporting on the discipline, efficiency, and economy of the Air Force. Directorate personnel examine and analyze USAF's operational readiness and mission capability, leadership, resource management, and systems management effectiveness. The directorate accomplishes its mission through a variety of inspections. The

directorates also conducts the worldwide inspection school.

The Directorate of Aerospace Safety is the Air Force's manager of flight, ground, missile, explosives, space, and systems safety programs. The directorate provides guidance on and monitors the implementation and effectiveness of mishap prevention programs. This includes administering the investigation and reporting of mishaps to determine their causes and corrections. The directorate also

designs, plans, and develops resources for professional safety education programs, including university-level safety courses, and publishes *Flying Safety* and *Road and Rec* magazines. The directorate also maintains the only "crash laboratory" for analyzing aircraft accidents.

The Directorate of Nuclear Surety operates as Detachment 1, AFISC, at Kirtland AFB, N. M. The directorate's responsibilities include managerial oversight of the Air Force Nuclear



Greg Gandee, SMSgt. Larry Graves, and Col. Bruce Wood, left to right, check out fire pattern damage in B-1B wreckage that later went on display in the "crash laboratory" of the Air Force Inspection and Safety Center's Directorate of Aerospace Safety.

CMSgt. Robert Holritz boards a C-130 in the Middle East on an AFISC "flying safety" mission during Operation Desert Shield. AFISC's Directorate of Inspection keeps an eye on the readiness and mission capability of the Air Force's operational units.



Weapons Surety Program to make it a top priority that nuclear surety is incorporated during all phases of design, operation, maintenance, modifications, and logistical movement. The directorate also maintains nuclear surety responsibility for terrestrial nuclear reactor systems and review procedures concerning space nuclear power systems and space or missile use of radioactive material. Directorate personnel originate all 122-series Air Force regulations and publish the *USAF Nuclear Surety Journal* for dissemination to nuclear-capable units.

The Directorate of Medical Inspection plans and conducts Air Force health-services management inspections (HSMIs), Air Reserve Components health-services readiness inspections (HSRIs), and special investigations to ensure effective management of health-care resources and the readiness of Air Force medical units. In addition to the 350 functional areas inspected in each medical facility, special emphasis items selected by the Air Force Surgeon General are given close attention. ■

Air Force Intelligence Agency

UNDER the command of Brig. Gen. Billy J. Bingham, the Air Force Intelligence Agency (AFIA) reports directly to the Assistant Chief of Staff for Intelligence (ACS/I). AFIA provides analysis and assessments in the application of all-source intelligence and services in support of the Air Staff and combatant commands.

More than 2,300 active-duty, reserve, and civilian intelligence professionals worldwide collect, process, disseminate, and apply reliable, accurate, and timely intelligence for Air Force commanders during peace, war, and contingency situations.

Headquartered at Fort Belvoir, Va., AFIA comprises ten directorates functionally aligned under deputy commanders for Assessments and Resources and the Air Force Special Activities Center.

Col. Storm C. Rhode III, deputy commander for Assessments, located at the Pentagon, is responsible for estimative, targeting, and warning intelligence. The directorates within the deputate are Special Studies and Arms Control Support, Threat and Technology, Warning and Regional Assessments, and Targets.

AFIA acts as the ACS/I's executive agent in the national intelligence process by developing Air Force positions in National Intelligence Estimates (NIEs), Defense Intelligence Projections for Planning (DIPPs), the Air Force Planning Guide (AFPG), and a host of other intelligence assessments used by plans and operations staffs.

AFIA directorates work closely with Air Force Systems Command's Foreign Technology Division in determining the threat to Air Force weapon systems posed by current and projected foreign weapon systems. These estimates ensure that USAF systems will be effective.

The Directorate of Targets at Bolling AFB, D. C., is the Hq. USAF executive agent for mapping, charting, and geodesy; for classical targeting functions; and for influencing weapons research, development, and acquisition.

From the Pentagon, AFIA provides intelligence briefings to the Secretary of the Air Force and the Chief of Staff on a regular basis and special briefings as necessary. AFIA also provides products to the joint-service *Daily In-*

telligence Digest, which is distributed to both Washington-based and global subscribers.

Col. John H. Birkner, vice commander and deputy commander for Resources, with elements at Bolling AFB and Fort Belvoir, is responsible for AFIA's intelligence-related support functions, including the Directorates of Security and Communications Management, Intelligence Data Management, Personnel, Intelligence Reserve Forces, Attaché Affairs, and Joint Services Support.

AFIA manages the worldwide Air Force Special Security Office and Sensitive Compartmented Information programs. The agency also plans, develops, and manages all Air Force intelligence data-handling systems.

AFIA centrally manages 1,400 intelligence reservists to support peacetime, wartime, and contingency requirements of twenty-six MAJCOMs and agencies. AFIA organizations manage participation in the Defense Attaché program and the DoD Code of Conduct training programs and central control of Air Force human intelligence activities. ■

Air Force Legal Services Center

THE Air Force Legal Services Center (AFLSC), headquartered in Washington, D. C., helps provide complete civil and military legal services to the Air Force and its members around the world.

AFLSC provides specialized legal services in military justice, claims for and against the Air Force, tort litigation, legal assistance, and labor, environmental, acquisition, and preventive law. It also handles all Air Force patent, copyright, and other intellectual property matters, provides judges and counsel for courts-martial, and reviews trial results.

The Air Force Judge Advocate General serves in a dual role as Commander of AFLSC.

The Air Force Court of Military Review, a directorate in AFLSC, reviews all courts-martial that result in a punitive discharge or confinement of one year or more.

The Judiciary Directorate in AFLSC has five divisions.

The Military Justice Division prepares regulations and policy on military justice. It advises the Judge Advocate General on petitions for new trial and other applications for relief

and reviews general court-martial records not reviewed by the Court of Military Review.

The Trial Judiciary Division oversees seven judiciary circuits, five in CONUS and two overseas.

The Defense Services Division represents USAF members before the Court of Military Review, the Court of Military Appeals, and the Supreme Court.

The Government Trial and Appellate Counsel Division represents the US before the Court of Military Review and the Court of Military Appeals and assists the Solicitor General in appeals to the Supreme Court.

The Clemency, Corrections, and Officer Review Division prepares officer dismissal cases for Secretarial action. It recommends clemency in appropriate cases to the Secretary or the Judge Advocate General.

The Judge Advocate General's Civil Law Directorate consists of eight divisions, six of which are included in the Legal Services Center.

The Preventive Law and Legal Assistance Office provides personal legal assistance to Air Force personnel assigned to the Pentagon and metro-

politan Washington, D. C., manages the Air Force preventive law and legal assistance programs, and advises the Air Staff on federal and state income tax issues affecting military interests.

The Claims and Tort Litigation Division adjudicates aviation, environmental, medical malpractice, and general tort claims and defends lawsuits arising from such claims.

The Environmental Law Division represents the Air Force in environmental, occupational safety and health, and land-use litigation.

The General Litigation Division represents the Air Force in administrative proceedings and all civil litigation brought against USAF and its officials involving personnel actions, the Freedom of Information Act, the Privacy Act, taxes, utilities, and constitutional and personal torts.

The Contract Law Division represents the Air Force in Federal Court litigation involving USAF contracts.

The Patents Division investigates and makes administrative decisions on patent and copyright claims of infringement against, and prepares and submits patent applications for, the Air Force. ■

Air Force Management Engineering Agency

THE mission of the Air Force Management Engineering Agency (AFMEA), located at Randolph AFB, Tex., is to develop and maintain Air Force manpower determinants. These determinants specify, by grade and skill, the number of people needed to perform Air Force missions. AFMEA also provides management engineering guidance to all the major commands. In addition, it provides technical help to command management engineering teams (CMETs) at nearly every Air Force base in the world.

The agency performs manpower-related analysis and provides information systems support for the Air Force manpower community. It also manages the Air Force's officer/enlisted grade distribution. It operates and maintains the Logistics Composite Model (LCOM). This model permits

the Air Force to simulate various weapon system support environments, enabling it to determine maintenance manpower requirements. AFMEA is also responsible for developing Transient and Personnel Holding Accounts factors for special Air Force manpower accounts. The Air Staff uses these accounts to adjust for military personnel having transient, patient, prisoner, or pre-separation status.

AFMEA manages three major Air Force productivity programs: the Air Force Suggestion Program, the Fast Payback Capital Investment (FAS-CAP) Program, and the Commercial Activities (A-76) Program. These programs capitalize on modern technology and new ideas to increase productivity, freeing manpower for other Air Force priorities. In FY 1990, the Suggestion Program saved taxpayers

\$137 million. Also in FY 1990, AFMEA directed the distribution of \$13.4 million to help bases finance productivity improvements and provided technical guidance to MAJCOMs for the A-76 program.

AFMEA has ten subordinate units throughout the United States. These include seven functional management engineering teams (FMETs) and three specialized units. The FMETs use industrial engineering techniques to develop efficient organizations and manpower determinants for functional areas common to most Air Force installations.

The FMETs include the Engineering and Services Management Engineering Team at Tyndall AFB, Fla. (AFESMET); Medical Management Engineering Team at Maxwell AFB, Ala. (AFMEDMET); Manpower and

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Personnel Management Engineering Team at Randolph AFB (AFMPMET); Special Staff Management Engineering Team at Peterson AFB, Colo. (AFSSMET); Security Police Management Engineering Team at Kirtland AFB, N. M. (AFSPMET); Logistics Management Engineering Team at Dover AFB, Del. (AFLOGMET); and

Communications-Computer Management Engineering Team at Scott AFB, Ill. (AFCOMMET).

The specialized units include Operating Location A (OLA) at the Pentagon and the Air Force Wartime Manpower and Personnel Readiness Team (AFWMPRT) at Fort Ritchie, Md. AFMEA also commands the Joint

Health-Care Management Engineering Team (JHMET) in San Antonio, Tex. The JHMET develops manpower determinants for medical functions common to the Army, Navy, and Air Force.

AFMEA has an authorized strength of sixty-four officers, 123 enlisted, and 134 civilians. ■

Air Force Military Personnel Center

MORE than 530,000 active-duty Air Force men and women are affected by the procedures and policies formulated and implemented at the Air Force Military Personnel Center, located at Randolph AFB, Tex. In addition, AFMPC provides services to approximately 620,000 retired Air Force members and spouses of deceased Air Force people.

AFMPC puts people with the right skills in the right jobs at the right time to enable commanders to accomplish their missions. During contingency operations, when AFMPC must respond quickly to wartime requirements, the Personnel Readiness Center coordinates personnel management activities.

AFMPC's military and civilian personnel balance the need to accommodate individual preferences and professional goals with the skill needs of commanders. Even before initial assignments are made, AFMPC works closely with the Air Force Recruiting Service and Air Training Command to acquire, classify, and train the numbers and types of personnel the Air Force needs.

AFMPC manages officer programs and conducts promotion boards. The center also administers the Weighted Airman Promotion System (WAPS) and the Stripes for Exceptional Performers (STEP) program.

AFMPC develops, implements, and manages the officer and enlisted evaluation systems directly affecting more than 650,000 active-duty, Guard, and Reserve officers and enlisted members.

The Air Force Retention Division is responsible for officer and enlisted retention and reenlistment programs and policies, the Aviator Continuation Pay program, the Pilots Electronic Bulletin Board, the Worldwide Personnel Issues and Retention Hotline, and the Career Airman Reenlistment Reservation System.

Military awards and decorations, quality force, line-of-duty determinations, USAF-level special trophies and recognition programs, dress and personal appearance programs, physical fitness programs, and morale, welfare, and recreation activities are AFMPC's responsibilities as well. AFMPC handles all separations and retirements, administers survivor annuity programs, and is the focal point for retiree activities.

AFMPC provides operational guidance and long-range planning for 126 active-duty consolidated base personnel offices (CBPOs) worldwide. AFMPC is functional manager for more than 3,000 unit orderly rooms USAF-wide and is responsible for orderly-room automation initiatives. One of those initiatives, Personnel Concepts

III (PC-III), is designed to improve personnel support to commanders, staffs, and unit personnel. PC-III will be implemented at all bases.

The Personnel Data System (PDS), developed and operated by AFMPC, supports active-duty military and civilian, Reserve, and Guard members through the personnel life cycle, from accession to retirement or separation.

A new program, managed by AFMPC, is transition assistance. The Air Force has formed a team to develop ways to help people leaving the service find productive employment in the civilian economy. A central feature of the program is a combined effort of DoD, the Department of Labor, and the Department of Veterans Affairs to provide seminars covering all aspects of the job search to retiring and separating Air Force members. Although the program currently operates at a limited number of sites, expansion to other sites is planned as the drawdown accelerates.

One of AFMPC's most sensitive responsibilities is administering the Air Force Casualty Services Program. In addition to assisting families of active-duty and retired casualties, the center maintains contact with the families of Air Force members unaccounted for in the southeast Asian conflict. ■

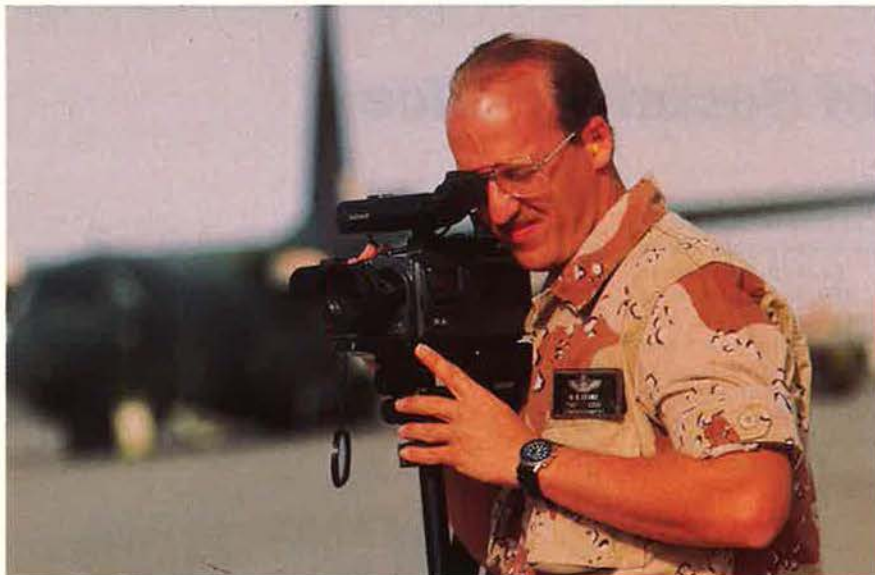
Air Force News Center

THE Air Force News Center (AFNEWS), headquartered at Kelly AFB, Tex., ensures that Air Force personnel everywhere are well informed. The center creates and furnishes public affairs products and

services to Air Force men and women and their families worldwide through print, broadcast, film, and video media.

The center is commanded by Col. Paul F. Heye and reports directly to the

Air Force Director of Public Affairs. AFNEWS has three mission elements: Air Force Internal Information, the Army and Air Force Hometown News Service, and the Air Force Broadcasting Service (AFBS).



TSgt. Wayne Evans gets footage of C-130 operations at a base in the Middle East for showing on "Air Force Now." The program is a service of Air Force Internal Information, one of three Air Force News Center mission elements.

Air Force Internal Information provides policy, products, and services to Air Force people, their families, and the general public through commanders and their public affairs representatives. Products include *Airman* Magazine, "Air Force Now" films and videos, the Air Force News Service, and the Air Force Policy Letter for Commanders.

This directorate oversees the base newspaper and base guide programs and originates the Air Force litho-

graphs series. It also creates the Air Force Radio News releases.

The Army and Air Force Hometown News Service provides stories about newsworthy individuals to their hometown newspapers and other local media throughout the United States. During 1990, more than 355,150 servicemen and -women were featured in 1.6 million releases to hometown newspapers.

The radio feature teams reached a vast audience through 838 radio sta-

tions. The television feature teams conducted 768 interviews reaching millions of households. Print-feature teams interviewed almost 2,000 servicemen and -women, whose stories were read by millions of readers of civilian newspapers.

The Air Force Broadcasting Service manages the Air Force functions of the Armed Forces Radio and Television Service, the world's largest radio-television network. AFBS operates 160 radio and television outlets in Alaska, Greenland, Europe, the Middle East, and the Pacific, reaching an audience of 250,000 military people and their families.

More than 600 airmen, soldiers, sailors, Marines, and civilian employees serve in the broadcast operation, bringing news, information, and entertainment to DoD people and their families around the world.

AFNEWS provides its three mission elements with administration, resources, communications, and computer support. The center provides budget, manpower, and logistics support to the Chicago, Los Angeles, and New York City regional public affairs offices and to the Air Force Orientation Group (AFOG) at Gentile AFS, Ohio. AFOG designs, builds, transports, and displays exhibits around the continental US to inform Americans about the Air Force and its people, equipment, and national contributions.

AFNEWS operates with a staff of 589 military and 238 civilians. ■

Air Force Office of Medical Support

THE Air Force Office of Medical Support (AFOMS) has its headquarters at Brooks AFB, Tex. Its commander serves on the staff of the Surgeon General, USAF, as the Director of Health-Care Support.

AFOMS assists the Air Force Surgeon General in developing programs, policies, and practices relating to Air Force health care in peace and war. The office is organized into the Directorate of Health-Care Support and Professional Affairs Activities.

The Directorate of Health-Care Support develops plans, programs, and management guidance through four divisions.

The Patient Administration Division develops and implements plans to

manage medical administrative functions for patient administration, ambulatory services, and medical records.

The Health Facilities Division serves as a consultant for medical design, construction, and maintenance.

The Medical Service Information Systems Division monitors the development, acquisition, installation, and application of computer-based medical information handling and retrieval systems.

The Medical Logistics Division develops plans and policies concerning medical materiel, supply, and equipment; biomedical equipment maintenance repair; facility management; and service contracts.

Professional Affairs Activities con-

sist of one program and one committee, each assisting the Surgeon General in its particular area of expertise. The Family Advocacy Program manages, monitors, and coordinates policy and guidance for the Air Force Exceptional Family Member Program (EFMP) and the Air Force Child and Spouse Abuse Program. The USAF Radioisotope Committee coordinates administrative and regulatory aspects of licensing, possession, use, storage, handling, and disposal of all radioactive material used by the Air Force.

AFOMS works directly on a daily basis with the Air Force Surgeon General, other Air Staff directorates, major commands, and other federal agencies in support of health-care operational policies and practices. ■

Air Force Office of Security Police

THE Air Force Office of Security Police (AFOSP) was activated September 1, 1979, at Kirtland AFB, N. M. Its commander, Brig. Gen. Frank K. Martin, is also the Air Force Assistant Inspector General for Security and the Air Force Chief of Security Police. His staff serves at Kirtland AFB and within the National Capital Region.

AFOSP establishes Air Force policies for security, law enforcement, air base ground defense, information security, and firearms training and maintenance. The agency plans, directs, and manages programs for more than 47,000 active-duty, reserve component, and civilian and contract security police and combat-arms training and maintenance personnel.

Programs include the security of combat and nuclear systems; maintenance of law and order; prisoner correction, confinement, and rehabilitation; security education; personnel and industrial security; and classification and safeguarding of information in the interest of national security.

During 1990, AFOSP accomplished the following:

- Provided funding and acquisition support to Air Force security police and other forces deployed for Operation Desert Shield.

Sgt. Gabriel Sanchez of the 833d Security Police Squadron, Holloman AFB, N. M., guards an "entry control point" at a Desert Storm air base. Such sentry duty is the responsibility of Air Force Office of Security Police, headquartered at Kirtland AFB, N. M.



—USAF photo by Sgt. Kimberly Yearnean

—Photo by Paul Kennedy



Security police guard a gate at Andrews AFB, Md. AFOSP sets Air Force policy for security, law enforcement, air base ground defense, information security, and firearms training and maintenance. It plans and directs programs for more than 47,000 uniformed and civilian security personnel in such areas as weapon systems security, law and order, and prisoner correction.

- Guided and assisted the development of security systems for the Kirtland Underground Munitions Storage Complex in New Mexico, weapons security storage systems overseas, and the Peacekeeper rail-garrison program.

- Became the DoD Executive Agent for managing military drug-detector dog team support for civilian law enforcement agencies as part of the national war on drugs.

- Assisted in DoD's reorganization of confinement and corrections facilities and approved the redesignation of seven Air Force confinement facilities as regional DoD facilities.

- Championed the first Joint Air Base Ground Defense Doctrine. The doctrine, which eliminates several individual memorandums of understanding among the services, is now published in joint service pamphlets and regulations.

- Represented the Air Force in the Joint Service Small Arms Program advanced combat rifle test and provided

seven combat arms instructors and twenty-three shooters for the test.

- Proposed and tested an initiative to upgrade the rifle orientation program in Air Force Basic Military Training to meet full qualification standards. More than ninety percent of the 1,227 basic trainees in the test group qualified on the M16 rifle.

- Tested and completed a new M60 machine gun training program to provide more realistic combat-oriented training USAF-wide for M60 gunners.

- Developed the Dispersed Inte-

grated Security System (DISS) concept of operations and requirements documents. DISS integrates tactical air forces' and Strategic Air Command's statements of need and Joint Service operational requirements. Osan AB, Korea, will be the first base to install the equipment, which is user-deployed, capable of multiple configurations, and easily relocatable.

- Gained approval at the Office of the Secretary of Defense (OSD) level for Joint Service Operational Requirements Documents for Delay and

Denial Systems. These are the first joint acquisition documents approved by OSD under the rules governing acquisition of physical security equipment. The system incorporates incremental penalties to discourage intruders.

- Implemented the Secret Periodic Reinvestigation program to enhance the evaluation of Air Force people for trustworthiness. This program was initially established to update previous investigations for secret clearances dated 1969 or earlier. ■

Air Force Office of Special Investigations

THE Air Force Office of Special Investigations (AFOSI) has been the Air Force's major investigative service since August 1, 1948. Headquartered at Bolling AFB, D. C., its commander is Brig. Gen. Francis R. Dillon.

AFOSI provides investigative and counterintelligence information and services to commanders USAF-wide. AFOSI seeks to identify and stop espionage, subversion, terrorism, sabotage, economic crime, and other criminal activities that may threaten Air Force resources. AFOSI investigators work closely with local wing and base commanders to direct efforts according to those commanders' priorities.

Local AFOSI detachments have a full range of on-call specialists and state-of-the-art techniques to assist them. Electronics, computer, forensic, and behavioral-science specialists routinely deploy worldwide to protect Air Force people and resources. AFOSI's polygraph examiners provide valuable investigative support.

AFOSI has about 2,500 personnel, of whom two-thirds are special agents. Eighty-eight percent of the

special agents are military, and twelve percent are civilian. AFOSI recruits, selects, and trains its own special agents, who come from almost every Air Force specialty.

Fighting fraud at all levels is one of AFOSI's highest priorities, particularly major weapon system procurement fraud, wherein inferior parts affect flight safety, false accounting costs taxpayers millions of dollars, and corruption degrades the integrity of the government's procurement system.

Investigating such major crimes as drug trafficking, murder, theft, rape, and assault consumes the largest portion (forty-two percent) of AFOSI man-hours.

AFOSI has a threefold responsibility in the fight against illegal drugs. First are AFOSI's traditional drug-enforcement responsibilities, which involve day-to-day street enforcement and suppression activities. Second is the Narcotics and Contraband Smuggling Enforcement Program, a strategy to detect and deter the use of Air Force personnel and resources to smuggle illicit drugs and contraband.

The third and newest mission is AFOSI's investigative support to DoD's counternarcotics mission. In this role, AFOSI develops, analyzes, and disseminates drug intelligence and provides specialized investigative support to unified and component commanders.

As a result of AFOSI's fraud investigations and general criminal investigations, the Air Force recovered nearly \$130 million in fines, forfeitures, restitutions, and civil penalties. These investigations led to the indictment of 537 individuals or corporations, 295 convictions, 231 pretrial diversions or Article Fifteens, and twenty-nine civil judgments.

Foreign intelligence service activities and terrorist threats directed against Air Force people and resources remain priority mission concerns for AFOSI.

In 1990, AFOSI presented 4,567 defensive counterintelligence awareness briefings to more than 213,000 Air Force personnel and about 2,000 antiterrorism briefings to some 50,000 airmen. ■

Air Force Program Executive Office

THE role of Air Force Program Executive Officers (PEOs) is to manage and be directly accountable for the execution (cost, schedule, and performance) of major and selected Air Force acquisition programs. There are six PEOs, each managing a

portfolio of mission-area-related programs assisted by a small military and civilian staff.

The PEO structure was established as a direct reporting unit of the Air Force Acquisition Executive/Assistant Secretary for Acquisition in Feb-

ruary 1990, based on recommendations of the Packard Commission and the Defense Management Review, and is now a field operating agency. The structure streamlines the chain of command between the program directors for major and selected pro-

grams and the Air Force Acquisition Executive. PEOs are charged with executing the programs in their portfolio as their only responsibility.

The Command, Control, and Communications (C³) Systems PEO, Brig. Gen. Kenneth R. Israel, handles the E-3A Airborne Warning and Control System, National Airspace System, Joint Tactical Information Distribution System, Cheyenne Mountain Upgrade, and Over-the-Horizon Backscatter Radar programs.

Robert Majors is the Information Systems PEO. His portfolio includes the MAC Command and Control Information Processing System, Depot Maintenance Management Information System, Requirements Database, Case Management Control System, and Reliability and Maintainability Information System programs.

Programs under Brig. Gen. Garry A. Schnelzer, the Space Systems PEO, include the Defense Meteorological Satellite Program, Defense Support Program, Defense Satellite Communication System, Navstar Global Positioning System, Titan IV, and Milstar.

Brig. Gen. Joseph K. Glenn is the Strategic Systems PEO. His programs include the B-1B bomber, Peacekeeper Rail Garrison, Advanced Cruise Missile, Short-Range Attack Missile II/Tactical, and Small ICBM. (The B-2 Program Director currently reports directly to the Air Force Acquisition Executive.)



USAF's program to develop and produce the C-17 airlifter (above) is overseen by one of six Air Force Program Executive Officers. PEOs are top-echelon managers of major Air Force acquisition programs grouped by mission areas and are accountable for those programs' costs, schedules, and performances. The PEO system was established to strengthen the acquisition chain of command.

The Tactical/Airlift Systems PEO, Maj. Gen. Edward P. Barry, Jr., manages the Advanced Tactical Fighter, F-15, F-16, C-17, Mk. XV Combat Identification System (proposed for cancellation), and Tanker/Transport Training System programs.

The Tactical Strike Systems PEO is Maj. Gen. Stephen M. McElroy. His programs include the Advanced Me-

dium-Range Air-to-Air Missile (AM-RAAM), Sensor Fuzed Weapon, Direct Airfield Attack Combined Munitions, Joint Surveillance and Target Attack Radar System (Joint STARS), and Tacit Rainbow (proposed for cancellation).

The PEO structure will continue to be refined and improved to meet the evolving needs of today's Air Force. ■

Air Force Review Boards Office

THE Air Force Review Boards Office (AFRBO) was established in 1982 to provide for management of various military and civilian appellate processes for the Secretary of the Air Force. The Deputy for Air Force Review Boards directs the operations of the organizations that make up AFRBO, develops overall policy, and acts for the Secretary of the Air Force in deciding individual cases before the various boards. The Deputy reports to the Assistant Secretary of the Air Force for Manpower, Reserve Affairs, Installations, and Environment.

Three separate but related organizations report to the Deputy.

The Air Force Personnel Council (AFPC) provides review of a broad range of military personnel issues by seven component boards: the Air Force Personnel Board, Physical Dis-

ability Appeal Board, Board of Review, Discharge Review Board, Decorations Board, Clemency and Pardon Board, and DoD Civilian/Military Service Review Board. The DoD Civilian/Military Service Review Board acts as DoD's executive agent in the review of group requests that civilian or contract service be considered active-duty service.

The Air Force Civilian Appellate Review Agency (AFCARA) processes discrimination complaints and grievances filed by Air Force civilian employees. Its Appellate Examining Division provides on-site investigators and grievance examiners to conduct fact-finding investigations and make recommendations on discrimination complaints and employee grievances to the local commander. The Appellate Review Office analyzes grievanc-

es and complaints and recommends a final Air Force decision to the Secretary of the Air Force.

The Air Force Board for Correction of Military Records (AFBCMR) is a statutory board of civilians that examines requests for correction of military records submitted by service members, veterans, or their heirs. USAF civilian executives are appointed by the Secretary of the Air Force to serve on the board as a collateral duty. The board meets several times each week to consider a broad range of military personnel issues: evaluation reports, discharges, benefits and allowances, and any other issue related to military personnel records. Because it renders the final administrative decision, the AFBCMR is known as the "Supreme Court" of the Air Force.

The Deputy for Air Force Review



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Boards is responsible for rendering final decisions for the Secretary of the Air Force regarding remissions of indebtedness for enlisted members and waivers for officers and civilian personnel. He also coordinates cases

having Presidential, congressional, Secretarial, or other interests concerning individual cases, inquiries, or complaints affecting Air Force members or civilian employees and their families.

The Air Force Review Boards Office exists to correct errors or injustices in military records and ensure due process, equity, and fair and impartial treatment for all Air Force military members and civilian employees. ■

Air Force Technical Applications Center

THE Air Force Technical Applications Center (AFTAC) is a unique national resource whose primary mission is to monitor compliance with several important nuclear treaties.

AFTAC operates and maintains the US Atomic Energy Detection System (USAEDS), a worldwide system of sensors to detect explosions in the atmosphere, underground, underwater, and in space. Gas samples and particles from those explosions are collected by airborne and ground-based samplers for analysis in AFTAC's laboratories using data collected by the USAEDS. AFTAC analysts determine if the explosions are nuclear in origin and report them, through Hq. USAF, to the national command authorities.

AFTAC, headquartered at Patrick AFB, Fla., has three major subordinate units, eleven detachments, six operating locations, and more than fifty unmanned equipment locations around the world.

AFTAC's largest subordinate unit is the Technical Operations Division at McClellan AFB, Calif. This major complex contains the McClellan Central Laboratory, AFTAC's primary analysis facility, and centralized engineering, maintenance, and supply functions. The division also trains airborne special equipment operators.

The command is divided into two operations areas. The Pacific Technical Operations Area is headquartered at Wheeler AFB, Hawaii, and the European Technical Operations Area is headquartered at Lindsey AB, Germany. They provide maintenance and personnel support for the detachments and operating locations in their respective theaters.

AFTAC employs about 1,400 military and nearly 100 civilian personnel. Many officers and civilians hold doctorates in nuclear physics, chemistry, and other technical fields. The enlisted force is largely composed of specially trained, scientific technicians, many of whom spend most of their Air Force career with AFTAC.

A1C James A. Kirby, an atomic energy detection specialist, takes readings on the plotter of a hydroacoustic recorder and processor. The Air Force Technical Applications Center uses a worldwide system of sensors to monitor compliance with a number of nuclear treaties.



—USAF photo by Sgt. Charles E. Raper, Jr.

The technical capabilities AFTAC has developed pay special dividends in other mission areas. AFTAC supports US Space Command with nuclear detonation (NUDET) information obtained from NUDET sensors on all Global Positioning System satellites. AFTAC personnel within US Space Command validate data and provide an assessment of any nuclear events detected by these satellite-based sensors.

AFTAC expertise supports NASA's manned flights by warning of any potential nuclear radiation exposure to astronauts. Such information can also be used in aircraft routing and for warning the general populace in an emergency. AFTAC is able to track nuclear debris from accidents in a number of possible scenarios, such as satellites reentering the atmosphere

with nuclear materials on board or a nuclear reactor accident like the 1986 disaster at Chernobyl in the Soviet Union.

With the signing of the Intermediate Nuclear Forces Treaty, members of AFTAC began applying their special technical skills to assist the On-Site Inspection Agency in monitoring compliance with that historic agreement. AFTAC technicians helped develop special radiation-monitoring equipment and frequently travel to the Soviet Union as members of the INF teams.

Dramatic changes in the past two years have brought hope of greater cooperation among world powers. The new treaties fostered by that cooperation make more critical AFTAC's capability to monitor compliance with those agreements. ■

Air Reserve Personnel Center

THE Air Reserve Personnel Center (ARPC), Lowry AFB, Colo., provides personnel support for the call-up, mobilization, and demobilization of more than 500,000 Air National Guard, Air Force Reserve, and retired members. ARPC's mission is to assist in the mobilization of the Air Reserve components, provide personnel support to individual members, and maintain their master personnel records.

ARPC has a staff of more than 750 military and civilian workers who provide support in assignments, promotions, discharges, retirements, school selections, orders, pay, airline tickets, veterans' entitlements, Servicemen's Group Life Insurance, Defense Enrollment/Eligibility Report System, Reserve Component Survivor Benefit Plan, and a myriad of other personnel-assistance activities to reservists worldwide. ARPC is one of only two locations where Air Force officers are considered for promotion by central selection boards.

ARPC's Consolidated Reserve Personnel Office is the largest base-level CBPO (consolidated base personnel office) in the Air Force, serving nearly

14,000 individual mobilization augmentees (IMAs) and participating Individual Ready Reservists. Because IMAs train directly with the active-duty force, their CBPO functions are handled at ARPC.

The center also operates three centrally managed programs for nearly 1,900 medical, 1,000 legal, and 570 chaplain reserve personnel. ARPC also provides support to some 2,100 students working toward medical degrees under the Health Professions Scholarship Program and to nearly 170 chaplain candidates.

The center used all work areas in 1990 to support Operation Desert Shield. This was the first time in more than two decades that reserve forces have been called up. ARPC's Personnel Mobilization Center worked night and day to accept the influx of reservists volunteering for duty. ARPC's chaplain, medical, and legal directorates were involved in recalling their professional individual mobilization augmentees. These augmentees were assigned to Stateside bases with personnel shortages due to active-duty deployments.

Other accomplishments in 1990 in-

cluded the kickoff of Total Quality Management Plus (TQM+). The center continued educating first-line supervisors by graduating two classes from its Excellence in Management Program. A new Management Symposium Program was established to enhance and improve mid-level managers' supervisory and management skills.

Programs scheduled for implementation in 1991 include installation of new office automation software and equipment as the first step in networking computers throughout the center. Along with the Air Force Military Personnel Center, ARPC expects to begin conversion of all microfiche personnel records to optical disk storage.

Since its inception in March 1954, ARPC has activated personnel of the Air Reserve components during four national emergencies—the Berlin crisis in 1961, the Cuban missile crisis in 1962, the USS *Pueblo* incident in 1968, and the Middle East crisis in 1990. Today, ARPC provides the personnel support needed to ensure mobilization readiness to meet any challenge or emergency. ■

US Air Force Historical Research Center

THE US Air Force Historical Research Center is the repository for USAF historical documents. It is collocated with the Air University Library and provides research facilities for professional military education students, faculty, visiting scholars, and the general public.

The center's collection, begun in Washington, D. C., during World War II, moved to Maxwell AFB, Ala., in 1949. It comprises more than 60,000,000 pages devoted to the history of the service and constitutes the largest and most valuable specialized collection of documents on US military aviation in the world.

Materials in the center's collection cover topics ranging from the use of balloons in the Civil War through the record of Air Force activities in World War II, Korea, and Vietnam, to the latest histories of Air Force units.

About three-fourths of the center's documents are US Air Force unit histories. Special collections, some dating back to the early 1900s, complement the unit histories.

Among the special collections are historical monographs and studies, more than 2,000 oral history interviews, end-of-tour reports of major overseas commanders, course materials of the Air Corps Tactical School from the 1930s, and working papers of key Army Air Forces staff offices, the British Air Ministry, and the German Air Force during World War II. More than 400 collections of personal papers of retired Air Force civilian and military officials are also available to researchers.

In addition to being a repository for Air Force historical documents, the Historical Research Center performs research and other historical services

for the Air Force. The center's staff answers requests for historical information from official sources and the general public, prepares historical reference works, conducts the Air Force's oral history program, maintains the record of the status of the Air Force organizations and aircraft, processes Air Force unit emblems, and determines the lineage and honors of Air Force units.

To make the historical collection more accessible to its users, the center provides research aids, including a computerized database and bibliographies for identifying relevant documents on specific topics. Almost the entire collection is recorded on 16-mm microfilm, with copies deposited at the National Archives and Records Administration, Washington, D. C., and the Office of Air Force History, Bolling AFB, D. C. ■

Air Force Reserve

Air Force Reserve airlift and air refueling personnel continued flying missions in January 1990 in support of the US invasion of Panama. When the operation was over at the end of the month, Reserve airlift units had flown nearly 1,500 hours and had airlifted 7,500 passengers and more than 4,000 tons of cargo. Refuelers had pumped several hundred thousand pounds of fuel.

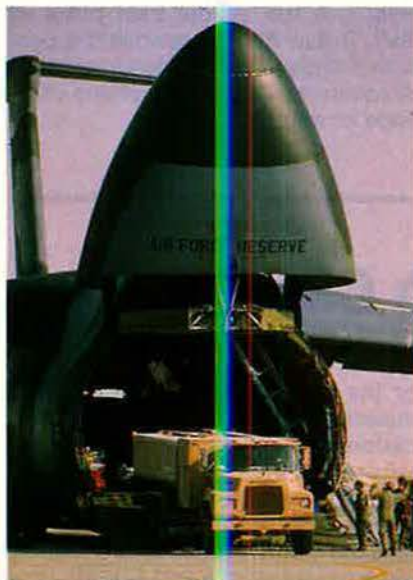
When the call for volunteers came after Iraq invaded Kuwait on August 2, Reservists quickly responded. During the first two weeks of the crisis, nearly 6,000 of the more than 9,000 volunteers were on duty.

A giant C-5 transport, flown by a volunteer Reserve crew and carrying active-duty passengers, crashed on August 29, shortly after takeoff from Ramstein AB, Germany. Only four of the seventeen people on board survived the ill-fated flight en route to the Middle East with supplies for Opera-



© Lane Stout

An example of Air Force Reserve upgrading is the switch from F-4Es to F-16s at Carswell AFB, Tex., scene of the preflight check above. Below, a fuel truck rolls off an AFRES C-5 in Saudi Arabia, part of MAC Reservists' cargo-hauling in the Gulf War.



tion Desert Shield. SSgt. Lorenzo Galvan, Jr., was the only aircrew member to survive the crash. The 68th Military Airlift Squadron loadmaster from Kelly AFB, Tex., later received the Airman's Medal for risking his life while evacuating fellow passengers.

Some 4,500 reservists were called to active duty by the end of November 1990 in support of Operation Desert Shield.

Reservists from the C-141 StarLifter-equipped 459th Military Airlift Wing, Andrews AFB, Md.; the C-5 Galaxy-

equipped 439th MAW, Westover AFB, Mass.; and the 433d MAW, Kelly AFB, went on active duty. Associate unit C-141 and C-5 aircrews placed on active duty came from the 315th MAW (Assoc.), Charleston AFB, S. C.; 349th MAW (Assoc.), Travis AFB, Calif.; 446th MAW (Assoc.), McChord AFB, Wash.; 512th MAW (Assoc.), Dover AFB, Del.; and 514th MAW (Assoc.), McGuire AFB, N. J. Selected maintenance personnel from these associate units and the 445th MAW (Assoc.), Norton AFB, Calif., were also called up.

C-130 Hercules aircrew, maintenance, and support personnel from the 914th Tactical Airlift Group, Niagara Falls International Airport, N. Y., and the 927th TAG, Selfridge ANGB, Mich., were placed on active duty. Reservists from the 34th Medical Service Squadron, Roslyn ANG Station, N. Y., and the 37th Aeromedical Evacuation Group, MacDill AFB, Fla., along with 266 individual mobilization augmentees from throughout the US, went on active duty. The call-up also included Reservists from aerial port squadrons at Dover AFB; McChord AFB; Charleston AFB; Tinker AFB, Okla.; Youngstown MAP, Ohio; and Wyoming City, Pa. The 926th Tactical Fighter Group, NAS New Orleans, La., was the first Reserve fighter unit called up to support Operation Desert Shield.

By mid-December 1990, Reservists had logged more than 86,981 hours of flying time in support of Operation Desert Shield. They flew nearly 110,000 passengers and hauled almost 194,000 tons of cargo. KC-10 Extender and KC-135 Stratotanker air refueling crews also pumped nearly 3,000,000 gallons of aircraft fuel.

Reservists won five major events at Military Airlift Command's international Airlift Rodeo competition at Pope AFB, N. C., took part in several training exercises, and helped fight fires in California.

AFRES provides MAC with half of its combat-ready C-141 and C-5 aircrews, forty percent of its strategic airlift maintenance force, half of the aerial port force, two-thirds of all MAC medical crews, half of all AC-130 gunship crews, and a fourth of all Air Force C-130 tactical airlift crews.

AFRES modernization continues in 1991. The 403d Tactical Airlift Wing at Keesler AFB, Miss., will assume the entire Air Force WC-130 weather reconnaissance mission. It gains eight active-duty WC-130 aircraft, fifty full-time air reserve technicians, and 100 Reservists. In addition, associate unit crews at Charleston AFB will convert from C-141 to C-17 aircraft; the 907th TAG, Rickenbacker ANGB, Ohio, will convert from C-130 to C-141 aircraft; and MH-60 helicopters will be accepted by air rescue squadrons. ■

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.) Brig. Gen. James E. Sherrard III, Commander	939th ARW	191th SOG	71st SOS	HH-3E, CH-3E	Davis-Monthan AFB, Ariz.	AFSOC
			711th SOS	AC-130A	Eglin AFB, Fla. (Aux. 3)	AFSOC
	349th MAW (Assoc)		304th ARS	HC-130H/UH-1H, HH-3E/CH-3E	Portland IAP, Ore.	MAC
			301st ARS	HC-130H/N, HH-3E/CH-3E	Homestead AFB, Fla.	MAC
			305th ARS	HC-130H/N, HH-3E/CH-3E	Selfridge ANGB, Mich.	MAC
			301st MAS (Assoc)	C-5A/B	Travis AFB, Calif.	MAC
			312th MAS (Assoc)	C-5A/B	Travis AFB, Calif.	MAC
			708th MAS (Assoc)	C-141B	Travis AFB, Calif.	MAC
			710th MAS (Assoc)	C-141B	Travis AFB, Calif.	MAC
	403d TAW	934th TAG	815th TAS	C-130E, WC-130E/H	Keesler AFB, Miss.	MAC
			96th TAS	C-130E	Minneapolis-St. Paul IAP, Minn.*	MAC
	433d MAW 302d TAW	943d TAG	68th MAS	C-5A	Kelly AFB, Tex.	MAC
			731st TAS	C-130B	Peterson AFB, Colo.	MAC
	440th TAW		303d TAS	C-130B	March AFB, Calif.	MAC
			95th TAS	C-130H	General Mitchell IAP, Wis.*	MAC
	445th MAW (Assoc)	927th TAG 928th TAG	63d TAS	C-130E	Selfridge ANGB, Mich.	MAC
			64th TAS	C-130H	O'Hare ARFF, Ill.*	MAC
			728th MAS (Assoc)	C-141B	Norton AFB, Calif.	MAC
			729th MAS (Assoc)	C-141B	Norton AFB, Calif.	MAC
	446th MAW (Assoc)		730th MAS (Assoc)	C-141B	Norton AFB, Calif.	MAC
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. David R. Smith, Commander	301st TFW	924th TFG	457th TFS	F-16C/D	Carswell AFB, Tex.	TAC
			704th TFS	F-16C/D	Bergstrom AFB, Tex.	TAC
	419th TFW	507th TFG 944th TFG	466th TFS	F-16A/B	Hill AFB, Utah	TAC
			465th TFS	F-16A/B	Tinker AFB, Okla.	TAC
	434th AREFW (H)	98th AREFG (H)	302d TFS	F-16C/D	Luke AFB, Ariz.	TAC
			72d AREFS (H)	KC-135E	Grisson AFB, Ind.	SAC
			78th AREFS (H) (Assoc)	KC-10A	Barksdale AFB, La.	SAC
	442d TFW	916th AREFG (H)	77th AREFS (H) (Assoc)	KC-10A	Seymour Johnson AFB, N. C.	SAC
			303d TFS	A-10A	Richards-Gebaur AFB, Mo.*	TAC
	917th TFW	930th TFG	45th TFS	A-10A	Grisson AFB, Ind.	TAC
			47th TFS	A-10A	Barksdale AFB, La.	TAC
	452d AREFW (H)	926th TFG	46th TFS	A-10A	Barksdale AFB, La.	TAC
			706th TFS	A-10A	NAS New Orleans, La.	TAC
			336th AREFS (H)	KC-135E	March AFB, Calif.	SAC
			79th AREFS (H) (Assoc)	KC-10A	March AFB, Calif.	SAC
482d TFW	940th AREFG (H)	314th AREFS (H)	KC-135E	Mather AFB, Calif.	SAC	
		93d TFS	F-16A/B	Homestead AFB, Fla.	TAC	
	906th TFG	89th TFS	F-16A/B	Wright-Patterson AFB, Ohio	TAC	
Fourteenth Air Force (Hq. Dobbins AFB, Ga.) Maj. Gen. Dale R. Baumler, Commander	94th TAW	932d AAG (Assoc)	73d AAS (Assoc)	C-9A	Scott AFB, Ill.	MAC
			700th TAS	C-130H	Dobbins AFB, Ga.*	MAC
	315th MAW (Assoc)	908th TAG 910th TAG	357th TAS	C-130H	Maxwell AFB, Ala.	MAC
			757th TAS	C-130H	Youngstown MAP, Ohio*	MAC
			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
			337th MAS	C-5A	Westover AFB, Mass.*	MAC
			758th TAS	C-130H	Greater Pittsburgh IAP, Pa.*	MAC
	439th MAW	911th TAG 914th TAG	328th TAS	C-130E	Niagara Falls IAP, N. Y.*	MAC
			756th TAS	C-141B	Andrews AFB, Md.	MAC
	459th MAW	913th TAG 907th TAG	327th TAS	C-130E	Willow Grove ARFF, Pa.*	MAC
			356th TAS	C-130E	Rickenbacker ANGB, Ohio	MAC
	512th MAW (Assoc)		326th MAS (Assoc)	C-5A	Dover AFB, Del.	MAC
			709th MAS (Assoc)	C-5A	Dover AFB, Del.	MAC
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	
514th MAW (Assoc)						

AAG Aeromedical Airlift Group
AAS Aeromedical Airlift Squadron
AREFG Air Refueling Group
AREFS Air Refueling Squadron
AREFW Air Refueling Wing
ARF Air Reserve Facility
ARFF Air Reserve Forces Facility
AFSOC Air Force Special Operations Command

ARS Air Rescue Squadron
ARW Air Rescue Wing
MAS Military Airlift Squadron
MAW Military Airlift Wing
SOG Special Operations Group
SOS Special Operations Squadron
TAG Tactical Airlift Group

TAS Tactical Airlift Squadron
TAW Tactical Airlift Wing
TFG Tactical Fighter Group
TFS Tactical Fighter Squadron
TFTS Tactical Fighter Training Squadron
TFW Tactical Fighter Wing
* AFRES Base

Air National Guard

WITH both a state and a federal mission, the Air National Guard (ANG) is unique among the Air Reserve components.

Air 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 Islands, and the Commanding General of the District of Columbia. Each governor is represented in the state or territory chain of command by the adjutant general.

Units may be called to federal service by the President, Congress, or both to enforce federal authority, to suppress insurrection, or in the national defense. During peacetime, ANG units are assigned to gaining Air Force major commands, which provide advisory assistance and evaluate unit training, safety, and readiness programs.

Air Guard units from all mission



Above, US airborne troops await loading on an Air National Guard C-130 to move closer to the Iraqi border. Below, an ANG tanker refuels a Navy carrier-based plane. ANG units performed many missions during Operations Desert Shield and Storm.

—USAF photo by TSgt. Hans Deffner



—USAF photo by SrA. Chris Pulnam

areas participate annually in training deployments, both within the US and overseas. Every day, ANG units work beside their active-duty counterparts. ANG units consistently place high in USAF-wide competitions.

At the beginning of Operation Desert Shield, Air National Guardsmen were among the first volunteers to support the deployment of initial units to Saudi Arabia. On August 23, the President authorized the call-up of the Guard and Reserve to support the operation in a true test of the Total Force policy. By the January 15 UN deadline, more than 6,000 Air Guard men and women had been called to active duty. They were augmented by more than 1,300 ANG volunteers.

ANG members took part in Operation Desert Storm in tactical fighters, aerial refueling aircraft, tactical and strategic airlifters, tactical reconnaissance, combat communications, aeromedical evacuation, civil engineering, services, mobile aerial port units, and security police.

Today the Air National Guard has 117,000 members and provides ninety-two percent of the fighter interceptor force, sixty percent of the reconnaissance force, forty-two percent of the tactical air support, thirty-seven percent of the tactical airlift, thirty-four percent of the air rescue capability, twenty-four percent of the tactical fighters, twenty-one percent of the air

refueling capability, and six percent of the strategic airlift capability of the total Air Force.

ANG F-15 and F-16 air defense units perform a twenty-four-hour alert mission along the coasts and borders of the US. The Hawaiian F-15 unit is responsible for the entire air defense of that state. Guard KC-135E tanker units also have crews and aircraft on round-the-clock alert in support of strategic defense requirements.

In 1991, ANG fighter units will continue modernization through conversions to the F-16. Five KC-135 tanker units will receive additional aircraft, bringing each unit's PAA (Primary Aircraft Authorized) to ten. In airlift, the 164th Tactical Airlift Group, Memphis, Tenn., will convert to the C-141B strategic airlift mission in 1992. The 179th TAG, Mansfield, Ohio, will be the ninth ANG unit to convert to the H model C-130. The Guard Air Rescue Groups, the 129th at NAS Moffett, Calif., and the 106th at Suffolk, N. Y., are converting from HH-3 to MH-60G Pave Hawk helicopters. Since its activation last year, the 210th Air Rescue Squadron has begun standing alert at Anchorage, Alaska, as part of the 176th Composite Group.

In 1991, Air Guard people and equipment will continue to serve the nation in the air and on the ground as important components in the US counter-narcotics program. ■

THE AIR NATIONAL GUARD BY MAJOR COMMAND ASSIGNMENT

(As of January 1, 1991)

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 ANGB, Ohio
161st Air Refueling Group	Phoenix, Ariz.
168th Air Refueling Group	Eielson AFB, Alaska
170th Air Refueling Group	McGuire AFB, N. J.
190th Air Refueling Group	Forbes Field, Kan.

TACTICAL AIR COMMAND

A-7D/K Corsair II

121st Tactical Fighter Wing	Rickenbacker ANGB, Ohio
132d Tactical Fighter Wing	Des Moines, Iowa
140th Tactical Fighter Wing	Buckley ANGB, 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 ¹	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-16A/B/C Fighting Falcon

113th Tactical Fighter Wing	Andrews AFB, Md.
127th Tactical Fighter Wing	Selfridge ANGB, Mich.
174th Tactical Fighter Wing	Syracuse, N. Y.
149th Tactical Fighter Group	Kelly AFB, Tex.
169th Tactical Fighter Group	McEntire ANGB, S. C.
183d Tactical Fighter Group	Springfield, Ill.
184th Tactical Fighter Group ¹	McConnell AFB, Kan.
187th Tactical Fighter Group	Montgomery, Ala.
188th Tactical Fighter Group	Fort Smith, Ark.

A-10A Thunderbolt II

128th Tactical Fighter Wing	Truax Field, Wis.
103d Tactical Fighter Group	Bradley ANGB, Conn.
104th Tactical Fighter Group	Barnes MAP, Mass.
175th Tactical Fighter Group	Baltimore, Md.

F-4E Phantom

108th Tactical Fighter Wing	McGuire AFB, N. J.
122d Tactical Fighter Wing	Fort Wayne, Ind.
131st Tactical Fighter Wing	St. Louis, Mo.
181st Tactical Fighter Group	Terre Haute, Ind.

RF-4C Phantom

117th Tactical Reconnaissance Wing	Birmingham, Ala.
124th Tactical Reconnaissance Group ²	Boise, Idaho
152d Tactical Reconnaissance Group	Reno, Nev.
155th Tactical Reconnaissance Group	Lincoln, Neb.
163d Tactical Reconnaissance Group	March AFB, Calif.
186th Tactical Reconnaissance Group	Meridian, Miss.

OA-37B Dragonfly

110th Tactical Air Support Group	Battle Creek, Mich.
182d Tactical Air Support Group	Peoria, Ill.

OA-10A Thunderbolt II

111th Tactical Air Support Group	Willow Grove ARFF, Pa.
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F-15A/B Eagle

116th Tactical Fighter Wing	Dobbins AFB, Ga.
159th Tactical Fighter Group	New Orleans, La.

AIR DEFENSE UNITS (TAC)

F-15A/B Eagle

102d Fighter Interceptor Wing	Otis ANGB, Mass.
142d Fighter Interceptor Group	Portland, Ore.

F-16A/B Fighting Falcon

144th Fighter Interceptor Wing	Fresno, Calif.
107th Fighter Interceptor Group	Niagara Falls, N. Y.
119th Fighter Interceptor Group	Fargo, N. D.
120th Fighter Interceptor Group	Great Falls, Mont.
125th Fighter Interceptor Group	Jacksonville, Fla.
147th Fighter Interceptor Group	Ellington Field, Tex.
148th Fighter Interceptor Group	Duluth, Minn.
158th Fighter Interceptor Group	Burlington, Vt.
177th Fighter Interceptor Group	Atlantic City, N. J.
191st Fighter Interceptor Group	Selfridge ANGB, Mich.

MILITARY AIRLIFT COMMAND

C-130 Hercules

118th Tactical Airlift Wing	Nashville, Tenn.
123d Tactical Airlift Wing	Louisville, Ky.
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	Channel Island ANGB, 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.
176th Composite Group ³	Anchorage, Alaska
179th Tactical Airlift Group	Mansfield, Ohio
189th Tactical Training Group ⁴	Little Rock, Ark.

HC-130 Hercules/MH-60G Blackhawk

106th Air Rescue Group	Suffolk, N. Y.
129th Air Rescue Group	NAS Moffett Field, Calif.

C-141B StarLifter

172d Military Airlift Group	Jackson, Miss.
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C-5A Galaxy

105th Military Airlift Group	Newburgh, N. Y.
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EC-130E Hercules

193d Special Operations Group	Harrisburg IAP, Pa.
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PACIFIC AIR FORCES

F-15A/B Eagle

154th Composite Group	Hickam AFB, Hawaii
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¹Replacement Training Unit (RTU). The 162d TFG also serves as an RTU for the F-16 Fighting Falcon.

²Combat Crew Training Unit (CCTU).

³Includes 210th Air Rescue Squadron with HC-130 and MH-60G aircraft.

⁴Aircrew CCTU.

The 1991 USAF Almanac Reports from the DRUs



Air Force District of Washington

THE Air Force District of Washington (AFDW) is the single manager for support of Air Force activities in the national capital region. Although its headquarters is located at historic Bolling AFB, D. C., there are AFDW operating locations at the Pentagon, Andrews AFB, Md., and Fort Meade, Md. AFDW comprises the 1100th Air Base Group (ABG) and the 1100th National Capital Region Support Group (NCR SPTG).

The 1100th ABG is the host unit for Bolling AFB. It has the squadrons and support agencies usually found at the base level. Supporting 3,301 military members and 993 civilians, the group provides housing for 295 officers and 1,100 noncommissioned officers; it has 165 transient quarters and maintains a payroll of \$114 million. These support functions also serve numerous tenant units at Bolling, such as the Air Force Office of Scientific Research, Hq. Air Force Office of Special Investigations, and the Office of Air Force History. The Surgeon General and the Chief of Chaplains are also among Bolling's Air Staff tenants.

The 1100th NCR SPTG provides broad support to organizations in the region, including the Office of the Secretary of Defense and its agencies, the Joint Staff, Hq. USAF, direct reporting units and field operating agencies, and the Air Force Civilian



—USAF photo by Keith Walker

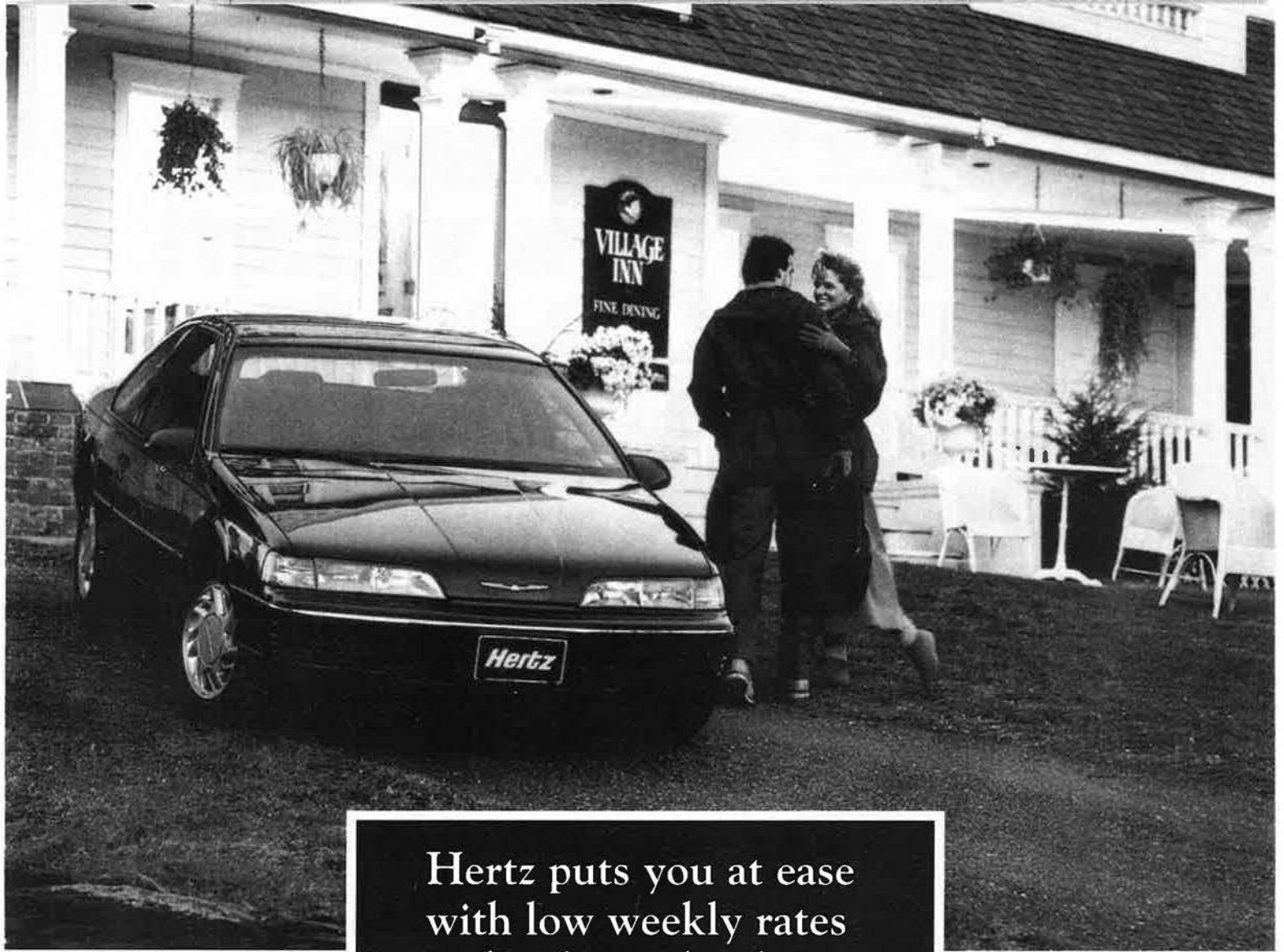
Among its other missions, AFDW is responsible for Air Force ceremonial events in the nation's capital. The Honor Guard (above), based at Bolling AFB, D. C., represents the Air Force in arrival and departure ceremonies for visiting dignitaries and participates in military funerals and memorial ceremonies.

Personnel Management Center. Its key functions include personnel, operations, comptroller, accounting and finance, and recreation services for AFDW assets. The Hq. USAF Security Force manages physical, personal, electronic, and information security within the Pentagon.

In addition to the duties associated

with these units, AFDW is responsible for Air Force ceremonial events in the nation's capital. Two of its most visible ambassadors are the US Air Force Honor Guard and the US Air Force Band, both based at Bolling.

The Honor Guard represents the Air Force at arrival and departure ceremonies for visiting dignitaries at the



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U.S. Military (Ret.)



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White House, the Pentagon, and Andrews AFB. It also participates in military funerals at Arlington National Cemetery and in memorial ceremonies at the Tomb of the Unknowns. The Air Force Band boasts some of

the nation's best musicians. Its varied components perform music worldwide in support of Air Force community relations programs.

AFDW's "Drug Free" program has appeared at schools in the national

capital region. This program, designed to educate young people on the hazards of drug use and provide them with positive, drug-free role models, is cosponsored by the Drug Enforcement Agency (DEA). ■

Air Force Operational Test and Evaluation Center

THE Air Force Operational Test and Evaluation Center (AFOTEC) is the Air Force's independent test agency responsible for operational testing of new or modified weapon systems and components being developed for Air Force and multiservice use.

AFOTEC's Commander, Maj. Gen. Peter D. Robinson, reports directly to the Chief of Staff of the Air Force. The primary purpose of operational test and evaluation is to reduce risk in the acquisition process by determining how well systems perform when operated and maintained by USAF personnel in a realistic operational environment. The results from the center's tests are used at all levels of the Air Force and DoD to support program decisions that lead to the production and fielding of systems. The center's efforts focus on evaluating the operational effectiveness and suitability of the Air Force's future weapon systems and supporting equipment.



AFOTEC tests and evaluates equipment for every kind of Air Force mission. The center, currently testing weapon system trainers for the B-1B and F-15E, recently completed operational tests of the real things (above, B-1B operational testing).



Other systems currently undergoing tests by AFOTEC include the Advanced Medium-Range Air-to-Air Missile (AMRAAM), which completed its initial operational test and evaluation in 1990 and is now in follow-on testing. AFOTEC personnel manage most test programs, and the major commands supply the test teams with evaluators.

The center tests and evaluates equipment used over the entire spectrum of Air Force missions, including aircraft, strategic missiles, munitions, space systems, flight simulators, intelligence systems, and command, control, and communications systems. AFOTEC is currently conducting tests that involve the Over-the-Horizon Backscatter (OTH-B) radar program, the Advanced Medium-Range Air-to-Air Missile (AMRAAM), and the Consolidated Space Operations Center.

The center is also testing the high-speed antiradiation missile (HARM), short-range attack missile (SRAM II), and simulator systems including the B-1B and F-15E weapon system trainers. Most recently, the center completed tests of the F-15E Strike Eagle and B-1B operational testing.

The center has approximately 650 people assigned to its headquarters at Kirtland AFB, N. M., five detachments, and twenty-one test teams. The cen-

ter's five detachments are located at Eglin AFB, Fla., Nellis AFB, Nev., Edwards AFB, Calif., Peterson AFB, Colo., and Kapaun Administrative Annex, Germany.

AFOTEC personnel form the management cadre for test programs, while the major commands supply the

test teams with the majority of their evaluators. There are approximately 2,000 individuals under the center's operational control. The additional personnel provide current operational experience to ensure that the evaluation reflects the needs of those who will ultimately use the system—oper-

ators, maintainers, and support and training specialists.

By testing under operationally realistic conditions, AFOTEC ensures that the equipment will meet users' requirements and will be ready for operational use in accomplishing the Air Force's mission. ■

US Air Force Academy

THE staff and faculty of the United States Air Force Academy are charged with providing instruction and experience to all cadets so that they graduate with the knowledge, character, and motivation essential to leadership as career officers in the United States Air Force. Before its graduates enter various flying and support specialties, the Academy trains them to be, first and foremost, Air Force officers. Of the nearly 24,000 cadets who have graduated from the Academy in thirty-two classes, more than sixty percent are still on active duty.

During its short history, the Academy has become a leader among undergraduate institutions. Thirty cadets, including two from the class of 1991, have earned Rhodes Scholarships. Nearly 200 others have been named Guggenheim or National Science Foundation Fellows, earned Marshall or Fulbright-Hays Scholarships, or accepted scholarships to attend Harvard University's John F. Kennedy School of Government.

Cadets completing four years of studies earn a bachelor of science degree. Academics, military training, athletic conditioning, and spiritual and ethical development are emphasized. Academics includes classes in the basic sciences, engineering, the humanities, and the social sciences. All cadets complete a core curriculum of 91.5 semester hours. They can specialize in any of twenty-five academic majors.

Nearly all Academy professors wear the uniform of the United States Air Force. Military development is central to the Academy experience and distinguishes it from other institutions of higher learning. Four primary areas are stressed: professional military studies, theoretical and applied leadership experiences, aviation science and airmanship programs, and military training. The intent is to provide the cadets with the knowledge, skills,



—Staff photo by Guy Aceto

The US Air Force Academy's curriculum emphasizes academics, military training, spiritual and ethical development, and athletic conditioning. Programs under the latter include the Academy's football team, the Falcons (above, a mascot and trainer).

values, and behavior patterns necessary to meet the leadership challenges of the twenty-first century.

Most cadets complete the sailplane program, about half earn parachuting wings, and all cadets planning to become pilots complete training in T-41s. About two-thirds of all graduates attend undergraduate pilot training.

Graduates from the class of 1991 who enter pilot training will incur an active-duty service commitment of eight years after earning their wings. For subsequent classes, the pilot-training commitment will be ten years. Class of 1991 graduates not attending flying training incur a five-year active-duty service commitment. Those in the class of 1996 and subsequent years will incur a six-year commitment.

Few schools in the country have such an extensive athletic program: intercollegiate sports, intramurals, and physical education. The Academy's goal is to enhance the physical

conditioning of all cadets, develop the physical skills necessary for officership, teach leadership in a competitive environment, and build character.

Seventeen men's and ten women's intercollegiate teams compete nationally. Each of the forty cadet squadrons fields a team in nineteen intramural sports, such as football, tennis, swimming, wrestling, and cross-country. The physical education program consists of mandatory courses and electives ranging from gymnastics to scuba diving.

The Honor Code is the centerpiece of a cadet's moral and ethical development. Cadets pledge: "We will not lie, steal, or cheat, nor tolerate among us anyone who does." All cadets take a formal course in ethics and receive honor and ethics instruction.

Information on admission procedures can be obtained from the Director of Admissions, US Air Force Academy, Colo. 80840-56E1. ■

The 1991 USAF Almanac

Guide to Major Air Force Installations Worldwide

Altus AFB, Okla. 73523-5000; within Altus city limits. Phone (405) 482-8100; DSN 866-1110. MAC base. 443d Military Airlift Wing (Training); 340th Air Refueling Wing (SAC); Field Training Det. 403; 71st Flying Training Wing, OLK ACE Det. (ATC), T-37 aircraft operations; Det. 4, 17th Weather Sqdn.; Det. 3, 1600th Management Engineering Sqdn.; Det. 4, 1365th Audiovisual Sqdn. Base activated Jan. 1943; inactivated May 1945; reactivated Jan. 1953. Area 3,582 acres, plus 818 leased. Altitude 1,376 ft. Military 2,988; civilians 776; approx. 200-300 TDY students (officer and enlisted) in training per month. Payroll \$92.9 million. Housing: 143 officer; 657 NCO; 380 VAO, 158 VOQ, 11 transient family units. 20-bed hospital.

Andersen AFB, Guam, APO San Francisco 96334-5000; 2 mi. N of Yigo. DSN 366-1110. PACAF base. Host unit: 633d Air Base Wing. Tenant unit: 605th Military Airlift Support Sqdn. (MAC). Base also supports Joint Typhoon Warning Center, Northwest Field, and Andersen South housing area. Andersen serves as a vital refueling point for aircraft operating in the Pacific. Base activated late 1944; named for Gen. James Roy Andersen, lost at sea between Kwajalein and Hawaii Feb. 26, 1946. General Andersen was the Chief of Staff, Headquarters Army Air Forces, Pacific Ocean Areas. Area: 20,504 acres. Altitude: 612 ft. Military 2,315; civilians 882. Payroll \$50 million. Housing: 157 officer; 1,656 enlisted. Two clinics.

Andrews AFB, Md. 20331-5000; 11 mi. SE of Washington, D. C. Phone (301) 981-9111; DSN 858-1110. MAC base. Hq. Air Force Systems Command (AFSC) provides aerospace systems, equipment, and initial spare parts for the Air Force's operational and support commands. 1776th Air Base Wing; 89th Military Airlift Wing; 113th Tactical Fighter Wing (ANG); 459th Military Airlift Wing (AFRES); 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 4,971 acres (incl. easements). Altitude 281 ft. Military 8,569; civilians 4,771. Payroll \$396.9 million. Housing: 362 officer; 1,729 NCO; 210 mobile home spaces; 312 transient (incl. 68 temporary living quarters for incoming personnel, 88 DV suites, 128 VOQ, 28 VAQ). 235-bed hospital.

Arnold AFB, Tenn. 37389; approx. 7 mi. SE of Manchester. Phone (615) 454-3000; DSN 340-5011. AFSC base. 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 dedicated June 1, 1950; named for Gen. H. H. "Hap" Arnold, wartime Chief of the AAF. Area 40,118 acres. Altitude 1,100 ft. Military 146; civilians 258; contractor employees 3,688. Payroll \$166.8 million. Housing: 24 officer; 16 NCO; 45 transient. Medical aid station.

Aviano AB, Italy, APO New York 09293-5000; adjacent to Aviano, 50 mi. N of Venice, Italy. Phone (commercial, from CONUS) 011-39-434-667111; DSN 632-1110. USAF base. 40th Tactical Support Wing manages this USAF main operating base in support of USAF and NATO. Although no aircraft are permanently assigned, host unit would exercise command and control of a variety of deployed weapon systems in case of a war in Europe. It also provides administrative and logistical support to 48 off-base units at 31 locations throughout Italy. Aviano is the only USAF tactical air base in Italy. This and its strategic location give the base special importance to NATO's southern flank. Originally an Italian flying school, which opened in 1939; 40th TSW began operation in Apr. 1966. Area 1,140 acres. Altitude 319 ft. Military 2,500; civilians 500. Payroll \$74.6 million. No on-base or government-leased housing. 665 billeting spaces. Clinic.

Barksdale AFB, La. 71110-5000; in Bossier City. Phone (318) 456-2252; DSN 781-1110. SAC base. Hq. 8th Air Force; 2d Bomb Wing, B-52G, KC-135, and KC-10 aircraft operations; 1st Electronic Combat Range 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), C-21 aircraft operations; 49th Test Sqdn.; 3097th Aviation Depot Sqdn. (AFLC); Det. 2, 4200th Test Sqdn.; Det. 1, 3903d School Sqdn. (SAC NCO Academy); 745th Air Force Band; 78th Air Refueling Sqdn. (AFRES), KC-10 aircraft operations; 917th Tactical Fighter Wing (AFRES), A-10 operations; Det. 1, 1360th Aerospace Audiovisual Sqdn. (MAC). Also home of 8th Air Force Museum. The 917th TFW trains all ANG and AFRES pilots in 46th Tactical Fighter Training Sqdn. 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 1,207. Payroll \$304 million.

Housing: 358 officer; 703 NCO; 29 transient. 50-bed hospital.

Beale AFB, Calif. 95903-5000; 13 mi. E of Marysville. Phone (916) 634-3000; DSN 368-1110. SAC base. 14th Air Div.; 9th Strategic Reconnaissance Wing; 7th Missile Warning Sqdn. (AFSPACECOM). Aircraft include U-2/TR-1 reconnaissance aircraft, KC-135 Stratotankers, and T-38 Talon trainers. Originally US Army's Camp Beale. Became Air Force installation Apr. 1948; became AFB 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 3,587; civilians 322. Payroll \$95.1 million. Housing: 217 officer; 1,501 enlisted; 94 transient. 25-bed hospital.

Bergstrom AFB, Tex. 78743-5002; 7 mi. SE of downtown Austin. Phone (512) 479-4100; DSN 685-1110. 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-4E fighter operations, scheduled for transition to the F-16A; TAC NCO Academy West; 602d Tactical Air Control Gp. Base activated Sept. 22, 1942; named for Capt. John A. E. Bergstrom, first Austin serviceman killed in WW II, who died Dec. 8, 1941, at Clark Field, Philippines. Area 4,050 acres. Altitude 541 ft. Military 3,620; civilians 895. Payroll \$200.2 million. Housing: 75 officer; 644 enlisted; 408 transient (88 VOQ, 120 VAO, 200 TLF). 30-bed hospital.

Bitburg AB, Germany, APO New York 09132-5000; 15 mi. N of Trier, Germany. Phone (commercial, from CONUS) 011-49-6561-61-1110; DSN 453-1110. USAF base. 36th Tactical Fighter Wing with three fighter squadrons flying F-15C/D Eagle aircraft. Base activated in 1952. Area 1,236 acres. Altitude 1,228 ft. Military 5,978; civilians 1,535. Payroll \$112 million. Housing: 75 officer; 1,128 NCO; 62 transient. 40-bed hospital.

Bolling AFB, D. C. 20332-5000; 3 mi. S of US Capitol. Phone (202) 545-6700; DSN 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. Reynal C. Bolling, first high-ranking Air Service officer killed in WW I. Area 604 acres. Military 3,301; civilians 993. Payroll \$114 million. Housing: 295 officer; 1,100 NCO; 165 transient. Clinic.

E-SYSTEMS



Our Pledge

I pledge allegiance to the flag
of the United States of America
and to the republic for which it stands,
one nation
under God,
indivisible,
with liberty
and justice for all.

— Francis Bellamy, 1892



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Brooks AFB, Tex. 78235; in SE San Antonio. Phone (512) 536-1110; DSN 240-1110. AFSC base. Human Systems Div.; USAF School of Aerospace Medicine (AFSC); Armstrong Laboratory; 6570th Air Base Gp. Tenant units include 6575th School Sqdn. (Systems Acquisition School); Air Force Office of Medical Support; Hq. AFSC Det. 20, Directorate of Professional Development; 2199th Communications Sqdn. (AFCC); Det. 26, 6592d Management Engineering Sqdn.; 6906th Electronic Security Sqdn. (ESC). Base activated Dec. 8, 1917; named for Cadet Sidney J. Brooks, Jr., killed Nov. 13, 1917, on his commissioning flight. Area 1,310 acres. Altitude 600 ft. Military 1,877; civilians 1,944. Payroll \$89 million. Housing: 70 officer; 100 NCO; 8 transient. Clinic.

Cannon AFB, N. M. 88103-5000; 7 mi. W of Clovis. Phone (505) 784-3311; DSN 681-1110. TAC base. 27th Tactical Fighter Wing, F-111D/G fighter operations. Base activated Aug. 1942; named for Gen. John K. Cannon, WW II commander of Allied air forces in the Mediterranean theater and former TAC commander. Area 25,663 acres. Altitude 4,295 ft. Military 4,269; civilians 521. Payroll \$116 million. Housing: 149 officer; 862 enlisted; 81 transient (20 VAQ, 30 VOQ, 31 TLF). 25-bed hospital.

Carswell AFB, Tex. 76127-5000; 7 mi. WNW of downtown Fort Worth. Phone (817) 782-5000; DSN 739-1110. SAC base. 7th Bomb Wing (SAC); 301st Tactical Fighter Wing (AFRES); 436th Strategic Training Sqdn. (SAC); Det. 1, 1365th Audiovisual Sqdn. (MAC); Det. 7, USAF Global Weather Central (MAC); Det. 415, 3751st Field Training Sqdn. (MAC); aircraft include B-52s, KC-135s, and AFRES F-4s. T-37 Accelerated Copilot Enrichment Program. 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. Carswell is the only military facility to have its namesake interred on the premises. Area 3,274 acres. Altitude 650 ft. Military 6,872; civilians 1,028. Payroll \$260.8 million. Housing: 105 officer; 652 NCO; 106 VOQ, 18 TLF, 80 VAQ. 140-bed regional hospital. Housing is unavailable due to massive renovations. The waiting list is indefinitely frozen.

Castle AFB, Calif. 95342-5000; 8 mi. NW of Merced. Phone (209) 726-2011; DSN 347-1110. SAC base. 93d Bomb Wing. Conducts training of all SAC B-52 and KC-135 aircraft. 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 4,731; civilians 492. Payroll \$145.9 million. Housing: 92 officer; 841 NCO; 392 transient (incl. 88 VAQ, 272 VOQ, 12 family quarters, 20 DVQ). 25-bed hospital.

Chanute AFB, Ill. 61868-5000; 14 mi. N of Champaign at Rantoul. Phone (217) 495-1110; DSN 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. Display center and historical aircraft park constitute a base museum. Base activated May 1, 1917; named for Octave Chanute, aeronautical engineer and glider pioneer who died in 1910. Area 2,174 acres. Altitude 735 ft. Military 3,937; civilians 1,207. Payroll \$104.4 million. Housing: 153 officer; 1,169 enlisted; 242 VOQ, 996 VAQ, 32 TLF. 15-bed hospital. Scheduled for closure in October 1993.

Charleston AFB, S. C. 29404-5000; located in North Charleston 10 mi. from downtown Charleston. Phone (803) 566-6000; DSN 673-2100. MAC base. Joint-use airfield. 437th Military Airlift Wing; 315th MAW (AFRES Assoc.); Det. 1, 107th Fighter Interceptor Gp. (TAC); Det. 7, 1361st Audiovisual Sqdn. Base activated Dec. 1941; inactivated Feb. 1946; reactivated 1952. Area 6,314 acres (incl. auxiliary airfield). Altitude 45 ft. Military 7,790 (incl. AFRES); civilians 1,362. Payroll \$141.5 million. Housing: 127 officer; 850 NCO; 1,798 dormitory spaces; 75 trailer spaces; 535 transient (7 DV suites, 128 VOQ, 400 VAQ). Medical clinic.

Cheyenne Mountain AFB, Colo. 80914-5515; 6 mi. S of Colorado Springs. Phone (719) 554-7321; DSN 692-7011. AFSPACECOM base. Host unit: 3d Space Support Wing (AFSPACECOM). Cheyenne Mountain Support Group, North American Aerospace Defense Command (NORAD) Command Center, and US Space Command operations center. Base activated 1966. Area 451 acres. Altitude 7,200 ft. More than 1,400 people representing US Army, Navy, and Air Force; Canadian Forces; and civilian technicians. No housing or transient quarters. Medical aid station.

Clark AB, Republic of the Philippines, APO San Francisco 96274-5000; 65 mi. N of Manila. Phone (commercial, from CONUS) 011-6345-39-21101; DSN 392-1101. PACAF base. Hq. 13th Air Force. Host unit: 3d Tactical Fighter Wing, F-4E and F-4G fighter operations (all fighter air-

craft scheduled to be removed from Clark AB by Sept. 16, 1991). Tenant units: 353d Special Operations Wing (AFSOC); 6200th Tactical Fighter Training Gp.; 624th Military Airlift Support Gp. (MAC); 13th Air Force Medical Center; 1961st Communications Gp. (PACAF); 6922d Electronic Security Sqdn. (ESC). Base activated as Fort Stotsenburg in 1903, renamed in 1919 for Maj. Harold M. Clark, an early aviator raised in the Philippines and killed in a seaplane crash at Miraflores Locks, Panama Canal Zone. Area 9,285 acres. Altitude 478 ft. Military 7,839; US civilians 1,019; local nationals 4,210. Payroll \$209.5 million. Housing: 391 officer; 2,821 NCO; 34 unaccompanied/bachelor dormitories; 190 transient, 128 temporary lodging facility units. 145-bed medical center.

Columbus AFB, Miss. 39701-5000; 10 mi. NNW of Columbus. Phone (601) 434-7322; DSN 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 1,880; civilians 532. Payroll \$60 million. Housing: 234 officer; 584 NCO; 70 transient. 7-bed hospital.

Davis-Monthan AFB, Ariz. 85707-5000; within the city limits of Tucson. Phone (602) 750-3900; DSN 361-1110. TAC base. 836th Air Div.; 355th Tactical Training Wing, A-10 combat crew training; 602d Tactical Air Control Wing, OA-10 and FAC training, operations, and management of 12th AF Tactical Air Control Sqdn.; 41st Electronic Combat Sqn., EC-130H electronic operations; 71st Special Operations Sqdn. (AFRES), HH-3 and CH-3 Jolly Green Giant helicopter operations; Det. 1, 120th Fighter Interceptor Gp. (Mont. ANG), F-16 air defense operations. Also site of AFLC's Aerospace Maintenance and Regeneration Center, storage location for excess DoD aerospace vehicles. Base activated 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 4,628; civilians 1,398. Payroll \$172.1 million. Housing: 133 officer; 1,106 enlisted; 498 transient (306 VAQ, 176 VOQ, 16 TLF). 35-bed hospital.

Dover AFB, Del. 19902-5154; 3 mi. SE of Dover. Phone (302) 678-7011; DSN 455-1110. MAC base. 436th Military Airlift Wing; 512th MAW (AFRES Assoc.). Dover operates the largest aerial port facility on the East Coast. Base activated Dec. 1941; inactivated 1946; reactivated Feb. 1951. Area 3,734 acres. Altitude 28 ft. Military 6,675; civilians 2,374. Payroll \$121.6 million. Housing: 110 officer; 1,446 enlisted; 763 transient (608 VAQ, 155 VOQ). 14 TLF. 30-bed hospital.

Dyess AFB, Tex. 79607-5000; WSW border of Abilene. Phone (915) 696-0212; DSN 461-1110. SAC base. 96th Bomb Wing, two B-1B squadrons (one operational, one training), one KC-135 squadron; 463d Tactical Airlift Wing, two C-130 squadrons; Det. 4, 1722d Combat Control Sqdn. (MAC); 1993d Communications Sqdn. (AFCC); Field Training Det. 417; 12th Flying Training Wing ACE Det. OLC; 436th Strategic Training Sqdn. (SAC); B-1B, KC-135, C-130, T-38 operations. First base to activate an operational B-1B wing. Conducts all B-1 combat crew training for the Air Force. First B-1B arrived June 1985; wing met initial operational capability Oct. 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 who escaped from a Japanese prison camp, killed in P-38 crash at Burbank, Calif., Dec. 1943. Area 6,405 acres. Altitude 1,789 ft. Military 5,331; civilians 449. Payroll \$220 million. Housing: 120 officer; 870 NCO; 271 VAQ/VOQ, 40 TLF. 35-bed hospital.

Eaker AFB, Ark. 72315-5000; 4 mi. NW of Blytheville. Phone (501) 762-7000; DSN 721-1110. SAC base. 97th Bomb Wing; aircraft include B-52s and KC-135s. Base activated June 1942; inactivated Feb. 1947; reactivated Aug. 1955. Known as Blytheville AFB until 1986, when name was changed to honor the late Gen. Ira C. Eaker, airpower pioneer and leader of 8th Air Force in World War II. Area 3,931 acres. Altitude 254 ft. Military 3,022; civilians 397. Payroll \$79.1 million. Housing: 195 officer; 733 NCO; 69 transient. 20-bed hospital.

Edwards AFB, Calif. 93523; 20 mi. E of Rosamond. Phone (805) 277-1110; DSN 527-1110. AFSC base. Site of Air Force Flight Test Center (AFFTC), which conducts developmental and follow-on testing and evaluation of manned and unmanned aircraft and related avionics flight-control and weapon systems. AFFTC also operates USAF Test Pilot School, which trains test pilots, flight-test engineers, and flight-test navigators. Also site of USAF Astronautics Laboratory, US Army Aviation Engineering Flight Activity, NASA's Ames Dryden Flight Research Facility, Jet Propulsion Laboratory's test facility, and primary landing site for space shuttle missions. Base activities began in Sept. 1933. Originally Muroc Army Air Field; renamed for Capt. Glen W. Edwards, killed June 5, 1948, in crash of a YB-49 "Flying Wing."

Area 301,000 acres. Altitude 2,302 ft. Military 6,000 (incl. tenant units); government and contractor civilians 12,000. Payroll \$528.9 million (incl. tenant units and contractors). Housing: 536 officer (incl. BQJ); 3,236 enlisted (incl. 1,466 dormitory spaces and 191 bachelor NCO quarters); 206 transient (64 VAQ, 91 VOQ, 51 TLF); 188 mobile home spaces. 25-bed hospital.

Eglin AFB, Fla. 32542; 2 mi. SW of the twin cities of Niceville and Valparaiso; 7 mi. NE of Fort Walton Beach. Phone (904) 882-3931; DSN 872-1110. AFSC base. Eglin is the free world's largest air force base in terms of land area, covering an area roughly two-thirds the size of Rhode Island. Host unit: Air Force Development Test Center. Associate units: Aeronautical Systems Division, Eglin, and Armament Lab (AFSC); 33d Tactical Fighter Wing; Tactical Air Warfare Center; 1972d Communications Gp.; 919th Special Operations Gp. (AFRES); 20th Surveillance Sqdn.; 55th Special Operations Sqdn.; 9th Special Operations Sqdn.; 655th Special Operations Maintenance Sqdn.; 728th Tactical Control Sqdn.; US Army Florida Ranger Camp; a US Navy Explosive Ordnance Disposal School; Air Force Armament Museum. 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 9,700; civilians 4,875; contractor 950 (excl. Hurlburt Field). Payroll \$421 million (excl. Hurlburt Field). Housing: 332 officer; 2,014 enlisted; 227 trailer spaces (officer and enlisted); 87 transient. 125-bed USAF regional hospital. AFSC clinic at Hurlburt Field.

Eielson AFB, Alaska 99702-5000; 26 mi. SE of Fairbanks. Phone (907) 377-1178; DSN (317) 377-1110. PACAF base. Host unit: 343d Tactical Fighter Wing, A-10 fighter operations; 343d Combat Support Gp. Major tenants include 6th Strategic Reconnaissance Wing (SAC); Arctic Survival School (ATC); 168th Air Refueling Gp. (ANG). Base activated Oct. 1944; named for Carl Ben Eielson, Arctic aviation pioneer who died Nov. 1929. Area 23,500 acres. Altitude 534 ft. Military 3,300; civilians 940. Payroll \$121 million. Housing: 140 officer; 1,227 NCO; 187 transient. Clinic.

Ellsworth AFB, S. D. 57706-5000; 12 mi. ENE of Rapid City. Phone (605) 385-1000; DSN 675-1000. SAC base. Host unit: Strategic Warfare Center. Tenant units: 44th Strategic Missile Wing, Minuteman II operations; 28th Bomb Wing, two B-1 squadrons, one each KC-135R, EC-135; 99th Strategic Weapons Wing, SAC focal point for strategic tactics development and bomber crew training; 812th Strategic Hospital; 812th Strategic Support Wing; 2148th Communications Gp. Home of South Dakota Air and Space Museum. Base activated July 1942 as Rapid City Army Air Base; renamed June 13, 1953, for Brig. Gen. Richard E. Ellsworth, killed Mar. 18, 1953, in crash of RB-36 in Newfoundland, Canada. Area 6,249 acres. Altitude 3,286 ft. Military 6,864; civilians 832. Payroll \$165.9 million. Housing: 332 officer; 1,415 enlisted; 242 transient units (DV 7, VOQ 39, VAQ 109, TLF 39, Strategic Training Center crew quarters 48). 30-bed hospital.

Elmendorf AFB, Alaska 99506-5000; bordering Anchorage. Phone (907) 552-1110; DSN (317) 552-1110. PACAF base. Hq. Alaskan Command; Hq. 11th Air Force (PACAF); Hq. Alaskan NORAD Region. Host unit: 21st Tactical Fighter Wing, F-15 fighter operations. Tenant units: 21st Combat Support Gp.; 11th Tactical Control Wing; 1931st Communications Gp. (PACAF); Alaskan NORAD Region Operations Control Center; Rescue Coordination Center; 962d AWACS (TAC); 6981st Electronic Security Gp. (ESC); 616th Military Airlift Gp. (MAC); 17th Tactical Airlift Sqdn. (MAC); 71st Air Rescue Sqdn. (MAC); 11th Weather Sqdn. (MAC); plus varied US Army, Navy, and Marine activities. Base activated July 1940; named for Capt. Hugh Elmendorf, killed Jan. 13, 1933, at Wright Field, Ohio, while flight-testing a new pursuit plane. Area 13,130 acres. Altitude 118 ft. Military 6,068; civilians 1,480. Payroll \$214 million. Housing: 232 officer; 1,485 NCO; transient includes 50 family units, 90 VOQ, 300 VAQ. 75-bed hospital.

England AFB, La. 71311-5004; 5 mi. W of Alexandria. Phone (318) 448-2100; DSN 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 Nov. 17, 1954, in F-86 crash in France. Area 2,282 acres. Altitude 89 ft. Military 3,090; civilians 440. Payroll \$108.4 million. Housing: 92 officer; 506 enlisted; 48 trailer park spaces; 76 transient (38 VAQ, 33 VOQ, 5 TLF). 15-bed hospital.

Fairchild AFB, Wash. 99011-5000; 12 mi. WSW of Spokane. Phone (509) 247-1212; DSN 657-1212. SAC base. 92d Bomb Wing (SAC); 3636th Combat Crew Training Wing (ATC); 141st Air Refueling Wing (ANG); Det. 24, 37th Air Rescue Sqdn. (MAC); 5th Satellite Control Sqdn. (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 4,223 acres. Altitude 2,462 ft. Military 4,356; civilians 957. Payroll \$103.8 million for active-duty military and civilian; \$20 million for ANG. Housing: 221 officer; 1,359 NCO; transient includes 126 VOQ, 121 VAQ, and 8 temporary lodging facilities. 40-bed hospital.

Falcon AFB, Colo. 80912-5000; 10 mi. E of Colorado Springs. Phone (719) 550-4113; DSN 560-1110. AFSPACECOM base. Host unit: 2d Space Wing, 1002d Space Support Gp.; 1879th Communications Gp.; 73d Space Surveillance Gp. Tenant unit: Strategic Defense Initiative National Test Facility. Base activated Sept. 26, 1985. Area 2,590 acres. Altitude 6,267 ft. Military active-duty 1,900; civilians 300; contractors 2,000. No housing or transient quarters. Medical aid station.

Francis E. Warren AFB, Wyo. 82005-5000; adjacent to Cheyenne. Phone (307) 775-1110; DSN 481-1110. SAC base. 90th Strategic Missile Wing; 90th Combat Support Gp.; 90th Security Police Gp.; 37th Air Rescue Sqdn. (MAC); SATAF (AFSC); Geodetic Survey Gp. (DoD). Base activated as Fort D. A. Russell July 4, 1867; under Army jurisdiction until 1947, when reassigned to USAF. Base renamed in 1930 for Francis Emory Warren, Wyoming senator and first state governor. Area 5,866 acres, plus 50 Peacekeeper and 150 Minuteman III missile sites distributed over 12,600 sq. mi. in Wyoming, Colorado, and Nebraska. F. E. Warren AFB will be the main operating base for the Peacekeeper rail-garrison system. Altitude 6,142 ft. Military 3,656; civilians 799. Payroll \$100 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; DSN 353-1110. TAC base. 35th Tactical Fighter Wing, F-4G training and operations, F-4 transitional and upgrade training, and German Air Force F-4 training; Det. 1, 144th Fighter Interceptor Wing (Calif. ANG). Base activated 1941; named for Brig. Gen. Harold H. George, WW I fighter pilot killed Apr. 29, 1942, in aircraft accident in Australia. Area 5,348 acres. Altitude 2,875 ft. Military 4,248; civilians 507. Payroll \$93.8 million. Housing: 145 officer; 1,494 enlisted; 115 transient (23 VAQ, 52 VOQ, 40 TLF). 20-bed hospital. Scheduled for closure in December 1992.

Goodfellow AFB, Tex. 76908-5000; 2 mi. SE of San Angelo. Phone (915) 654-3231; DSN 477-3231. ATC base. Goodfellow Technical Training Center provides technical training for all Air Force people entering the intelligence career fields and also provides cryptologic training for members of the other military services, civilian intelligence agencies, and foreign military personnel. Major units include 3480th Technical Training Wing (ATC); 3480th Technical Training Gp. (ATC); 3480th Student Gp. (ATC); 3490th Technical Training Gp. (ATC); 3495th Technical Training Gp. (ATC); 8th Missile Warning Sqdn. (at nearby Eldorado AFS, the location of Southwest Pave Paws radar site) (AFSPACECOM); Det. 6, USAF Occupational Measurement Center (USAFOMC); 2081st Communications Sqdn. (ATC); NCO Professional Military Education Center (ESC); 344th Military Intelligence Battalion (US Army); 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 1,964; civilians 623. Payroll \$92.5 million. Housing: 35 officer; 264 NCO; 889 transient (740 VAQ, 120 VOQ, 29 TLF). Clinic.

Grand Forks AFB, N. D. 58205-5000; 16 mi. W of Grand Forks. Phone (701) 747-3000; DSN 362-1110. SAC base. 42d Air Div.; 319th Bomb Wing (KC-135R and B-1B); 321st Strategic Missile Wing (Minuteman III); 2152d Communications Sqdn.; Det. 15, 26th Weather Sqdn. (MAC); 419th Field Training Det. (ATC); Det. 3, 37th Air Rescue Sqdn. (MAC); 41st Flying Training Sqdn. (ATC); ACE Det. Base activated 1956; named after the city of Grand Forks, whose citizens bought the property for the Air Force. Area 5,422 acres. Missile complex covers an additional 7,500 sq. mi. Altitude 911 ft. Military 4,662; civilians 773. Payroll \$124 million. Housing: 384 officer; 1,887 NCO; 136 transient 15-bed hospital.

Griffiss AFB, N. Y. 13441-5000; 1 mi. NE of Rome. Phone (315) 330-1110; DSN 587-1110. SAC base. 416th Bomb Wing; Rome Air Development Center (AFSC); 485th Engineering Installation Gp. (AFCC); Northeast Air Defense Sector (TAC); 10th Aviation Brigade (US Army). 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 4,817; civilians 2,801. Payroll \$238.4 million. Housing: 169 officer; 566 NCO; 50 trailers; 109 transient. 20-bed hospital.

Grissom AFB, Ind. 46971-5000; 7 mi. S of Peru. Phone (317) 688-5211; DSN 928-1110. SAC base. 305th Air Re-

fueling Wing; 930th Tactical Fighter Gp. (AFRES); 434th Air Refueling Wing (AFRES). Activated Jan. 1943 for Navy flight training; reactivated June 1954 as Bunker Hill AFB; renamed May 1968 for Lt. Col. Virgil L. "Gus" Grissom, killed Jan. 27, 1967, at Cape Kennedy, Fla., with other astronauts Edward White and Roger Chaffee in Apollo capsule fire. Area 3,000 acres. Altitude 800 ft. Military 2,693; civilians 836. Payroll \$59 million (SAC only). Housing: 144 officer; 972 NCO; 133 transient. Clinic, outpatient care only.

Gunter AFB, Ala. 36114; 4 mi. NE of Montgomery. Phone (205) 279-1110; DSN 446-1110. AU base. Hq. Computer Systems Div. (AFCC); 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 advocate, died 1940. Area 368 acres. Altitude 220 ft. Military 1,526; civilians 903. Payroll included in Maxwell entry. Housing: 118 officer; 206 NCO; 363 transient (103 VOQ, 257 VAQ, 3 TLF).

Hahn AB, Germany, APO New York 09122-5000; 2 mi. from Sohren, approx. 70 mi. W of Frankfurt. Phone (commercial, from CONUS) 011-49-6543-51-1110; DSN 450-1110. USAF base. 50th Tactical Fighter Wing with three squadrons of F-16C/D aircraft. Base activated in 1951; USAF began operations in 1953. Area 1,920 acres. Altitude 1,560 ft. Military 5,493; civilians 952. Payroll \$164.6 million. Housing: 672 apts.; 302 US Govt. leased housing. Billeting: 53 officer; 1,787 enlisted. 20-bed hospital.

Hanscom AFB, Mass. 01731; 17 mi. NW of Boston. Phone (617) 377-4441; DSN 478-5980. AFSC base. Hq. Electronic Systems Div. (AFSC) manages development and acquisition of command, control, communications, and intelligence (C³) systems. Also site of 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. Base named for Laurence G. Hanscom, a pre-WW II advocate of private aviation, killed in a lightplane accident in 1941. Area 846 acres. Altitude 133 ft. Military 2,676; civilians 2,800. Payroll \$190 million. Housing: 402 officer; 457 NCO; 40-unit TLF, 738 BOQ/VOQ. Clinic.

Hickam AFB, Hawaii 96853-5000; 9 mi. W of Honolulu. Phone (808) 471-7110 (Oahu military operator); DSN 471-7110. 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., EC-135J flying operations. Major associate units include Hq. 3d Air Div. (SAC); 834th Airlift Gp. (MAC); 1st Weather Wing (MAC); 154th Composite Gp. (ANG); 619th Military Airlift Support Sqdn. (MAC); Det. 1, 89th Military Airlift Wing (MAC); 1957th Communications Gp. (PACAF). Base activated Sept. 1938; named for Lt. Col. Horace M. Hickam, air pioneer killed in crash Nov. 5, 1934, at Fort Crockett, Tex. Area 2,761 acres. Altitude sea level. Military 5,077; civilians 1,627. Payroll \$252.3 million (incl. Hickam and Wheeler AFBs and Bellows AFS). Housing: 637 officer; 2,310 enlisted. Clinic.

Hill AFB, Utah 84056-5990; 5 mi. S of Ogden. Phone (801) 777-7221; DSN 458-1110. AFLC base. Hq. Ogden Air Logistics Center. Furnishes logistics support for Minuteman, Peacekeeper, and Small ICBM missiles; Mawerick air-to-ground missiles; laser and electro-optical guided bombs; F-4 and F-16 systems manager; air munitions; aircraft landing gear, including wheels, brakes and struts, tires, and tubes; photographic and aerospace training equipment. Other units include 388th Tactical Fighter Wing (TAC); 419th Tactical Fighter Wing (AFRES); 729th Tactical Control Sqdn. (TAC); 6545th Test Gp. (AFSC), which oversees management of Utah Test and Training Range and RPV test programs. Hill AFB Heritage Museum. Base activated Nov. 1940; named for Maj. Ployer P. Hill, killed Oct. 30, 1935, test-flying the first B-17. Area 6,866 acres; manages 961,401 acres. Altitude 4,788 ft. Military 4,900; civilians 13,600. Payroll \$587 million. Housing: 263 officer; 882 NCO; 45 transient. 35-bed hospital.

Holloman AFB, N. M. 88330-5000; 8 mi. SW of Alamogordo. Phone (505) 479-6511; DSN 867-1110. TAC base. 833d Air Div.; 49th Tactical Fighter Wing, F-15 operations; 479th Tactical Training Wing, AT-38B "top-off" training; 4449th Mobility Support Sqdn., Harvest Bare; 83d Tactical Control Sqdn.; 6585th Test Gp. (AFSC), test and evaluation of aircraft and missile systems. Twenty other tenant units located at Holloman, including 4th Satellite Communications Sqdn. (AFSPACECOM), Air Force Geophysical Laboratory detachment, and a US Army unit. Base activated 1942; named for Col. George Holloman, guided-missile pioneer, killed in B-17 crash on Formosa Mar. 19, 1946. Area 57,000 acres. Altitude 4,093 ft. Military 5,044; civilians 1,052. Payroll \$193 mil-

lion. Housing: 191 officer; 1,360 NCO; 483 transient (239 VAQ, 194 VOQ, 50 TLF). 20-bed hospital.

Homestead AFB, Fla. 33039-5000; 5 mi. NNE of Homestead. Phone (305) 257-8011; DSN 791-0111. TAC base. 31st Tactical Fighter Wing, F-16 fighter operations; site of ATC sea-survival school; 726th Tactical Control Sqdn.; Naval Security Group Activity; 482d Tactical Fighter Wing (AFRES); 301st Air Rescue Sqdn. (AFRES); Det. 1, 125th Fighter Interceptor Gp. (Fla. ANG); Inter-American Air Forces Academy; System of Cooperation Among the American Air Forces (SICOFAA) Secretariat. Base activated Sept. 1942. Area 3,345 acres. Altitude 7 ft. Military 3,727; civilians 1,021. Payroll \$131 million. Housing: 230 officer; 1,385 enlisted; 330 transient (116 VAQ, 195 VOQ, 19 TLF). 50-bed hospital.

Howard AFB/Albrook AFS, Panama, APO Miami 34001-5000. DSN 285-6110. TAC base. With headquarters at Howard, Air Forces Panama represents USAF in operations throughout Latin America. Air Forces Panama is a TAC unit reporting to 12th Air Force, Bergstrom AFB, Tex. Major tenant: 61st Military Airlift Gp. (MAC). Howard originally established in 1928 as a military post, known as Bruja Point Military Reservation; later named for Maj. Charles Harold Howard. Military 2,365; civilians 618. Payroll \$44.4 million. Housing: 256 officer, 918 enlisted.

Hurlburt Field, Fla. 32544-5000; 5 mi. W of Fort Walton Beach. Phone (904) 882-1110 (Eglin AFB); for information DSN 579-1110. Hurlburt Field is a MAC base, though located on the Eglin AFB (AFSC) reservation. Host unit: 834th Air Base Wing (MAC). Home of Air Force Special Operations Command, the focal point for all USAF special operations matters. Major tenant: 1st Special Operations Wing, equipped with MC-130E (Combat Talon), AC-130H (Spectre Gunship), and MH-53J (Pave Low) aircraft located at Hurlburt Field. Also part of 1st SOW are the HC-130 and MH-60G (Pave Hawk) aircraft located at Eglin AFB. Other tenants include USAF Special Operations School; 1720th Special Tactics Gp.; 1723d Special Tactics Sqdn.; 6th Weather Sqdn.; Det. 75, 6th Weather Sqdn.; 4441st Tactical Training Gp.; Det. 1, 3400th Technical Training Gp. (ATC); Joint Warfare Center; 327th Field Training Det.; Det. 14, 1600th Management Engineering Sqdn.; Special Missions Operational Test and Evaluation Center; 4442d Tactical Control Gp., which includes US Air Force Air Ground Operations School and 727th Tactical Control Sqdn.; 823d Civil Engineering Sqdn. RED HORSE; Det. 8, 1361st Audiovisual Sqdn. Base activated 1943; named for Lt. Donald W. Hurlburt, WW II pilot killed Oct. 1, 1943, in a crash on Eglin reservation. Altitude 38 ft. Military 5,300; civilians 740. Payroll \$140 million. Housing: 36 officer; 344 NCO; transient VOQ/VAQ 258, TLF 24. Medical clinic only at Hurlburt, but 155-bed hospital at Eglin Regional Hospital 12 mi. away.

Incirlık AB, Turkey, APO New York 09289-5000; 10 mi. E of Adana. Phone (commercial, from CONUS) 011-90-71-221774 through 221780; DSN 676-1110. USAF base. Host unit: 39th Tactical Gp., supports rotational weapons training deployments for USAF fighter aircraft. Also home for 628th Military Airlift Support Sqdn., which provides a full aerial port operation. Base activated in May 1954; present unit began operations in Mar. 1966. Incirlik, in Turkish, means fig orchard. Area 3,400 acres. Altitude 240 ft. Military 1,960; civilians 1,795. Payroll \$49.1 million. Housing: 950 units; 49 TLF; 330 VAQ; 192 VOQ; 432 dorm rooms. Regional hospital.

Iraklion AB, Crete, Greece, APO New York 09291-5000; 10 mi. E of Iraklion. Phone (commercial, from CONUS) 011-30-81761-196/197; DSN 668-1110. USAF base. Host unit: 7276th Air Base Gp. Other major units include 6931st Electronic Security Sqdn. and 2115th Communications Sqdn. Base named after Crete's capital city. Area 197 acres. Altitude 90 ft. Military 821; civilians 196. Payroll \$17 million. Housing: 23 officer, 28 Senior NCO, 128 NCO, 36 billeting rooms, 364 beds. 3-bed hospital.

Kadena AB, Japan, APO San Francisco 96239-5000; 15 mi. N of Naha, Okinawa. Phone (commercial, from CONUS) 011-81-9838-1111; DSN 630-1110. PACAF base. Host organization: Hq. 313th Air Div. Tenant units: 18th Tactical Fighter Wing, F-15C/D operations; 18th Combat Support Wing; 400th Munitions Maintenance Sqdn. (Theater); 376th Strategic Wing (SAC), KC-135 and RC-135 operations; 1962d Communications Gp. (PACAF); 6990th Electronic Security Gp. (ESC); 961st Airborne Warning and Control Sqdn. (PACAF), E-3 operations; 603d Military Airlift Support Gp. (MAC); 33d Air Rescue Sqdn. (MAC), HH-3 operations; 17th Special Operations Sqdn. (AFSOC), HC-130 operations; Western Pacific Rescue Coordination Center (MAC); 13th Military Airlift Sqdn. (MAC), C-12F operations. Base named for city of Kadena, Okinawa. Area 14,778 acres. Military 7,054; appropriated fund civilians 3,508; nonappropriated fund civilians, including contractors, 13,589. Payroll \$350 million. Housing: 7,215 on-base units (officer/enlisted);

522 transient; 57 temporary. Clinic. US Naval Hospital at Camp Lester.

Keesler AFB, Miss. 39534-5000; located in Biloxi. Phone (601) 377-1110; DSN 597-1110. ATC base. Hq. Keesler Technical Training Center (avionics, communications, electronics, radar systems, computer and command and control systems, personnel, and administrative courses); Keesler USAF Medical Center. Hosts MAC and AFRES weather reconnaissance units; AFRES tactical airlift unit; TAC airborne command and control sqdn.; AFCC engineering installation gp.; AFCCNCO Academy/Leadership School; USAF First Sergeant's Academy. 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 8,554; civilians 2,812. Payroll \$230 million. Housing: 291 officer; 1,665 NCO; 51 trailer spaces; 76 transient (376 VOQ and 1,348 VAQ units or space availability; technical training students may occupy many units). 350-bed hospital.

Kelly AFB, Tex. 78245-5000; 5 mi. SW of San Antonio. Phone (512) 925-1110; DSN 945-1110. AFCC base. Hq. San Antonio Air Logistics Center provides logistics management, procurement, and distribution support for such USAF aircraft as the C-5A and C-5B, C-17, C-131, F-106, OV-10A, T-37, and T-38. As a specialized repair activity, SA-ALC modernizes and performs heavy depot maintenance on the entire USAF fleet of C-5s, a significant portion of Strategic Air Command's B-52s, and various engines, including the TF39, T56, 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, and the Air Force's fleet of boats and ships. Other major units include Hq. Electronic Security Command; Air Force Electronic Warfare Center; Air Force Cryptologic Support Center; Joint Electronic Warfare Center; Air Force News Center; 433d Military Airlift Wing (AFRES); 149th Tactical Fighter Gp. (ANG); 1827th Electronics Installation Sqdn.; Defense Reutilization and Marketing Office; Air Force Audit Agency Office. Dating from Nov. 21, 1916, Kelly AFB is the oldest continuously active air base 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 4,400; civilians 18,600. Payroll \$611.4 million. Housing: 45 officer; 368 NCO. Clinic.

Kirtland AFB, N. M. 87117-5000; SE quadrant of Albuquerque. Phone (505) 844-0011; DSN 244-0011. MAC base. 1606th Air Base Wing. Major agencies and units include Air Force Operational Test and Evaluation Center; Air Force Space Technology Center (AFSC); Air Force Weapons Laboratory (AFWC); Air Force Office of Security Policy; 1550th Combat Crew Training Wing (MAC); 150th Tactical Fighter Gp. (New Mexico ANG); Field Command's Defense Nuclear Agency; Naval Weapons Evaluation Facility; Sandia National Laboratories; Lovelace Biomedical and Environmental Research Institute; Department of Energy's Albuquerque Operations Office; AFSC NCO Academy; 1960th Communications Sqdn. (AFCC); 3098th Aviation Depot Sqdn.; Det. 1, 1369th Audiovisual Sqdn.; Air Force Directorate of Nuclear Surety; Interservice Nuclear Weapons School. These agencies furnish contract management; nuclear and laser research, development, and testing; advanced helicopter training and search-and-rescue operations; para-rescue training; and operational test and evaluation. Other major units include AFLC Nuclear Support Office; Albuquerque Seismological Laboratory; University of New Mexico Civil Engineering Research Facility. Base activated Jan. 1941; named for Col. Roy C. Kirtland, air pioneer and commandant of Langley Field in the 1930s, who died May 2, 1941. Area 52,450 acres. Altitude 5,352 ft. Military 6,096; civilians 14,628. Payroll \$957.3 million. Housing: 2,122 homes; BOQ/VOQ; officers 241 beds; enlisted 1,799 beds. Air Force/Veterans Administration joint medical center located outside base gates (in-patient); Air Force Clinic (outpatient).

K. I. Sawyer AFB, Mich. 49843-5000; 20 mi. S of Marquette. Phone (906) 346-6511; DSN 472-1110. SAC base. 410th Bomb Wing; Navy Communications Unit, Marquette; 2001st Communications Sqdn. (AFCC); Det. 24, 26th Weather Sqdn. (AWS); Det. 2 (SATAF); 5th Flying Training Sqdn. Base activated 1959; named for Kenneth I. Sawyer, who proposed site for county airport, died 1944. Area 5,202 acres. Altitude 1,220 ft. Military 3,600; civilians 600. Payroll \$88.1 million. Housing: 279 officer; 1,398 NCOQ, 192 SNCOQ; 199 trailer spaces; 26 BNCOQ; 18 BOQ; 112 transient (incl. 35 fully furnished TLFs, 36 VAQ, 33 VOQ, 3 DVQ, and 5 Senior NCO). 15-bed hospital.

Kunsan AB, Republic of Korea, APO San Francisco 96264-5000; 8 mi. SW of Kunsan City. Phone (commercial, from CONUS) 011-82-654-470-1110; DSN 782-1110. PACAF base. Host unit: 8th Tactical Fighter Wing, F-16C/D aircraft operations, home of the "Wolf Pack." The 8th

TFW converted to the F-16 Fighting Falcon in Sept. 1981, making it the first active overseas F-16 wing. Base built by Japanese in 1938. Area 2,174 acres. Altitude 29 ft. Military 3,000; US civilians 33; local nationals 460. Payroll \$97.6 million. Housing: 264 officer; 2,500 enlisted; all unaccompanied housing (dormitory/BAQ); 211 transient. 5-bed hospital.

Lackland AFB, Tex. 78236-5000; 8 mi. WSW of San Antonio. Phone (512) 671-1110; DSN 473-1110. ATC base. Provides basic military training for active-duty, Air National Guard, and Air Force Reserve airmen; technical training for basic and advanced security police/law enforcement personnel; cryptographic maintenance operators and technicians; DoD military working dog-handler courses; training of instructors, recruiters, and social actions/drug abuse counselors; Officer Training School; Defense Language Institute English Language Center; Wilford Hall USAF Medical Center (Air Force's largest medical center, with 1,000 beds, conducts medical education and clinical research); ATC NCO Academy; military training instructor reserve squadron; 539th Air Force Band; Det. 40, Air Force 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. 3,872 acres at Lackland Training Annex). Altitude 745 ft. Military 11,885; civilians 4,671. Payroll \$352 million. Housing: 100 officer; 619 NCO; 1,856 transient.

Lajes Field, Azores, Portugal, APO New York 09406-5000; Terceira Island, 900 mi. W of Portugal. DSN 725-1410. MAC base. Host unit: 1605th Military Airlift Support Wing. Support base for aircraft crossing the Atlantic Ocean. Tenant units: US Forces Azores; Navy Forces Azores; Army Transportation Terminal Unit Azores; Naval Security Gp. Activity Azores; Det. 3, Air Force European Broadcasting Sqdn. Base provides en route support for MAC, USAF, USN, USMC, third nation, and other authorized aircraft crossing the Atlantic and supporting US Navy antisubmarine warfare missions. US operations began at Lajes Field in 1946. Area 1,148 acres. Altitude 180 ft. Military 1,740; civilians 1,737. Payroll \$35.9 million. Housing: 99 officer; 390 enlisted; 30 TLF; 109 VOQ; 760 VAQ; 6 DVQ; 2 senior NCO. 7-bed hospital.

Langley AFB, Va. 23665-5000; 3 mi. N of Hampton. Phone (804) 764-9990; DSN 574-1110. TAC base. Hq. Tactical Air Command. Host unit: 1st Tactical Fighter Wing, F-15 fighter operations. Tenant units: Hq. 1st Air Force (TAC); 2d Aircraft Delivery Gp. (TAC); 480th Tactical Intelligence Gp. (TAC); 1913th Communications Gp. (TAC); 1912th Computer Systems Gp. (TAC); 564th Tactical Air Command Band; US Army TRADOC Flight Det.; 48th Fighter Interceptor Sqdn. (TAC); Center for Low Intensity Conflict; 20 other tenant units. Base activated Dec. 30, 1916. Langley is one of the oldest continuously active air bases in the US; named for aviation pioneer and scientist Samuel Pierpont Langley, who died in 1906. NASA's Langley Research Center is located adjacent to the base. Area 3,439 acres. Altitude 10 ft. Military 9,096; civilians 1,914. Payroll \$337 million. Housing: 384 officer; 1,254 NCO; 298 transient (99 VAQ, 102 VOQ, 100 TLF). 70-bed hospital.

Laughlin AFB, Tex. 78843-5000; 6 mi. E of Del Rio. Phone (512) 298-3511; DSN 732-1110. ATC base. 47th Flying Training Wing, undergraduate pilot training. Base activated Oct. 1942; named for 1st Lt. Jack T. Laughlin, Del Rio native, B-17 pilot killed over Java on Jan. 29, 1942. Area 4,006 acres. Altitude 1,080 ft. Military 1,830; civilians 1,117. Payroll \$72.8 million. Housing: 603 units; 54 mobile home sites; 24 temporary family lodging facilities. 20-bed hospital. In 1989, Laughlin became the first ATC base to convert from military to all-civil-service aircraft maintenance operation with the 588-member Most Efficient Organization replacing 1,034 military and civilian positions.

Laurence G. Hanscom AFB (see Hanscom AFB).

Lindsey AB, Germany, APO New York 09634-5000; in Wiesbaden. Phone (commercial, from CONUS) 011-49-611-82-0; DSN 339-1110. USAFE base. Host unit: 7100th Combat Support Wing, responsible for 17th Air Force's 25 collocated operating bases and five geographically separated munitions support squadrons, providing war- and peacetime health care through 7100th Combat Support Wing Medical Center and supporting approximately 60 associate units. Major associated units: Hq. 65th Air Div.; 1st Combat Communications Gp. (USAFE); 1836th Engineering Installation Group (AFCC); 691st Electronic Security Wing (ESG); Dist. 70, Office of Special Investigations, Department of Defense Dependent School, Germany Region. Established in 1897 as a German installation; Air Force gained control in 1947. Named for Medal of Honor recipient Darrell R. Lindsey, a WW II pilot killed during a bombing mission over France. Area 1,006 acres. Altitude 557 ft. Military 2,686; civilians 1,809. Payroll \$30.1 million. Housing: No on-base housing (Wiesbaden Military Community housing is operated by the US

Army); billeting (bachelor enlisted): 757 male and 168 female bed spaces. 185-bed medical center.

Little Rock AFB, Ark. 72099-5000; 17 mi. NE of Little Rock. Phone (501) 988-3131; DSN 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 Hq. Joint Readiness Training Center, US Army Center (JRTC) trains and evaluates light infantry units within the Army, using Fort Chaffee, Ark., as the training ground); Arkansas Air National Guard; 22d Air Force NCO Leadership School; 96th Mobile Aerial Port Sqdn.; 3548th USAF Recruiting Sqdn. Base was selected to house rail-garrison Peacekeeper missiles and will acquire a SAC unit by 1994 (projected completion year). Base activated 1955. Area 11,372 acres. Altitude 310 ft. Military 4,871; civilians 896. Payroll \$157 million. Housing: 212 officer; 1,323 enlisted; 13 single-occupancy dormitories house 974 people; 360 transient (140 VAQ, 220 VOQ). 50-bed hospital.

Loring AFB, Me. 04751-5000; 4 mi. W of Limestone. Phone (207) 999-1110; DSN 920-1110. SAC base. 42d Bomb Wing was activated here Feb. 25, 1953, as Limestone AFB; renamed for Maj. Charles Loring, Jr., F-80 pilot killed Nov. 22, 1952, in North Korea and posthumously awarded Medal of Honor. Area 11,165 acres. Altitude 756 ft. Military 3,593; civilians 500. Payroll \$84.6 million. Housing: 303 officer; 1,481 NCO; 122 transient; 4 VIP. 20-bed hospital. The bomber mission converted to conventional as of Oct. 1, 1988.

Los Angeles AFB, Calif. 90009-2960; located in Southbay Los Angeles, city of El Segundo, 3 mi. S of Los Angeles IAP. Phone (213) 643-1000; DSN 833-1110. AFSC base. Headquarters of AFSC's Space Systems Division, which manages the design, development, acquisition, and launch of DoD's space program. Support unit is 6592d Air Base Gp. 24 tenant units on base. Activated Apr. 1, 1964 as Los Angeles AFS. Area 96 acres at Los Angeles AFB and 96 acres at Fort MacArthur Annex and Crest/Heights housing areas. Altitude 95 ft. Military 2,235; civilians 2,582. Payroll \$105.4 million. Housing at Fort MacArthur Annex: 574 townhouses; 56 enlisted quarters; 29 VOQ; 4 DVQ; 22 TLF. Clinic, commissary, child-care center, and Air Force Family Support Center.

Lowry AFB, Colo. 80230-5000; on border between Denver and Aurora. Phone (303) 676-1110; DSN 926-1110. ATC base. Technical Training Center; Defense Finance and Accounting Center-Denver Center; Air Reserve Personnel Center; 3320th Correction and Rehabilitation Sqdn. Lowry Technical Training Center conducts training in avionics, space operations, munitions, logistics, and audiovisual fields. Base activated Oct. 1, 1937; named for 1st Lt. Francis B. Lowry, killed in action Sept. 26, 1918, near Crepon, France, while on a photo mission. Area 1,863 acres. Altitude 5,400 ft. Military 5,101; civilians 4,616. Payroll \$250.1 million. Housing: 87 officer; 780 NCO; 240 VOQ (additional 258 when new facility completed June/July 1991), 585 VAQ, 40 TLF. USAF clinic on base, with Fitzsimons Army Medical Center 15 minutes away.

Luke AFB, Ariz. 85309-5000; 20 mi. WNW of Phoenix. Phone (602) 856-7411; DSN 853-1110. TAC base. 832d Air Div.; 405th Tactical Training Wing, F-15 operations; 58th Tactical Training Wing, F-16 operations; 944th Tactical Training Wing, F-16 operations; 607th Tactical Control Training Sqdn., TACS CRC training. Luke, the largest fighter training base in the free world, conducts training of USAF and foreign pilots in the F-15, F-15E, and F-16. Base activated 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 at Gila Bend, Ariz. Altitude 1,090 ft. Military 4,677; civilians 1,279. Payroll \$206 million. Housing: 95 officer; 779 enlisted; 305 transient (180 VOQ, 85 VAQ, 40 TLF). 55-bed hospital.

MacDill AFB, Fla. 33608-5000; adjacent to Tampa city limits. Phone (813) 830-1110; DSN 968-1110. TAC base. 56th Tactical Training Wing, F-16 operations; Hq. US Special Operations Command; Hq. US Central Command; 71st Tactical Control Sqdn. 56th Tactical Training Wing conducts training of USAF pilots 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 5,134; civilians 1,012. Payroll \$214 million. Housing: 58 officer; 746 enlisted; 540 transient (114 VAQ, 316 VOQ, 110 TLF). 65-bed hospital.

Malmstrom AFB, Mont. 59402-5000; 1.5 mi. E of Great Falls. Phone (406) 731-1110; DSN 632-1110. SAC base. 40th Air Div.; 341st Strategic Missile Wing; 301st Air Refueling 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

Europe

USAF's Major Installations Overseas



Atlantic



Pacific



Central America



Minuteman wing and newest flying unit. Area 3,573 acres, plus about 23,000 sq. mi. of missile complex. Altitude 3,525 ft. Military 3,844; civilians 579. Payroll \$109 million. Housing: 258 officer; 1,148 NCO; 105 transient. Clinic.

March AFB, Calif. 92518-5000; 9 mi. SE of Riverside. Phone (714) 655-1110; DSN 947-1110. SAC base. Hq. 15th Air Force; 22d Air Refueling Wing; Southwest Air Defense Sector (TAC); 22d Strategic Hospital; 452d Air Refueling Wing (AFRES); 943d Tactical Airlift Gp.; 163d Tactical Fighter Gp. (ANG); Customs Aviation Operations Center West. Base activated Mar. 1, 1918; named for 2d Lt. Peyton C. March, Jr., who died in Texas of crash injuries Feb. 18, 1918. Area 6,846 acres. Altitude 1,530 ft. Military 3,665; civilians 1,813. Payroll \$215.7 million. Housing: 107 officer; 804 NCO; 215 transient. 105-bed hospital.

Mather AFB, Calif. 95655-5000; 12 mi. ESE of Sacramento. Phone (916) 364-1110; DSN 828-1110. ATC base. DoD executive agent for Specialized Undergraduate Navigator Training (SUNT); USAF, Navy, and Marine Corps basic navigator training. Provides navigator training for 2d German Air Force and 90 other countries. Only navigator training base; also trains USAF electronic warfare officers. 323d Flying Training Wing (ATC); 940th Air Refueling Gp. (AFRES), KC-135E operations; 323d Air Base Gp. (ATC); 3506th Recruiting Gp. (ATC); USAF Civil Air Patrol Pacific Liaison Region. 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 3,632; civilians 1,273. Payroll \$161.7 million. Housing: 452 officer; 820 NCO; 208 transient. 70-bed hospital. Scheduled for closure in Sept. 1993.

Maxwell AFB, Ala. 36112-5000; 1 mi. WNW of Montgomery. Phone (205) 953-1110; DSN 875-1110. AU base. 3800th Air Base Wing; Hq. Air University, professional military education center for USAF; Air War College; Air Command and Staff College. Center for Aerospace Doctrine, Research, and Education; Ira C. Eaker Center for Professional Development; Squadron Officer School; Air Force Historical Research Center; Hq. Air Force ROTC (ATC); Hq. Civil Air Patrol USAF; Community College of the Air Force (ATC); 908th Tactical Airlift Gp. (AFRES). (Senior NCO Academy and Extension Course Institute are at Gunter AFB.) Base activated 1918; named for 2d Lt. William C. Maxwell, killed in air accident Aug. 12, 1920, in the Philippines. Area 2,524 acres. Altitude 168 ft. Military 2,821; civilians 1,654. Payroll \$300 million. Housing: 264 officer; 400 NCO; 1,123 transient (1,070 VOQ, 23 VAQ, 30 TLF). 60-bed hospital.

McChord AFB, Wash. 98438-5000; 8 mi. S of Tacoma. Phone (206) 984-1910; DSN 976-1110. MAC base. 62d Military Airlift Wing; 446th Military Airlift Wing (AFRES Assoc.); Northwest Air Defense Sector (TAC). 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 4,272; civilians 2,360. Payroll \$157 million. Housing: 111 officer; 870 NCO; 284 transient. Dispensary.

McClellan AFB, Calif. 95652; 9 mi. NE of Sacramento. Phone (916) 643-2111; DSN 633-1110. AFLC base. Hq. Sacramento Air Logistics Center provides logistics management, procurement, maintenance, and distribution support for F/EB/EF-111, A-10, A-7, and F-117A weapon systems. It will also be support center for the Advanced Tactical Fighter. Other responsibilities include more than 200 electronic systems and programs and eight space systems. Also, technology centers for very-high-speed integrated circuits, fiber optics, and advanced composites. The center has unique capability for robotic nondestructive inspection using X-ray and neutron radiology on F-111-size aircraft. Other major units include Hq. Air Rescue Service (MAC); 1849th Electronics Installation Sqdn. (AFCC); Technical Operations Division, Air Force Technical Applications Center; 431st Test and Evaluation Sqdn. (TAC); Hq. 4th Air Force (AFRES); 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 3,755 acres. Military 3,150; civilians 13,000. Payroll \$534 million. Housing: 132 officer; 343 NCO; 21 transient. USAF Medical Clinic.

McCormick AFB, Kan. 67221-5000; 5 mi. SE of Wichita. Phone (316) 652-6100; DSN 743-1110. SAC base. 384th Bomb Wing; 184th Tactical Fighter Gp. (ANG). First B-1B arrived Jan. 1988. Base activated June 5, 1951; named for Capt. Fred J. McCormick, WW II B-24 pilot who died in crash of a private plane Oct. 25, 1945, and for his brother, 2d Lt. Thomas L. McCormick, also a WW II B-24 pilot, killed July 10, 1943, during attack on Bougainville. Area 3,066 acres. Altitude 1,371 ft. Military 3,435; civilians 403. Payroll \$92.3 million. Housing: 123 officer; 466 NCO; 68 transient (20 VOQ, 24 VAQ, 24 TLF). 22-bed hospital.

McGuire AFB, N. J. 08641-5000; 18 mi. SE of Trenton. Phone (609) 724-1100; DSN 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; OLB, 1361st Audiovisual Sqdn. Base adjoins Army's Fort Dix; formerly Fort Dix Army Air Base. Activated as AFB 1949; named for Maj. Thomas B. McGuire, Jr., P-38 pilot, second leading US ace of WW II, recipient of Medal of Honor, killed in action Jan. 7, 1945, in the Philippines. Area 3,552 acres. Altitude 133 ft. Military 10,140 (incl. AFRES and ANG); civilians 2,595 (incl. AFRES). Payroll \$202 million. Housing: 193 officer; 1,560 NCO; 863 transient (237 VOQ, 626 VAQ). Dispensary and 150-bed hospital at Fort Dix.

Minot AFB, N. D. 58705-5000; 13 mi. N of Minot. Phone (701) 723-1110; DSN 453-1110. SAC base. 57th Air Div.; 91st Strategic Missile Wing, Minuteman III operations; 5th Bomb Wing, B-52H and KC-135 operations; 2150th Communications Sqdn.; Det. 7, 37th Air Rescue Sqdn. (MAC), HH-1H operations; 64th Flying Training Wing OLB (ATC), T-38 operations; Det. 21, 9th Weather Sqdn. (AWS); AFOSI Det. 1312; Det. 35, 3904th Management Engineering Sqdn.; Det. 520, Air Force Audit Agency; 15th Air Force NCO Leadership School. Base activated Jan. 1957; named after the city of Minot, whose citizens donated \$50,000 toward purchase of the land for the Air Force. Area 5,085 acres, plus additional 19,324 acres for missile sites. Altitude 1,668 ft. Military 5,324; civilians 617. Payroll \$102 million. Housing: 467 officer; 3,410 enlisted; 156 transient (incl. 32 VOQ, 84 VAQ, 40 TLF). 45-bed hospital.

Misawa AB, Japan, APO San Francisco 96519-5000; within Misawa city limits. Phone (commercial, from CONUS) 011-81-176-53-5181; DSN 226-1110. PACAF base; joint service base. Host unit: 432d Tactical Fighter Wing, F-16C/D operations. Tenant units: 6920th Electronic Security Gp. (ESC); Naval Air Facility (USN); Naval Security Gp. Activity (USN); US Army field station; Company "E" US Marine Corps. Base occupied by US forces Sept. 1945. Area 3,873 acres. Altitude 119 ft. Military 5,289 (total US forces); US civilians 777; local nationals 876. Payroll \$115 million. Housing: 325 officer; 1,859 NCO; 305 transient. 15-bed hospital.

Moody AFB, Ga. 31699-5000; 10 mi. NNE of Valdosta. Phone (912) 333-4211; DSN 460-1110. TAC base. 347th Tactical Fighter Wing, F-16C/D (LANTIRN-equipped) 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 3,160; civilians 477. Payroll \$87 million. Housing: 36 officer; 268 enlisted; 58 transient (16 VAQ, 30 VOQ, 12 TLF). 25-bed hospital.

Mountain Home AFB, Idaho 83648-5000; 10 mi. SW of Mountain Home. Phone (208) 828-2111; DSN 857-2111. TAC base. 366th Tactical Fighter Wing, F-111A fighter-bomber and EF-111A electronic countermeasures aircraft performing operations and training missions; 777th Radar Sqdn. (OTH-B); Det. 2, USAF Fighter Weapons School; Det. 3, Tactical Air Warfare Center. Base activated Aug. 1943. Area 9,112 acres. Altitude 3,000 ft. Military 3,185; civilians 556. Payroll \$88 million. Housing: 152 officer; 1,369 enlisted; 150 transient (76 VAQ, 60 VOQ, 14 TLF). 20-bed hospital.

Myrtle Beach AFB, S. C. 29579-5000; in south Myrtle Beach. Phone (803) 238-7211; DSN 748-1110. TAC base. Shares runway with Myrtle Beach Jetport. 354th Tactical Fighter Wing, A-10 fighter operations; 73d Tactical Control Sqdn. Served as Army air base 1941-47; USAF base since 1956. Area 3,793 acres. Altitude 25 ft. Military 3,236; civilians 464. Payroll \$85 million. Housing: 95 officer; 682 enlisted; 65 trailer lots; 133 transient (81 VAQ, 38 VOQ, 14 TLF). 20-bed hospital.

Nellis AFB, Nev. 89191-5000; 8 mi. NE of Las Vegas. Phone (702) 643-1800; DSN 682-1800. TAC base. USAF Tactical Fighter Weapons Center, F-15, F-15E, F-16, F-111, A-10; 57th Fighter Weapons Wing; USAF Fighter Weapons School; USAF Air Demonstration Sqdn. (Thunderbirds); 4440th Tactical Fighter Training Gp. (Red Flag); 4443d Tactical Training Gp. (Air Warrior); 554th Operations Support Wing; 820th Civil Engineering Sqdn. RED HORSE. Base activated July 1941; 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 1,869 ft. Military 8,159; civilians 1,204. Payroll \$443 million. Housing: 107 officer; 1,367 enlisted; 100 trailer spaces; 424 transient (153 VOQ, 211 VAQ, 60 TLF). 35-bed hospital.

Newark AFB, Ohio 43057; 1 mi. SW of Newark. Phone (614) 522-2171; DSN 346-2171. AFLC base. Aerospace Guidance and Metrology Center repairs inertial guidance and navigation systems for most of the Air Force's missiles and aircraft as well as a variety of inertial systems for other branches of the armed forces. Also man-

ages the Air Force's worldwide measurement and calibration program, providing the link between the National Bureau of Standards and the Air Force's 130 precision measurement equipment laboratories at bases around the world. Five tenant units. Activated as an Air Force station Nov. 7, 1962. Military 80; civilians 2,400. Payroll \$85 million.

Norton AFB, Calif. 92409-5000; 60 mi. E of Los Angeles, within San Bernardino corporate limits. Phone (714) 382-1110; DSN 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); Ballistic Missile Organization (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 2,341 acres. Altitude 1,095 ft. Military 8,421 (incl. AFRES); civilians 2,899. Payroll \$378 million. Housing: 379 transient (39 TLF, 166 VAQ, 174 VOQ); 1,495 dormitory beds, 19 full hook-up trailer lots, 22 trailer sites. Clinic. Scheduled for closure in FY 1994.

Offutt AFB, Neb. 68113-5000; 8 mi. S of Omaha. Phone (402) 294-1110; DSN 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); 1st Aerospace Communications Wing; 1000th Satellite Operations Gp. (AFSPACECOM); 6949th Electronic Security Sqdn. (ESC); Joint Strategic Target Planning Staff (JSTPS); National Emergency Airborne Command Post (NEACP); 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, who 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 12,593; civilians 1,948 (incl. 483 contractors). Payroll \$498 million. Housing: 513 officer; 2,167 enlisted; 102 VAQ; 69 VOQ; 62 TLF. 93-bed hospital.

Onizuka AFB, Calif. 94088-3430; 37 mi. S of San Francisco at Sunnyvale. Phone (408) 752-3110; DSN 359-3110. AFSPACECOM base. Host unit: 2d Satellite Tracking Gp., 1004th Space Support Sqdn. Tenant units: Consolidated Space Test Center (AFSC); 1999th Communications Sqdn. (AFCC); Det. 3, Hq. Air Weather Service. Base activated Dec. 2, 1959, as Sunnyvale AFS, renamed for Lt. Col. Ellison S. Onizuka, killed Jan. 28, 1986, in the space shuttle *Challenger* accident. Area 20 acres. Altitude 34 ft. Military 704, civilians 222, contractors 2,000. Housing: 20 officer, 80 NCO (located at NAS Moffett Field). No transient housing.

Osan AB, Republic of Korea, APO San Francisco 96570-5000; 38 mi. S of Seoul. Phone (commercial, from CONUS) 011-82-333-414-1110; DSN 784-4110. PACAF base. Hq. 7th Air Force. Host unit: 51st Tactical Fighter Wing, F-16C/D and OA-10 operations. Tenant units: 2146th Communications Gp. (PACAF); 6903d Electronic Security Gp. (ESC); 611th Military Airlift Support Gp. (MAC); 554th Civil Engineering Sqdn. RED HORSE (PACAF); 38th Air Rescue Sqdn. (MAC). Originally designated K-55; runway opened Dec. 1952. Renamed Osan AB in 1956 for nearby town that was the scene of first fighting between US and North Korean forces in July 1950. Area 1,674 acres. Altitude 38 ft. Military 7,013; US civilians 263; local nationals 1,717. Payroll \$232.8 million. Housing: 153 officer; 59 enlisted. Transient 515, 16 temporary lodging facility units. 30-bed hospital.

Patrick AFB, Fla. 32925-6655; 2 mi. S of Cocoa Beach. Phone (407) 494-1110; DSN 854-1110. AFSPACECOM base. Operated by the Eastern Space and Missile Center in support of DoD, NASA, and other agency missile and space programs. Home of 9th Space Division. Major tenants are Defense Equal Opportunity Management Institute; Air Force Technical Applications Center; Det. 15, 41st Air Rescue Sqdn.; 2d Combat Communications Gp.; (TAC); Det. 11, 2d Weather Sqdn. (MAC). Base activated 1940; serves as control center for Cape Canaveral AFS. Cape Canaveral AFS has supported more than 3,000 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 3,722; civilians 1,700. Payroll \$140.6 million (military, Civil Service). Housing: 157 officer; 1,419 NCO. 15-bed hospital.

Peterson AFB, Colo. 80914-5000; at eastern edge of Colorado Springs. Phone (719) 554-7321; DSN 692-7011. AFSPACECOM base. Hq. Air Force Space Command. Host unit: 3d Space Support Wing (AFSPACECOM). Provides support to Hq. North American Aerospace Defense Command; Hq. US Space Command; Hq. Army Space Command; 1st Space Wing; 302d Tactical Airlift Wing (AFRES); 2d Space Wing, located 10 mi. E at Falcon AFB. Base activated 1942; named for 1st Lt. Edward J. Peter-

son, who was killed Aug. 8, 1942, in aircraft crash at the base. Area 1,277 acres. Altitude 6,200 ft. Military active-duty 4,380; reserves 1,414; civilians 2,940. Payroll \$206 million. Housing: 107 officer; 384 NCO; 217 transient (75 VOQ, 102 VAQ, 40 TLF). Clinic.

Plattsburgh AFB, N. Y. 12903-5000; adjacent to Plattsburgh. Phone (518) 565-5000; DSN 689-5000. SAC base. 380th Bomb Wing, medium bomber and tanker operations with FB-111 and KC-135. 530th Combat Crew Training Sqn., trains all FB-111 combat crews for SAC. OLP-3903d School Sqn.; SAC NCO Leadership School at Plattsburgh; FOLE, 71st Flying Training Wing (ATC); 2042d Communications Sqn. (AFCC); 210th Field Training Det. Oldest active military installation in the US, established 1814; AFB since 1955. Area 4,879 acres. Altitude 235 ft. Military 3,766; civilians 496. Payroll \$122 million. Housing: 218 officer; 1,307 NCO. 15-bed hospital.

Pope AFB, N. C. 28308-5000; 12 mi. NNW of Fayetteville. Phone (919) 394-0001; DSN 486-1110. MAC base. 317th Tactical Airlift Wing; USAF Airlift Center; 1st Aeromedical Evacuation Sqn.; 1943d Communications Sqn. (AFCC); 1721st Combat Control Sqn.; 53d Mobile Aerial Port Sqn. (AFRES); Det. 3, MACOS (Combat Control School); 215th Field Training Detachment (ATC); Tactical Air Control Party (TAC); OLC, 1361st Audiovisual Service and 1724th Special Tactics Sqn. (AFSOC). Base adjoins Army's Fort Bragg and provides intratheater airlift support for airborne forces and other personnel, equipment, and supplies. Base activated 1919; named after 1st Lt. Harley H. Pope, WW I flyer, killed Jan. 7, 1917, when his JN-4 "Jenny" crashed into the Cape Fear River near Fayetteville. Area 1,750 acres. Altitude 218 ft. Military 4,223; civilians 719. Payroll \$109.4 million. Housing: 68 transient. Clinic.

RAF Alconbury, United Kingdom, APO New York 09238-5000; 3 mi. NW of Huntingdon; 60 mi. N of London. Phone (commercial, from CONUS) 011-44-480-82300; DSN 223-3000. Royal Air Force base. 10th Tactical Fighter Wing (USAFE) provides air-to-ground support for US and Allied forces in Europe with two A-10 Thunderbolt II squadrons. Major associate units include 17th Reconnaissance Wing (SAC), which flies the TR-1 "Dragon Lady"; 6952d Electronic Communications Sqn. (AFCC); Det. 36, 28th Weather Sqn. (MAC); Det. 6, 7200th Management Engineering Sqn.; Det. 4, 7000th Contracting Sqn. (RAF Upwood). Initially activated in 1938; first used by US forces in Sept. 1942. Area 2,954 acres. Altitude 160 ft. Military 3,800; civilians 1,250. Payroll \$122 million. Housing: 103 officer, 738 enlisted; 300 leased units (enlisted only); 2,485 dorm spaces. Clinic.

RAF Bentwaters/RAF Woodbridge, United Kingdom, APO New York 09755-5000; 90 mi. NE of London. Phone (commercial, from CONUS) 011-44-394-433000; DSN 225-1110. Royal Air Force base. 81st Tactical Fighter Wing (USAFE) operates the twin bases (which are four miles apart), four A-10 attack squadrons (two at each base), and one squadron of F-16Cs flown by 527th Aggressor Sqn. The wing also supports three forward operating location detachments in Germany. Associate units include three squadrons of 39th Special Operations Wing-Woodbridge (AFSOC) and 2164th Communications Sqn. (AFCC). Bases opened by RAF in 1944 and 1943, respectively, and reactivated by the US in 1951 and 1952. Bases named after local landmark and nearby town, respectively. Area 1,990 acres. Altitude 86 ft. Military 4,297; civilians 970. Payroll \$115 million. Housing: 156 officer; 1,026 enlisted; 1,411 dorm spaces; 180 transient quarters. Clinic.

RAF Chicksands, United Kingdom, APO New York 09193-5000; 9 mi. S of Bedford; 45 mi. N of London. Phone (commercial, from CONUS) 011-44-462-812571; DSN 234-1110. Royal Air Force base. 7274th Air Base Gp. (USAFE) provides logistics, administrative, and air base management. Mission units provide rapid radio relay; secure communications; and command, control, and communications countermeasures support to US and Allied forces. The base supports three major mission units: 693d Electronic Security Wing (ESC); 6950th Electronic Security Gp. (ESC); Department of Defense Joint Operations Center Chicksands (DoD). Base activated in 1939; US presence began in November 1950. Base named after the sandy soil on which it sits. Area 411 acres. Military 1,272; civilians 408. Payroll \$29.6 million. Housing: 45 officer; 368 enlisted; 28 UNCO; 16 TLF; 75 billeting rooms; four dorms with 603 bed spaces. Clinic.

RAF Lakenheath, United Kingdom, APO New York 09179-5000; 70 mi. NE of London; 25 mi. from Cambridge. Phone (commercial, from CONUS) 011-44-638-52-3000; DSN 226-1110. Royal Air Force base. 48th Tactical Fighter Wing (USAFE) flies the F-111 and trains for and conducts tactical air operations in support of NATO. Base activated in 1941; 48th TFW began operations in Jan. 1960. Named after nearby village. Area 2,226 acres. Altitude 32 ft. Military 4,490; civilians 1,603. Payroll

\$137.1 million. Housing: 651 units; 1,065 US Govt. leased housing; 295 billeting spaces. Regional medical center.

RAF Mildenhall, United Kingdom, APO New York 09127-5000; 30 mi. NE of Cambridge. Phone (commercial, from CONUS) 011-44-638-51-1110; DSN 238-1110. Royal Air Force base. Hq. 3d Air Force (USAFE). 513th Airborne Command and Control Wing (USAFE) supports four major USAF functions. Associate units include 306th Strategic Wing (SAC) (rotational), 313th Tactical Airlift Gp. (MAC) (rotational), Silk Purse Control Gp. (USEUCOM), and 2147th Communications Wing (AFCC). Base activated in 1934; US presence began in July 1950. Named after the village of Mildenhall. Area 1,144 acres. Altitude 33 ft. Military 2,793; civilians 976. Payroll \$73.2 million. Housing: 95 officer; 510 enlisted; 1,115 US Govt. leased housing; 1,485 transient (40 TLF; 238 VOQ; 467 VAQ; 740 BAQ). Medical annex.

RAF Upper Heyford, United Kingdom, APO New York 09194-5000; 13 mi. N of Oxford. Phone (commercial, from CONUS) 011-44-869-232331; DSN 263-1110. Royal Air Force base. 20th Tactical Fighter Wing (USAFE) provides long-range, all-weather tactical fighter and electronic combat sorties for NATO. Associate units include 2130th Communications Gp., 317th Contingency Hospital, 7520th Air Base Sqn., and 2119th Communications Sqn. Activated during WW I; 20th TFW began operations here in Dec. 1969. Named after local town. Area 1,221 acres. Altitude 412 ft. Military 5,089; civilians 1,939. Payroll \$153 million. Housing: 203 officer; 624 enlisted; 350 enlisted US Govt. leased housing; 53 TLF; 8 BOQ; 42 VOQ; 104 senior enlisted and 1,970 junior NCO/airman BEQ; 30 VEQ. Hospital.

Ramstein AB, Germany, APO New York 09094-5000; adjacent to Ramstein; 10 mi. W of Kaiserslautern. Phone (commercial, from CONUS) 011-49-6371-47-113; DSN 480-1110. USAF base. Hq. USAF; Hq. Allied Air Forces Central Europe (NATO). Host unit: 316th Air Div., composed of two major wings: 377th Combat Support Wing and 86th Tactical Fighter Wing, which flies the F-16C/D. Major associates include Hq. European Electronic Security Div. (ESC); Hq. 7th Air Div. (SAC); Hq. 322d Airlift Div. (MAC); 2d Weather Wing (MAC); 7455th Tactical Intelligence Wing (USAFE); 608th Military Airlift Gp. (MAC); 1856th Communications Gp. (AFCC); 1964th Communications Gp. (AFCC). Base activated and US presence began in 1953. Area 5,292 acres. Altitude 782 ft. Military 7,867; civilians 6,531. Payroll \$539.9 million. Housing: 5,891 units; 569 US Govt. leased units; 5,116 billeting units. Clinic.

Randolph AFB, Tex. 78150-5000; 17 mi. ENE of San Antonio. Phone (512) 652-1110; DSN 487-1110. ATC base. Hq. Air Training Command; 12th Flying Training Wing, T-37 and T-38 pilot instructor training; Air Force Military Personnel Center; Hq. Air Force Management Engineering Agency; USAF Occupational Measurement Sqn.; Civilian Personnel Management Center; Hq. Joint Military Medical Command; Hq. USAF Recruiting Service; USAF Instrument Flight Center. 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 3,129 acres. Altitude 761 ft. Military 5,159; civilians 3,496. Payroll \$292 million. Housing: 254 officer; 765 NCO; 542 transient. Clinic.

Reese AFB, Tex. 79489-5000; adjacent to Lubbock. Phone (806) 885-4511; DSN 838-1110. 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 during a train-strafing mission at Cagliari, Sardinia, May 14, 1943. Area 2,467 acres. Altitude 3,338 ft. Military 1,672; civilians 588. Payroll \$67 million. Housing: 112 officer; 261 NCO; 63 transient (8 suites, 25 TLF, 14 VOQ, 16 VAQ). 9-bed hospital.

Rhein-Main AB, Germany, APO New York 09097-5000; 5 mi. S of Frankfurt. Phone (commercial, from CONUS) 011-49-69-699-1110; DSN 330-1110. MAC base. Host unit: 435th Tactical Airlift Wing. Largest combined cargo and passenger terminal in the Air Force. Shares runways with the busiest commercial airport on the Continent. The 37th Tactical Airlift Sqn. flies C-130E aircraft in support of DoD and European theater airlift requirements. The 2d Aeromedical and Evacuation Sqn. and 55th Aeromedical Airlift Sqn. provide inter- and intratheater aeromedical airlift. Other major units include 39th Special Operations Wing (AFSOC); On-Site Inspection Agency Field Office Europe; Army's 21st Replacement Battalion. Base activated July 1936; US Forces began operations Mar. 1945. Named after the confluence of the Rhein and Main rivers west of Frankfurt. Area 923 acres. Altitude 365 ft. Military 3,993; civilians 2,334. Military payroll \$95.3 million. Housing (on-base, government-owned): 152 officer; 490 enlisted; (off-base, government-owned): 12 officer; 145 enlisted; (off-base, government-leased): 10 officer; 290 enlisted rooms/556 beds at base hotel; 173 rooms/278 beds VAQ. USAF clinic.

Robins AFB, Ga. 31098; 15 mi. SSE of Macon at Warner Robins. Phone (912) 926-1110; DSN 468-1110. AFLC base. Hq. Warner Robins Air Logistics Center provides worldwide logistics management for the F-15 air superiority fighter, C-130 and C-141 cargo aircraft, as well as helicopters, air-to-air missiles, air-to-ground missiles, a ground-to-air missile, and remotely piloted vehicles. Other management responsibilities include the Low-Altitude Navigation and Targeting Infrared for Night system, the Joint Tactical Information Distribution System, the Navstar Global Positioning System, E-3 Airborne Warning and Control System avionics, most Air Force airborne electronic warfare equipment, airborne communications equipment, airborne bomb and gun directing systems, fire fighting equipment, general-purpose vehicles, general-purpose computers, and measuring and hand tools. Other major units include Hq. Air Force Reserve (AFRES); 2853d Air Base Gp.; 19th Air Refueling Wing (SAC); 5th Combat Communications Gp. (TAC); 3503d USAF Recruiting Gp.; 1926th Communications-Computer Systems Gp. (AFCLC); 9th Missile Warning Sqn. (AFSPACECOM). Base activated Mar. 1942; named for Brig. Gen. Augustine Warner Robins, an early Chief of the Materiel Division of the Air Corps, who died June 16, 1940. Area 8,800 acres. Altitude 294 ft. Military approx. 4,000; civilians approx. 14,500. Payroll \$667.7 million. Housing: 249 officer; 1,147 NCO; 40 TLF; 145 VOQ; 111 VAQ; 100 trailer spaces. 25-bed hospital.

San Vito Dei Normanni AB, Italy, APO New York 09240-5000; 7 mi. NW of Brindisi; 200 mi. ESE of Naples. Phone (commercial, from CONUS) 011-39-831-42-3519; DSN 622-1110. USAF base. 7275th Air Base Gp. provides logistics, administrative, and air base management support to other associate and tenant units such as 6917th Electronic Security Gp.; 2113th Communications Sqn.; Det. 8, 4th Weather Wing; OLA, Det. 7, Air Force European Broadcasting Service; OLA, Det. 6, 7000th Contracting Sqn.; Baker-Nunn Spacetrack; Det. 1, 4th Surveillance Sqn.; Naval Security Group Activity, San Vito. Base activated and US presence began Nov. 1960. Named for nearby village. Area 318 acres. Altitude 15 ft. Military 1,447; civilians 325. Payroll \$41.6 million. Housing: 42 officer; 338 enlisted; 447 dorm spaces for E-1 to E-6; 6 Senior NCO; 10 VOQ; 3 DVS; 36 VAQ; 30 TLF rooms. Clinic.

Sawyer AFB (see *K. I. Sawyer AFB*).

Scott AFB, Ill. 62225-5000; 6 mi. ENE of Belleville. Phone (618) 256-1110; DSN 576-1110. MAC base. 375th Military Airlift Wing; Hq. Military Airlift Command; Hq. Air Force Communications Command; Hq. US Transportation Command; 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.); 375th Combat Support Gp. Base activated June 14, 1917; named for Cpl. Frank S. Scott, the first enlisted man to die in an aircraft accident, killed Sept. 28, 1912, while "hitching" a ride in one of the Wright B Flyers at College Park, Md. Area 3,000 acres. Altitude 453 ft. Military 7,250; civilians 3,400. Payroll \$317.3 million. Housing: 309 officer; 1,396 NCO; plus 115 spaces for privately owned trailers; 300 transient; 130-bed hospital; 100-bed aeromedical staging facility.

Sembach AB, Germany, APO New York 09130-5000; 9 mi. NE of Kaiserslautern. Phone (commercial, from CONUS) 011-49-6302-67-113; DSN 496-1110. USAF base. Hq. 17th Air Force (USAFE). Host unit: 66th Electronic Combat Wing, with a mission of employing electronic combat weapon systems in the European theater of operations flying the EC-130H Compass Call aircraft. Major associate units include 601st Tactical Control Wing; 2134th Communications Sqn.; 31st Weather Sqn.; 6914th Electronic Security Sqn. Sembach is also a forward operating location for Det. 1, 81st Tactical Fighter Wing, RAF Bentwaters, which flies the A-10 Thunderbolt II. Base activated 1930; US presence began July 1953. Named after a nearby farming community. Area 862 acres. Altitude 1,037 ft. Military 3,685; civilians 564. Payroll \$76.1 million. Housing: 92 officer; 414 enlisted; 1,021 billeting spaces. Clinic.

Seymour Johnson AFB, N. C. 27531-5000; within Goldsboro city limits. Phone (919) 736-5400; DSN 488-1110. TAC base. 4th Tactical Fighter Wing, F-15E fighter operations; 68th Air Refueling Wing (SAC), KC-10 operations; 916th Air Refueling Gp. (AFRES), KC-10 operations; OLAD, 191st Fighter Interceptor Gp. (Mich. ANG), F-16 operations. Base activated June 12, 1942; named for Navy Lt. Seymour A. Johnson, Goldsboro native, killed Mar. 5, 1941, in aircraft accident in Maryland. Area 3,320 acres. Altitude 109 ft. Military 4,748; civilians 669. Payroll \$125.5 million. Housing: 154 officer; 1,543 enlisted; 117 transient (46 VAQ, 44 VOQ, 27 TLF). 20-bed hospital.

Shaw AFB, S. C. 29152-5000; 10 mi. WNW of Sumter. Phone (803) 668-8110; DSN 965-1110. TAC base. 363d Tactical Fighter Wing, F-16 fighter operations; Hq. 9th Air

Force (TAC); 507th Tactical Air Control Wing, OV-10 FAC operations and management of 9th AF TACS. 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 France on July 9, 1918, when his Bristol fighter was shot down during a reconnaissance mission. Area 3,363 acres; supports another 8,078 acres. Altitude 244 ft. Military 5,520; civilians 1,613. Payroll \$176 million. Housing: 170 officer; 1,534 enlisted; 251 transient (124 VAQ; 87 VOQ; 40 TLF). 40-bed hospital.

Shemya AFB, Alaska (APO Seattle 98736-5000); located at western tip of the Aleutian Islands chain, midway between Anchorage, Alaska, and Tokyo, Japan. Phone (907) 392-3000; DSN 392-3000. PACAF base. Host unit: 5073d Air Base Gp. (PACAF) Tenant units: 16th Surveillance Sqdn. (AFSPACECOM); Det. 1, 6th Strategic Reconnaissance Wing (SAC). 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 U.S. Island area about 11.25 sq. mi. Altitude 270 ft. Military 702; civilian contract employees 122; seasonal civilian construction workers 170. Payroll \$19.5 million. Housing: 70 transient. Dispensary.

Sheppard AFB, Tex. 76311-5000; 4 mi. N of Wichita Falls. Phone (817) 676-2511; DSN 736-1001. ATC base. Sheppard Technical Training Center includes 3700th Technical Training Wing, which conducts courses in aircraft maintenance, civil engineering, communication, comptroller, transportation, and instructor training; 3790th Medical Service Training Wing, which provides training in biomedical sciences, dentistry, health service administration, medical readiness, medicine, nursing, and the Physician Assistant Training Program; 3785th Field Training Wing, which provides training on specific weapon systems and on-the-job training advisory service at 72 field training detachments and 18 operating locations worldwide; 80th Flying Training Wing (ATC), which conducts T-37 and T-38 undergraduate pilot training and instructor pilot training for 12 nations in the Euro-NATO Joint Jet Pilot Training Program; 2054th Communications Sqdn.; 3750th Air Base Gp. Base activated June 14, 1941; named for US Sen. Morris E. Sheppard of Texas, who died April 9, 1941. Area 5,500 acres. Altitude 1,015 ft. Military 6,391; civilians 1,635. Payroll \$149 million. Housing: 200 officer; 1,084 NCO; 262 VOQ, 1,322 VAQ, 50 TLF, UOQ 136, UEQ 936. 120-bed hospital.

Soesterberg AB, the Netherlands, APO New York 09292-5000; 3 mi. from Zeist; 26 mi. from Amsterdam. Phone (commercial, from CONUS) 011-31-3463-58199; DSN 363-8199. Royal Netherlands air base. 32d Tactical Fighter Gp. (USAFE) prepares for and conducts all-weather operations in intercept, identification, and air superiority roles in support of NATO using the F-15. Base activated 1913; US presence began 1954. Area 515 acres. Altitude 66 ft. Military 1,344; civilians 1,740. Payroll \$63.6 million. Housing: 40 officer; 190 leased units (incl. 14 officer), 140 government-owned units (incl. 26 officer); 508 dorm spaces; 31 VAQ; 6 VOQ. Clinic.

Spangdahlem AB, Germany, APO New York 09126-5000; 8 mi. E of Bitburg; 20 mi. NE of Trier. Phone (commercial, from CONUS) 011-49-6565-61-1110; DSN 452-1110. USAF base. 52d Tactical Fighter Wing is the only Wild Weasel base in USAF. Base activated and US presence began in 1953. Named after the local town. Area 1,282 acres. Altitude 1,196 ft. Military 4,800; civilians 900. Payroll \$106 million. Housing: 43 officer; 615 enlisted; 500 US Govt. leased units; 1,110 billeting spaces. Clinic.

Thule AB, Greenland, APO New York 09023-5000; NW coast of Greenland; 700 mi. N of Arctic Circle; approx. 900 mi. S of North Pole. Phone (commercial, from CONUS) 011-299-50124; DSN 834-1211 for Cheyenne Mountain AFB, then ask for Thule operator. AFSPACECOM base. 1012th Air Base Sqdn.; 12th Missile Warning Gp.; Det. 3, 2d Satellite Tracking Gp. Base activated in 1952. Area 2,600 acres. Altitude sea level. Military 150; civilians 100 American contractors and approx. 1,000 Danish contractors. Housing: no family housing; no quarters or facilities for visitors. Permanent party dormitories for military and civilian personnel. Transient quarters available only for TDY personnel.

Tinker AFB, Okla. 73145-5990; 8 mi. SE of Oklahoma City. Phone (405) 732-7321; DSN 884-1110. AFLC base. Hq. Oklahoma City Air Logistics Center furnishes logistics support for bombers, jet engines, instruments, and electronics. Other major units include Engineering Installation Div. (AFCC); 3d Combat Communications Gp. (TAC); 28th Air Div. (TAC); 507th Tactical Fighter Gp. (AFRES). Base activated Mar. 1941; named for Maj. Gen. Clarence L. Tinker, whose LB-30 (an early model B-24) went down at sea southwest of Midway Island on June 7, 1942. Area 5,001 acres. Altitude 1,291 ft. Military 7,056; civilians 15,930. Payroll \$681 million (FY 1990). Housing: 108 officer; 622 NCO. 35-bed hospital.

Torrejon AB, Spain, APO New York 09283-5000; 14 mi. NE of Madrid. Phone (commercial, from CONUS) 011-341-665-7777; DSN 723-1110. USAF base. Hq. 16th Air Force (USAFE). 401st Tactical Fighter Wing (USAFE) mission is to fly, maintain, and mobilize F-16C/D combat-ready aircraft in support of the NATO Southern Region and contingency tasks by Southern Air Command and USAF; supports joint and combined forces through strike attack and air-superiority missions. Operates one main operating base and eight communications sites; responsible for the support and protection of one collocated operating base and 65 associate units, including Hq. 16th Air Force. Major associates include 625th Military Airlift Support Gp. (MAC); Air Force Office of Special Investigations, District 68. Base activated and US forces began operation in June 1957. Named for the village of Torrejon de Ardoz. Area 3,206 acres. Altitude 2,000 ft. Military 3,281; civilians 1,515. Payroll \$168.2 million. Housing: 67 units; 858 US Govt. leased units; 254 VOQ/VAQ rooms; 147 TLF; 616 dorm rooms. 35-bed hospital.

Travis AFB, Calif. 94535-5000; 50 mi. NE of San Francisco at Fairfield. Phone (707) 424-5000; DSN 837-1110. MAC base. Hq. 22d Air Force; 60th Military Airlift Wing; 349th Military Airlift Wing (AFRES Assoc.); David Grant Medical Center; 504th Air Force Band of the Golden Gate. Primary mission of 60th MAW is strategic airlift. Base activated May 17, 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 12,900; civilians 3,600. Payroll \$305 million. Housing: 258 officer; 1,907 enlisted; 3,546 enlisted dormitory spaces; 704 transient (100 TLF; 165 VOQ; 439 VAQ). 298-bed hospital (acute care). 75 aeromedical staging flight beds and 52 dental treatment rooms.

Tyndall AFB, Fla. 32403-5000; 12 mi. E of Panama City. Phone (904) 283-1113; DSN 523-1113. TAC base. USAF Air Defense Weapons Center; 325th Tactical Training Wing, F-15 operations; 475th Weapons Evaluation Gp., air-to-air weapons testing and evaluation. The 325th TTW provides training of F-15 pilots, Sector Operations Control Center weapons controllers, and centralized training for all F-15 maintenance personnel. TAC units include Southeast Air Defense Sector and TAC NCO Academy East. Tenant units include Air Force Engineering and Services Center (AFESC) and 3625th Technical Training Sqdn. (ATC). 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 29,115 acres. Altitude 18 ft. Military 4,370; civilians 1,095. Payroll \$140 million. Housing: 137 officer; 933 enlisted; 1,175 transient (852 VAQ; 283 VOQ; 40 TLF). 35-bed hospital.

US Air Force Academy, Colo. 80640-5000; N of Colorado Springs. Phone (719) 472-1818; DSN 259-3110. Direct Reporting Unit. Established Apr. 1, 1954. First class entered Lowry AFB, Colo., July 1955. Moved to permanent location Aug. 1958. Tenant units include 1876th Communications Gp.; Frank J. Seiler Research Lab (AFSC); DoD Medical Exam Review Board. Aircraft flown: T-41; Cessna 150 (cadet flying team); UV-18 (Det. 1, Peterson AFB); 126E (sailplane); ASK-21 (sailplane); SGS-2-33A (glider); TG7A (motor glider). Area 19,268 acres. Altitude 7,280 ft. Military 2,490; cadets 4,410; Preparatory School students 226; civilians 1,625. Payroll \$240 million. Housing: 445 officer; 772 enlisted; 78 transient; 28 temporary family quarters. 65-bed hospital.

Vance AFB, Okla. 73705-5000; 3 mi. SSW of Enid. Phone (405) 237-2121; DSN 962-7110. ATC base. 71st Flying Training Wing, undergraduate pilot training. Base activated Nov. 1941; named for Lt. Col. Leon R. Vance, Jr., Enid native, 1939 West Point graduate, and Medal of Honor recipient, killed July 26, 1944, when air-evac plane returning to the US went down in the Atlantic near Iceland. Area 4,000 acres. Altitude 1,007 ft. Military 1,276; civilians 1,369 (1,200 contract employees). Payroll \$90.2 million. Housing: 132 officer; 98 enlisted; 34 transient, 10 TLF. Clinic.

Vandenberg AFB, Calif. 93437-5000; 8 mi. NNW of Lompoc. Phone (805) 866-1611; DSN 276-1110. AFSPACECOM base. Host unit: Western Space and Missile Center, conducts polar-orbiting space launches and supports research and development tests for DoD, USAF, and NASA space, ballistic missile, and aeronautical systems. The WSMC furnishes facilities and essential services to more than 60 aerospace contractors on base. The major tenant unit, Strategic Missile Center (SAC), conducts all SAC missile combat crew training and ICBM follow-on operational testing and evaluation. 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 3,263; civilians 1,191; civilian contractors 4,314. Payroll \$116.3 million (military and civilians); \$132.4 million (contractors). Housing: 511 offi-

cer; 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) 471-7110 (Oahu military operator); DSN 471-7110. PACAF base. Host unit: 15th Air Base Sqdn. Associate units include 6010th Aerospace Defense Gp. (Hawaii Regional Operations Control Center); US Army aviation units from Schofield Barracks. Base activated Feb. 1922; named for Maj. Sheldon H. Wheeler, commanding officer of Luke Field, Hawaii, in 1919, killed there July 13, 1921, when his biplane crashed during an aerial exhibition. Area 1,389 acres. Altitude 845 ft. Military 715; civilians 94. Payroll included in entry for Hickam AFB. Housing: 102 officer; 390 enlisted. Dispensary run by 15th Medical Gp.

Whiteman AFB, Mo. 65305-5000; 2 mi. S of Knob Noster. Phone (816) 687-1110; DSN 975-6123. SAC base. 100th Air Division; 351st Strategic Missile Wing; Det. 509 was activated in 1990. Whiteman AFB is responsible for 150 Minuteman II ICBMs and is scheduled to receive the first B-2 bombers when they become operational in the 1990s. Base activated 1942; named for 2d Lt. George A. Whiteman, nearby Sedalia resident, who was the first pilot to die in aerial combat during the attack on Pearl Harbor. Area 3,729 acres, plus missile complex of about 10,000 sq. mi. Altitude 869 ft. Military 3,461; civilians 528. Payroll \$142 million. Housing: 129 officer; 849 enlisted; 74 transient (incl. 12 3-bdrm. guest houses, 40 VAQ, 18 VOQ, 4 DVQ). 30-bed hospital.

Williams AFB, Ariz. 85240-5000; 10 mi. E of Chandler. Phone (602) 988-2611; DSN 474-1001. ATC base. 82d Flying Training Wing, largest undergraduate pilot training base; home of AFSC Human Resources Lab/Flying Training Div., doing extensive research on flight simulators. Base activated July 1941; named for 1st Lt. Charles L. Williams, killed in bomber crash near Fort DeRussy, Hawaii, July 6, 1927. Area 5,398 acres. Altitude 1,385 ft. Military 1,918; civilians 672. Payroll \$69.8 million. Housing: 272 officer; 428 NCO; 40 transient. 15-bed hospital.

Wright-Patterson AFB, Ohio 45433; 10 mi. ENE of Dayton. Phone (513) 257-1110; DSN 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; Acquisition Logistics Division; Logistics Management Systems Center; AFLC International Logistics Center; 2750th Air Base Wing (AFLC); 906th Tactical Fighter Gp. (AFRES); more than 100 other DoD activities and government agencies. Originally separate, Wright Field and Patterson Field were merged and redesignated Wright-Patterson AFB 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 8,833; civilians 17,287; contracted service and contractor employees 5,800. Payroll \$968 million. Housing: 732 officer; 1,629 NCO. 301-bed hospital.

Wurtsmith AFB, Mich. 48753-5000; 3 mi. NW of Oscoda. Phone (517) 739-2011; DSN 623-1110. SAC base. 379th Bomb Wing. Base activated 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. Base assigned to SAC Apr. 1, 1960. Area 5,221 acres. Altitude 634 ft. Military 3,062; civilians 672, plus 53 contractors. Payroll \$87.7 million. Housing: 224 officer; 1,118 NCO; 7 TLF units; 8 UOQ; 18 VOQ; 28 VAQ. 20-bed hospital.

Yokota AB, Japan, APO San Francisco 96328-5000; approx. 28 mi. W of Tokyo. Phone (commercial, from CONUS) 011-81-0425-2511, Ext. 7020; DSN 225-7020. PACAF base. Hq. US Forces, Japan; Hq. 5th Air Force. Host unit: 475th Air Base Wing, UH-1N operations. Tenant units: 374th Tactical Airlift Wing, C-130, C-9, and C-21 operations. Primary aerial port in Japan. Base opened as Tama Army Air Field by Japanese in 1940. Area 1,750 acres. Altitude 457 ft. Military 4,412; US civilians 901; local nationals 1,424. Payroll \$188 million. Housing: 551 officer; 1,633 enlisted; 324 transient; 52 temporary lodging facility units. 30-bed hospital.

Zaragoza AB, Spain, APO New York 09286-5000; 12 mi. SW of Zaragoza. Phone (commercial, from CONUS) 011-34-76-32-67-11; DSN 724-1110. USAF base. 406th Tactical Fighter Training Wing provides air-to-ground and air-to-air training for USAF Central Region fighter bases. Current US presence began Feb. 1970. Area 2,982 acres. Altitude 863 ft. Military 750; 260 TDY personnel per month; civilians 978. Payroll \$22.6 million. Housing: 30 officer; 126 enlisted; 174 VOQ; 357 VAQ; 10 TLF. Clinic.

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Social Security Number		Birthdate		Home Phone	
<input type="checkbox"/> Own	<input type="checkbox"/> Buying	Monthly Payment		Years/Months There	
<input type="checkbox"/> Rent	<input type="checkbox"/> Other (specify)	Position		Bus. Phone	No. and ages of dependents
Annual Salary		Other Income**		Source	
Previous Employer		Position		Years/Months There	
Nearest Relative (not living with you)		Address		City/State/Zip	
Phone		Relationship			
Co-Applicant Information					
First Name		Middle Initial		Last Name	
Mailing Address			City	State	Zip
Permanent Home Address			City	State	Zip
Social Security Number		Birthdate		Home Phone	
Employer		Position		Bus. Phone	No. and ages of dependents
Annual Salary		Other Income**		Source	
Previous Employer		Position		Years/Months There	

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Annual Percentage Rate	Membership Fee
18% for Purchases 14% for Cash	Free in first year, \$15 each year thereafter.
Cash Advance Fee	Late Fee
2% of the amount of the cash advance.	5% of Minimum Payment Due
Grace Period For Purchases	Method of Computing Finance Charges
25 days if previous balance is paid in full by due date. No grace period for cash advances.	Finance Charges, when incurred, will be calculated using the average daily balance method. (Including new purchases.)
Overlimit Fee	
\$20 Overlimit Fee	

All the information given on this application is true, correct, and complete. No bankruptcy proceedings have been filed by/or against any party to this application, nor are there any unsatisfied judgments, default, or insolvency proceedings pending against any party to this application. Central Fidelity may obtain and/or verify my/our credit history and bank references in order to evaluate my/our application. If approved, I/we agree to be bound by the terms and conditions of The Central Fidelity Bank Cardholder Agreement and Truth In Lending Disclosure and any amendments thereto and agree to pay all collection and court costs, including Central Fidelity's attorney fees up to 25% of my/our new balance as allowed by the Commonwealth of Virginia. Issuance of this credit card(s) will be governed by the laws of the Commonwealth of Virginia.

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Guide to USAF's Minor Installations

In addition to the places listed in this "Guide to Major Air Force Installations Worldwide," USAF has a number of minor installations. These Air Force stations (AFS) and air stations (AS) perform various missions, including air defense and missile warning. Here is a listing of such installations with state (or APO), ZIP code, and major command. When an installation can be reached by a general-purpose DSN number, that number is also listed. In some cases, the designation air base (AB) is used because of political sensitivities.

Ankara AS (Turkey), APO New York 09254-5000 (USAFE)	DSN 672-1110	Izmir AS (Turkey), APO New York 09224-5000 (USAFE)	DSN 675-1110
Avon Park AFS , Fla. 33825 (TAC)	DSN 968-1110	King Salmon Airport (Alaska), APO Seattle 98713 (PACAF)	cmcl. 907-721-3301
Cape Canaveral AFS , Fla. 32925-5000 (AFSPACECOM)	DSN 467-1110	New Boston AFS , N. H. 03031-5000 (AFSPACECOM)	DSN 881-1550
Cape Cod AFS , Mass. 02532-1419 (AFSPACECOM)	DSN 557-2202	Pirinlik AS (Turkey), APO New York 09294-5000 (USAFE)	DSN 679-1110
Cavalier AFS , N. D. 58220-5000 (AFSPACECOM)	DSN 330-3292	Pruem AS (Germany), APO New York 09692-5000 (USAFE)	DSN 453-1110
Clear AFS (Alaska), APO Seattle 99704-5000 (AFSPACECOM)	DSN 585-6416	RAF Croughton (UK), APO New York 09378-5000 (USAFE)	DSN 236-1110
Decimomannu AB (Italy), APO New York 09161-5000 (USAFE)	DSN 621-9267	RAF Fairford (UK), APO New York 09125-5000 (USAFE)	DSN 247-1110
Duke Field AFS , Fla. 32542-6005 (MAC)	DSN 872-1110	RAF Greenham Common (UK), APO New York 09150-5000 (USAFE)	DSN 266-1110
Eldorado AFS , Tex. 76936-5000 (AFSPACECOM)	DSN 477-4220	Sondrestrom AB (Greenland), APO New York 09121-5000 (AFSPACECOM)	DSN 834-1211; ask for Sondrestrom AB.
Galena Airport (Alaska), APO Seattle 98723 (PACAF)	cmcl. 907-446-3311	Tempelhof Central Airport AS (Germany), APO New York 09611-5155 (USAFE)	DSN 332-5300
Gila Bend Air Force Auxiliary Field , Ariz. 85337-5000 (TAC)	DSN 853-5220	Woomera AS (Australia), APO San Francisco 96287-5000 (AFSPACECOM)	DSN 730-1350
Hessisch-Oldendorf AS (Germany), APO New York 09669-5000 (USAFE)	DSN 331-1110		
High Wycombe AS (UK), APO New York 09241-5000 (USAFE)	DSN 232-1110		
Indian Springs Air Force Auxiliary Field , Nev. 89018-5000 (TAC)	DSN 682-6201		

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 in which or near which 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 Major Air Force Installations Worldwide" elsewhere in this issue.

Anchorage, Alaska (Kulis ANG Base at Anchorage International Airport) 99502. Phone (907) 249-1208; DSN 626-1208. 176th Tactical Airlift Gp. (ANG); 144th Tactical Airlift Sqdn. (ANG) and 210th Air Rescue Sqdn. (ANG). Base named for Lt. Albert Kulis, killed in training flight in 1954. Area 129 acres. Altitude 124 ft. Military 1,094, full-time personnel 422. Payroll \$19.3 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; DSN 925-2500. 129th Tactical Control Sqdn. and 118th Tactical Control Sqdn. (ANG). Area 13 acres. Altitude 1,060 ft. Military 355, full-time personnel 47. Payroll through Dobbins AFB.

Atlantic City International Airport, N. J. (400 Langley Rd., Pleasantville) 08232-8500; 10 mi. W of Atlantic City. Phone (609) 645-6000; DSN 455-6000. 177th Fighter Interceptor Gp. (ANG). Area 286 acres. Altitude 76 ft. Military 1,015, full-time support 383. Payroll \$14.3 million.

Baltimore, Md. (Glenn L. Martin State Airport) 21220-2899; 8 mi. E of Baltimore. Phone (301) 687-6270; DSN 243-6210. 175th Tactical Fighter Gp. (ANG); 135th Tactical Airlift Gp. (ANG). Area 175 acres. Altitude 24 ft. Military 1,890, full-time personnel 520. Payroll \$20.1 million. Clinic.

Bangor ANG Base, Me. 04401-3099; 4 mi. NW of Bangor. Phone (207) 990-7700; DSN 698-7700. 101st Air Refueling Wg. (ANG); 776th Radar Sqdn. (TAC). Area 300 acres. Altitude 192 ft. Military 1,026, full-time personnel 385, Title 5 civilians 25. Payroll \$16.2 million. Small BX.

Battle Creek, Mich. 49015-1291; adjacent to W. K. Kellogg Airport. Phone (616) 963-1596; DSN 580-3210. 110th Tactical Air Support Gp. (ANG). Area 315 acres. Altitude 941 ft. Military 951, full-time personnel 254. Payroll \$10.6 million.

Birmingham Municipal Airport, Ala. 35217. Phone (205) 841-9200; DSN 694-2210. 117th Tactical Recon Wg. (ANG). Area 86 acres. Altitude 650 ft. Military 1,204, full-time personnel 344. Payroll \$17.6 million.

Boise Air Terminal, Idaho (Gowen Field) 83707; 6 mi. S of Boise. Phone (208) 389-5011; DSN 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 1,994 acres. Altitude 2,858 ft. Military 1,511, full-time personnel 537. Payroll \$16.2 million. Limited transient facilities available during Army Guard camps.

Bradley ANG Base, Conn. 06026-5000; 15 mi. N of Hartford at East Granby, adjacent to Bradley International

Airport. Phone (203) 623-8291; DSN 636-8310. 103d Tactical Fighter Gp. (ANG); Army National Guard aviation battalion. Base named for Lt. Eugene M. Bradley, killed in P-40 crash in Aug. 1941. Area 165 acres. Altitude 173 ft. Military 996, full-time personnel 310. Payroll \$14.1 million.

Buckley ANG Base, Colo. 80011; 8 mi. E of Denver. Phone (303) 366-5363; DSN 877-9011. 140th Tactical Fighter Wg. (ANG); 154th Tactical Control Gp.; Hq. Colorado ANG; 227th Air Traffic Control Flt. (ANG); and 240th Civil Engineering Flt. (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. Base named for Lt. John H. Buckley, National Guardsman, killed in the Argonne, France, Sept. 27, 1918. Area 3,328 acres. Altitude 5,663 ft. Military 1,436, full-time personnel 364, Title 5 civilians 257. Payroll \$26.8 million. Dispensary.

Burlington, Vt. (Burlington International Airport) 05401; 3 mi. E of Burlington. Phone (802) 658-0770; DSN 220-5210. 158th Fighter Interceptor Gp. (ANG). Area 241 acres. Altitude 371 ft. Military 995, full-time personnel 398. Payroll \$14.3 million.

Channel Island ANG Base, Calif. (Point Mugu) 93041-4001. Phone (805) 986-8000; DSN 893-7000. 146th Tactical Airlift Wg. (ANG). Area 86 acres. Altitude 12 ft. Military 1,506, full-time personnel 369. Payroll \$18.2 million.

Charleston, W. Va. (Yeager Airport) 25311-5000; 4 mi. NE of Charleston. Phone (304) 341-6210; DSN 366-9210. 130th Tactical Airlift Gp. (ANG). Airport named for Brig. Gen. Charles "Chuck" Yeager, first man to break the sound barrier.

er. Area 236 acres. Altitude 981 ft. Military 942, full-time personnel 249. Payroll \$11.1 million. Dispensary, clinic.

Charlotte, N. C. (Charlotte/Douglas International Airport) 28208. Phone (704) 391-4100; DSN 939-8210. 145th Tactical Airlift Gp. (ANG). Area 79 acres. Altitude 749 ft. Military 1,284, full-time personnel 332. Payroll \$17.1 million. Clinic.

Cheyenne, Wyo. (Cheyenne Municipal Airport) 82001. Phone (307) 772-6201; DSN 943-6201. 153d Tactical Airlift Gp. (ANG). Area 71 acres. Altitude 6,156 ft. Military 1,025, full-time personnel 266. Payroll \$11.7 million.

Des Moines Municipal Airport, Iowa 50321; in city of Des Moines. Phone (515) 287-9210; DSN 939-8210. 132d Tactical Fighter Wg. (ANG). Area 113 acres. Altitude 957 ft. Military 1,091, full-time personnel 344. Payroll \$14.2 million.

Dobbins AFB, Ga. 30069-5000; 2 mi. S of Marietta, 16 mi. NW of Atlanta. Phone (404) 421-5000; DSN 925-1110. AFRES base. Hq. 14th Air Force (AFRES); 94th Tactical Airlift Wg. (AFRES); 116th Tactical Fighter Wg. (ANG); 151st Military Intelligence Battalion (ARNG); 145th and 412th Medical Detachments (USAR). Base activated 1943. Named for Capt. Charles Dobbins, WW II pilot killed in action near Sicily. Area 1,656 acres (ANG 55 acres). Altitude 1,068 ft. AFRES: active duty 37, full-time personnel 158, civilians 844, Reservists 1,744. Payroll \$53.2 million. ANG: military 1,213, full-time personnel 386. Payroll \$18.8 million. USAR: active duty 3; reservists 69. Housing: 5 NCO; VOQ, VAQ. Dispensary. NAS Atlanta, Lockheed Aeronautical Systems Co./Air Force Plant 6 adjoin Dobbins AFB and use airfield facilities.

Duluth International Airport, Minn. 55811-5000; 5 mi. NW of Duluth. Phone (218) 727-6886; DSN 825-7210. 148th Fighter Interceptor Gp. (ANG). Area 409 acres. Altitude 1,429 ft. Military 1,009, full-time personnel 379 (+ 24 civilians). Payroll \$16.3 million.

Ellington ANG Base, Tex. 77034-5586; adjacent to Ellington Field, a City of Houston Airport 17 mi. SE of downtown Houston. Phone (713) 929-2221; DSN 954-2221. 147th Fighter Interceptor Gp. (ANG). Other tenants include NASA Flight Operations, US Coast Guard, Army National Guard, FAA. Base named for Lt. Eric L. Ellington, pilot killed in Nov. 1913. Area 213 acres. Altitude 40 ft. Military 1,025, full-time personnel 418. Payroll \$18.1 million.

Fargo, N. D. (Hector Field) 58105-5536. Phone (701) 237-6030; DSN 362-8110. 119th Fighter Interceptor Gp. (ANG). Area 133 acres. Altitude 900 ft. Military 1,154, full-time personnel 400. Payroll \$18.6 million.

Forbes Field, Kan. 66619-5000; 2 mi. S of Topeka. Phone (913) 862-1234; DSN 720-1234. 190th Air Refueling Gp. (ANG). Area 192 acres. Altitude 1,079 ft. Military 978, full-time personnel 346 (+ 40 civilians). Payroll \$14.7 million.

Fort Smith Municipal Airport, Ark. 72906. Phone (501) 648-5210; DSN 962-8210. 188th Tactical Fighter Gp. (ANG). Area 98 acres. Altitude 468 ft. Military 1,048, full-time personnel 301. Payroll \$12.2 million.

Fort Wayne, Ind. (Fort Wayne Municipal Airport) 46809-5000; 5 mi. SSW of Fort Wayne. Phone (219) 478-3210; DSN 786-1210. 122d Tactical Fighter Wg. (ANG). Area 138 acres. Altitude 800 ft. Military 1,328, full-time personnel 365. Payroll \$15.7 million.

Fresno Air Terminal, Calif. 93727-2199; 5 mi. NE of Fresno. Phone (209) 454-5155; DSN 949-9210. 144th Fighter Interceptor Wg. (ANG). Area 127 acres. Altitude 332 ft. Military 1,004, full-time personnel 395. Payroll \$16 million.

General Mitchell International Airport, Wis. 53207-6299; 3 mi. S of Milwaukee. AFRES base. Altitude 723 ft. ANG and AFRES have separate phones and facilities. ANG phone (414) 747-4410; DSN 580-8410. 128th Air Refueling Gp. (ANG). ANG area 111 acres. Military 999, full-time personnel 334. Payroll \$14.6 million. AFRES phone (414) 481-6400; DSN 786-9110. 440th Tactical Airlift Wg. (AFRES). AFRES area 101 acres. Full-time personnel and civilians 323, Reservists 1,206. Payroll \$17.4 million.

Greater Peoria Airport, Ill. 61607-1498; 7 mi. SW of Peoria. Phone (309) 633-3000; DSN 724-4210. 182d Tactical Air Support Gp. (ANG). Area 386 acres. Altitude 624 ft. Military 1,018, full-time personnel 266. Payroll \$10.9 million. Dispensary.

Greater Pittsburgh International Airport, Pa. 15231-0459; 15 mi. NW of Pittsburgh. Altitude 1,203 ft. AFRES base. ANG and AFRES have separate phones and facilities. 171st Air Refueling Wg. (ANG); phone (412) 269-8402, DSN 277-8402. 112th Tactical Fighter Gp. (ANG);

phone (412) 269-8441, DSN 277-8441. ANG area 94 acres. Military 1,881, full-time personnel 517. Payroll \$21.2 million. AFRES phone (412) 269-8000; DSN 277-8000. 911th Tactical Airlift Gp. (host unit). AFRES area 165 acres. Military 25, full-time personnel 141, civilians 206, Reservists 1,261. Payroll \$20 million. Other units include 2185th Communications Installation Gp. (MAC). Base activated 1943. Housing: 50 VOQ, 230 enlisted qtrs. Limited BX; no on-base billeting.

Great Falls International Airport, Mont. 59401-5000; 5 mi. SW of Great Falls. Phone (406) 727-4650; DSN 279-2301. 120th Fighter Interceptor Gp. (ANG). Area 139 acres. Altitude 3,674 ft. Military 1,019, full-time personnel 392. Payroll \$17.1 million. Dispensary.

Gulfport-Biloxi Regional Airport, Miss. 39501; within city limits of Gulfport. Phone (601) 868-6200; DSN 363-8200. Training site; also host to 255th Tactical Control Sqdn. (ANG); Army National Guard Transportation Repair Shop; and 173d Civil Engineering Ft. An air-ground gunnery range is located 70 mi. due N of site. Area 219 acres. Altitude 28 ft. ANG military 513, full-time personnel 50. Payroll \$4.4 million. 2-bed dispensary.

Harrisburg International Airport, Middletown, Pa. 17057; 10 mi. E of Harrisburg. Phone (717) 948-2201; DSN 454-9201. 193d Special Operations Gp. (ANG). ANG area 64 acres. Altitude 310 ft. Military 1,125, full-time personnel 319. Payroll \$20.7 million.

Jackson, Miss. (Allen C. Thompson Field) 39208-0810; 7 mi. E of Jackson. Phone (601) 939-3633; DSN 731-9210. 172d Military Airlift Gp. (ANG). ANG area 116 acres. Altitude 346 ft. Military 1,198, full-time personnel 316. Payroll \$16.4 million. 6-bed dispensary.

Jacksonville International Airport, Fla. 32229; 15 mi. NW of Jacksonville. Phone (904) 741-7150; DSN 460-7150. 125th Fighter Interceptor Gp. (ANG). Area 332 acres. Altitude 26 ft. Military 1,007, full-time personnel 405. Payroll \$17.7 million. 5-bed dispensary.

Kingsley Field, Ore. 97603-0400; 5 mi. SE of Klamath Falls. Phone (503) 883-6350; DSN 830-6350. 114th Tactical Fighter Training Sqdn. (ANG); 142d OLAD (ANG). Field named for 2d Lt. David R. Kingsley of Oregon, WW II Medal of Honor winner, killed June 23, 1944, over Ploesti, Romania. Area 425 acres. Altitude 4,000 ft. Military 406, full-time personnel 375. Title 5 civilians 16. Payroll \$40.1 million. Clinic.

Knoxville, Tenn. (McGhee Tyson Airport) 37901; 10 mi. SW of Knoxville. Phone (615) 985-3210; DSN 588-3210. 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 282 acres. Altitude 980 ft. Military 1,162, full-time personnel 354. Payroll \$16.4 million. Dispensary.

Lincoln Municipal Airport, Neb. 68524-1897; 1 mi. NW of Lincoln. Phone (402) 473-1326; DSN 720-1352. 155th Tactical Recon Gp. (ANG). Also hosts Army National Guard unit. Area 175 acres. Altitude 1,207 ft. Military 1,117, full-time personnel 342. Payroll \$12.9 million. Tactical clinic.

Louisville, Ky. (Standiford Field) 40213. Phone (502) 364-9400; DSN 989-4400. 123d Tactical Airlift Wg. (ANG); 223d Communications Sqdn. (ANG). Area 65 acres. Altitude 497 ft. Military 1,121, full-time personnel 317. Payroll \$13.5 million.

Mansfield Lahm Airport, Ohio 44901-5000; 3 mi. N of Mansfield. Phone (419) 521-0100; DSN 696-6210. 179th Tactical Airlift Gp. (ANG). Airport named for nearby city and aviation pioneer Brig. Gen. Frank P. Lahm. Area 224 acres. Altitude 1,296 ft. Military 945, full-time personnel 259. Payroll \$10.8 million. Clinic. Limited dependent ID card service. Coast Guard exchange.

Martinsburg, W. Va. (Shepherd Field) 25401; 4 mi. S of Martinsburg. Phone (304) 267-5100; DSN 242-9210. 167th Tactical Airlift Gp. (ANG). Area 420 acres. Altitude 556 ft. Military 1,269, full-time personnel 295. Payroll \$13.8 million. Dispensary.

McEntire ANG Base, S. C. 29044; 12 mi. E of Columbia. Phone (803) 776-5121; DSN 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 accident in 1961. Area 2,473 acres. Altitude 250 ft. Military 1,356, full-time personnel 383. Payroll \$14.9 million. Dispensary.

Memphis International Airport, Tenn. 38181-0026; within Memphis city limits. Phone (901) 369-4111; DSN 966-8111. 164th Tactical Airlift Gp. (ANG). ANG occupies 99 acres. Altitude 332 ft. Military 949, full-time personnel 263. Payroll \$11.7 million. Clinic.

Meridian, Miss. (Key Field) 39302-1825; located at municipal airport near Hwys. 20 and 59. Phone (601) 693-5031; DSN 694-9210. 186th Tactical Recon Gp. (ANG); host to 238th Combat Communications Sqdn. (ANG). Area 116 acres. Altitude 297 ft. Military 1,272, full-time personnel 368. Payroll \$15.2 million. Dispensary.

Minneapolis-St. Paul International Airport, Minn. 55450-5000; in Minneapolis, near confluence of the Mississippi and Minnesota Rivers. AFRES base. Altitude 840 ft. ANG and AFRES have separate phones and facilities. ANG phone (612) 725-5011; DSN 825-5552. 133d Tactical Airlift Wg. (ANG). ANG area 128 acres. Military 1,406, full-time personnel 300. Payroll \$16.2 million. AFRES phone (612) 725-5011; DSN 825-5110. 934th Tactical Airlift Gp. (AFRES) flies C-130 aircraft. AFRES area 300 acres. Reservists 1,150, full-time personnel 130, civilians 180. Payroll \$17 million. Other units include 210th Engineering and Installation Sqdn. (ANG); 237th Air Traffic Control Ft. (ANG); Navy Readiness Comd., Region 16; OLG, 2185th Communications Gp. (AFRES); Naval Air Reserve Center; Marine Wg. Support Gp. 47, Det. A; USAF-CAP/NCLR and CAP MNLO; Rothe Development Inc. (AFRES); Det. 3, 1974th Teleprocessing Gp. (USAF). Billeting and BX available.

Montgomery, Ala. (Dannelly Field) 36196; 7 mi. SW of Montgomery. Phone (205) 284-7210; DSN 742-9210. 187th Tactical Fighter Gp. (ANG). Base hosts 232d Combat Communications Sqdn. Field named for Ens. Clarence Dannelly, Navy pilot killed at Pensacola, Fla., during WW II. Area 51 acres. Altitude 221 ft. Military 1,053, full-time personnel 346. Payroll \$18.1 million. Dispensary.

Nashville Metropolitan Airport, Tenn. 37217-0267; 6 mi. SE of Nashville. Phone (615) 361-4600; DSN 446-6210. 118th Tactical Airlift Wg. (ANG). Area 85 acres. Altitude 597 ft. Military 1,392, full-time personnel 372. Payroll \$19 million.

Naval Air Station Dallas, Tex. (Hensley Field) 75211. Phone (214) 266-6111; DSN 874-6111. 136th Tactical Airlift Wg. (ANG). Area 49 acres. Altitude 495 ft. Military 961, full-time personnel 255. Payroll \$13.1 million.

Naval Air Station Moffett, Calif. 94035; 2 mi. N of Mountain View. ANG phone (415) 404-9129; DSN 494-9129. 129th Air Rescue Gp. (ANG). Area 13 acres. Altitude 34 ft. Military 749, full-time personnel 263. Payroll \$15.4 million.

Naval Air Station New Orleans, La. (Alvin Callender Field) 70143-5400; 15 mi. S of New Orleans. Altitude 3 ft. ANG and AFRES have separate phones and facilities. ANG phone (504) 391-8618; DSN 457-8618. 159th Tactical Fighter Gp. (ANG). ANG military 1,215, full-time personnel 426. Payroll \$18 million. AFRES phone (504) 393-3293; DSN 363-3293. 926th Tactical Fighter Gp. (AFRES). Military 986, full-time personnel 303. Payroll \$15 million. NAS New Orleans was the first joint Air Reserve Training Facility. Field named for Alvin A. Callender, who served with the British Royal Flying Corps during WW I and was shot down over France in 1918. Area 3,245 acres (ANG 19 acres). Dispensary.

Niagara Falls International Airport, N. Y. 14304-5000; 6 mi. E of Niagara Falls. Phone (716) 236-2000; DSN 489-3011. AFRES base. 914th Tactical Airlift Gp. (AFRES); 107th Fighter Interceptor Gp. (ANG). Base activated Jan. 1952. Area 979 acres (ANG 104 acres). Altitude 590 ft. AFRES: civilians 255, Reservists 1,200. Payroll \$18.7 million. ANG: military 995, full-time personnel 375. Payroll \$15.6 million.

O'Hare Air Reserve Forces Facility, Ill. 60666; 22 mi. NW of Chicago's Loop. Phone (312) 825-6000; DSN 930-1110. AFRES base. 928th Tactical Airlift Gp. (AFRES); 126th Air Refueling Wg. (ANG); Defense Contract Administration Services Region, Chicago. 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 Gilbert Islands. Area 391 acres (ANG 36 acres). Altitude 643 ft. Reservists 1,440, full-time personnel and civilians (all units) 1,350, Illinois ANG 1,365, full-time personnel 348. Payroll for total facility \$64 million (\$16.1 million for ANG). Limited BX, no on-base billeting facilities.

Ontario International Airport, Ontario, Calif. 91761. Phone (714) 984-2705; DSN 947-3559. 148th Combat Communications Sqdn. (ANG); 210th Weather Ft. (ANG). Area 11 acres. Altitude 900 ft. Military 154, full-time personnel 26. Payroll \$1.1 million.

Otis ANG Base, Mass. 02542-5001; 7 mi. NNE of Falmouth. Phone (508) 968-1000; DSN 557-4003. 102d Fighter Interceptor Wg. (ANG); 567th USAF Band (ANG); 101st and 202d Weather Flts. (ANG). Adjacent installations and organizations include Cape Cod AFS (6th Missile Warning Sqdn., 2165th Communications Sqdn.); US Coast Guard Air Station Cape Cod; Camp Edwards Army National Guard Training Site; 26th Aviation Brigade

(ARNG); 1st Battalion, 25th Marines (Reserve); Massachusetts National Cemetery (VA). Base named for 1st Lt. Frank J. Otis, ANG flight surgeon and pilot killed in 1937 crash. Area 3,849 acres. Altitude 132 ft. ANG military 1,149, ANG full-time personnel 417 (+ 318 Title 5 civilian employees). Payroll \$27.8 million.

Pease ANG Base, N. H. 03803-6505; 1 mi. E of Portsmouth. Phone (603) 430-2453; DSN 852-2453. 157th Air Refueling Gp. (ANG). Named for Capt. Carl Pease, Jr., AAF, Medal of Honor recipient, killed in action in the South Pacific, Aug. 7, 1942. Area 220 acres. Altitude 101 ft. ANG military 1,170, ANG full-time personnel 370. Payroll \$12 million.

Phelps Collins ANG Base, Alpena, Mich. 49707; 7 mi. W of Alpena. Phone (517) 354-6291; DSN 741-3500. Training site detachment. Facilities used by ANG and AFRES units for annual field training and by ARNG and Marine Reserve for special training. Base named for Capt. W. H. Phelps Collins, American Flying Corps, killed in France in Mar. 1918. Area 2,708 acres. Altitude 689 ft. Military 69, civilian full-time support 69. Payroll \$2.2 million. Housing: 1,500 personnel. 14-bed hospital. Dispensary.

Phoenix, Ariz. (Sky Harbor International Airport) 85034. Phone (602) 244-9841; DSN 853-9072. 161st Air Refueling Gp. (ANG). Area 51 acres. Altitude 1,230 ft. Military 1,076, full-time personnel 342. Payroll \$16.6 million.

Portland International Airport, Portland, Ore. 97218-2797. Phone (503) 335-4100; DSN 638-4000. 142d Fighter Interceptor Gp. (ANG); 244th Combat Communications Sqdn. (ANG); 272d Combat Communications Sqdn. (ANG); 116th Tactical Control Sqdn. (ANG); 12th Special Forces Gp. (USAR); Oregon Wg., CAP. Also host to 939th Aerospace Rescue and Recovery Gp. (AFRES) and 83d Aerial Port Sqdn. (AFRES). Area 232 acres. Altitude 26 ft. Military 1,388, full-time personnel 499 (+ 59 civilians). Payroll \$25.8 million.

Providence, R. I. (Quonset Point State Airport) 02852; 20 mi. S of Providence. Phone (401) 886-1200; DSN 476-3210. 143d Tactical Airlift Gp. (ANG). Area 79 acres. Altitude 9 ft. Military 996, full-time personnel 270. Payroll \$15.1 million.

Puerto Rico International Airport, Puerto Rico (Muniz ANG Base) 00914; E of San Juan. Phone (809) 253-5100; DSN 860-9210. 156th Tactical Fighter Gp. (ANG). Base named for Lt. Col. José A. Muniz, killed in an aircraft accident July 4, 1960. Area 85 acres. Military 969, full-time personnel 300. Payroll \$15.7 million.

Reno-Cannon International Airport, Nev. (May ANG Base) 89502; 5 mi. SE of Reno at 1776 ANG Way. Phone (702) 788-4500; DSN 830-4500. 152d Tactical Recon Gp. (ANG). Base named for Maj. Gen. James A. May, Nevada Adjutant General. Area 64 acres. Altitude 4,411 ft. Military 1,104, full-time personnel 334. Payroll \$13.5 million. Dispensary.

Richards-Gebaur AFB, Mo. 64030-5000; 17 mi. S of Kansas City. Phone (816) 348-2000; DSN 463-1110. 442d Tactical Fighter Wg. (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-USAF military units and federal agencies. Joint-use airport facility with Kansas City, Mo. Altitude 1,090 ft. AFRES and active-duty USAF 1,471, full-time personnel 362. Payroll \$21.3 million. On-base, Marine Corps-operated, all-service housing: 27 officer, 214 enlisted. Consolidated open mess and 156 transient quarters available.

Richmond, Va. (Byrd International Airport) 23150; 4 mi. SE of downtown Richmond. Phone (804) 222-8884; DSN 274-8884. 192d Tactical Fighter Gp. (ANG). Airport named for Adm. Richard E. Byrd, famous Arctic and Antarctic explorer. Area 143 acres. Altitude 167 ft. Military 1,089, full-time personnel 337. Payroll \$13.9 million.

Rickenbacker ANG Base, Ohio 43217; 13 mi. SSW of Columbus. Phone (614) 492-8211; DSN 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); 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 2,016 acres. Altitude 744 ft. ANG military 1,940, full-time personnel 583, Title 5 civilians 299. Payroll \$32.7 million.

Roslyn ANG Station, Roslyn, N. Y. 11576-2399; 27 mi. E of New York City. Phone (516) 299-5214; DSN 456-5201. 274th Combat Communications Sqdn. (ANG); 213th En-

gineering Installation Sqdn. (ANG). Also hosts two Army National Guard units. Area 50 acres. Altitude 320 ft. Military 399, full-time personnel 42. Payroll through Stewart IAP, N. Y.

Salt Lake City International Airport, Utah 84116; 3 mi. W of Salt Lake City. Phone (801) 595-2200; DSN 790-9210. 151st Air Refueling Gp. (ANG); 169th Electronic Security Sqdn. (ANG). Also hosts ANG's 130th Engineering Installation Sqdn. and 106th and 109th Tactical Control Flts. Area 132 acres. Altitude 4,220 ft. Military 1,585, full-time personnel 409 (+ 41 civilians). Payroll \$20.2 million. Dispensary.

Savannah International Airport, Ga. 31402; 4 mi. NW of Savannah. Phone (912) 964-1941; DSN 860-8210. 165th Tactical Airlift Gp. (ANG). Also field training site. Area 232 acres. Altitude 50 ft. Military 1,176, full-time personnel 330. Payroll \$17.7 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; DSN 974-9221. 109th Tactical Airlift Gp. (ANG). Area 106 acres. Altitude 378 ft. Military 1,102, full-time personnel 258. Payroll \$11.6 million. Dispensary.

Selfridge ANG Base, Mich. 48045; 3 mi. NE of Mount Clemens. Phone (313) 466-4011; DSN 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 3,071 acres. Altitude 583 ft. ANG military 2,070, ANG full-time personnel 581 (+ 530 civilians). Payroll \$44.6 million. Dispensary.

Sioux Falls, S. D. (Joe Foss Field) 57104; N side of Sioux Falls. Phone (605) 333-5700; DSN 939-7210. 114th Tactical Fighter Gp. (ANG). Field named for Brig. Gen. Joseph J. Foss, WW II ace, former governor of South Dakota, former AFA National President, and founder of the South Dakota ANG. Area 163 acres. Altitude 1,428 ft. Military 962, full-time personnel 291. Payroll \$12 million.

Sioux Gateway Airport, Iowa 51110; 7 mi. S of Sioux City. Phone (712) 255-3511; DSN 939-6210. 185th Tactical Fighter Gp. (ANG). Area 112 acres. Altitude 1,098 ft. Military 937, full-time personnel 294. Payroll \$13.4 million. Dispensary.

Springfield, Ill. (Capital Airport) 63707-5000; 2 mi. NW of Springfield. Phone (217) 753-8850; DSN 892-8210. 183d Tactical Fighter Gp. (ANG). Area 91 acres. Altitude 592 ft. Military 1,168, full-time personnel 336. Payroll \$14.1 million. Dispensary.

Springfield-Beckley Municipal Airport, Ohio 45501-1780; 5 mi. S of Springfield. Phone (513) 323-8653; DSN 346-2311. 178th Tactical Fighter Gp. (ANG); 251st Combat Communications Gp. (ANG); 269th Combat Communications Sqdn. (ANG). Area 114 acres. Altitude 1,052 ft. Military 1,205, full-time personnel 333. Payroll \$15.9 million. 6-bed dispensary.

Stewart ANG Base, N. Y. (Stewart International Airport) 12550-0031; 4 mi. W of Newburgh, 15 mi. N of USMA (West Point). Phone (914) 563-2000; DSN 247-2000. Hq. New York ANG; 105th Military Airlift Gp. (ANG); USMA subpost airport. Stewart AFB until 1969; acquired by state of New York in 1970. ANG area 304 acres. Altitude 491 ft. ANG military 1,757, full-time personnel 672. Payroll \$18 million. Dispensary. Most military services available through West Point or subpost.

St. Joseph, Mo. (Rosecrans Memorial Airport) 64503; 4 mi. W of St. Joseph. Phone (816) 271-1300; DSN 720-9210. 139th Tactical Airlift Gp. (ANG). Area 207 acres. Altitude 724 ft. Military 916, full-time personnel 264. Payroll \$11.5 million.

St. Louis International Airport, Mo. (Lambert Field) 63145. Phone (314) 263-6200; DSN 693-6200. 131st Tactical Fighter Wg. (ANG). Area 49 acres. Altitude 589 ft. Military 1,551, full-time personnel 375. Payroll \$22.8 million.

Suffolk County Airport, Westhampton Beach, N. Y. 11978-1294; within corporate limits of Westhampton Beach. Phone (516) 288-7300; DSN 456-7410. 106th Air Rescue Gp. (ANG). Area 70 acres. Altitude 67 ft. Military 793, full-time personnel 270. Payroll \$12.7 million.

Syracuse, N. Y. (Hancock Field) 13211-7099; 5 mi. NE of Syracuse. Phone (315) 470-6100; DSN 587-9100. 174th Tactical Fighter Wg. (ANG). Base operations for Hancock ANG Base. 152d Tactical Control Gp.; 108th and 113th

Tactical Control Sqdns. (ANG). Area 376 acres. Altitude 421 ft. Military 1,433, full-time personnel 378. Payroll \$15.1 million. Dispensary.

Terre Haute, Ind. (Hulman Regional Airport) 47803-5000; 5 mi. E of Terre Haute. Phone (812) 877-5210; DSN 724-1210. 181st Tactical Fighter Gp. (ANG). Area 279 acres. Altitude 585 ft. Military 1,170, full-time personnel 321. Payroll \$13.9 million. 5-bed dispensary.

Toledo Express Airport, Swanton, Ohio 43558; 14 mi. W of Toledo. Phone (419) 868-4078; DSN 580-4078. 180th Tactical Fighter Gp. (ANG). Area 84 acres. Altitude 684 ft. Military 1,040, full-time personnel 297. Payroll \$14.3 million. 4-bed clinic.

Truax Field, Madison, Wis. (Dane County Regional Airport) 53704-2591; 2 mi. N of Madison. Phone (608) 241-6200; DSN 273-8210. 128th Tactical Fighter Wg. (ANG). Activated June 1942 as AAF base; taken over by Wis. ANG in Apr. 1968. Named for Lt. T. L. Truax, killed in a P-40 training accident in 1941. Area 155 acres. Altitude 862 ft. Military 1,006, full-time personnel 310. Payroll \$12.2 million. Housing: 7 transient. Dispensary.

Tucson International Airport, Ariz. 85734; within Tucson city limits. Phone (602) 573-2210; DSN 853-4210. 162d Tactical Fighter Gp. (ANG). Area 86 acres. Altitude 2,650 ft. Military 1,583, full-time personnel 862. Payroll \$24.3 million.

Tulsa International Airport, Okla. 74115. Phone (918) 832-8300; DSN 956-5297. 138th Tactical Fighter Gp. (ANG); 219th Electronic Installation Sqdn. Area 82 acres. Altitude 676 ft. Military 1,148, full-time personnel 310. Payroll \$13 million.

Volk Field ANG Base, Wis. 54618-5001; 90 mi. NW of Madison. Phone (608) 427-1210; DSN 798-3210. ANG field training site featuring air-to-air and air-to-ground gunnery ranges and providing training for ANG flying units. Base and field named for Lt. Jerome A. Volk, first Wisconsin ANG pilot killed in the Korean War. Area 2,273 acres. Altitude 910 ft. Military 74, full-time personnel 74. Payroll \$2.1 million. 6-bed dispensary.

Westfield, Mass. (Barnes Municipal Airport) 01085; 3 mi. N of Westfield. Phone (413) 568-9151; DSN 636-1210/11. 104th Tactical Fighter Gp. (ANG). Area 133 acres. Altitude 270 ft. Military 1,046, full-time personnel 309. Payroll \$14.3 million.

Westover AFB, Mass. 01022-5000; 5 mi. NE of Chicopee. Phone (413) 557-1110; DSN 589-1110. AFRES base. 439th Military 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 2,386 acres. Altitude 244 ft. Reservists 2,350, full-time personnel (AFRES and tenant units) 211, civilians 744. Payroll \$46.1 million. Housing: 355 VAO quarters (594 beds), 48 VOO (89 beds).

Willow Grove Air Reserve Forces Facility, Pa. 19090-5130; 14 mi. N of Philadelphia. Altitude 356 feet. ANG and AFRES have separate phones and facilities. ANG phone (215) 443-1500; DSN 991-1500. 111th Tactical Air Support Gp. (ANG). ANG area 39 acres. Military 1,147, full-time personnel 292. Payroll \$11.2 million. AFRES phone (215) 443-1062; DSN 991-1062. 913th Tactical Airlift Gp. (AFRES). AFRES area 162 acres. Reservists 856, full-time personnel 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, 5624 Air Guard Dr., Oklahoma City, Okla. 73169-5000; 7 mi. SW of Oklahoma City. Phone (405) 686-5210; DSN 956-8210. 137th Tactical Airlift Wg. (ANG). Area 134 acres. Altitude 1,290 ft. Military 1,253, full-time personnel 254. Payroll \$14.2 million.

Wilmington, Del. (Greater Wilmington Airport) 19720; 5 mi. S of Wilmington. Phone (302) 323-3500; DSN 445-3360. 166th Tactical Airlift Gp. (ANG); Army National Guard aviation company. Area 57 acres. Altitude 80 ft. Military 1,010, full-time personnel 261. Payroll \$10.8 million. 2-bed dispensary.

Youngstown Municipal Airport, Ohio 44473-5000; 16 mi. N of Youngstown. Phone (216) 392-1000; DSN 346-1000. AFRES base. 910th Tactical Airlift Gp. (AFRES); 757th Tactical Airlift Sqdn. (AFRES). Other units include 76th Mobile Aerial Port Sqdn. (AFRES); Defense Contract Administration Services. Base activated 1952. Area 741 acres. Altitude 1,196 ft. Reservists 1,005, full-time personnel 143, civilians 233. Payroll \$17 million. ■

Records, Trophies, and Competitions

Absolute World Records

The desirability of a standard procedure to certify air records was recognized early in the history of powered flight. In 1905, representatives of Belgium, Germany, the United States, Great Britain, France, Spain, Italy, and Switzerland met in Paris to form the Fédération Aéronautique Internationale (FAI), the world body of national aeronautic sporting interests. The FAI

today comprises the national aero clubs of seventy nations and certifies national records as world records.

Since 1922, the National Aeronautic Association (NAA), based in Washington, D. C., has been the US representative to the FAI. The NAA supervises all attempts at world and world-class records in the United States.

Absolute world records are the su-

preme achievements of all the hundreds of records open to flying machines. Several of these records are more than ten years old. The NAA notes that, "since the performance of many government-backed airplanes . . . is wrapped in a blanket of national security, the breaking of some of these records will depend as much on political considerations as technical ones."

Absolute Aviation World Records

Record	Pilot(s)	Aircraft	Route/Location	Date(s)
Speed Around the World, Nonstop, Nonrefueled: 115.65 mph (186.11 kph)	Richard Rutan and Jeana Yeager	Voyager experimental aircraft	Edwards AFB, Calif., to Edwards AFB, Calif.	December 14-23, 1986
Great Circle Distance Without Landing: 24,986.727 miles (40,212.139 kilometers)	Richard Rutan and Jeana Yeager	Voyager experimental aircraft	Edwards AFB, Calif., to Edwards AFB, Calif.	December 14-23, 1986
Distance in a Closed Circuit Without Landing: 24,986.727 miles (40,212.139 kilometers)	Richard Rutan and Jeana Yeager	Voyager experimental aircraft	Edwards AFB, Calif., to Edwards AFB, Calif.	December 14-23, 1986
Altitude: 123,523.58 feet (37,650.00 meters)	Alexander Fedotov	E-266M, a modified MiG-25 "Foxbat"	Podmoskovnoye, USSR	August 31, 1977
Altitude in an Aircraft Launched from a Carrier Airplane: 314,750.00 feet (95,935.99 meters)	Maj. Robert M. White, USAF	North American X-15 No. 3 research aircraft	Edwards AFB, Calif.	July 17, 1962
Altitude in Horizontal Flight: 85,068.997 feet (25,929.031 meters)	Capt. Robert C. Helt, USAF	Lockheed SR-71A "Blackbird" reconnaissance aircraft	Beale AFB, Calif.	July 28, 1976
Speed Over a Straight Course: 2,193.16 mph (3,529.56 kph)	Capt. Eldon W. Joersz, USAF	Lockheed SR-71A "Blackbird" reconnaissance aircraft	Beale AFB, Calif.	July 28, 1976
Speed Over a Closed Circuit: 2,092.294 mph (3,367.221 kph)	Maj. Adolphus H. Bledsoe, Jr., USAF	Lockheed SR-71A "Blackbird" reconnaissance aircraft	Beale AFB, Calif.	July 28, 1976

The Robert J. Collier Trophy

The Robert J. Collier Trophy is the most prestigious award in American aviation. Presented by the National Aeronautic Association (NAA), the trophy is awarded for the "greatest achievement in aeronautics or astronautics in America, with respect to improving the performance, efficiency, and safety of air or space vehicles,

the value of which has been thoroughly demonstrated by actual use during the preceding year."

The award is named for Robert J. Collier, a prominent publisher, sportsman, and aviator. Mr. Collier, the first person to purchase a Wright airplane for personal use, commissioned the trophy and presented it to the Aero

Club of America (the forerunner of the NAA) in 1911. Its purpose was to encourage the positive aspects of aviation.

The 525-pound bronze trophy is the work of sculptor Ernest Wise Keyser. It is on permanent display in the National Air and Space Museum in Washington, D. C.

Recipients of the Collier Trophy

Year	Recipient(s)	Achievement
1911	Glenn H. Curtiss	Development of the hydro-aeroplane
1912	Glenn H. Curtiss	Flying boat
1913	Orville Wright	Development of the automatic stabilizer
1914	Elmer A. Sperry	Gyroscopic control
1915	W. Sterling Burgess	Burgess-Dunne hydro-aeroplane
1916	Elmer A. Sperry	Drift indicator
1917-20	No award (World War I and aftermath)	
1921	Grover Loening	Development of the aerial yacht
1922	Personnel of the US Mail Service	
1923	Personnel of the US Mail Service	Night flying
1924	The US Army	
1925	S. Albert Reed	Development of the metal propeller
1926	Maj. E. L. Hoffman	Development of the practical parachute
1927	Charles L. Lawrance	Radial air-cooled engine
1928	Aeronautics Branch of the Department of Commerce	Development of airways and air navigation facilities
1929	The National Advisory Committee for Aeronautics	NACA cowling
1930	Harold Pitcairn and his staff	Autogiro
1931	The Packard Motor Car Co.	Aircraft diesel engine
1932	Glenn L. Martin	Development of an outstanding biengined, high-speed, weight-carrying airplane
1933	The Hamilton Standard Propeller Co. and Chief Engineer Frank W. Caldwell	Controllable-pitch propeller
1934	Maj. Albert F. Hegenberger	Blind landing experimentation
1935	Donald Douglas and his staff	Development of the DC-2
1936	Pan American Airways	Transpacific and overwater operations
1937	The Army Air Corps	Design and equipment of a stratosphere airplane
1938	Howard Hughes and crew	Round-the-world flight
1939	Airlines of the United States	Record of safety in air travel
1940	Dr. Sanford Moss and the Army Air Corps	Development of the supercharger
1941	The Air Forces and the airlines	Worldwide operations typified in the routes of the Air Transport Command

Year	Recipient(s)	Achievement
1942	Gen. H. H. Arnold	Organization and leadership of the mightiest air force in the world
1943	Capt. Luis De Flores, USNR	Development of synthetic training devices for flyers
1944	Gen. Carl A. Spaatz	Demonstrating the airpower concept through employment of US aviation in the war against Germany
1945	Dr. Luis W. Alvarez	Development of the ground controlled approach radar landing system
1946	Lewis A. Rodert	Development of a thermal ice-prevention system
1947	John Stack, Lawrence D. Bell, and Capt. Charles E. Yeager	Supersonic flight
1948	Radio Technical Commission for Aeronautics	Development of a system of air traffic control to permit safe and unlimited operations under all weather conditions
1949	William P. Lear	Development of the Lear F-5 automatic pilot and automatic control coupler system
1950	The helicopter industry, the military services, and the Coast Guard	Conception, development, and use of rotary-wing aircraft for air rescue operations
1951	John Stack and associates at Langley Aeronautical Laboratory, NACA	Conception, development, and practical application of the transonic wind tunnel throat
1952	Leonard S. Hobbs of United Aircraft Corp.	Design, development, and production of the J57 jet engine
1953	James H. Kindelberger and Edward H. Heinemann	Development of the first supersonic airplanes in service
1954	Richard Travis Whitcomb, NACA Research Scientist	Discovery and experimental verification of the area rule, yielding higher speed and greater range with the same power
1955	William M. Allen and the Boeing Airplane Co. and Gen. Nathan F. Twining and the US Air Force	Development and operational use of the B-52
1956	Charles I. McCarthy and associates of Chance-Vought Aircraft, Inc., and Vice Adm. James S. Russell and associates of the US Navy Bureau of Aeronautics	Conception, design, and development of the F8U Crusader
1957	Edward P. Curtis	His report "Aviation Facilities Planning," developed while he was Special Assistant to the President of the United States
1958	The US Air Force and the Industry Team responsible for the F-104 interceptor:	
	Clarence L. Johnson of Lockheed Aircraft Corp.	Design of the airframe
	Neil Burgess and Gerhard Neumann of the Flight Propulsion Division, General Electric Co.	Development of J79 turbojet engines
	Maj. Howard C. Johnson, USAF	World landplane altitude record
	Capt. Walter W. Irwin, USAF	World straightaway speed record
1959	The US Air Force, the Convair Division of General Dynamics Corp., and Space Technology Laboratories, Inc.	Developing, testing, producing, and putting into operation the Atlas, America's first intercontinental ballistic missile
1960	Vice Adm. William F. Raborn	Under his direction the US Navy, science, and industry created the operational fleet ballistic missile weapon system, Polaris
1961	Maj. Robert M. White, Joseph A. Walker, A. Scott Crossfield, and Cmdr. Forrest Petersen, representing the US Air Force, the National Aeronautics and Space Administration, North American Aviation, and the US Navy, respectively	Invaluable technological contributions to the advancement of flight and for great skill and courage as test pilots for the X-15
1962	Lt. Cmdr. M. Scott Carpenter, USN; Maj. L. Gordon Cooper, USAF; Lt. Col. John H. Glenn, Jr., USMC; Maj. Virgil I. Grissom, USAF; Cmdr. Walter M. Schirra, Jr., USN; Cmdr. Alan B. Shepard, Jr., USN; and Maj. Donald K. Slayton, USAF	Pioneering manned spaceflight in the US
1963	Clarence L. "Kelly" Johnson	Designing and directing the development of the USAF A-11 Mach 3 aircraft

Year	Recipient(s)	Achievement
1964	Gen. Curtis E. LeMay	Great achievements with respect to air vehicles and US national defense
1965	James E. Webb and Hugh L. Dryden, representing the Gemini program teams	Significantly advancing human experience in spaceflight
1966	James S. McDonnell	Leadership and perseverance in advancing aeronautics and astronautics, exemplified by the F-4 Phantom aircraft and the Gemini space vehicles
1967	Lawrence A. Hyland, representing the Surveyor Program Team at Hughes Aircraft Co., the Jet Propulsion Laboratory, and associated organizations	Putting the eyes and hands of the United States on the moon
1968	Col. Frank Borman, USAF; Capt. James A. Lovell, Jr., USN; and Lt. Col. William A. Anders, USAF, as the crew of Apollo 8 and representing the entire United States spaceflight team	Successful and flawless execution of the first manned lunar orbit mission
1969	Neil A. Armstrong; Col. Edwin E. Aldrin, Jr., USAF; and Col. Michael Collins, USAF	The epic flight of Apollo 11 and the first landing of man on the surface of the moon, July 20, 1969
1970	The Boeing Co., with particular recognition to Pratt & Whitney Division of United Aircraft Corp. and to Pan American World Airways	Leading the industry-airline-government team that successfully introduced the 747 into commercial service
1971	Col. David R. Scott, USAF, Col. James B. Irwin, USAF, and Lt. Col. Alfred M. Worden, USAF, the crew of Apollo 15; and Dr. Robert T. Gilruth of the Apollo 15 engineering team	Demonstrating superb skill and courage in Apollo 15 (crew) and (Dr. Gilruth) as representative of the engineering genius of the manned spaceflight team
1972	Adm. Thomas H. Moorer, USN, representing the officers and men of the Seventh and Eighth Air Forces of the US Air Force and Task Force 77 of the US Navy	Operation Linebacker II
1973	The Skylab Program, with special recognition to William C. Schneider, program director, and the three Skylab astronaut crews	Proving beyond question the value of future manned explorations of space and producing data of benefit to all the people of Earth
1974	Dr. John F. Clark, NASA, and Daniel J. Fink, General Electric Co., representing the NASA/industry team responsible for the Earth Resources Technology Satellite Program, LANDSAT, with special recognition to Hughes Aircraft Co. and RCA	Proving the value of US space technology in the management of the Earth's resources and environment for the benefit of all mankind
1975	David S. Lewis, General Dynamics Corp., and the F-16 Air Force/industry team	Significant advancements in aviation technology leading to innovative fighter aircraft effectiveness
1976	US Air Force, Rockwell International Corp., and the B-1 industry team	Highly successful design, development, management, and flight test of the B-1 strategic aircraft system
1977	Gen. Robert J. Dixon, commander, and Tactical Air Command, US Air Force	Developing and implementing Red Flag, an unprecedented combat simulated flight training program for aircrews of the US armed forces
1978	Sam B. Williams, Williams Research Corp.	Conceiving and developing the world's smallest high-efficiency turbofan engine, which was selected to power US cruise missiles
1979	Dr. Paul B. MacCready, Aeroenvironment, Inc., with special recognition to pilot Bryan Allen	Concept, design, and construction of the <i>Gossamer Albatross</i> , which made the first human-powered flight across the English Channel
1980	NASA's Voyager Mission Team, represented by its Chief Scientist, Dr. Edward C. Stone	Spectacular flyby of Saturn and the return of new basic knowledge of the solar system
1981	NASA, Rockwell International Corp., Martin Marietta Corp., Thiokol Corp., and the entire government-industry team, with special recognition to space shuttle <i>Columbia</i> astronauts John W. Young, Capt. Robert L. Crippen, USN, Col. Joe H. Engle, USAF, and Capt. Richard H. Truly, USN	Proving the concept of manned reusable spacecraft
1982	T. A. Wilson, the Boeing Co., with the support of the Federal Aviation Administration, industry, and the airlines	Development of two advanced technology airliners, the 757 and the 767
1983	The US Army, Hughes Helicopters, Inc., and the industry team	Development of the AH-64A Apache advanced technology helicopter weapon system

Year	Recipient(s)	Achievement
1984	The National Aeronautics and Space Administration and Martin Marietta Corp., with special recognition to astronaut Capt. Bruce McCandless II, USN; NASA's Charles E. Whitsett, Jr.; and Walter W. Bollendonk of Martin Marietta	Development of the manned maneuvering units and the NASA team that rescued three disabled satellites
1985	Russell W. Meyer, the Cessna Aircraft Co., and Cessna's line of Citation business jet aircraft	Outstanding safety record of the worldwide fleet of Citation aircraft
1986	Jeana L. Yeager, Richard G. Rutan, Elbert L. Rutan, Bruce Evans, and the team of volunteers	Design and development of the <i>Voyager</i> aircraft and skillful execution of the first nonstop, nonrefueled flight around the world
1987	The NASA Lewis Research Center and the NASA-industry advanced turboprop team	Development of advanced turboprop propulsion concepts for single rotation, gearless counterrotation, and geared counterrotation unducted fan systems
1988	Rear Adm. Richard Truly, USN	Outstanding leadership in the direction of the recovery of the nation's manned space program
1989	Ben R. Rich and the entire Lockheed-Air Force team	Production and deployment of the F-117A Stealth aircraft, which changes the entire concept of military aircraft design and combat deployment for the future
1990	The Bell-Boeing team	Development of the V-22 Osprey tilt-rotor, the world's first large-scale tilt-rotor aircraft

The Hughes Achievement Trophy

The Hughes Achievement Trophy is presented annually to the top Air Force squadron with an air defense mission. The idea for the trophy dates back to 1952. Gen. Benjamin Childlaw, the new commander of Air Defense Command, was looking for a way to motivate his units and reward squadron excellence.

Hughes Aircraft Co.'s principal products during that period were closely associated with air defense. The company was eager to sponsor a special award, and the result was the Hughes Trophy.

Julian Focan, a metalsmith working for Hughes, created the original trophy in 1953. It was presented to the 58th Fighter Interceptor Squadron at Otis AFB, Mass., the first winner. It was reclaimed after the 58th FIS had been deactivated and, since 1963, has been presented to the winning unit.

Recipients of the Hughes Trophy

Year	Unit, Base	Aircraft
1953	58th FIS, Otis AFB, Mass.	F-94C
1954	96th FIS, New Castle County Airport, Del.	F-94C
1955	496th FIS, Landstuhl AB, West Germany	F-86D
1956	317th FIS, McChord AFB, Wash.	F-86D/F-102A
1957	512th FIS, RAF Bentwaters, England	F-86D
1958	31st FIS, Elmendorf AFB, Alaska	F-102A
1959	54th FIS, Ellsworth AFB, S. D.	F-89J
1960	460th FIS, Portland IAP, Ore.	F-102A
1961	83d FIS, Hamilton AFB, Calif.	F-101B
1962	444th FIS, Charleston AFB, S. C.	F-101B
1963	497th FIS, Torrejon AB, Spain	F-102A
1964	329th FIS, George AFB, Calif.	F-106A/B
1965	317th FIS, Elmendorf AFB, Alaska	F-102A
1966	32d FIS, Soesterberg AB, the Netherlands	F-102A
1967	317th FIS, Elmendorf AFB, Alaska	F-106A/B
1968	64th FIS, Clark AB, the Philippines	F-102A
1969	71st FIS, Malmstrom AFB, Mont.	F-106A/B
1970	57th FIS, NAS Keflavik, Iceland	F-102A
1971	48th FIS, Langley AFB, Va.	F-106A/B
1972	43d TFS, Elmendorf AFB, Alaska	F-4E
1973	555th TFS, Udorn RTAFB, Thailand	F-4D
1974	119th FIG (ANG), Hector Field, Fargo, N. D.	F-101B
1975	318th FIS, McChord AFB, Wash.	F-106A/B
1976	57th FIS, NAS Keflavik, Iceland	F-4C
1977	43d TFS, Elmendorf AFB, Alaska	F-4E
1978	49th FIS, Griffiss AFB, N. Y.	F-106A/B
1979	32d TFS, Soesterberg AB, the Netherlands	F-15A/B
1980	32d TFS, Soesterberg AB, the Netherlands	F-15A/B
1981	12th TFS, Kadena AB, Okinawa, Japan	F-15C/D
1982	44th TFS, Kadena AB, Okinawa, Japan	F-15C/D
1983	67th TFS, Kadena AB, Okinawa, Japan	F-15C/D
1984	318th FIS, McChord AFB, Wash.	F-15A/B
1985	120th FIG (ANG), Great Falls IAP, Mont.	F-106A/B
1986	67th TFS, Kadena AB, Okinawa, Japan	F-15C/D
1987	57th FIS, NAS Keflavik, Iceland	F-15C/D
1988	22d TFS, Bitburg AB, West Germany	F-15C/D
1989	67th TFS, Kadena AB, Okinawa, Japan	F-15C/D
1990	To be announced mid-1991	

The Mackay Trophy

The Mackay Trophy is the oldest award presented exclusively to members of the US Air Force. Presented by the National Aeronautic Association, the trophy is awarded annually for "the most meritorious flight of the year" by an Air Force person, persons, or organizations.

The trophy was established by Clar-

ence H. Mackay, a wealthy industrialist, philanthropist, communications pioneer, and aviation enthusiast. He donated the elaborate silver trophy to the War Department in 1912.

From 1912 to 1915, the winner was decided by an aerial reconnaissance competition. For many years after that, a specially appointed committee

chose the trophy recipient. As of this printing, complete information on the achievements of recipients before 1947 was not available. The Mackay Trophy winner is now selected by the Air Force Chief of Staff.

The trophy is on permanent display at the National Air and Space Museum in Washington, D. C.

Recipients of the Mackay Trophy

Year	Recipient(s)	Year	Recipient(s)
1912	2d Lt. Henry H. Arnold	1927	Lt. Albert F. Hegenberger and Lt. Lester J. Maitland
1913	2d Lt. Joseph E. Carberry and 2d Lt. Fred Seydel	1928	1st Lt. Harry A. Sutton
1914	Capt. Townsend F. Dodd and Lt. Shapler W. Fitzgerald	1929	Capt. Albert W. Stevens
1915	Lt. B. W. Jones	1930	Maj. Ralph Royce
1916-17	No competition	1931	Maj. Gen. Benjamin D. Foulois
1918	Lt. Edward V. Rickenbacker	1932	1st Lt. Charles H. Howard
1919	Lt. Belvir W. Maynard, Lt. Alexander Pearson, Jr., Lt. R. S. Worthington, Capt. John O. Donaldson, Capt. Lowell H. Smith, Lt. Col. Harold E. Hartney, Lt. E. H. Manzelman (posthumously), Lt. R. G. Bagby, Lt. D. B. Gish, and Capt. F. Steinle	1933	Capt. Westside T. Larson
1920	Capt. St. Clair Street, Capt. Howard T. Douglas, 1st Lt. Clifford C. Nutt, 2d Lt. Erik H. Nelson, 2d Lt. C. H. Crumrine, 2d Lt. Ross C. Kirkpatrick, Sgt. Edmond Henriques, Sgt. Albert T. Vierra, and Sgt. Joseph E. English	1934	Brig. Gen. Henry H. Arnold
1921	Lt. John A. Macready	1935	Maj. Albert W. Stevens and Capt. Orville Anderson
1922	Lt. John A. Macready and Lt. Oakley G. Kelly	1936	Capt. Richard E. Nugent, 1st Lt. Joseph A. Miller, 1st Lt. Edwing G. Simenson, 2d Lt. William P. Ragsdale, Jr., 2d Lt. Burton W. Armstrong, 2d Lt. Herbert Morgan, Jr., TSgt. Gilbert W. Olsen, SSgt. Howard M. Miller, and Corpsman 2d Class Frank B. Conner
1923	Lt. John A. Macready and Lt. Oakley G. Kelly	1937	Capt. Carl J. Crane and Capt. George V. Holloman
1924	Capt. Lowell H. Smith, 1st Lt. Leigh Wade, 1st Lt. Leslie P. Arnold, 1st Lt. Erik H. Nelson, 2d Lt. John Harding, Jr., and 2d Lt. Henry H. Ogden	1938	Second Bombardment Group (General Headquarters Air Force). All those in the Second Bombardment Group at the time of the "Good Will" flight to Buenos Aires, Argentina, 15-27 February 1938, should be considered recipients.
1925	Lt. Cyrus Bettis and Lt. James H. Doolittle	1939	Maj. Caleb V. Haynes, Maj. William D. Old, Capt. John A. Samford, Capt. Richard S. Freeman, 1st Lt. Torgils G. Wold, MSgt. Adolph Cattarius, TSgt. Henry L. Hines, TSgt. William J. Heldt, TSgt. David L. Spicer, SSgt. Russel E. Junior, SSgt. James E. Sands
1926	Maj. Herbert A. Dargue, Capt. Ira C. Eaker, Capt. Arthur B. McDaniel, Capt. C. F. Woolsey (posthumously), 1st Lt. J. W. Benton (posthumously), 1st Lt. Charles McRobinson, 1st Lt. Muir S. Fairchild, 1st Lt. Bernard S. Thompson, 1st Lt. Leonard D. Weddington, and 1st Lt. Ennis C. Whitehead	1940-46	Trophy inactive

Year	Recipient(s)	Achievement
1947	Capt. Charles E. Yeager	First supersonic flight in the XS-1
1948	Lt. Col. Emil Beaudry	Rescue of thirteen marooned airmen from Greenland
1949	Capt. James G. Gallagher and flight crew of the B-50 <i>Lucky Lady II</i>	First around-the-world nonstop flight
1950	27th Fighter Escort Wing personnel	Planning and executing the mission of Fox Able Three, involving the movement of 180 jet fighter aircraft across the Atlantic

Year	Recipient(s)	Achievement
1951	Col. Fred J. Ascani	Establishing a new world speed record of 635.686 mph in the 100 kilometer closed-course event at the National Air Races
1952	Maj. Louis H. Carrington, Jr., Maj. Frederick W. Shook, and Capt. Wallace D. Yancey	First nonstop transpacific flight of an RB-45 multiengine jet bomber, a distance of 3,460 nautical miles in nine hours, fifty minutes, with two air refuelings
1953	40th Air Division, SAC	Operation Longstride, the deployment of jet fighter aircraft, utilizing air refueling techniques, on a nonstop flight from the US to bases in the UK and North Africa
1954	308th Bombardment Wing (M)	Successfully completing the "leapfrog" intercontinental maneuver, expanding and proving the combined operational capabilities of the B-47 and determining fatigue limits of combat crews
1955	Col. Horace A. Hanes	Establishing a world speed record of 822.135 mph in an F-100C aircraft at the National Air Show
1956	Capt. Iven C. Kincheloe, Jr., Air Research and Development Command	Flying the Bell X-2 aircraft to an altitude considerably higher than had ever been reached in a piloted aircraft
1957	93d Bombardment Wing, SAC	Operational Powerflight, the first jet around-the-world, nonstop flight by three of its B-52 crews
1958	Tactical Air Command's Composite Air Strike Force, X-Ray Tango	Rapid and effective deployment to the troubled Far East
1959	4520th Aerial Demonstration Team (Thunderbirds)	Six-week goodwill tour of the Far East
1960	6593d Test Squadron (Special)	Aerial recoveries of space capsules ejected from orbiting satellites
1961	Lt. Col. William R. Payne, Maj. William L. Polhemus, and Maj. Raymond R. Wagener, 43d Bomb Wing, SAC	Nonstop flight from Carswell AFB, Tex., to Paris, France, which established two international speed records
1962	Maj. Robert G. Sowers, Capt. Robert McDonald, and Capt. John T. Walton	Members of a SAC B-58 crew that established three transcontinental speed records
1963	Crew of C-47 <i>Extol Pink</i> (Capts. Warren P. Tomsett, John R. Ordemann, and Donald R. Mack; TSgt. Edsol P. Inlow; and SSgts. Jack E. Morgan and Frank C. Barrett)	Evacuation of wounded troops in Vietnam at night and under heavy enemy fire
1964	464th Troop Carrier Wing, TAC	Participation in the humanitarian airlift of some 1,500 hostages and refugees from rebel-held territory in the Republic of the Congo (now Zaire)
1965	YF-12A/SR-71 Test Force (Col. Robert L. Stephens, Lt. Cols. Daniel Andre and Walter F. Daniel, and Maj. Noel T. Warner and James P. Cooney)	Flight in the YF-12A that established nine new world speed and altitude records
1966	Col. Albert R. Howarth, PACAF	Exemplary courage and airmanship as a pilot in a combat strike mission in southeast Asia, under the most hazardous conditions of darkness and intense enemy fire
1967	Maj. John J. Casteel, Capts. Dean L. Hoar and Richard L. Trail, and MSgt. Nathan C. Campbell, SAC	First multiple air refuelings of aircraft under emergency conditions
1968	Lt. Col. Daryl D. Cole, PACAF	Conspicuous gallantry as a C-130 pilot in southeast Asia
1969	49th Tactical Fighter Wing, TAC	Flawless deployment of seventy-two F-4D aircraft from Spangdahlem AB, West Germany, to Holloman AFB, N. M., without a single abort, completing 504 successful air-to-air refuelings on the 5,000-mile trip
1970	Capt. Alan D. Milacek and crew (Capt. James A. Russell, Capt. Roger E. Clancy, Capt. Ronald C. Jones, Capt. Brent C. O'Brien, TSgt. Albert A. Nash, SSgt. Adolfo Lopez, Jr., SSgt. Ronald R. Wilson, Sgt. Kenneth E. Firestone, and A1C Donnell H. Cofer), PACAF, crew of an AC-119K based in Vietnam	While attacking a heavily defended road section in southeast Asia, their aircraft was badly damaged by intense fire. The crew kept the aircraft on target and destroyed three enemy supply trucks. Despite losing fifteen feet of their right wing and one aileron, the crew successfully returned to base.
1971	Lt. Cols. Thomas B. Estes and Dewain C. Vick, SAC	Aircraft commander and reconnaissance systems officer, respectively, on the SR-71 that established a record ten-and-one-half-hour flight, a distance of 15,000 miles, at speeds over Mach 3 and altitudes above 80,000 feet. The flight also proved the extended supersonic reconnaissance capability of the SR-71.

Year	Recipient(s)	Achievement
1972	Cpts. Richard S. "Steve" Ritchie, Charles B. DeBellevue, and Jeffrey S. Feinstein, PACAF	The three Air Force aces of the Vietnam conflict
1973	The aircrews of Military Airlift Command	Excellent performance during Operation Homecoming, the return of prisoners of war to the US
1974	Maj. Robert J. Smith, Maj. David W. Peterson, and Maj. Willard R. MacFarlane	F-15 Advanced Tactical Fighter test pilots during Operation Streak Eagle
1975	Maj. Robert W. Undorf	Conspicuous gallantry, initiative, and resourcefulness during the joint military operation to rescue the SS <i>Mayaguez</i> crew from an opposing armed force on Tang Island in the Gulf of Thailand
1976	Capt. James A. Yule	Gallantry and unusual presence of mind while participating in a flight as an instructor of a B-52D aircraft
1977	C-5 aircrew, Mission AAM 1962-01—Capt. David M. Sprinkel and crew	The aircrew—members of the 436th Military Airlift Wing and the 512th Military Airlift Wing (Assoc.)—airlifted a large superconducting electromagnet, support equipment, and personnel in support of a joint US-USSR energy research program
1978	C-5 aircrew, Mission AM 770021 (Zaire airlift)—Lt. Col. Robert F. Schultz and crew and Capt. Todd H. Hohberger and crew, 436th MAW, Dover AFB, Del.	First C-5 airlift mission in support of free world efforts against rebel forces in Zaire
1979	Maj. James E. McArdle, Jr.	Rescuing twenty-eight Taiwanese seamen from a sinking cargo ship
1980	Crews S-21 and S-31, 644th Bombardment Squadron	Nonstop, around-the-world mission to locate and photograph elements of the Soviet Navy operating in the Arabian Sea
1981	Capt. John J. Walters	Piloting an HH-3 helicopter during an air rescue mission of passengers and crew of the Dutch luxury ocean liner <i>Prinsendam</i> from frigid waters 120 miles south of Yakutat, Alaska
1982	B-52 Crew E-21, 19th Bombardment Wing	Successfully landing their B-52 after the aircraft lost both of its rudder/elevator hydraulic systems, a feat never before accomplished without significant damage or complete destruction of the aircraft
1983	SAC Crew E-113, 42d Bombardment Wing	Successfully refueling an F-4E only 2,000 feet above the ocean and towing the aircraft 160 miles (continuing to refuel) until it could regain sufficient thrust to maintain flight on its own
1984	Lt. Col. James L. Hobson, Jr.	Assuming the lead from another MC-130 and successfully completing an assault on Point Salines, Grenada
1985	Lt. Col. David E. Faught	Successfully completing an emergency landing (in a KC-135) with the nose gear retracted, following a 13.5-hour flight, ten emergency reverse air refuelings, and fifty-seven attempts to lower the nose gear manually
1986	SAC Crew KC-10, 68th Air Refueling Group	Safely recovering all deployed aircraft during a transatlantic deployment of US Marine Corps A-4 aircraft to Lajes Field, the Azores, in spite of rapidly worsening weather and critical fuel shortages
1987	Detachment 15, Air Force Plant Representative Office, and B-1B System Program Office	Two B-1B flights (July 4 and September 17) that established seventy-two world records and national speed, distance, and payload records
1988	C-5 Crew, 436th Military Airlift Wing	Mission to the nuclear test site at Semipalatinsk, Soviet Central Asia, as part of the Intermediate-range Nuclear Forces Treaty accords
1989	B-1B Crew, 96th Bombardment Wing	Successfully landing their B-1B with a nose wheel retracted
1990	AC-130 Crew, 16th Special Operations Squadron	Flight over the Republic of Panama to deliver firepower against the Panamanian Defense Forces

The Gen. Thomas D. White USAF Space Trophy

The Gen. Thomas D. White USAF Space Trophy is presented annually by the National Geographic Society to Air Force individuals (civilian or military) or organizations that made the year's outstanding contribution to progress in aerospace.

The award was established in 1961 by Dr. Thomas A. McKnew, the advisory chairman of the National Geo-

graphic Society's board of trustees. The award is named for Gen. Thomas D. White, the fourth Air Force Chief of Staff and a longtime champion of USAF's role in space. Dr. McKnew created the award as a tribute to General White and as an incentive to Air Force personnel involved in the space effort.

Dr. McKnew served as the project officer for the joint Army-National

Geographic Society project that sent a manned balloon 72,395 feet into the stratosphere in 1935. This ascent held the record for twenty-one years.

The trophy was designed by sculptor Felix de Weldon, who also created the Iwo Jima Memorial. The trophy is on display in the National Air and Space Museum in Washington, D. C. Yearly winners receive bronze plaques.

Recipients of the White Trophy

Year	Recipient(s)	Achievement
1961	Capt. Virgil I. Grissom	Suborbital flight of fifteen minutes in the Mercury spacecraft <i>Liberty Bell 7</i>
1962	Maj. Robert M. White	Rocket research in winged aircraft, especially for piloting the X-15 to a height of 59.6 miles
1963	Maj. L. Gordon Cooper	Flight of thirty-four hours and twenty minutes and twenty-two orbits of the Earth in the Mercury spacecraft <i>Faith 7</i>
1964	Air Force Systems Command	Advancing space technology through the successful development of reliable space-launch vehicles
1965	Lt. Col. Edward H. White II	First US walk in space, for twenty minutes during an extravehicular maneuver on the flight of Gemini 4
1966	Dr. Alexander H. Flax, Assistant Secretary of the Air Force	Distinguished direction of Air Force research and development programs
1967	Gen. John P. McConnell, Chief of Staff, US Air Force	Leadership and direction and for promulgating use of aerospace vehicles
1968	Col. Frank Borman, USAF, Lt. Col. William A. Anders, USAF, and Capt. James A. Lovell, Jr., USN	First moon orbital flight
1969	Neil A. Armstrong, Col. Edwin E. Aldrin, Jr., USAF, and Col. Michael Collins, USAF	First lunar landing—Apollo 11
1970	Brig. Gen. Robert A. Duffy of Air Force Systems Command's Space and Missile Systems Organization	Distinguished service in directing the Department of Defense's Advanced Ballistic Missile Reentry System program
1971	Lt. Gen. Samuel C. Phillips	Exceptionally meritorious accomplishments in directing the Air Force's space and missile research and development program
1972	Hon. Robert C. Seamans, Jr., Secretary of the Air Force	Extraordinary and decisive leadership of Air Force aeronautical and astronautical programs
1973	Lt. Col. Henry W. Hartsfield, Jr.	Outstanding work on Skylabs 1, 2, 3, and 4 and preparation and evaluation of crew procedures for transporting, installing, and deploying a parasol device to protect Skylab 1 from the sun after its solar reflective meteoroid shield had been lost during the boost phase
1974	Col. William R. Pogue	Outstanding achievement as pilot of the third manned Skylab mission while assigned to Det. 12, 1137th USAF Special Activities Squadron, NASA, Houston, Tex.
1975	Maj. Gen. Thomas P. Stafford	Participation in the Apollo-Soyuz Test Project, a joint venture with the Soviet Union
1976	Gen. William J. Evans, Commander, Air Force Systems Command	Personal leadership, exemplary foresight, and ceaseless efforts in the successful development and deployment of numerous space systems critical to the national defense

Year	Recipient(s)	Achievement
1977	Fred W. Haise, Jr., and Lt. Col. Charles G. Fullerton, USAF, pilots of the first test flight of the space shuttle <i>Enterprise</i> on August 12, 1977	Superior flying skills, initiative, and professionalism that resulted in complete success of this first internationally important mission
1979	Maj. Gen. John E. Kulpa, Jr.	Outstanding service as Director of Special Projects, Office of the Secretary of the Air Force, with additional duty as Deputy Commander of Satellite Programs, Space and Missile Systems Organization, Los Angeles, Calif.
1980	Gen. Lew Allen, Jr., Air Force Chief of Staff	Providing the systems and programs necessary to ensure an operational military space capability
1981	Col. Joe Henry Engle, USAF, and Capt. Richard H. Truly, USN	Exceptionally meritorious conduct as crew of the second flight of the Space Transportation System orbiter <i>Columbia</i>
1982	Lt. Gen. Richard Charles Henry	As the Department of Defense's manager for the Space Transportation System, established the military program for the use of payload specialists on the space shuttle and follow-on efforts to use man in space; established Air Force Space Command
1983	Gen. James V. Hartinger	Dynamic leadership as Commander in Chief, North American Aerospace Defense Command, and as Commander, US Space Command; powerful advocacy; and far-reaching vision that expanded awareness of the need to strengthen national security through space operations
1984	Lt. Gen. Forrest S. McCartney	Outstanding service as Commander, Space Division, Air Force Systems Command, Los Angeles AFS, Calif.
1985	Maj. Gen. Donald W. Henderson	Outstanding contributions to US progress in space launch and ballistic missile testing as Commander of the Air Force Space and Missile Test Organization, Vandenberg AFB, Calif.
1986	Gen. Donald J. Kutyna	Meritorious achievement while Director of Space Systems and Command, Control, and Communications for the Deputy Chief of Staff, Research, Development, and Acquisition, Hq. USAF
1987	Col. Victor Whitehead	Implementing the national space-launch strategy and spearheading efforts to restore heavyweight launch capacity after the <i>Challenger</i> and Titan 34D launch failures in 1986
1988	Dr. Robert R. Barthelemy	Service as program director of the X-30 hypersonic plane project at Air Force Systems Command's Aeronautical Systems Division at Wright-Patterson AFB, Ohio
1989	Launch Systems Directorate, Air Force Systems Command's Space Systems Division, Los Angeles AFB, Calif.	Development and procurement of a diverse array of expendable launch boosters and satellite systems for military and civilian applications
1990	Award to be announced mid-1991	

Airlift Rodeo: MAC's Tactical Airlift Competition

Airlift Rodeo, Military Airlift Command's annual tactical airlift competition, is a week-long, head-to-head contest held at Pope AFB, N. C. Its origins date to 1962. Participants include the top USAF active-duty, Air National Guard, and Air Force Reserve aircraft and teams and those of allied nations. The meet tests not only flying proficiency but also maintenance, security police, combat control, and other skills.

The major trophy of the contest,

awarded to the best overall wing or numbered air force, has borne several names over the past three decades. Since 1980, the trophy for the best overall wing has been named after Gen. William G. Moore, the eighth commander in chief of MAC.

The airlift competition itself has had different names: Aerial Delivery Competition, CARP Rodeo (1962-64), Combat Airlift Competition (1969-72), Volant Rodeo (1979-86), and Airlift Rodeo (1987-present).

Recipients of the Gen. William G. Moore Trophy

Year	Unit(s)	Year	Unit(s)
1962	1502d Air Transport Wing, Hickam AFB, Hawaii	1981	314th TAW, Little Rock AFB, Ark.
1963	62d Air Transport Wing, McChord AFB, Wash.	1982	Italian airlift wing
1964	1608th Air Transport Wing, Charleston, AFB, S. C.	1983	314th TAW, Little Rock AFB, Ark.
1965-68	No competition	1984	Italian airlift wing
1969	US 21st Air Force (multiwing)	1985	94th TAW (AFRES), Dobbins AFB, Ga.
1970	US 21st Air Force (multiwing)	1986	136th TAW (ANG), Hensley Field, Dallas, Tex.
1971	US 22d Air Force (multiwing)	1987	West German airlift wing
1972	US 21st Air Force (multiwing)	1988	No competition
1973-78	No competition	1989	Australian airlift wing
1979	443d MAW, Altus AFB, Okla.	1990	63d MAW, Norton AFB, Calif.
1980	317th TAW, Pope AFB, N. C.		

Gunsmoke: TAC's Fighter Gunnery Competition

Gunsmoke is an air-to-ground tactical fighter gunnery competition sponsored by USAF's Tactical Air Command and held biennially at Nellis AFB, Nev. Its purpose is to test various capabilities of the tactical air forces, demonstrate the capabilities of fighter/attack weapon systems, enhance *esprit de corps*, increase unit training efficiency, and recognize the best aircrews, maintenance teams, and munitions load teams. Teams from around the world represent units from TAC, USAFE, PACAF, Air Force Reserve, and Air National Guard in the Gunsmoke competition.

The Top Gun Award goes to the individual who has the highest aggregate score on completion of several different bombing and attack profiles.



An F-16 gun is loaded during a Gunsmoke shootout. Teams from USAF units around the globe go at it in TAC's biennial gunnery competition at Nellis AFB, Nev.

Gunsmoke Top Guns

Year	Individual	Aircraft	Unit, Base
1949	Unknown	Unknown	Unknown, Las Vegas AFB, Nev.
1950	Unknown	Unknown	Unknown, Nellis AFB, Nev.
1954	Unknown	Unknown	Unknown, Nellis AFB, Nev.
1955	Maj. Frederick C. Blesse	F-86	3596th CCTS, Nellis AFB, Nev.
1956	Capt. Asa Whitehead	F-86	3595th CCTW, Nellis AFB, Nev.
1958	Maj. Jack F. Brown	F-100	4520th CCTW, Nellis AFB, Nev.
1960	Capt. Aubrey C. Edinburgh	F-100	4520th CCTW, Nellis AFB, Nev.
1962	Capt. Charles E. Tofferi	F-104	479th TFW, George AFB, Calif.

1964–1980	No competition		
1981	Lt. Col. Wayne Schultz	A-7	120th TFS (ANG), Buckley ANGB, Colo.
1983	Lt. Col. Roy Niesz	F-16	388th TFW, Hill AFB, Utah
1985	Capt. Mark Fredenburgh	F-16	50th TFW, Hahn AB, West Germany
1987	Maj. Danny Hamilton	F-16	419th TFW, Hill AFB, Utah
1989	Capt. Patrick Shay	F-16	944th TFG (AFRES), Luke AFB, Ariz.

Olympic Arena: SAC's Strategic Missile Competition

Olympic Arena is Strategic Air Command's annual competition to determine which strategic missile wing can be called the best overall for the year. Ever since it was started in 1967, the meet has been held at Vandenberg AFB, Calif. The Air Force held no Olympic Arena competition in 1968.

Olympic Arena has become known as a gathering of the best of the best in the US ICBM community, with the winner taking home the Blanchard Trophy, named for former Air Force Vice Chief of Staff Gen. William H. Blanchard. From SAC's six ICBM wings come top launch crews and other specialists. Each ICBM wing competes in five categories and can score a maximum of some 3,100 points. The five categories are operations, maintenance, security police functions, civil engineering, and communications.



Col. Edward L. Burchfield, left, whose missile wing, the 341st SMW, Malmstrom AFB, Mont., won the Blanchard Trophy in 1990 for the third time, is congratulated by Gen. John T. Chain, Jr., then CINCSAC.

Recipients of the Blanchard Trophy

Year	Unit(s)	System	Year	Unit(s)	System
1967	351st SMW, Whiteman AFB, Mo.	Minuteman	1979	390th SMW, Davis-Monthan AFB, Ariz.	Titan
1968	No competition		1980	381st SMW, McConnell AFB, Kan.	Titan
1969	321st SMW, Grand Forks AFB, N. D.	Minuteman	1981	351st SMW, Whiteman AFB, Mo.	Minuteman
1970	44th SMW, Ellsworth AFB, S. D.	Minuteman	1982	44th SMW, Ellsworth AFB, S. D.	Minuteman
1971	351st SMW, Whiteman AFB, Mo.	Minuteman	1983	381st SMW, McConnell AFB, Kan.	Titan
1972	381st SMW, McConnell AFB, Kan.	Titan	1984	90th SMW, F. E. Warren AFB, Wyo.	Minuteman
1973	90th SMW, F. E. Warren AFB, Wyo.	Minuteman	1985	308th SMW, Little Rock AFB, Ark.	Titan
1974	321st SMW, Grand Forks AFB, N. D.	Minuteman	1986	341st SMW, Malmstrom AFB, Mont.	Minuteman
1975	381st SMW, McConnell AFB, Kan.	Titan	1987	321st SMW, Grand Forks AFB, N. D.	Minuteman
1976	341st SMW, Malmstrom AFB, Mont.	Minuteman	1988	91st SMW, Minot AFB, N. D.	Minuteman
1977	351st SMW, Whiteman AFB, Mo.	Minuteman	1989	351st SMW, Whiteman AFB, Mo.	Minuteman
1978	91st SMW, Minot AFB, N. D.	Minuteman	1990	341st SMW, Malmstrom AFB, Mont.	Minuteman

Proud Shield: SAC's Bombing and Navigation Competition

For forty years, SAC's top bomber crews have gathered to take part in the annual Bombing and Navigation Competition, which in 1986 took the name Proud Shield. Begun on a small scale in the late 1940s, it has grown into a tournament of major size and importance.

The competition had its origins in May 1948, when SAC Deputy Commander Maj. Gen. Clements McMullen instructed all SAC bomber units to improve their bombing skills. Small, simple contests were held in 1948 and 1949. The Korean War caused cancellation of the meet in 1950, but in 1951 Gen. Curtis LeMay, SAC's commander in chief, revived it on a grand scale. He also added a navigation phase. In addition, bombers began to conduct many simulated rather than actual releases of weapons.

The Gen. Muir S. Fairchild Trophy, named for the aviation pioneer and first commandant of Air University and donated by the Hughes Aircraft Corp., was established in 1951. It is awarded to the SAC bomber-tanker wing with the highest competition effectiveness, excluding the fighter intercept exercise and high-altitude bombing.

Recipients of the Gen. Muir S. Fairchild Trophy

Year	Unit(s)	System
1951	97th BMW, Biggs AFB, Tex.	B-50D
1952	93d BMW, Castle AFB, Calif. 97th BMW, Biggs AFB, Tex. (tie)	B-50D B-50D
1953	92d BMW, Fairchild AFB, Wash.	B-36D
1954	11th BMW, Carswell AFB, Tex.	B-36H
1955	320th BMW, March AFB, Calif.	YRB-47B
1956	11th BMW, Carswell AFB, Tex.	B-36H
1957	321st BMW, Pinecastle AFB, Fla.	B-47B
1958	306th BMW, MacDill AFB, Fla.	B-47E
1959	307th BMW, Lincoln AFB, Neb.	B-47E
1960	11th BMW, Altus AFB, Okla.	B-52E
1961	4137th BMW, Robins AFB, Ga.	B-52G
1962	No competition	
1963	2d BMW, Barksdale AFB, La. ¹	B-52 ²
1964	70th BMW, Clinton-Sherman AFB, Okla. ¹	B-52 ²
1965	454th BMW, Columbus AFB, Miss.	B-52F
1966	19th BMW, Homestead AFB, Fla.	B-52H
1967-68	No competition	
1969	319th BMW, Grand Forks AFB, N. D.	B-52H
1970	93rd BMW, Castle AFB, Calif.	B-52F
1971	449th BMW, Kincheloe AFB, Mich.	B-52H
1972-73	No competition	
1974	380th BMW, Plattsburgh AFB, N. Y.	FB-111A
1975	No competition	
1976	380th BMW, Plattsburgh AFB, N. Y.	FB-111A
1977	380th BMW, Plattsburgh AFB, N. Y.	FB-111A
1978	380th BMW, Plattsburgh AFB, N. Y.	FB-111A
1979	509th BMW, Pease AFB, N. H.	FB-111A
1980	320th BMW, Mather AFB, Calif.	B-52G
1981	509th BMW, Pease AFB, N. H.	FB-111A
1982	509th BMW, Pease AFB, N. H.	FB-111A
1983	509th BMW, Pease AFB, N. H.	FB-111A
1984	380th BMW, Plattsburgh, AFB, N. Y.	FB-111A
1985	97th BMW, Blytheville AFB, Ark.	B-52 ²
1986	92d BMW, Fairchild AFB, Wash.	B-52 ²
1987	379th BMW, Wurtsmith AFB, Mich.	B-52G
1988	5th BMW, Minot AFB, N. D.	B-52 ²
1989	28th BMW, Ellsworth AFB, S. D.	B-1B
1990	No competition	

¹Trophy given for overall annual performance, not for scores in SAC Bombing and Navigation Competition.

²No model listing in official standings.

TAC's Reconnaissance Air Meet

Tactical Air Command's Reconnaissance Air Meet (RAM) is an international contest that focuses on procedures and techniques used by allied reconnaissance units. Competitors include teams representing several nations, including the United States, Australia, Great Britain, and Germany.

The first RAM was held in 1986, the second in 1988, and the third in 1990.

Winners of the RAM Competition

Year	Unit, Location
1986	152d TRG (ANG), Reno, Nev.
1988	26th TRW, Zweibrücken AB, West Germany
1990	152d TRG (ANG), Reno, Nev.



Tactical reconnaissance, exemplified by this RF-4C, holds the stage at the TAC-sponsored Reconnaissance Air Meet (RAM) competition for USAF and allied units.

The William Tell Weapons Meet

The Air Force's William Tell air-to-air weapons meet is named for the legendary Swiss archer noted for spectacular feats of marksmanship. It originated in 1954 as the air-to-air rocketry portion of the annual Fighter Gunnery and Weapons meet.

The first three competitions were held in Arizona. The meet moved to Tyndall AFB, Fla., its current location,

in 1958 and became a biennial affair in 1959. No competitions were held during the Vietnam War years 1966-69 or during Operation Desert Shield in 1990.

Tactical Air Command breaks the competition into separate categories for fighters of similar performance and capability. Each fighter wing in this worldwide contest competes as a

team, but pilots also compete for individual "Top Gun" honors. At some meets, a Top Gun was named for every category, but now only one pilot (or crew) wins the trophy.

William Tell also includes events for weapons controllers, weapons loaders, and maintainers to provide a complete test for a unit in the air-to-air business.

William Tell Winners and Top Guns

Year	Unit, Base	Aircraft	Top Gun (and Aircraft)
1954	3550th FTW (Interceptor), Moody AFB, Ga.	F-94C	Crew of Capt. Clarence W. Lewis and 1st Lt. James R. Boone, 3550th FTW (Interceptor), Moody AFB, Ga.
1955	26th Air Division, Duluth MAP, Minn. (Members of the 48th, 96th, and 332d FISs)	F-94C	Crew of Col. B. H. King and Lt. F. S. Goad, 26th Air Division, Duluth MAP, Minn.
1956	94th FIS, Selfridge AFB, Mich.	F-86D	Crew of Col. Donald W. Graham and 1st Lt. Billy R. Thomson, 66th FIS, Elmendorf AFB, Alaska (F-89D), and 1st Lt. Robert B. Long, 94th FIS, Selfridge AFB, Mich. (F-86D)
1958	465th FIS, Griffiss AFB, N. Y. 326th FIS, Richards-Gebaur AFB, Mo. 125th FIG (ANG), Jacksonville IAP, Fla.	F-89J F-102A F-86D	Crew piloted by Col. Frank J. Keller, 465th FIS, Griffiss AFB, N. Y. (F-89J); Col. Roy B. Caviness, 482d FIS, Seymour Johnson AFB, N. C. (F-102A); and Col. Robert E. Dawson, 125th FIG, Jacksonville IAP, Fla. (F-86D)

Year	Unit, Base	Aircraft	Top Gun (and Aircraft)
1959	319th FIS, Bunker Hill AFB, Ind. 460th FIS, Portland IAP, Ore. 538th FIS, Larson AFB, Wash.	F-89J F-102A F-104A	Crew of Capt. Billy S. Linebaugh and 1st Lt. Donald M. Burke, 319th FIS, Bunker Hill AFB, Ind. (F-89J); Capt. Frederick H. England, 460th FIS, Portland IAP, Ore. (F-102A); and Maj. John T. Guice, 125th FIG, Jacksonville IAP, Fla. (F-100A)
1961	445th FIS, Wurtsmith AFB, Mich. 59th FIS, Goose Bay, Labrador, Canada 456th FIS, Castle AFB, Calif.	F-101B F-102A F-106A	Lt. Col. Frank R. Jones, 59th FIS, Goose Bay, Labrador, Canada (F-102A)
1963	445th FIS, Wurtsmith AFB, Mich. 146th FIS (ANG), Greater Pittsburgh IAP, Pa. 318th FIS, McChord AFB, Wash.	F-101B F-102A F-106A	Lt. Col. J. W. Rogers, 317th FIS, Elmendorf AFB, Alaska (F-102A)
1965	62d FIS, K. I. Sawyer AFB, Mich. 32d FIS, Camp New Amsterdam, the Netherlands 71st FIS, Selfridge AFB, Mich. 331st FIS, Webb AFB, Tex.	F-101B F-102A F-106A F-104A	Crew of Capt. D. E. Libby and Capt. L. R. Livingston, 62d FIS, K. I. Sawyer AFB, Mich. (F-101B); Capt. J. McMichael, 326th FIS, Richards-Gebaur AFB, Mo. (F-102A); Lt. Col. Glendon P. Dunaway, 71st FIS, Selfridge AFB, Mich. (F-106A); Capt. J. D. Dunn, 319th FIS, Homestead AFB, Fla. (F-104A)
1966-69	No competition		
1970	119th TFG (ANG), Hector Field, Fargo, N. D. 148th TFG (ANG), Duluth IAP, Minneapolis, Minn. 71st FIS, Malmstrom AFB, Mont.	F-101B F-102A F-106A	Crew of Capt. James Reimers and Capt. Arthur Jacobson, 119th TFG (ANG), Hector Field, Fargo, N. D. (F-101B)
1972	119th TFG (ANG), Hector Field, Fargo, N. D. 115th TFG (ANG), Truax Field, Wis. 460th FIS, Grand Forks AFB, N. D.	F-101B F-102A F-106A	Crew of Capt. Lowell Butters and Capt. Douglas Danko, 425th All-Weather Fighter Squadron, Bagotville, Quebec, Canada (CF-101B)
1974	101st TFG (ANG), Bangor IAP, Me. 124th FIG (ANG), Boise Air Terminal, Idaho 120th FIG (ANG), Great Falls IAP, Mont.	F-101B F-102A F-106A	Maj. Ralph D. Townsend, 124th FIG (ANG), Boise Air Terminal, Idaho (F-102A)
1976	142d FIG (ANG), Portland IAP, Ore. 4th TFW, Seymour Johnson AFB, N. C. 120th FIG (ANG), Great Falls IAP, Mont.	F-101B F-4E F-106A	Crew of Maj. Bradford A. Newell and Lt. Col. Donald R. Tonole, 142d FIG (ANG), Portland IAP, Ore. (F-101B)
1978	147th FIG (ANG), Ellington AFB, Tex. 86th TFW, Ramstein AB, West Germany 49th FIS, Griffiss AFB, N. Y.	F-101B F-4E F-106A	Crew of Earl G. Robertson and Capt. Brian J. Salmon, Canadian Forces Composite Group (CF-101B)
1980	147th FIG (ANG), Ellington AFB, Tex. 347th TFW, Moody AFB, Ga. 144th FIW (ANG), Fresno ANGB, Calif. ¹	F-101B F-4E F-106A	Crew of Lt. Col. Maurice Udell and Maj. Davis S. Miller, 147th FIG (ANG), Ellington AFB, Tex. (F-101B)
1982	409 Squadron, CFB Comox, British Columbia, Canada 18th TFW, Kadena AB, Okinawa, Japan ¹ 49th FIS, Griffiss AFB, N. Y. 57th FIS, NAS Keflavik, Iceland	CF-101B F-15C F-106A F-4E	Crew of Maj. Bob Worbets and Capt. Bill Ricketts, 409 Squadron, CFB Comox, British Columbia, Canada (CF-101B); Lt. Col. Jere Wallace, 18th TFW, Kadena AB, Okinawa, Japan (F-15C); Lt. Col. Robert Boehringer, 144th FIW, Fresno ANGB, Calif. (F-106A); and crew of Capt. Tom Watson and Capt. Dave Pfeifer, 57th FIS, NAS Keflavik, Iceland (F-4E)
1984	33d TFW, Eglin AFB, Fla. ¹ 142d FIG (ANG), Portland IAP, Ore. 177th FIG (ANG), Atlantic City IAP, N. J.	F-15C F-4C F-106A	Capt. Scott H. Turner, 32d TFS, Camp New Amsterdam, the Netherlands (F-15C); Maj. Ron M. Moore and Maj. Bill C. DeJager, 142d FIG (ANG), Portland IAP, Ore. (F-4C); Maj. Lynn Robinson, 177th FIG (ANG), Atlantic City IAP, N. J. (F-106A)
1986	33d TFW, Eglin AFB, Fla. ¹ 119th FIG (ANG), Hector Field, Fargo, N. D.	F-15C F-4D	Capt. John Reed (USAF Exchange Pilot), 425 Squadron, CFB Bagotville, Quebec, Canada (CF-18A)
1988	49th TFW, Holloman AFB, N. M. ¹ 33d TFW, Eglin AFB, Fla. 18th TFW, Kadena AB, Okinawa, Japan 57th FIS, NAS Keflavik, Iceland	F-15A F-15C F-15C F-15C	Capt. Teddy Varwig, 49th TFW, Holloman AFB, N. M. (F-15A)
1990	No competition		

¹Overall competition winner. The naming of an overall winner was instituted with William Tell 1980.

We Believe...



Photo by Guy Aceto



We believe in airpower. It has special advantages—mobility, speed, range, and flexibility—that, in our view, have been demonstrated repeatedly and convincingly. Over the past few years, however, some have questioned the value of military airpower. Critics claimed that it was “over-sold” and complained that it was “not decisive.” They speculated that perhaps the US Air Force should be assigned a diminished or subsidiary role in the nation’s defense.

Operation Desert Storm provided an impressive answer to such theorists. It showed what well-equipped, well-trained air forces, operating under the direction of a single air commander, can accomplish. AFA pledges its full energy to helping the American public understand and remember what the US Air Force—and other air forces—achieved in the Gulf War.

As the AFA Statement of Policy says, “the United States requires a balanced mix of land, sea, and air forces.” We do not endorse single-dimension strategies, and we warn against listening to those who do. We believe the US Air Force’s concept of “Global Reach, Global Power” is aptly put and that the lessons learned from the Gulf War will be enduring and of great value.

If you would like more information about the role and value of military airpower, write to us.

The Air Force Association
1501 Lee Highway
Arlington VA 22209-1198

Gallery of USAF Weapons

By Susan H. H. Young Edited by John W. R. Taylor

Bombers

B-1B Lancer

Officially named Lancer in May of last year, the B-1B is smaller than the B-52, which it partners in SAC's strategic bomber force, but carries a considerably greater weapons load because of improved engine performance and advanced aerodynamic technology. Ninety of the 97 currently available B-1Bs are assigned to a nuclear mission, each with three weapons bays providing the flexibility to carry long- and short-range nuclear air-to-surface missiles, nuclear and conventional gravity bombs, mines, other weapons, or additional fuel, as required. They are expected to remain capable of penetrating sophisticated enemy defenses through much of this decade and of operating within less heavily defended areas into the next century. A movable bulkhead in the forward weapons bay allows for the carriage of a wide range of different size weapons. A B-1B has been modified to permit airborne development of the SRAM II missile prior to its first launch this year. IOC for B-1B SRAM II capability is scheduled for 1993. USAF has no plans to convert B-1Bs to cruise missile carriers in the foreseeable future.

The B-1B has a blended wing/body configuration with variable-geometry wings. The unswept wing setting would permit 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 bomber's offensive avionics include a modern forward-looking and terrain-following radar, an extremely accurate inertial navigation system, new computer-driven avionics, strategic Doppler radar, and a radar altimeter. The efficiency of these systems was demonstrated in November 1989 when an operational B-1B flew the type's first low-level night sortie over terrain that varied greatly in altitude, using the fully automatic terrain-following equipment.

The defensive avionics package is built around the ALQ-161 ECM system, with a wide frequency coverage and tail warning function, supplemented by such expendables as chaff and flares. Development of the full potential of this system has proved difficult, and the decision was made to develop a separate radar warning receiver for the B-1B while efforts to improve the existing avionics suite continue. Radar-absorption materials are used to reduce the aircraft's radar signature, which is only one percent that of a B-52. A program to attach Kevlar, a tough, synthetic fiber, to vulnerable areas of the B-1B will prevent repetition of an accident that occurred in 1987 when an aircraft was lost through birdstrike.

Dyess AFB, Tex., received the first operational B-1B in June 1985 and achieved IOC in September 1986. Deliveries were completed in April 1988. Dyess now has 27 B-1Bs; Ellsworth AFB, S. D., has 34; Grand Forks AFB, N. D., and McConnell AFB, Kan., each have 17 aircraft.

In 1987, a series of international speed and distance with payload records was set by the B-1B. On July 4, a 2,000 km closed circuit was covered at a speed of 669.96 mph with a payload of 30,000 kg (66,140 lb). On September 17, a similar payload was carried around a 5,000 km circuit at 655.05 mph.

Contractors: Rockwell International, North American Aircraft; Eaton Corporation, AIL Division; Boeing Military Airplanes; and General Electric.

Power Plant: four General Electric F101-GE-102 turbofans; each 30,780 lb thrust.

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.

Weights: empty, equipped 192,000 lb, gross 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 24 AGM-69 SRAMs, 12 B28 or 24 B61 or B83 free-fall nuclear bombs; in a nonnuclear role up to 84 Mk 82 (500 lb) bombs or Mk 36 (500 lb) mines.

B-2A

Continued funding for the B-2 Advanced Technology Bomber program has again been approved in the final FY 1991 budget. A total of \$4.1 billion has been allocated, with \$1.75 billion for R&D and \$2.35 billion for procurement. However, the specific purpose of the procurement funding was unclear. Meanwhile, USAF has requested

further funding for four aircraft in FY 1992, with seven more in FY 1993. The first B-2A made its maiden flight from Air Force Plant 42 in Palmdale, Calif., to Edwards AFB, Calif., in July 1989. Since then, the aircraft has entered a program of flight tests that has expanded the flight envelope and included aerial refuelings. The critical low-observability test program began last October. The second B-2A, which is instrumented for dynamic loads testing, flew for the first time in that same month.

The B-2A is being developed as a highly survivable strategic bomber to supplement, and ultimately replace, the B-1B in its penetration role. It employs sophisticated



B-1B Lancer



B-2 Advanced Technology Bomber refueling from a KC-135

technologies, notably low-observable techniques to minimize the possibility of detection. Its ability to cruise at high or low altitude, at relatively high subsonic speed, would, according to SAC, make it "difficult to track and shoot down."

Of flying wing configuration, the B-2A has no vertical tail surfaces. The smoothly blended "fuselage" section accommodates a two-person flight crew, with room for a third person, and with two large weapons bays side by side to the rear. These contain rotary launchers capable of carrying a total weapons load of between 40,000 and 75,000 lb, but about 25,000 lb of nuclear weapons would be normal under the nation's Single Integrated Operational Plan (SIOP). Mounted in pairs within the wing structure are four nonafterburning turbofans, with scalloped overwing intake ducts and shielded overwing trailing-edge nozzles. The aircraft has a quadruplex-redundant fly-by-wire digital flight control system, actuating movable surfaces at the wing trailing-edges which combine aileron, elevator, and flap functions. A landing gear track of 40 ft enables the B-2 to use any runway that will handle a Boeing 727 airliner. In flight, the bomber is reported to be near neutrally stable. It is claimed to have almost 50 percent better fuel efficiency than the B-1B and to require less than half the latter's air refueling support to accomplish SIOP missions. A typical unrefueled range of 6,218 miles is estimated for a hi-lo-hi mission carrying eight SRAMs and eight B61 nuclear free-fall bombs.

Flight testing of the B-2 is expected to continue for four years, with the key radar signature tests due for completion in 1993. As a result of the Secretary of Defense's Major Aircraft Review, it is proposed to procure 75 aircraft. If all goes according to plan, the first operational B-2As will be delivered to Whiteman AFB, Mo., and will achieve IOC in the mid-1990s.

Prime Contractor: Northrop Corporation, with Boeing, LTV, and General Electric as key members of the development team.

Power Plant: four General Electric F118-GE-100 turbofans, each estimated at 19,000 lb thrust.

Accommodation: basic crew of two, with provision for third person.

Dimensions: span 172 ft 0 in, length 69 ft 0 in, height 17 ft 0 in.

Weights: empty 100,000–110,000 lb, gross 371,330 lb.

Performance: approach speed 161 mph, service ceiling 50,000 ft, unrefueled range 4,250 to 7,500 miles.

Armament: in a nuclear role: up to 20 B61 nuclear bombs; or 16 AGM-69A SRAMs, AGM-131A SRAM IIs, or B83 nuclear bombs, or a combination thereof. In a conventional role: 80 500 lb bombs or various other conventional weapons, including sea mines. There are no plans to carry the AGM-129A ACM on the B-2A.

B-52G/H Stratofortress

A veteran of the war in Vietnam, the B-52 once again entered front-line operations with regular missions flown in support of Operation Desert Storm. Constituting a substantial element in the SAC inventory, the 232 B-52s currently operational are capable of delivering a wide range of weapons. Apart from their nuclear mission, they are employed in important 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 allies.

Two versions are still in service: the B-52G, which introduced a redesigned wing containing integral fuel tanks, fixed underwing external tanks, a tailfin of reduced height and broader chord, and a remotely controlled tailgun turret that allowed the gunner to be repositioned with the rest of the crew; deliveries began in February 1959; 193 were built, of which 137 remain operational; and the B-52H, which switched to TF33 turbofans, providing increased unrefueled range, and which has improved defensive armament, including a 20-mm Vulcan multibarrel tailgun; 102 were built, with deliveries beginning in May 1961; 95 remain operational.

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 were equipped with an AN/

ASQ-151 electro-optical viewing system (EVS), using forward-looking infrared (FLIR) and low-light-level TV sensors to improve their low-level flight capability, and were updated with Phase VI avionics. These include ALQ-122 SNOE (smart noise operation equipment) and AN/ALQ-155(V) advanced ECM; an AFSATCOM kit permitting worldwide communications via satellite; a Dalmo Victor ALR-46 digital radar warning receiver; Westinghouse ALQ-153 pulse-Doppler tail warning radar; and an improved ITT Avionics ALQ-117 Pavé Mint or ALQ-172 ECM jamming system. The G/Hs have also been 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.

As development and deployment of the B-1B were followed by the B-2A program, the primary role of the B-52 was changed to ALCM (AGM-86) carrier. A typical profile envisaged multiple ALCM launches at high altitude, often followed by B-52 low-level descent to attack additional targets using gravity weapons or SRAMs (currently grounded). USAF has deployed AGM-86s on 98 on-line B-52Gs and 95 B-52Hs, each with 12 external cruise missiles, although the former will be retired by FY 1993. Full-scale production of the Common Strategic Rotary Launcher (CSRL), which will permit internal carriage of eight additional AGM-86s in the B-52H, is under way. This will allow a total ALCM offensive weapon load of 20 cruise missiles. Full operational capability for this system at all SAC bases is scheduled for late summer 1993. Eventually, B-52Hs will be equipped with the AGM-129A Advanced Cruise Missile (ACM). Captive-carry tests of 12 ACMs mounted on a B-52H's underwing pylons began early in 1989. Initial operational capability is anticipated for 1992, at SAC's 410th Bomb Wing, K. I. Sawyer AFB, Mich.

All B-52 crews train to drop conventional weapons, and the ALCM-modified B-52Gs are being assigned increasingly to support conventional operations by employing airpower over great distances at short notice on behalf of theater CINCs. In 1988, B-52Gs achieved IOC fitted with an Integrated Conventional Stores Management System (ICSMS). This enables aircraft to carry a range of conventional weapons, as required, by rearranging data stored in the weapon systems computer, using a pre-programmed removable software cassette. The 39 non-ALCM-modified B-52Gs are assigned to the primary role of supporting the conventional requirements of theater CINCs, and naval antisurface warfare operations, with 30 of the aircraft modified for Harpoon deployment; one full squadron is based at Loring AFB, Me., for Atlantic operations. (Data for B-52G, except where noted.)

Contractor: Boeing Military Airplanes.

Power Plant: eight Pratt & Whitney J57-P-43WB turbojets; each 13,750 lb thrust.

Accommodation: two pilots, side by side, plus navigator, radar navigator, electronic warfare officer, and fire control system operator (gunner).

Dimensions: span 185 ft 0 in, length 160 ft 11 in, height 40 ft 8 in.

Weight: 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.



B-52 Stratofortress

Armament: G model has four 0.50-caliber guns in tail turret; H model has 20-mm gun. G/H models carry eight 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, G models can carry conventional weapons including bombs up to 2,000 lb, air-dropped mines, cluster bombs, AGM-142A Hove Nap missiles, and, on some aircraft, eight to 12 Harpoons in underwing clusters.

FB-111A

The FB-111A is beginning a new career with TAC, in modified form, as the F-111G dual-role combat aircraft. It was designed originally as a two-seat, medium-range, supersonic strategic bomber version of the variable-geometry F-111, capable of high-precision, low-altitude weapons delivery in all weather, day or night, to replace early versions of the B-52 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; 61 aircraft remain.

Current upgrading includes installation of improved terrain-following radar, and it is planned to replace the existing analog flight control system with a digital system by 1994. Only current operator of the FB-111A is the 380th Bomb Wing.



F-4G Phantom II

Contractor: General Dynamics Corporation.

Power Plant: two Pratt & Whitney TF30-P-7 turbofans; 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 1/2 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.

Fighters

F-4E/G Phantom II

Designed in the mid-1950s, the F-4 has been replaced largely by the F-15 and F-16 in active USAF units. However, continuous updating has maintained the effectiveness of versions still operational, enabling them to play their part in the recent Gulf War.

The F-4E was developed as a multirole fighter for counterair, close-support, and interdiction missions. A 20-mm Vulcan multibarrel gun is fitted, with an improved fire-control system and an additional fuselage fuel tank compared with previous versions. Leading-edge slats, to improve maneuverability, were retrofitted to all USAF F-4Es. From 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. Further improvements include the Pavé Tack system, providing day/night adverse weather capability to acquire, track, and designate ground targets for laser, infrared, and electro-optically guided weapons; the Pavé Spike day tracking/laser ordnance designator pod, for use with "smart" weapons; and a digital intercept computer that includes launch computations for USAF AIM-7 and AIM-9 air-to-air missiles. Latest armament being made available for F-4Es includes AIM-9L/M Sidewinders, improved AGM-65D Maverick TV-guided air-to-ground missiles, and a new area-denial submunition, the CBU-87/89. A new laser warning system is in R&D, using equipment installed in a Pavé Tack pod on an F-4E. Some aircraft have a new one-piece bird-resistant windshield to reduce the birdstrike hazard during low-level missions.

The F-4G **Advanced Wild Weasel** is a modified F-4E with its gun replaced by AN/APR-47 electronic warfare equipment. Working in "hunter-killer" teams of two aircraft, such as F-4G and F-4E or F-4G and F-16C, the F-4G "hunter" will 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). F-4Gs were deployed to Saudi Arabia in support of Operation Desert Storm. (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 7 1/2 in, length 63 ft 0 in, height 16 ft 5 1/2 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 700 miles.

Armament: one 20-mm M61A1 multibarrel gun; provision for up to four AIM-7E Sparrow, AGM-45A Shrike, AGM-65 Maverick, AGM-88A HARM, or AIM-9 Sidewinder missiles on four underfuselage and four underwing mountings, or up to 16,000 lb external stores.

F-15 Eagle

The F-15 is USAF's primary air-superiority fighter, in service with PACAF, TAC, USAFE, and ANG. The original single-seat F-15A and two-seat F-15B were followed in 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). Basic F-15 equipment includes a Hughes Aircraft APG-63 or APG-70 lightweight X-band pulse-Doppler radar for long-range detection and tracking of small high-speed objects down to treetop level. Under ongoing contracts initiated in February 1983, the F-15 is undergoing a Multistage Improvement Program (MSIP). Improvements include Programmable Armament Control Set (PACS), improved central computer, an expanded tactical electronic warfare system (TEWS) that provides improvements to the ALR-56C radar warning receiver and ALQ-135 countermeasures set, and provision for AIM-120A AMRAAM. F-15C/Ds were deployed to the Persian Gulf in support of Operation Desert Storm.



F-15 Eagle

The F-15E is USAF's two-seat, dual-role, totally integrated fighter for all-weather air-to-air and deep interdiction missions. The rear cockpit is upgraded to include four multipurpose CRT displays for radar, weapon selection, and monitoring of enemy tracking systems; modifications to the front cockpit include redesigned controls, a wide-field-of-view head-up display, and three CRT multipurpose displays. The F-15E is capable of carrying up to 24,500 lb of ordnance. The digital, triple-redundant Lear Siegler flight-control system permits coupled automatic terrain following, and navigational accuracy is 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 carries a high-resolution Hughes APG-70 radar and LANTIRN (Low-Altitude Navigation and Targeting Infrared for Night) pods, with wide-field forward-looking infrared (FLIR).

To accommodate the new avionics, internal fuel capacity was reduced slightly, but the F-15E is 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 retains its air-superiority performance and weapons. Armament options include AIM-7 Sparrow, AIM-9 Sidewinder, and AIM-120A AMRAAM, as well as AGM-65 Maverick, GBU-12/-24 laser-guided bombs, and GBU-15 glide bombs. A new engine bay was developed by McDonnell Douglas to permit installation of improved turbofans. The 4th TFW at Seymour Johnson AFB, N. C., was the first operational F-15E wing. Subsequent F-15E deployment in support of Operation Desert Storm proved a major contribution to the realization of air supremacy within that theater. Funding for 200 F-15Es has been approved, with the final buy in FY 1991.

An advanced one-off experimental version, the F-15 Short Takeoff and Landing and Maneuvering Technology Demonstrator (SMTD) is currently being used for research into advanced thrust-vectoring technology at the Air Force Flight Test Center at Edwards AFB, Calif.

A further version of the F-15 has been proposed by the manufacturers to fulfill USAF's requirement for a Follow-on Wild Weasel (FWW) defense suppression aircraft to replace the current F-4G. (Data for F-15C, except where stated.)

Contractor: McDonnell Aircraft Company, Division of McDonnell Douglas Corporation.

Power Plant: F-15C: two Pratt & Whitney F100-PW-220 turbofans; each approx 23,450 lb thrust. F-15E: as F-15C/D, General Electric F110-GE-129 optional.

Accommodation: pilot only in F-15A/C; two seats in F-15B/D/E.

Dimensions: span 42 ft 9 3/4 in, length 63 ft 9 in, height 18 ft 5 1/2 in.

Weights: empty 28,600 lb, gross 68,000 lb in F-15A/B/C/D; empty 31,700 lb, gross 81,000 lb in F-15E.

Performance: F-15C: max speed Mach 2.5, service ceiling 60,000 ft, ferry range, with external fuel tanks, more than 2,878 miles; with CFTs, 3,570 miles. F-15E: max level speed at height Mach 2.5, max range 2,765 miles.

Armament: one internally mounted M61A1 20-mm six-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 24,500 lb of ordnance on weapon stations on F-15E.

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 from the start in the single-seat F-16A and two-seat F-16B versions made them two of the most maneuverable fighters ever built. Equipment includes a multimode radar with a clutter-free look-down capability, advanced radar warning receiver, a head-up display, internal chaff/flare dispensers, and a 500-round 20-mm internal gun. The aircraft also has provisions for ECM.

The F-16 entered operational service with TAC's 388th TFW at Hill AFB, Utah, in January 1979. Production of the F-16A and B for USAF ended in 1985. However, USAF and NATO operators are cooperating in an operational capabilities upgrade. The OCU program improves the radar, fire-control computer, stores-management computer, and avionics software, giving F-16A/Bs the ability to use next-generation air-to-air and air-to-surface weapons. Planned reliability/maintainability improvements for the early 1990s include a ring-laser gyro INS and installation of the upgraded F100-PW-220E turbofan.

A forward-looking plan for the aircraft, known as the Multinational Staged Improvement Program (MSIP), was implemented by USAF in February 1980 to ensure the aircraft's ability to accept systems under development, thereby minimizing retrofit costs. As a first stage, all F-16s delivered since November 1981 have had built-in structural and wiring provisions and systems architecture that expand the single-seater's multirole flexibility. MSIP II was applicable to the improved F-16C (single-seat) and F-16D (two-seat) versions, of which deliveries to USAF began in July 1984. These aircraft have a Wes-



F-16C Fighting Falcon

tinghouse APG-68 multimode radar, with increased range and advanced ECCM, and advanced cockpit displays including a wide-angle head-up display. Weapons improvements include multitarget AMRAAM compatibility. Also introduced were systems improvements that include installation of a LANTIRN nav/attack system, GPS, EEGS, digital flight controls, automatic terrain following, advanced IFF, increased T-O weight and maneuvering limits, an 8,000-hour airframe, and 9g capability. Follow-on systems include ALE-47 improved defensive countermeasures, ALR-56M advanced radar warning receiver, advanced programmable signal processor employing VHSIC technology in the APG-68(V5) fire-control radar, full HARM/Shrike capability, and increased performance engines, to be supplied principally by General Electric (F110-GE-129 IPE engines), with Pratt & Whitney as secondary supplier (F100-PW-229 IPE engines). F-16C/Ds, with interim HARM/Shrike capability, are used for defense suppression missions in conjunction with F-4G Wild Weasels based at Spangdahlem AB, Germany.

A sophisticated research variant of the F-16, known as the AFTI/F-16, is being modified but will continue in use at Edwards AFB, Calif. to test and evaluate advanced fighter technologies, including a digital flight-control system, pilot/vehicle interface, an automated maneuvering attack system, digital terrain management and display system, head-steerable FLIR, integrated night vision helmet, automatic target hand-off system, and Pave Penny. Final reports are due at the end of this year.

Up to 270 of the original F-16A/Bs are being modified to F-16 ADF (Air Defense Fighter) standard under a contract awarded in October 1986, to replace aging F-106s and F-4s in eleven ANG continental air defense squadrons. The APG-66 radar of these aircraft is being upgraded with an AMRAAM data link, provisions for AIM-7 Sparrows, improved ECCM, and improved capability against cruise missiles. New equipment includes HF radio, an IFF interrogator, an ID light, a crash-survivable flight data recorder, and provisions for GPS. Armament includes the M61 gun and up to six missiles, including combinations of Sparrows, AMRAAMs, and Sidewinders. The F-16 ADF entered service in 1989; the last modified aircraft is due in 1992.

Another 130 of the original F-16A/Bs are being considered for an F-16 MLU (midlife upgrade) in a codevelopment and coproduction program with the European Participating Governments (EPG) of the F-16 Multinational Fighter Program (MNFP). The modified F-16 MLU will enhance the capability of the F-16A/Bs, while achieving maximum avionics commonality to the latest model F-16C/Ds.



F-111F

Modified F-16s, known as F/A-16s, are under consideration as close air support/battlefield air interdiction (CAS/BAI) aircraft. The FY 1992 budget requests include the provision that 300-450 aircraft be modified to this standard prior to termination of F-16 production in that fiscal year. Meanwhile, ANG's 138th TFS at Syracuse, N. Y., was first to convert from A-10s to F-16As in the dedicated CAS/BAI role, with centerline GPU-5/A 30-mm gun pod.

F-16s are standard equipment throughout TAC, USAF, and PACAF and are progressively replacing older aircraft in the AFRES and ANG. F-16As also equip USAF's Thunderbirds. The F-16 program involves the US Navy, as well as 15 foreign nations, more than 50 distinct aircraft configurations, and extensive foreign coproduction. (Data for F-16C.)

Contractor: General Dynamics Corporation.

Power Plant: one augmented turbofan. General Electric F110-GE-100 (27,600 lb thrust) and Pratt & Whitney F100-PW-220 (23,450 lb thrust) are alternative standard engines.

Accommodation: pilot only.

Dimensions: span over missiles 32 ft 9 3/4 in, length overall 49 ft 4 in, height 16 ft 8 1/2 in.

Weights: empty (F100-PW-220) 18,238 lb, (F110-GE-100) 19,020 lb; gross 42,300 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 (YF-22A and YF-23A)

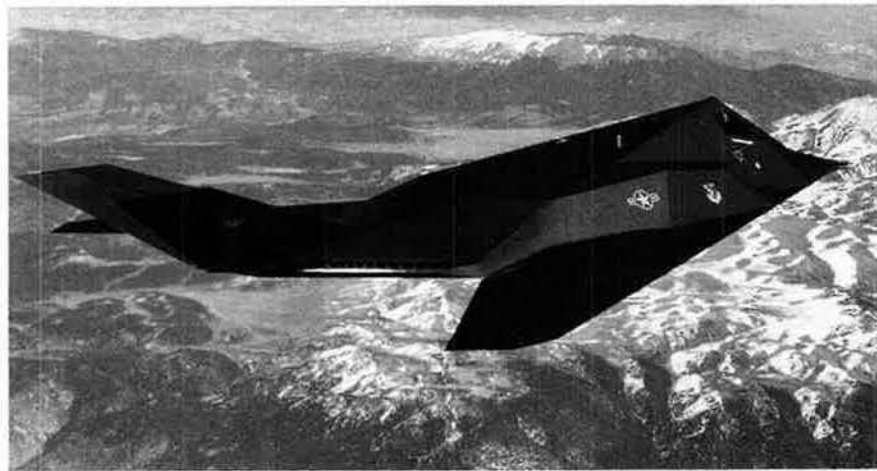
The aim of the Advanced Tactical Fighter (ATF) program is to produce the next-generation air-superiority fighter as a follow-on to the F-15, to counter the threat projected for the turn of the century and beyond. ATF is designed to penetrate high-threat enemy airspace and support AirLand Battle forces with a first-look, first-kill capability against multiple targets. It combines a highly maneuverable airframe at both sub- and supersonic speeds with low-observable stealth technologies; sustained supersonic cruise capability without the use of afterburners; and advanced, significantly integrated avionics and weapon systems, permitting simultaneous engagement of multiple targets. To this end, VHSIC common signal processors are being developed to communicate with and tie together various avionics elements and collections of major offensive and defensive functions. Projected armament includes such existing and planned weapons as AIM-9 Sidewinder and AMRAAM air-to-air missiles as well as an internal gun. Program emphasis from the outset has been on achieving a proper balance of reliability/supportability, affordability, survivability, and performance.

In 1986, the program was restructured to incorporate the development of prototype vehicles, implement Packard Commission recommendations, emphasize "fly before buy" competition, and reduce technical/cost risk for full-scale development (FSD). In October of the same year, USAF awarded contracts to the Lockheed and Northrop Corporations to enter the 54-month demonstration/validation phase of the program, later extended by six months. First flight of the number one prototype Northrop YF-23A occurred on August 27, 1990, at Edwards AFB. The number one Lockheed YF-22A first flew on September 29, 1990, from Palmdale, Calif. Both number two prototypes flew in late October 1990.

Lockheed has teamed with Boeing and General Dynamics, Northrop with McDonnell Douglas. Simultaneous demonstration and validation of ground-based avionics prototypes and development of ground-test General Electric YF120 and Pratt & Whitney YF119 prototype engines are also under way. The YF119 powered the first Northrop YF-23, and the YF120 powered the first Lockheed YF-22; the reverse was true in the second prototype aircraft. At the conclusion of flight testing, the four prototypes were put into flyable storage pending the USAF decision, scheduled for May 1 of this year, as to which airframe and power plant should enter the FSD phase. IOC is slated for the early 2000s.

F-111

Maintaining USAF's around-the-clock, long-range, interdiction mission, four versions of this pioneer variable-geometry tactical aircraft were built. Deliveries of production F-111As to the first operational wing began in October 1967, and 141 were built. This version served with distinction in southeast Asia 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 currently serve with the 20th TFW, based at RAF Upper Heyford in the UK, in support of NATO. Replacement of their analog bombing and navigation systems with digital equipment began in 1989 and should be completed in 1993. This will enable F-111E aircraft to handle the latest munitions and advanced sensors, as well as future systems such as the Global Positioning System (GPS). 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 upgraded 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. The F-111F is capable of employing the GBU-15, as well as TV and IR precision guided weapons. Under the Pacer Strike program, F-111D/F aircraft are undergoing an avionics modernization, involving the removal of outdated subsystems and the installation of a ring-laser gyroscopic Standard Inertial Navigation Unit, GPS receiver, and new cockpit dis-



F-117A

plays. The program also includes new computer software, integration and test of prototype D and F models, and production of modification kits for the remaining 161 aircraft to be reworked.

Production of the F-111 was completed in 1976. Its EW capabilities are being updated with the ALQ-131/184 ECM pod system, and future improvements will include AIM-9L/M self-defense capability. Following the signing of the INF Treaty in 1987, a program was initiated to modify SAC FB-111As to F-111G standard for dual-role service with TAC. A conventional weapons-release system is added. Other modifications include Have Quick UHF radio and a new ECM system. The first F-111Gs were completed early in 1989. Transfer from SAC to TAC's 27th TFW at Cannon AFB, N. M., began last year. The last conversion is scheduled for completion in 1994.

In addition to its nuclear and conventional bombing capability, the F-111 can carry up to twelve French Durandal parachute-retarded, rocket-boosted, runway attack bombs for low-altitude high-speed delivery, and Gator, USAF's first air-delivered mine system.

The **EF-111A** is an ECM conversion of the F-111A (see p. 168). The FB-111A strategic bomber version is described more fully on p. 164.

Contractor: General Dynamics Corporation.

Power Plant: F-111A/E: two Pratt & Whitney TF30-P-103 turbofans; each 18,500 lb thrust with afterburning. F-111D: two TF30-P-109 turbofans; each 19,600 lb thrust with afterburning. F-111F: two TF30-P-111 turbofans; 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 1/2 in, length 73 ft 6 in, height 17 ft 1 1/2 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 49,000 ft, range with max internal fuel more than 2,925 miles.

Armament: up to four nuclear bombs on four pivoting wing pylons, and two in internal weapon bay. Wing pylons carry total external load of up to 25,000 lb of bombs, rockets, missiles or fuel tanks.

F-117A

Although the existence of the F-117A had been rumored since it became operational in October 1983, its existence was not revealed officially until November 1988. The first production combat type designed to exploit low-observable technology, it embodies many components that were either transferred or modified from existing aircraft, to minimize the potential risks involved in the decision to proceed concurrently with FSD and low-level production. The 37th TFW, at Tonopah Test Range Airfield, Nev., became the first USAF unit to deploy the single-seat, twin-engine F-117A, and is scheduled to transfer with its aircraft to Holloman AFB, N. M., in late FY 1992.

Initially, the F-117As were restricted mainly to night flying, in order to maintain secrecy; three were lost in much-publicized accidents. Public acknowledgment of their existence permitted the aircraft to operate in daylight and facilitated their integration into operational planning and exercises. Their mission is to attack high-value, heavily defended targets on land, with stealth as the key to their lethality and survivability. Six F-117As were assigned to Operation Just Cause, the Panama invasion. F-117As were deployed to Saudi Arabia for Operation Desert Storm. One F-117A dropped the first bomb of the operation, with a direct hit on the Iraqi Air Force headquarters.



A-7D Corsair II

The F-117A's designers, in the famous Lockheed "Skunk Works" at Burbank, Calif., relied on the concept of faceting to give the aircraft its minimal radar signature. The skin panels of the arrowhead-shaped airframe (leading-edge sweep of about 67.5 degrees) are divided into many small, perfectly flat surfaces, which reflect at a variety of angles all signals from probing hostile ground or airborne radars. Much of the aircraft's external surface is made of composite radar-absorbent materials (RAM) and has a dull black finish that reflects little light. The engine air intakes and exhaust nozzles are above the wings and rear fuselage, respectively, to shield them from infrared seekers below.

F-117As can be carried on board C-5 Galaxy transports with their wings folded or removed. The power plant comprises two General Electric F404 nonafterburning turbofans, giving the aircraft low noise signature and high subsonic performance. Quadruple redundant fly-by-wire flight controls and a state-of-the-art digital avionics suite, complemented by a specially developed automated mission planning system, are key features of the aircraft. Navigation is believed to be by high-precision INS and GPS, with FLIR and DLIR (downward-looking infrared) radar housed in a steerable turret built into the underside of the aircraft, with a boresight laser designator and an autotracker to ensure precision attack.

Contractor: Lockheed Aeronautical Systems Company, Burbank, Calif.

Power Plant: two General Electric F404-GE-F1D2 nonafterburning turbojets; 10,800 lb thrust.

Accommodation: pilot only.

Dimensions: span 43 ft 4 in, length 65 ft 11 in, height 12 ft 5 in.

Weight: max gross 52,500 lb.

Performance: high subsonic speeds; little other detail available.

Armament: full internal carriage of what is described as a wide variety of tactical weapons, including laser-guided 2,000 lb munitions; provisions (type unknown) for self-defense.



A-10 Thunderbolt II

Attack and Observation Aircraft

A-7D/K Corsair II and YA-7F

Operated by ANG units in nine 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-identification pods were installed on 383 A-7Ds. LTV is modifying 75 A-7Ds and eight A-7Ks for low-altitude night attack (LANA) capability, with a wide-angle head-up display, forward-looking infrared (FLIR), and automatic terrain-following (ATF) systems to provide around-the-clock effectiveness. The first LANA-equipped A-7 was delivered in July 1987 to the 150th TFG. LTV has also tested augmented wing flaps and spoilers to enhance flight-control characteristics. A Singer tactical mission computer will be installed on non-LANA-modified A-7s. A single-piece windscreens that offers increased visibility and greater protection against birdstrike has been tested by the 162d TFG.

Under a contract awarded in May 1987, LTV upgraded two LANA-equipped A-7Ds to supersonic A-7F configuration, under the official designation **YF-7F**. The aim was to prove the practicability of upgrading a 20-year-old design to offer basically the same reliability, maintainability, and performance as a new aircraft. With afterburning engines installed, the two YF-7Fs logged 316.1 hours in 183 flights between November 1989 and January 1991. They will now be stored, as LTV does not expect further contracts following Defense Acquisition Board and congressional proposals on future close support equipment for USAF. (Data for A-7D.)

Contractor: LTV Corporation (formerly Vought Corporation).

Power Plant: one Allison TF41-A-1 nonafterburning turbofan; 14,500 lb thrust.

Accommodation: pilot only.

Dimensions: span 38 ft 9 in, length 46 ft 1 1/2 in, height 16 ft 0 3/4 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/OA-10 Thunderbolt II

Designed specifically for the close air support (CAS) mission, the **A-10A**'s ability to combine large military load, long loiter, and wide combat radius proved a vital asset to Operation Desert Storm. In a typical antiarmor close air support mission, the A-10, affectionately nicknamed "Warthog," can 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 12,086 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 navigational system, head-up display, Pave Penny laser target identification pod, ECM, target penetration aids, self-protection systems, and associated equipment for Maverick missiles and air-to-air 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. The first IR Maverick-equipped A-10 squadron became fully operational at RAF Bentwaters, UK, in February 1986. Introduction of the AIM-9 missile system for self-defense has since involved configuring the aircraft to accommodate dual rail adapters with associated launchers.

Units equipped with A-10s include USAF's 10th and 81st TFWs, based, respectively, at RAF Alconbury and RAF Bentwaters/Woodbridge in the UK; and TAC's 23d and 354th TFWs and 355th TTW. The 57th FWW, Nellis AFB, Nev., has some A-10s. PACAF's 18th TFS at Eielson AFB, Alaska, and 25th TFS at Suwon AB (moving this year to Osan AB), South Korea, are also A-10-equipped.

A-10s were the first first-line aircraft to be assigned to the ANG; they equip the 128th TFW and the 103d, 104th,

and 175th TFGs. A-10s also equip the 442d and 917th TFWs and the 926th and 930th TFGs of AFRES.

In October 1987, the first of 18 operational and two backup OA-10s entered the inventory of the 23d Tactical Air Support Squadron for use in the Forward Air Control (FAC) mission, providing coordination for, and control of, CAS assets. The 19th TASS at Osan AB, South Korea, is also equipped with 12 OA-10s. These aircraft are A-10s that have been redesignated and are intended to be used for combat escort, search and rescue, and visual reconnaissance. The 30-mm GAU-8/A gun is retained, but underwing stores are restricted normally to canisters of white phosphorous rockets for target marking.

An A/OA-10 Technology Demonstrator program is under way, to evaluate avionics improvements that should increase the effectiveness of A-10 CAS and OA-10 FAC aircraft.

Contractor: Fairchild Republic Company, Division of Fairchild Industries.

Power Plant: two General Electric TF34-GE-100 turbofans; each 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 hardpoints and three under fuselage for up to 16,000 lb of ordnance, including various types of free-fall or guided bombs, combined effects munition (CEM) dispensers, gun pods, six AGM-65 Maverick missiles, or four AIM-9 Sidewinder missiles, and jammer pods. Chaff and flares carried internally to counter radar-directed or infrared-directed threats. The centerline pylon and the two flanking fuselage pylons cannot be occupied simultaneously.

AC-130A/H/U Spectre

Two versions of the AC-130 gunship are currently in USAF service. AC-130As are operated by the Air Force Reserve's 711th SOS at Eglin AFB, Fla.; AC-130Hs continue in active service with Air Force Special Operations Command's 1st Special Operations Wing, 16th SOS. 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 and the 7.62-mm Miniguns are deleted. 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. Under an improvement program announced in the spring of 1987, AC-130Hs will have been fitted with new fire-control computers, navigation equipment, and sensors by FY 1992.

In July 1987, Rockwell was awarded a contract to cover research and development of a new AC-130U side-firing gunship to replace the aging and increasingly unsupportable AC-130A version. A total of twelve AC-130Us will be procured to replace ten AC-130As, using new C-130H airframes supplied by Lockheed, with the aim of producing aircraft capable of combining intense firepower with the latest methods of target location and increased loiter capability. AC-130Us will have a highly accurate suite of 105-mm, 40-mm, and 25-mm guns that can be slaved to FLIR, all-light-level television, and Hughes AN/APG-80 fire-control radar, permitting night and/or adverse weather operations. ECM will enhance survivability in a low-to-medium-threat environment. Other equipment will include HUD, combined INS and GPS/Navstar, triple MIL-STD-1553B databus, and Spectra/ceramic armor protection. Apart from their primary precision fire support mission, the air-refuelable AC-130Us will be capable of performing other special operations roles, including escort, surveillance, and reconnaissance/interdiction. Each will carry a crew of only 13, as one of the gunners of the AC-130A will no longer be required. Rollout of the first AC-130U took place last summer. The test program will extend into 1992, when the first of the new gunships will be delivered to the 16th SOS. (Data basically as for C-130.)

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 and 182d Tactical Air Support Groups. Some OA-37Bs are based at TAC's 24th Composite Wing, Howard AFB, Panama.

Contractor: Cessna Aircraft Company.

Power Plant: two General Electric J85-GE-17A turbojets; 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

First flown in August 1967, the twin-turboprop OV-10A 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. USAF took delivery of 157, and OV-10As still equip TAC and PACAF units. Over today's highly dangerous battlefield environments, they are used mainly for communications relay and air-borne command post missions.

Contractor: Rockwell International Corporation, Aircraft Operations.

Power Plant: two Garrett T76-G-416/417 turboprops; each 715 shp.

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 spars, 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.



OA-37B Dragonfly



OV-10A Bronco



TR-1

Reconnaissance and Special-Duty Aircraft

U-2R and TR-1

The last of 37 U-2R and TR-1 high-altitude reconnaissance aircraft was delivered to USAF in October 1989, marking completion of a contract awarded in 1979 as a follow-on to earlier U-2 production. The total was made up of seven single-seat U-2Rs, one two-seat U-2R(T), 25 single-seat TR-1As, two two-seat TR-1Bs, and two basically similar ER-2s delivered to NASA for Earth resources research.

Production of the original U-2 had begun in the late 1950s; 55 are believed to have been built, in various forms but with similar dimensions. They were followed by the U-2R, a version with much increased span and length, 12 of which were manufactured in the late 1960s. The U-2R is now the only operational version of the U-2, following retirement of the last U-2C in 1989.

All U-2s have been essentially powered gliders, with high-aspect-ratio wings and lightweight structure, designed to perform strategic reconnaissance for long periods at very high altitudes. "Superpods" can be fitted to the wings, containing specialized equipment appropriate to individual mission demands. This versatility has enabled Air Force U-2s to perform 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.

Structurally identical to the U-2R, the TR-1A is a single-seat tactical reconnaissance aircraft designed for high-altitude standoff surveillance missions. It was first flown in 1981, and pilot training at Beale AFB, Calif., began later that year. Currently, TR-1As and TR-1B trainers are based at Beale AFB and at RAF Alconbury in the UK. Those operating in Europe remain under the jurisdiction of SAC, which has responsibility for all U-2s and TR-1s. Each TR-1 is equipped with electronic sensors to provide continuously available, day or night, all-weather sur-

veillance of a battle area or potential battle area in direct support of US and allied ground and air forces during peace, crisis, and war. The sensors include an advanced synthetic aperture radar system in side-looking airborne radar (SLAR) form and modern ECM.

A proposal to reengineer up to 40 U-2R/TR-1 aircraft with the General Electric F101-GE-F29 engine is under consideration. A derivative of the F118 engine used in the Northrop B-2, the new engine is in the 19,000 lb thrust class and would have the dual benefit of enhancing all-around performance in the aircraft while providing much-improved supportability over the current engine, which is used in no other USAF operational aircraft. (Data for TR-1A/U-2R.)

Contractor: Lockheed Corporation.



RF-4C

Power Plant: one Pratt & Whitney J75-P-13B turbojet; 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, ceiling 90,000 ft, range more than 3,000 miles.
Armament: none.

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 three TAC and USAF 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 inches compared with the fighter version. Twenty-four RF-4Cs were fitted 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, supplemented recently by a new navigation and weapons delivery system (NWDS) and improved-accuracy ring-laser gyro, together with data link transmission of TERC intelligence in near-real time to enhance timeliness of information to tactical decision-makers. (Data similar to those for F-4.)

EC-130

Several variants of the basic C-130 have been produced for specialized missions, including the **EC-130E ABCCC** used as an airborne battlefield command and control center by the 7th Airborne Command and Control Squadron at Keesler AFB, Miss., a geographically separated unit of the 28th Air Division, Tinker AFB, Okla.; the **EC-130E "Volant Solo II"** psychological operations (PSYOP) broadcasting version operated by the 193d Special Operations Group ANG, Harrisburg IAP, Pa.; and the **EC-130H "Compass Call"** communications jammer operated by the 41st Electronic Combat Squadron at Davis-Monthan AFB, Ariz., also a geographically separated unit of the 28th Air Division, and by the 66th Electronic Combat Wing at Sembach AB, Germany. Altogether, 16 EC-130Hs are in service. An upgrade program is in progress. (Data basically as for C-130.)

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/E/G/H/J/L/P/Y** aircraft are assigned to SAC, TAC, PACAF, and USAF. They are fitted with extensive communications equipment to support strategic command and control missions of their respective CINCs. On July 24, 1990, EC-135Cs ceased to be on continuous airborne alert, but at least one aircraft flies a mission each day. Accommodat-



EC-135J (J. Gaffney)

ing a flight crew of four, a general officer, and a staff of 18, EC-135Cs can be refueled by SAC tankers. Thirteen are in service and have been adapted to provide control of Minuteman ICBMs. TAC provides overseas deployment control of tactical fighters with the **EC-135K**. Modifications to the EC-135 aircraft include continuation of the ultrahigh-frequency line-of-sight system replacement, the initial Milstar transition satellite communications terminals, and the Peacekeeper upgrades to Airborne Launch Control Aircraft. Future enhancements include full Milstar capability and improved low- and very-low-frequency radios and antennas.

Three **EC-135N 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 for electronic reconnaissance with SAC, and **RC-135Ss**, **RC-135Us**, and **RC-135Xs** for specific reconnaissance tasks. RC-135s have been stationed in Saudi Arabia in support of military operations in that theater. **WC-135Bs**, converted C-135Bs operated by MAC, provide atmospheric sampling capability. Under the Milstar program, an **NKC-135** will collect data to assist airworthiness certification of the radome installation on the SAC EC-135.

To minimize the cost of retrofitting the special-purpose -135s with more efficient turbofan engines, USAF 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 for C-135.)

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 system's frequency coverage, reliability, and effectiveness of available jamming power enables the EF-111A to suppress extremely dense electronic defenses. Other equipment includes self-protection systems from the F/BB-111 (ALQ-137, ALR-62). The cockpit is revised, and a modified vertical stabilizer houses the ALQ-99E receivers. An upgrade program for the EF-111A is currently being developed, with improvements to the ALQ-99E that will enable the system to counter advanced electronic defenses for this decade and beyond. Other improvements under the avionics modernization program (AMP)

include upgrading the terrain-following radar, installation of GPS equipment, and a new inertial navigation system. Flight testing is under way of a Class IVA safety modification aimed at replacing the current analog flight-control computers with a digital system. Angle of attack transmitters and normal accelerometers are also included.

Forty-two EF-111As were produced for missions that include barrier standoff jamming, degradation of acquisition radars during close-in jamming operations, and direct support 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. These aircraft have one of the highest utilization rates in the Air Force. The 42d ECS, at RAF Upper Heyford in the UK, became the second operational location in February 1984. Aircraft from this unit took part in the attack on Libyan targets in April 1986. EF-111s were deployed to Saudi Arabia last fall to take part in Operation Desert Storm.

Contractor: Grumman Aerospace Corporation.
Power Plant: two Pratt & Whitney TF30-P-109 turboprops; each 19,600 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 11½ 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-3B/C Sentry (AWACS)

AWACS is a mobile, flexible, survivable, and jam-resistant surveillance and command, control, and communications (C³) 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, AWACS 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 Corp. look-down radar, which makes possible all-altitude surveillance over land or water, thus correcting a serious deficiency in earlier surveillance systems.

The E-3 serves a dual role within USAF: as a command and control center to support quick reaction deployment and tactical operations by TAC units and as a survivable early warning command and control center for identification, surveillance, and tracking of airborne enemy forces and for the command and control of NORAD forces over the continental USA.

Deliveries of the basic production 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. Twenty-four were built. Twenty-two of them, plus two prototypes, have been upgraded to **E-3B** configuration. Improvements include much-enhanced 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 July 1984.

A **US/NATO Standard E-3A** configuration was introduced starting with the 25th production USAF Sentry, delivered in December 1981. In this version, the data processing capability is improved and a maritime detection capability included. Nine were built for USAF, and one of the original E-3As was upgraded to this standard. NATO operates a further 18, purchased as part of a cooperative program to upgrade the command and control of NATO's air defense forces. Saudi Arabia has five E-3s; Britain's Royal Air Force and the French Air Force have also acquired the E-3.

The ten US Standard E-3A aircraft were upgraded to E-3Cs, with additional command and control capability, in 1984-88.

A \$425 million Multistage Improvement Program (MSIP) for the E-3 was proposed by ESD, to be phased over five years. Eventually, all USAF and NATO E-3s will be equipped with the Joint Tactical Information Distribution System (JTIDS) for antijam digital communications. As a first step, Boeing was awarded a contract in May 1987 for E-3 improvements that include full-scale development and integration into US and NATO aircraft of the Quick Look ESM system that will detect signals emitted by both hostile and friendly targets. Additional enhancements to US E-3s will include upgrading of JTIDS to TADIL-J (tactical digital information link-J) capability, central computer memory upgrade, and ability to employ GPS. Full-scale development contracts for a major radar upgrade under the Radar System Improvement Program (RSIP) were awarded in September 1989. This will enable the AWACS aircraft to detect much smaller targets such as cruise missiles. IOC for these improvements is scheduled for FY 1995, with contract completion by 1998.

E-3s assumed a US continental air defense role in January 1979, when NORAD personnel began augmenting TAC E-3 flight crews on all operational NORAD missions by 28th Air Division's 552d AWACW from Tinker AFB. Overseas units of the 28th Air Division include the 960th, 961st, and 962d AWAC Squadrons based, respectively, at NAS Keflavik, Iceland; Kadena AB, Japan; and Elmendorf AFB, Alaska. Deployments have been made to the Pacific, the Middle East, southwest Asia, the Mediterranean area, and Europe, and most recently in support of Operation Desert Storm. AWACS aircraft are also used in support of the US drug enforcement program.

Contractor: Boeing Aerospace and Electronics.

Power Plant: four Pratt & Whitney TF33-PW-100/100A turbofans; each 21,000 lb thrust.

Accommodation: basic operational crew of 20, including 16 AWACS mission specialists.

Dimensions: span 145 ft 9 in, length 152 ft 11 in, height 41 ft 9 in.

Weight: gross 335,000 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's 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 (C³) equipment. Four fully developed E-4B Airborne Command Post aircraft (three of them converted from E-4As) now support the NEACP mission. They are hardened against the effects of nuclear explosions, including electromagnetic pulse; are 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 anti-jam features and will support operations in a nuclear environment over extended ranges. The E-4B system is capable of tying into commercial telephone and radio networks and could, potentially, be used for radio broadcasts to the general population. Recent improvements have included a data processing capability and more survivable C³, including initial Milstar modification. The first E-4B entered service with SAC in January 1980, and the first operational mission was flown in March of that year.

Contractor: Boeing Aerospace.

Power Plant: four General Electric CF6-50E2 turbofans; 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.

E-8A Joint STARS

The USAF/US Army Joint Surveillance and Target Attack Radar System (Joint STARS) was given an unexpected, and highly successful, opportunity to prove its capability during Operation Desert Storm early this year.

The original contract for full-scale development of the system had been awarded to Grumman in September 1985. The company was made responsible for subsystems installation, integration, and flight testing of specialized equipment on board two 707-320 airframes specially modified by Boeing for this purpose. Airborne equipment on the prototypes includes a Norden multi-mode side-looking radar antenna, some 25 ft long, faired into the belly of each aircraft. With a reported range in excess of 155 miles, this radar operates in synthetic aperture radar (SAR) mode to detect and locate stationary objects, such as parked tanks, and alternates between SAR and a Doppler-type mode to locate and track slow-moving targets. The Joint STARS system then directs attack to the targets, in real time, via the Joint Tactical Information Distribution System (JTIDS). To facilitate this process, each E-8 is equipped with 17 operations-and-control consoles, two of them doubling as communications stations, that display color-coded images of behind-the-lines terrain, and of wheeled and tracked vehicles moving anywhere on it.

The first modified airframe was delivered to Grumman in August 1987, followed by the second in November 1988. First flight of a fully Joint STARS-configured aircraft took place in December 1988. The second aircraft flew in August 1989 and became the primary test version, following the installation of additional equipment. A third E-8, contracted to Grumman in November of last year, will serve as the preproduction example. The system was deployed to Europe last fall, where it successfully demonstrated its capabilities in a NATO environment before being sent to Saudi Arabia, where the two E-8s served as USAF's 4411th Joint STARS Squadron. They logged more than 600 hours and flew 54 missions, with

great success, which should ensure approval of USAF plans to acquire at least 20 more E-8s, with delivery to begin in 1995. Funding of \$232.5 million had already been approved in the FY 1991 budget, with production go-ahead requested for FY 1992. Because new Boeing 707 airframes are no longer available, USAF has decided to purchase and modify used 707s, rather than qualify another type of aircraft. Production E-8As will carry a crew of around 17 USAF and Army specialists to man the radar processing and communications consoles in the cabin.

Contractor: Grumman Corporation.



E-3A Sentry



E-4B



E-8A Joint STARS aircraft



E-9A



EC-18B ARIA

E-9A

Under this designation, two highly modified Boeing Canada (de Havilland) DHC Dash 8M aircraft are operated by the Air Force Air Defense Weapons Center at Tyndall AFB, Fla., as airborne platform telemetry relay aircraft. Each is equipped with a sensor suite developed by the Sierra Research Division of LTV, including an AN/APS-128D sea surveillance radar in a ventral radome and a five-beam, electronically steerable 75-square-foot phased-array telemetry antenna, in a starboard side fuselage fairing. This is capable of automatically detecting, tracking, and relaying data simultaneously from five distinct sources traveling at speeds of Mach 5 or more. It is used for low-altitude, over-the-horizon data gathering during missile tests and for sea surveillance in order to keep boats out of the Gulf Test Range during tests.

Contractor: de Havilland Division of Boeing Canada.

Power Plant: two Pratt & Whitney Canada PW120A turboprops; each 1,800 shp. (No military designation on these engines.)

Accommodation: three: pilot, copilot, and systems operator.

Dimensions: span 85 ft 0 in, length 73 ft 0 in, height 24 ft 7 in.

Weight: gross 33,000 lb fully fueled.

Performance: max speed at 25,000 ft 245 mph, max operational altitude 25,000 ft, loiter time 5 hr.

EC-18B/D

The EC-18B Advanced Range Instrumentation Aircraft (ARIA) is a modified former American Airlines Boeing 707-320 series transport, of which four replaced some of the EC-135N ARIAs operated by ASD's 4950th Test Wing. In common with the EC-135 ARIAs, the 707s are 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 increased to provide greater support for the expanding ARIA mission, including DoD and NASA space and missile programs. The aircraft can accommodate a crew of

16-24. Following conversion, the first EC-18B was flown for the first time in February 1985 and entered operational service in January 1986. A sonobuoy missile impact location system (SMILS) of the kind fitted on some USN P-3s is currently under development for the EC-18B.

A \$42.6 million contract was awarded to Electrospace Systems Inc. to modify two Boeing 707s for use as dedicated Cruise Missile Mission Control Aircraft (CMMCA). Specialized equipment includes an AN/APG-63 surveillance radar, telemetry receiver, and weather radar. Designated EC-18D, they are scheduled to be flown by the 4950th TW at Wright-Patterson AFB, Ohio, on completion of flight testing, in support of USN and SAC missile testing. They will also be capable of monitoring and controlling unmanned aerial vehicles.

Contractor: Boeing Military Airplanes.

WC-130E/H

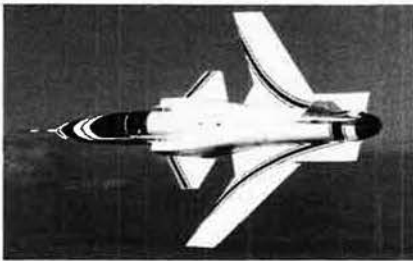
Modified C-130 Hercules transports, designated WC-130E and H, are equipped for weather reconnaissance duties, including penetration of tropical storms to obtain data for forecasting storm movements. They are assigned to the Air Rescue Service (ARS) of MAC and the 815th TAS of AFRES. (Data similar to those for C-130.)

X-29A Forward Swept Wing Demonstrator

Flight testing of the unique X-29A Forward Swept Wing (FSW) multitechnology demonstrator has been under way at NASA's Dryden Flight Research Center at Ed-

wards AFB, Calif., since December 1984. A reexamination of the FSW principle was made both practical and feasible by the introduction of advanced lightweight composite materials that eliminate many of the problems encountered with conventional metal construction. 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



X-29 Advanced Technology Demonstrator



C-5 Galaxy

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 canards, flaperons, and strake flaps at the tail work together to enhance maneuverability.

The early phase of the flight program, following the installation of an improved backup flight-control system in the fall of 1985, was aimed at testing stability and control loads, flutter, and wing divergence up to 40,000 ft and at speeds up to Mach 1.5. The first supersonic flight took place in December 1985, when preliminary data showed Mach 1.03 airspeed at an altitude of 40,000 ft. This phase ended in December 1986 after 104 flights. Before commencement of the second phase, a calibrated engine with two thrust measuring systems for performance data, a NASA noseboom calibrated for air data measurements, and upgraded instrumentation were installed. In June 1988, this first X-29 made its 200th flight, a record for a single X series aircraft. Performance and asymmetric load testing were completed after a total of 242 flights, during which a maximum speed of Mach 1.52 at 51,000 ft had been recorded. The aircraft was grounded in 1988 but was subsequently restored to flight status for public display.

Work on design modification and installation of flight test instrumentation and an antispin parachute on the second X-29 began in the summer of 1987, with delivery in October 1988. First flight took place in May 1989. This aircraft is being used to explore the low-speed, high-angle-of-attack (high alpha) side of the envelope. The test program aims at taking the aircraft to around the forty-degree angle of attack (AOA), while keeping the ability to maneuver in roll, pitch, and yaw. Thereafter, it aims to demonstrate only pitch control at an AOA of seventy-plus degrees. A subsequent phase of the X-29 program is to assess the military utility of high AOA.

Contractor: Grumman Corporation.
Power Plant: one General Electric F404-GE-400 turbofan; 16,000 lb thrust class.

Accommodation: pilot only.
Dimensions: span 27 ft 2 1/2 in, length overall 53 ft 11 1/4 in, height 14 ft 3 1/2 in.

Weights: empty 13,800 lb, gross 17,800 lb.
Performance: max level speed approx Mach 1.6.

NASP/X-30A

The National Aerospace Plane (NASP) research program, initiated jointly by DoD and NASA, is intended to develop the technology for hypersonic cruise and single-stage-to-orbit aircraft/spacecraft able to take off from and land on conventional runways. Such vehicles could

place payloads in orbit at costs far below those of current expendable launch vehicles or the space shuttle. They could also point the way to future military trans-atmospheric vehicles (TAVs) able to leave and return to orbital flight on reconnaissance or attack missions. The program is jointly managed by DoD and NASA, with USAF designated as lead agency.

The current technology development phase of the program began in April 1986, when DoD and NASA announced the award of contracts for propulsion and airframe development. In the following year, two of the airframe contractors were eliminated, leaving General Dynamics, McDonnell Douglas, and Rockwell International to proceed into a three-year preliminary design phase on the airframe, with Rocketdyne and Pratt & Whitney continuing their propulsion work. By late 1989, it had been decided to stretch the NASP program to reduce both cost uncertainties and technical risks in the long term. In January 1990, the five prime contractors engaged in the program announced plans to form a national contractor team to pool resources and develop the vehicle jointly. The NASP National Contractor Office relocated to Palm-dale, Calif.

An experimental aircraft, designated X-30A, similar in size to a McDonnell Douglas MD-80 series airliner, is intended to be used in the third phase of the program to develop and demonstrate Aerospace Plane technologies throughout the flight envelope for hypersonic cruise and acceleration to low-Earth orbit. This demonstrator will be a lifting body design with small wings and twin stabilizers, powered by three to five scramjets. First flight is currently scheduled for 1997.

Transports and Tankers

C-5A/B Galaxy

The C-5 is capable of airlifting loads up to 291,000 lb, such as two M60 tanks or three CH-47 Chinook helicopters, over transoceanic ranges. The huge capacity of this long-range, air refuelable, heavy logistics transport was of major importance to the massive airlift of US forces to Saudi Arabia in the early stages of Operation Desert Shield. Well over 90 percent of the total available C-5 fleet was used in the operation.

The prototype flew in June 1968, and USAF took delivery of 81 basic C-5As between December 1969 and May 1973. Under a subsequent major modification program,

Lockheed produced component kits to extend the service life of the C-5A's wings by 30,000 flight hours, without load restrictions. These kits replaced only the five main load-carrying wing boxes, to which other existing components were transferred. The use of 7175-T73511 aluminum alloy provided greater strength and resistance to corrosion. Modification of all 77 aircraft in the inventory took place between 1982 and 1987. In December 1984, the 433d MAW at Kelly AFB, Tex., became the first AFRES unit to be equipped with "AFRES-owned" C-5As, and the 439th MAW at Westover AFB, Mass., began replacing its C-130s with C-5s in 1987. ANG's 105th MAG, at Newburgh, N. Y., received its first C-5As in July 1985. Two C-5As have been modified to carry outside space cargo by extending the cargo bay and modifying the aft doors.

To meet an urgent need for additional heavy airlift capacity, USAF acquired 50 C-5Bs, generally similar to the C-5A but embodying all the improvements 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 (MAfunction Detection Analysis and Recording) instrument units were replaced by the more advanced MADAR II. The first C-5B flew for the first time in 1985 and was delivered to Altus AFB, Okla., in January 1986. Deliveries were completed in April 1989. The two operational C-5B units (each with 22 aircraft) are the 60th MAW at Travis AFB, Calif., and the 436th MAW at Dover AFB, Del. A program is in hand to upgrade the C-5A fleet with the avionics subsystems developed for the C-5B, including installation of MADAR II. All C-5s are being fitted with new, safer interior panels. In addition, under the Pacer Snow project, Lockheed was awarded a contract to develop and install a prototype missile defense system on two C-5s, to include Tracor AN/ALE-40 flare dispensers and a Honeywell AN/AAR-47 missile warning system. Modification of the aircraft was scheduled to be completed by November 1990, with testing to be undertaken at Eglin AFB, Fla., and Holloman AFB, N. M., by the Air Force Special Missions Operations Test and Evaluation Center. One hundred and twenty-six C-5s are now within the purview of US Transportation Command, which was activated in October 1987. (Data for C-5B.)

Contractor: LASC Georgia Division of Lockheed Corporation.

Power Plant: four General Electric TF39-GE-1C turbofans; each 43,000 lb thrust.

Accommodation: crew of six, rest area for 15 (relief crew, etc.); seating for 75, and 36 standard 463L pallets or assorted vehicles, or a maximum of 340 passengers in an Airbus configuration.

Dimensions: span 222 ft 8 1/2 in, length 247 ft 10 in, height 65 ft 1 1/2 in.

Weights: empty 374,000 lb, max payload 261,000 lb, gross (for 2g) 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 3,434 miles, range with max fuel 6,469 miles.

C-9A/C Nightingale

Derived from the DC-9 Series 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, now redesignated the 375th Military Airlift Wing, was completed by February 1973; this unit is now augmented by the 73d AAS (Assoc.) of AFRES, collocated at Scott AFB, Ill. The Nightingale also performs overseas theater aeromedical evacuation missions in Europe, with five C-9As based at Rhein-Main AB, Germany, and in the Pacific, with three C-9As based at Yokota AB, Japan. Because of the critical nature of its mission, the aircraft carries a flight mechanic and a small supply of spares. 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 turbofans; 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 3 in, length 119 ft 3 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 Huron

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. C-12As refitted with PT6A-42 engines are redesignated C-12E. Six C-12D versions, with cargo

door, high flotation landing gear, and provision for tip tanks, were delivered to USAF.

MAC uses 40 passenger/cargo-capable Super King Air B200Cs, (C-12Fs) at eleven bases throughout CONUS, PACAF, and USAF for the time-sensitive movement of people and cargo. The C-12Fs, along with the C-21A aircraft, replaced the CT-39 fleet. Six C-12Fs have been delivered to the ANG, which also has six C-12Js (military versions of the 19-passenger Beechcraft 1900C). The first of the C-12Js was delivered in September 1987, and they serve as mission support aircraft, replacing Convair C-131s. (Data for C-12A.)

Contractor: Beech Aircraft Corporation.

Power Plant: two Pratt & Whitney Canada PT6A-38 turboprops; each 750 shp. (C-12F: 850 shp PT6A-42s.)

Accommodation: crew of two; up to eight passengers or 4,764 lb of cargo. Convertible to aeromedical evacuation configuration.

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 301 mph, service ceiling 31,000 ft, range at max cruising speed 1,824 miles.

C-17A

Assembly of the first McDonnell Douglas C-17A airlifter was completed at the end of last year, with its initial flight scheduled for the middle of this year. The C-17A was developed to meet US force projection requirements. It is a heavy-lift, air-refuelable cargo transport, designed to provide intertheater and intratheater airlift of all classes of military cargo, including outside. It will be able to operate routinely into small, austere airfields (3,000 ft x 90 ft) previously restricted to C-130s and will provide the first capability to airland or airdrop/extract outside cargo in the tactical environment. The C-17A will not only enhance US airlift capability across the board but will also provide much-needed force structure modernization. It will be based at active-duty locations.

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 development (FSD) work on the C-17. FSD was approved in February 1985. Initial procurement funding was authorized in the FY 1987 budget, together with continued R&D. The first two production aircraft were funded in FY 1988, with a further ten through FY 1991; full production, with an annual maximum of 18 aircraft, is requested from FY 1992, with a total planned buy of 120.

Subcontractors for the C-17 program include Beech Aircraft Corp. (composite winglets); Delco Electronics Corp. (mission computer and electronic display system); Grumman Aircraft Systems (ailerons, rudder, and elevators); GEC Avionics (advanced HUD); LTV Aircraft Products (vertical and horizontal stabilizers, engine nacelles); Honeywell Inc. (support equipment and air data computers); and General Electric (electronic flight-control system).

The 437th MAW at Charleston AFB, S. C., has been designated as the first C-17 unit, with delivery commencing next year and IOC scheduled for FY 1994.

Prime Contractor: Douglas Aircraft Company, Division of McDonnell Douglas Corporation.

Power Plant: four Pratt & Whitney F117-PW-100 turboprops; each 41,700 lb thrust, on early aircraft; power plant for later aircraft is open to competition.

Accommodation: normal flight crew of two, plus loadmaster. Provisions for the full range of military airlift missions.

Dimensions: span 165 ft 0 in, length 174 ft 0 in, height 55 ft 1 in.

Weights: max payload (2.25g) 172,200 lb, gross 580,000 lb.

Performance (estimated): normal cruising speed at height 518 mph (Mach 0.77), range with 167,000 lb payload 2,765 miles.

C-20A/B Gulfstream III

The Air Force acquired eleven off-the-shelf Gulfstream III transports, each with accommodation for five crew and 14 passengers, for VIP duties, to replace aging, fuel-inefficient C-140Bs. Three C-20As and one C-20B, delivered to the 89th Military Airlift Wing in FY 1983 and FY 1984 under a lease/purchase agreement, were subsequently purchased. Another seven C-20Bs, with advanced mission communications equipment and revised interior, were ordered in January 1986. As these were delivered to Andrews AFB, Md., the original three C-20As were transferred to Ramstein AB, Germany, in support of 58th MAS's special airlift mission in Europe. The C-20s provide the Special Airlift Mission (SAM) fleet with intercontinental range and ability to operate from short runways.

Contractor: Gulfstream Aerospace Corporation.

Power Plant: two Rolls-Royce F113-RR-100 turboprops; 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 4 1/2 in.

Weight: gross 69,700 lb.

Performance: max cruising speed 561 mph, service ceiling 45,000 ft, range 4,050 miles.

C-21A

Eighty-three C-21As are operated by active-duty and ANG units from twelve US bases and three overseas locations. These aircraft, together with the C-12Fs, replaced the CT/7-39 fleet and are used to provide operational support airlift for time-sensitive movement of people and cargo throughout the United States and the Pacific and European theaters, including aeromedical missions if required. The first C-21A was delivered to USAF in 1984. In 1987, ANG acquired four C-21s to replace its T-39s based at Andrews AFB, Md. All C-21A aircraft are currently undergoing modification with digital electronic engine controls.

Contractor: Learjet Corporation.

Power Plant: two Garrett TFE731-2 turboprops; each 3,500 lb thrust.

Accommodation: crew of two and up to eight passengers, or 3,153 lb cargo. Convertible to aeromedical evacuation configuration.

Dimensions: span 39 ft 6 in, length 48 ft 8 in, height 12 ft 3 in.

Weight: gross 18,300 lb.

Performance: cruising speed Mach 0.81, service ceiling 45,000 ft, range with maximum passenger load 2,420 miles, with maximum cargo load 1,653 miles.

C-22B

Under the designation C-22B, four Boeing 727 commercial transports have been purchased and modified for use by ANG on operational support airlift missions. Two aircraft will be further modified to accommodate an additional 1,100 gallons of fuel and landing gear rated for 170,000 lb gross landing weight.



C-17A



C-20A Gulfstream III



C-21A

C-23A Sherpa

With the elimination of the European Distribution System (EDS), the eighteen Sherpa light transport aircraft previously operated by MAC for ferry aircraft engines and spares to bases throughout Europe are being transferred to Air Force Systems Command (using the aircraft from Edwards AFB, Calif.), the US Army, and the US Forest Service.

The Sherpa, which entered the USAF inventory in 1984, 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.

Contractor: Short Brothers PLC.

Power Plant: two Pratt & Whitney Canada PT6A-45R turboprops; each 1,198 shp.

Accommodation: crew of three; up to 7,000 lb of freight, including four LD3 containers, and engines the size of the F100 series.

Dimensions: span 74 ft 8 in, length 58 ft 0 1/2 in, height 16 ft 3 in.

Weight: gross 25,500 lb.

Performance: max cruising speed at 10,000 ft 218 mph, range 770 miles with 5,000 lb payload.

VC-25A

The first of two Boeing VC-25A Presidential transports was delivered to the 89th Military Airlift Wing at Andrews AFB, Md., on August 23 last year, with the second due for delivery early this year. Based on Boeing 747-200B airframes, they replace the former primary and backup "Air Force One" transports (C-137Cs). The new aircraft have a Bendix Aerospace EFIS-10 electronic flight instrument system and state-of-the-art, on-board communications equipment. A pair of self-contained air-stairs is located on the left side and a built-in baggage loader on the right side. Together with a second auxiliary power unit, they allow the aircraft to be practically self-sufficient and reduce the need for ground-support equipment. Despite its long range, the VC-25A is air refuelable.

Contractor: Boeing Military Airplanes.

Power Plant: four General Electric CF6-80C2B1 turbofan engines, each 56,750 lb thrust.

Accommodation: crew of 23; up to 77 passengers.

Dimensions: span 195 ft 8 in, length 231 ft 10 in, height 63 ft 5 in.

Weight: long-range mission T-O weight 803,700 lb.

Performance: high speed cruise Mach 0.88-0.91, normal cruising speed Mach 0.84, unrefueled range 7,140 miles.

C-26A

USAF has acquired 13 Fairchild Metro III commuter transport aircraft to replace ANG C-131s, under the designation C-26A. The first aircraft was delivered in March 1989 and was assigned to the 147th FIG at Ellington ANGB, Tex. The C-26As serve in the ANGOSTA (Air National Guard Operational Support Transport Aircraft) role. They have a quick-change interior, enabling passenger seats to be replaced by a medevac or cargo-carrying configuration.

Up to 53 more C-26s will be delivered to USAF over a five-year period, beginning in January 1992.

Contractor: Fairchild Aircraft Corporation.

Power Plant: two Garrett TPE331-11U-612G turboprops, each 1,100 shp.

Accommodation: crew of two; 19-20 passengers.

Dimensions: span 57 ft 0 in, length 59 ft 4 1/4 in, height 16 ft 8 in.

Weights: empty 9,494 lb, gross 16,000 lb.
Performance: max cruising speed at midcruise weight of 12,500 lb 321 mph, service ceiling 26,700 ft, range with 19 passengers, 1,224 miles.

C-27A

Under a contract awarded in August of last year, Chrysler Technologies Airborne Systems is to deliver five C-27A STOL intratheater transports for use by US Southern Command. The C-27As are commercially available Aeritalia G222 medium airlifters, modified by Chrysler to include new communications and navigation avionics. The aircraft will provide rapid response airlift of person-



C-26A



C-130 Hercules

Performance: max level speed and max cruising speed at 29,000 ft 525 mph, service ceiling 43,000 ft, range with max payload 3,305 miles.

C-130 Hercules

In times of crisis, as well as peace, the remarkable C-130 Hercules continues to demonstrate its wide operational capabilities. Basic and specialized versions perform a diversity of roles worldwide, including airlift support, DEW Line and Arctic ice cap resupply, aeromedical missions, natural disaster relief missions, aerial spray missions, and fire-fighting duties for the US Forest Service. It is now four decades since TAC issued its original design specification, yet the aircraft remains in production. 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. C-130Bs are used in aerial fire-fighting missions by ANG and AFRES units. Six C-130Bs were modified in 1961 for airsnatch 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 (jet-assisted takeoff) rockets. The C-130E is an extended-range development of the C-130B, with large underwing fuel tanks; 3E9 were ordered for MAC and TAC, with deliveries beginning in April 1962. A wing modification to correct fatigue and corrosion on USAF's current force of C-130B/Es has extended the life of the aircraft well into the next century. Ongoing modifications include a self-contained navigation system (SCNS) to enhance navigation capabilities, especially in the low-level environment. SCNS incorporates an integrated communications navigation management system that features the USAF standard laser-gyro inertial navigational unit and the 1553B databus; installation began last year. Other modifications include enhanced station keeping equipment (ESKE), 50kHz

nel and cargo to remote locations accessible, primarily through unimproved airfields with short, unprepared landing surfaces. The first C-27A is scheduled for delivery to Howard AFB, Panama, this August. Options exist on a further thirteen aircraft. (Data for standard G222.)

Contractor: Chrysler Technologies Airborne Systems Inc

Power Plant: two Fiat-built General Electric T64-GE-P4 turboprops, each 3,400 shp

Accommodation: crew of three; various configurations, including provision for 53 fully equipped troops or 19,840 lb cargo.

Dimensions: span 94 ft 2 in, length 74 ft 5½ in, height 32 ft 1¼ in.

Weights: empty 32,165 lb, gross 61,730 lb.

Performance: max level speed at 15,000 ft 336 mph; service ceiling 25,000 ft; ferry range with max fuel 2,879 miles.

C-29A

The first of six British Aerospace 125-800 business-jet type aircraft, equipped with a state-of-the-art LTV-Sierra flight inspection system, was delivered to MAC in April last year. The aircraft are off-the-shelf models, the only modifications being the addition of some military avionics, an upgraded electrical system, UHF radios, and an oxygen system. The MAC flight inspection mission provides worldwide, all-weather, certified instrument approaches, traffic control and landing system equipment, and air-ground communications evaluation during contingency or wartime operations. All six aircraft were delivered by January of this year to replace the six now-retired C-140s and T-39As, which had accomplished the C-FIN (combat flight inspection and navigation) mission up until that time. The C-29As are assigned to Scott AFB, Ill., Rhein-Main AB, Germany, and Yokota AB, Japan, but have meanwhile supported Operations Desert Shield and Desert Storm.

Contractor: British Aerospace PLC.

Power Plant: two Garrett TFE731-5R-1H turbofans, each 4,300 lb thrust.

Accommodation: crew of two on flight deck.

Dimensions: span 51 ft 4½ in, length 51 ft 2 in, height 17 ft 7 in.

Weight: gross 27,400 lb.

VOR/ILS receivers, secure voice capability, replacement radar for the adverse weather aerial delivery system (AWADS), and GPS capability. Eleven were scheduled for an extensive modification to enhance their Special Operations Low Level (SOLL) capability. Another major modification installs a state-of-the-art autopilot that incorporates a ground proximity warning system (GPWS). Specifically modified aircraft are used by the 356th TAS, AFRES, based at Rickenbacker ANGB, Ohio, for aerial spraying, typically to suppress mosquito-spread epidemics. 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, Germany, and Florida, respectively, and now part of the new Air Force Special Operations Command (AFSOC). The MC-130E is being supplemented by the improved, night/adverse weather, low-level MC-130H (Combat Talon II). Twenty-four are being acquired, equipped with an in-flight refueling receptacle; explosive-suppressive fuel tanks; a modified cargo ramp area for the high-speed, low-level aerial delivery system; Emerson Electric AN/APQ-170 precision terrain-following and terrain-avoidance radar; dual radar altimeters; dual inertial navigation systems; and provision for a GPS receiver. The defensive avionics suite is much improved over that of the MC-130E and will eventually be retrofitted on the earlier aircraft. Deliveries to the 1st SOW's 8th SOS, based at Hurlburt Field, Fla., were due to begin in June 1990 and are scheduled for the 16th SOS, also at Hurlburt Field, in 1992. Combat Talon II training will commence at the 1550th Combat Crew Training Wing at Kirtland AFB, N. M., this year.

Generally similar to the E model, the basic C-130H has updated T56-A-15 turboprops, a redesigned outer wing, updated avionics, and other, minor improvements; delivery began in April 1975. Well over 350 C-130Hs and derivatives have been ordered for the US services. Four LC-130Hs, modified with wheel-ski gear, have been acquired by ANG. Additionally, as a partial response to the "overwhelming role" played by the tactical airlift fleet in Panama and in the Persian Gulf, Congress has approved \$10 million to initiate development of an updated C-130J version. Improvements include an entirely new and advanced two-person flight deck with four high-resolution, full-color liquid crystal display screens and two fold-down head-up displays; updated T56 engines driving new propellers; increased fuel efficiency allowing the deletion of external fuel tanks without loss of range; and carbon brakes, with improved antiskid system.

Other variants include HC-130H/N/P, AC-130A/H/U, and WC-130E/H, all described separately. Four HC-130Hs were modified as JC-130H with added equipment for aerial recovery of reentering space capsules, and one was modified as DC-130H for drone control duties. ANG C-130s acquired a new role in 1987 when about nine aircraft were assigned to ANG fighter wings and groups to provide support for jet fighter units on deployments. (Data for C-130H.)

Contractor: LASC Georgia, Division of Lockheed Corporation.

Power Plant: four Allison T56-A-15 turboprops; 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: operating empty 76,469 lb, max payload 42,673 lb, gross 175,000 lb.

Performance: max cruising speed at 20,000 ft 374 mph, service ceiling (at 130,000 lb) 33,000 ft, range with max payload 2,356 miles.

HC-130H/N/P

All active-duty HC-130 tanker aircraft are now dedicated to special operations missions. Eight primary aircraft are assigned to the 9th SOS, Eglin AFB, Fla. All eight are modified with communications, navigation, and countermeasures systems, and night vision goggle (NVG)-compatible lighting. Six further primary aircraft are assigned to the 17th SOS, Kadena AB, Japan, and the 67th SOS, RAF Woodbridge, UK. Others are assigned to the 1550th Combat Crew Training Wing at Kirtland AFB, N. M. The aircraft's primary mission is to conduct single-ship or formation in-flight refueling of special operations helicopters in a no- to low-threat environment. These missions involve night vision goggle low-level flights using minimum lighting, minimum communications, and deceptive course changes. All 31 HC-130s in the active Air Force inventory, including primary, backup, and training aircraft, are to be modified to special operations configuration. Modifications under way include installation of the self-contained navigation system (SCNS), NVG-compatible lights, new communications equipment, and rheostats to adjust the Benson refueling pod lights, which, in standard form, are too bright for helicopter pilots wearing NVGs. In addition, 14 HC-130s are assigned to AFRES and ANG, dedicated to rescue and recovery operations. (Data similar to those for C-130.)

KC-135 Stratotanker

As single manager of all USAF KC-135 tanker aircraft, SAC supports its own refueling requirements as well as the aerial refueling requirements of other Air Force commands, the US Navy and Marines, and other nations. In particular, the KC-135 is an integral part of the Single Integrated Operational Plan (SIOP), providing mission-critical fuel to the strategic bomber force, a role that proved crucial in the war in the Persian Gulf. 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. First flight of the KC-135A was in August 1956, and by 1966 a total of 732 had been built. Many of the 633 remaining in operational service have been modified to later standards in three programs initiated to enhance the KC-135's capability and extend its operational utility well into the next century. 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. Reengineered aircraft are designated KC-135R and have a gross weight of 322,500 lb. They embody modifications to 25 major systems and 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 KC-135R flight was in August 1982, and first deliveries to SAC were in July 1984; the 219th reengineered aircraft was delivered in December 1990, with approval in the FY 1991 budget for the reengineering of a further 24 aircraft. Second, the JT3D re-engineering program upgrades the 163 KC-135As serving in 13 ANG and three AFRES units to KC-135E standard with JT3D turbofans, removed from surplus commercial 707s, and including 14 aircraft allocated under the 1989 ANG/AFRES tanker fleet expansion plans. The final tankers to be modified to "E" standard are scheduled for delivery by this summer. Finally, the Life Extension Structural Modification has provided for the renewal of the lower wing skin, enabling the fleet of KC-135s to remain fully operational past the year 2020. Development of new and improved aerial refueling systems is also under way. (Data for KC-135R.)

Contractor: Boeing Military Airplanes.

Power Plant: four CFM International F108-CF-100 turbofans; each 22,224 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 119,231 lb, gross 322,500 lb.

Performance: max speed at 30,000 ft 610 mph, service ceiling 50,000 ft, range with 120,000 lb of transfer fuel 2,128 miles, ferry mission 11,192 miles.

C-135A/B Stratolifter

Thirteen C-135 transports and variants, without the KC-135'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 turbojets and C-135B with Pratt & Whitney TF33-P-5 turbofans. Eleven Bs were retrofitted with revised interior for VIP transportation; others became WC-135Bs and RC-135E/Ms. Additionally, two C-135s belonging to ASD's 4950th Test Wing were permanently modified as Laser Communications Airborne Test-Beds for the Have Lace program. (Data similar to KC-135, except where indicated.)

Dimension: length 134 ft 6 in.

Weights (C-135B): operating weight empty 102,300 lb, gross 275,500 lb.

Accommodation (C-135B): 60 passengers.

Performance (C-135B): max speed 600 mph, range with 54,000 lb payload 4,625 miles.

VC-137B/C Stratoliner

Seven specially modified Boeing 707 transports are operated by MAC's 89th Military Airlift Wing from Andrews AFB, Md., for VIP duties. There are four VC-137Cs, which are Boeing 707-320s, and three smaller 707-120s, currently designated VC-137B. Two of the VC-137Cs were the original "Air Force One" aircraft.

Contractor: The Boeing Company.

Power Plant: four Pratt & Whitney JT3D-3 turbofans; each 17,200 lb thrust.

Dimensions: VC-137B: span 130 ft 10 in, length 144 ft 6 in, height 42 ft 0 in; VC-137C: span 145 ft 9 in, length 152 ft 11 in, height 42 ft 5 in.

Weights: VC-137B: gross 258,000 lb; VC-137C gross 322,000 lb.

Performance (VC-137C): max speed 627 mph, service ceiling 42,000 ft, range 5,150 miles.

C-141A/B StarLifter

MAC airlift operations in support of Operation Just Cause in Panama and, more recently, the massive move-

ment of US forces to Saudi Arabia, relied heavily on the C-141 transport. The C-141A entered service with MAC in April 1965, and 285 were built, some of which were structurally modified to accommodate the 82,207 lb Minuteman ICBM. Subsequently, USAF funded modification of the entire force of 270 (now 266) aircraft to C-141B standard (except four AFSC aircraft used for test purposes), in order to realize the aircraft's full payload potential. 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 received 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. Under the Pacer Center program, initiated in 1987, a center wing structural modification is under way, which, coupled with other structural upgrades, will extend the C-141's original flying life by 15,000 hours. Current plans call for 118 aircraft to receive this modification. Other C-141 modification plans include 50kHz VOR/ILS receivers, secure voice capability on UHF and HF radios, permanently mounted SATCOM antennas, and a digital display fuel-quantity-indicating system. A program to install a state-of-the-art autopilot and all-weather landing system with enhanced flight display instrumentation is a major modification to enhance maintenance supportability. Improved airdrop systems for the C-141 are also in production. One C-141A has been greatly modified as an **Advanced Radar Test-Bed (ARTB)** for use as an airborne laboratory platform to test a wide range of sensors in a dynamic electronic countermeasures environment. In addition, 13 437th MAW C-141Bs are scheduled for modifications to increase their Special Operations Low Level (SOLL) capability and survivability.

Since 1986, AFRES and ANG have received C-141s transferred from the active force; 64 aircraft are scheduled for transfer by 1997. These C-141s play a major role in intertheater medevac missions and are used frequently for humanitarian missions, transporting vital supplies to areas that, in recent years, have been devastated by natural disaster, such as the Caribbean Basin and Soviet Armenia. Two hundred and thirty-four C-141Bs have moved under the purview of US Transportation Command (USTRANSCOM). (Data for C-141B.)

Contractor: Lockheed-Georgia Company.

Power Plant: four Pratt & Whitney TF33-P-7 turbofans; 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 3 1/2 in, height 39 ft 3 in.

Weights: operating 149,000 lb, max payload 89,000 lb, gross 343,000 lb.

Performance: max cruising speed 566 mph, range with max payload 2,293 miles without air refueling.

KC-10A Extender

The KC-10 was conceived to meet USAF requirements for an Advanced Tanker/Cargo Aircraft (ATCA). It is based on the commercial DC-10 Series 30CF, modified to include fuselage fuel cells, a boom operator's station with aerial refueling boom and integral hose reel/drogue unit, a receiver refueling receptacle, and military avionics. In its primary role of enhancing worldwide air mobility, the KC-10A combines the tasks of tanker and cargo aircraft in a single unit. With this capability, the Extender supports fighter deployments, strategic airlift, strategic reconnaissance, and conventional operations, and, as such, played a crucial role in the Gulf deployment. Since it has both types of tanker refueling equipment installed, the KC-10A can service USAF, USN, USMC, and allied aircraft on the same mission.

For deployment, the KC-10A's refueling capabilities and long range will, in many situations, dispense with the need for forward bases, while leaving vital fuel supplies in the theater of operations untouched. Aircraft maintenance is performed under the contractor logistics support concept, where flight-line maintenance is provided by USAF while intermediate and depot-level maintenance is supported by a contractor. In addition, extensive commonality with the commercial DC-10 allows USAF to capitalize on a worldwide network of spares and maintenance facilities.

The KC-10A made its maiden flight in July 1980, and the first service usage by SAC took place in March 1981. USAF units equipped with KC-10As include the 6th and 9th AREFS at March AFB, Calif., the 2d and 32d AREFS at Barksdale AFB, La., and the 344th and 911th AREFS at Seymour Johnson AFB, N. C. AFRES also crews the aircraft under the Associate Reserve concept. Associate units include the 79th AREFS at March AFB, the 78th AREFS at Barksdale AFB, and the 77th AREFS at Seymour Johnson AFB.

Fifty-nine KC-10As are in the USAF inventory. The final production aircraft, delivered in April 1990, was used to test wing-mounted air refueling pods designed to supplement the standard fuselage hose reel/drogue unit and refueling boom. Currently, 20 aircraft have been scheduled for modification to accept the wing-mounted pods. An additional modification, currently under development, to utilize an on-board loader, will allow pallet handling without repositioning wide-body cargo loading



KC-135R Stratotanker



C-141B StarLifter

equipment. Installation should be complete by 1992.

Contractor: Douglas Aircraft Company, Division of McDonnell Douglas Corporation.

Power Plant: three General Electric CF6-50C2 turbofans; each 52,500 lb thrust.

Accommodation: crew of four; additional seating possible for up to 75 persons; max 27 pallets; max cargo payload 169,409 lb.

Dimensions: span 165 ft 4 1/2 in, length 181 ft 7 in, height 58 ft 1 in.

Weight: gross 590,000 lb.

Performance: cruising speed Mach 0.825, service ceiling 42,000 ft, range with max cargo 4,370 miles.

Trainers

T-1A Jayhawk

A contract for provision of the Tanker/Transport Training System (TTTS), to be used for specialized undergraduate pilot training (SUPT), was awarded in February 1990 to the team of McDonnell Douglas, Beech Aircraft Corp., and Quintron. As team leader, McDonnell Douglas is responsible for system integration; Quintron will supply flight simulators and Beech the aircraft. Designated Beechjet 400T, these will be similar to the Beechjet 400A corporate transport. The flight deck will be configured for a student in the left seat, an instructor in the right seat, and another student to the rear. Structural enhancements will provide for a large number of landings per flight hour, increased birdstrike resistance, and an additional fuselage fuel tank. The T-1A will also have single-point pressure fueling and fewer cabin windows. A Rockwell Collins avionics package will include a five-tube EFIS, turbulence detection radar, digital autopilot, tactical air navigation with air-to-air capability, and a central diagnostics and maintenance system.

Forty-two T-1As have been funded to date. Beech plans to deliver the first 400T this year, followed by 22 in 1992 and completion of the currently planned 191-aircraft program by 1997. Instructor pilot training at the



T-1A Jayhawk



T-37B Tweet



64th FTW, Reese AFB, Tex., is scheduled to start in March 1992, with student training beginning the following September. Pilots trained on the TTTS will then progress to transports such as the C-5 and C-17 and tankers such as the KC-10 and KC-135.

Contractor: Beech Aircraft Corporation.
Power Plant: two Pratt & Whitney JT15D-5B turbofans; each 2,900 lb thrust.

Accommodation: two, side-by-side, and one to the rear; rails are fitted to accommodate an extra four seats to permit use as a personnel transport.

Dimensions (400A): span 43 ft 6 in, length 48 ft 5 in, height 13 ft 9 in.

Weights: empty 5,200 lb, gross (400A) 16,100 lb.
Performance (400A): max speed at 27,000 ft 538 mph, ceiling 45,000 ft, range 2,222 miles.

EFS Aircraft

USAF plans to buy 125 off-the-shelf light aircraft to support the enhanced flight screening (EFS) program that will be undertaken by pilot candidates prior to specialized undergraduate pilot training (SUPT). Eight companies took part in suitability demonstrations last summer under the scrutiny of ATC and the Air Force Academy, which will be conducting EFS, and AFSC. Details of operational requirements, matched to affordability, are being finalized for the EFS aircraft competition to be held in November. Deliveries of the selected aircraft are expected to begin in May 1992.

T-37B Tweet

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; all A models were converted subsequently to B standard. Following cancellation of the T-46A, which had been planned as a replacement for these aircraft, a contract was awarded in August 1989 to Sabreliner Corp. for the T-37B Service Life Extension Program (SLEP). The contract included the design, testing, and production of kits, to be installed by USAF, which will modify or

T-38 Talon



T-41C Mescalero (J. Gaffney)

replace critical structural components for the entire fleet, extending the capability of the T-37 into the next century. Delivery of production kits is scheduled to begin this year and continue until 1993. Well over 1,000 T-37s were built, and more than 600 remain in USAF's inventory. All are being repainted in a distinctive dark blue and white to help formation training and to ease maintenance. ATC plans to replace the T-37B with a new Joint Primary Aircraft Training System (JPATS) from 1994.

Contractor: Cessna Aircraft Company.
Power Plant: two Continental J69-T-25 turbojets; each 1,025 lb thrust.

Accommodation: two, side by side.
Dimensions: span 33 ft 9/4 in, length 29 ft 3 in, height 9 ft 2 1/4 in.

Weight: empty 3,870 lb, gross 6,575 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 and AT-38B Talon

Almost identical in structure to the F-5A export tactical fighter, the T-38A lightweight twin-jet advanced trainer is capable of flying well above supersonic speed in level

flight. First flown in April 1959, it was in continuous production from 1956 to 1972 and entered operational service in March 1961. Of 1,187 T-38s built, more than 1,100 were delivered to USAF, and some 800 remain in service throughout the Air Force. Most are used by ATC for high-performance pilot training; others fly with SAC and with the 479th Tactical Training Wing at Holloman AFB, N. M., where a slightly different version, designated AT-38B, with a gunsight and practice bomb dispensers, is used for Lead-In Fighter Training (LIPT).

An ongoing program called Pacer Classic, the T-38 SLEP, is integrating ten modifications, including major structural renewal, into one program. As a result, the service life of the T-38s should extend to the year 2010. Additionally, the introduction of the T-1A Jayhawk Tanker/Transport Training System (TTTS) will significantly relieve the T-38's training work load.

Contractor: Northrop Corporation.
Power Plant: two General Electric J85-GE-5A turbojets; 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 4 1/2 in, height 12 ft 10 1/2 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-41A/C Mescalero

The T-41A trainer is a standard Cessna Model 172 light aircraft acquired by USAF for use in the generalized preliminary flight screening program for USAF pilot candidates. An initial order for 170 aircraft in 1964 was supplemented by a further 34 in 1967. More powerful T-41Cs, based on the Cessna Model R172E, are used for cadet flight training at the USAF Academy. Around 100 T-41s remain in USAF service. (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 9 1/2 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-engined 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 18 aircraft ordered for ATC were completed in July 1974. Most remain in the ATC inventory; four others are assigned to the ANG; one T-43A with VIP interior is assigned to the 58th MAS at Ramstein AB, Germany. The aircraft are being repainted in an all-white paint scheme.

Contractor: Boeing Aerospace Company.
Power Plant: two Pratt & Whitney JT8D-9 turbofans; each 14,500 lb thrust.

Accommodation: crew of two, 12 students, five advanced students, and three instructors.

Dimensions: span 93 ft 0 in, length 107 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.

UV-18B Twin Otter

The UV-18B is a military version of the DHC-6 Twin Otter STOL utility transport. Two were procured in FY 1977 for use as parachute jump training aircraft at the Air Force Academy.

Contractor: The de Havilland Aircraft of Canada Ltd.
Power Plant: two Pratt & Whitney Canada PT6A-27 turboprops; 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 25,700 ft, range with 2,500 lb payload 806 miles.

Helicopters

HH-1H Iroquois

Basically a military version of the Bell Model 205, the HH-1H is a general-purpose helicopter first ordered by USAF in 1970 and used for missile site support duties.

Contractor: Bell Helicopter Textron Inc.
Power Plant: one Textron Lycoming T53-L-13B turbo-shaft; 1,400 shp.

Accommodation: two pilots and 12 passengers; or two crew and 2,400 lb of cargo.

Dimensions: rotor diameter 48 ft 4 in, length of fuselage 42 ft 0 in, height 13 ft 0 in.

Weight: gross 9,500 lb.

Performance: max speed 120 mph, service ceiling at mission gross weight 13,450 ft, range with max fuel 347 miles.

UH-1N Iroquois

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 missile site support duties and administrative airlift. The UH-1N is also used by the 1550th CCTW at Kirtland AFB, N. M., for training purposes.

Contractor: Bell Helicopter Textron Inc.

Power Plant: Pratt & Whitney Canada T400-CP-400 Turbo "Twin-Pac," consisting of two PT6 turboshafts 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 2 1/4 in, length of fuselage 42 ft 4 3/4 in, height 14 ft 10 1/4 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.

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 reengineered CH-3Cs, of which 50 were adapted subsequently as HH-3Es (see below). CH-3 missions include Special Operations duties, natural disaster relief, and evacuation.

Contractor: Sikorsky Aircraft, Division of United Technologies Corporation.

Power Plant: two General Electric T58-GE-5 turboshafts; 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 percent 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 Air Rescue 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-3Es are now assigned primarily to rescue units of AFRES and ANG. (Data basically similar to those for CH-3E, above.)

MH-53J/Pave Low/TH-53A

In a program initiated in 1986 to upgrade the Special Operations Forces, Sikorsky has modified the 41 remaining HH/CH-53B/C and MH-53H helicopters. Designated MH-53J, these **Pave Low III "Enhanced"** aircraft are equipped with a nose-mounted FLIR, an integrated digital avionics suite that includes Texas Instruments AN/APQ-158 terrain-following and terrain-avoidance radar, GPS terminals, secure communications, an advanced ECM system, titanium armor plating, mounts for .50-caliber machine guns and/or 7.62-mm Miniguns, and chaff/flare dispensers.

Deliveries began in the summer of 1987 to the 20th SOS at Hurlburt Field AFB, Fla., followed by the 21st SOS at RAF Woodbridge, UK, in 1988. A further four were delivered to the 1550th Combat Crew Training Wing at Kirtland AFB, N. M. This unit also uses four **TH-53As**, modified USMC CH-53As, as basic qualification trainers. Modifications include the installation of General Electric T64-GE-416 engines and some standard USAF equipment. Two more CH-53As for conversion are to be delivered by 1992. (Data for MH-53J.)

Contractor: Sikorsky Aircraft, Division of United Technologies Corporation.

Power Plant: two General Electric T64-GE-100 turboshafts; each 4,330 shp.

Accommodation: crew of six.

Dimensions (HH-53B): rotor diameter 72 ft 3 in, length of fuselage (without refueling probe) 67 ft 2 in, height 24 ft 11 in.

MH-60G/Pave Hawk

As a remedy for a shortfall in its rescue helicopter inventory, USAF acquired 92 UH-60A Black Hawks in standard US Army configuration, including a rescue hoist, deicing system, and winterization and air transportability kits. Beginning in 1982-83, these were delivered to the 55th ARRS (now the 55th SOS) at Eglin AFB, Fla. Sikorsky Support Services of Troy, Ala., has since been contracted to modify these helicopters to MH-60G Pave Hawk standard by installing an aerial refueling probe, auxiliary fuel tank, and fuel management panel. All will be upgraded further to have Doppler/INS, an electronic map display, Tacan, a lightweight weather/ground mapping radar, secure HF and Satcom, and .50-caliber machine guns. Ten of the MH-60G helicopters have been designated for Special Operations; the remainder will go to combat rescue units of the active-duty, Reserve, and ANG forces. The MH-60Gs will be suitable for precision low-level missions in day/night VMC, including marginal weather.

Contractor: Sikorsky Aircraft, Division of United Technologies Corporation.

Power Plant: two General Electric T700-GE-700 turboshafts; each 1,560 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 0 3/4 in, height 16 ft 10 in.

Weights: empty 10,624 lb, max gross 22,500 lb.

Performance: max speed 192 mph, service ceiling 19,000 ft, max range, with reserves, 373 miles (internal fuel), 500 miles (auxiliary tank).

V-22A Osprey

Despite appropriated FY 1991 funding of \$238 million for continued R&D and \$165 million (plus \$200 million from earlier funding) for advance procurement of pro-



UH-1N Iroquois



MH-53/Pave Low (right)



MH-60G/Pave Hawk



V-22A Osprey

duction representative aircraft, the Secretary of Defense has maintained his decision, made in the FY 1990 budget submission, to terminate the V-22 Osprey program.

Following on from the US government's Joint Services Advanced Vertical Lift Aircraft (formerly JVX) proposal, a contract was awarded in May 1986 to Boeing Helicopters and Bell Helicopter Textron as prime contractors in a seven-year full-scale development (FSD) program for the V-22 Osprey. The USN and USAF were to have participated in the program, with the former as executive service. This tilt-rotor, multimission aircraft, based on Bell's XV-15, is designed to have the maneuverability and lift capability of a helicopter and the speed of a fixed-wing aircraft. Boeing has overall responsibility for the aircraft's tail unit, overwing fairings, and fuselage, while Bell provides the wing, nacelles, transmissions, and rotor hub assemblies. Under subcontracts, Grumman is responsible for design and manufacture of the V-22's tail unit, General Electric the digital fly-by-wire flight-control system, LMSC-Georgia the wing control surfaces and fixed trailing-edge, and Menasco of Canada and Dowty of Canada, respectively, the nose and main landing gear. Allison supplies the aircraft's two 6,000 shp T406-AD-400 turboshaft engines.

The Marines have a stated requirement for 552 aircraft, the Navy 50 aircraft, and USAF Special Operations Forces (SOF) 55. The SOF (CV-22A) version was to carry 12 troops or up to 2,880 lb of internal cargo over an 860-mile combat radius at 288 mph, with capability to hover OGE (out of ground effect) at 4,000 ft at 95 degrees Fahrenheit.

First flight of the V-22 Osprey was made in March 1989, and all six full-scale development aircraft are scheduled to be flying by the end of this year. On September 14, 1989, the Osprey achieved full conversion from helicopter mode to airplane mode while in flight. The aircraft had also demonstrated a speed in excess of 322 knots TAS at 13,000 ft, made 268 flights, and accumulated 292 hours of accident-free flying time by early 1991.

Dimensions: rotor diameter (each) 38 ft 0 in, fuselage length 57 ft 4 in, height over tail fins 17 ft 7 3/4 in.

Weights (normal mission weight): VTO 47,500 lb, STO 60,700 lb.

Performance: max cruising speed in helicopter mode 115 mph, in airplane mode 345 mph, service ceiling 26,000 ft, range VTO 1,382 miles, STO 2,073 miles.

Strategic Missiles

LGM-30F/G Minuteman

With more than two decades of operational service, Minuteman remains a key element of the US strategic deterrent posture. It is a three-stage, solid-propellant ICBM, 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 undergoing a depot-level maintenance refurbishment, known as Rivet Mile, to correct existing, and retard future, age-related deterioration of facilities. The current versions:

LGM-30F Minuteman II: Similar in configuration to the original Minuteman I, Minuteman II has increased range and targeting coverage and increased accuracy and payload capacity. Operational since 1965, it is based at Malmstrom AFB, Mont.; Ellsworth AFB, S. D.; and Whiteman AFB, Mo. In the late summer of 1986, Minuteman IIs at Malmstrom and Whiteman AFBs were equipped with a command data buffer capability to permit remote targeting, as in Minuteman III.

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. First test launch was made in 1968. 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. Deployment of the larger yield Mk 12A RV was completed in 1983.

Of the original force of 450 Minuteman IIs and 550 Minuteman IIIs, 50 have been displaced by Peacekeeper missiles. However, enhancements and modifications under way will maintain the viability of the force well beyond the year 2000. On the missile itself, the second-stage motors on both versions are being washed out and repoured; the third-stage motors on Minuteman III are being remanufactured. In addition, improvements to the Minuteman II's missile guidance set are continuing under the Accuracy, Reliability, Supportability Improvement Program; Minuteman III's guidance has been upgraded to improve its accuracy by 30 percent. The Rapid Execution and Combat Targeting (REACT) Program will ensure long-term supportability of the aging electronics components and will modify the Launch Control Center, enabling real-time status information on the weapons and com-

munications nets to correct operability problems, improve responsiveness to launch directives, and provide rapid retargeting capability.

Assembly and Checkout: Boeing Aerospace.

Power Plant: first stage: Thiokol M-55 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; 17,000 lb thrust (LGM-30F), 34,400 lb thrust (LGM-30G).

Guidance: Autonetics Division of Rockwell International inertial guidance system.

Warheads: LGM-30F: one nuclear (1.2 megatons); LGM-30G: three Mk 12A MIRVs (each 335 kilotons).

Dimensions: length LGM-30F 55 ft 10 in.; LGM-30G 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

In response to the improved hardness of Soviet strategic forces, deployment of 50 Peacekeeper missiles in existing Minuteman III silos near F. E. Warren AFB, Wyo., began in June 1986. Initial operational capability for the first ten Peacekeepers was achieved in December of that year; full operational capability with 50 missiles followed in December 1988. Altogether, 102 Peacekeepers were funded during FYs 1984-90, with 12 more approved in FY 1991. However, the FY 1990 budget approved a statutory cap on deployment of only 50 of these missiles. Plans to redeploy the Peacekeepers in a rail-garrison mode for greater survivability have been revised, with the congressional decision to allocate funding only for completion of the current research stage of the system, which is then to be mothballed for possible future use.

Peacekeeper is a four-stage ICBM that carries up to ten independently targetable reentry vehicles. It has many advantages over other missile systems currently in the US inventory. In particular, it is more accurate, carries more warheads, and has greater range and target flexibility than the Minuteman missiles. 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 would provide a decisive deterrent to any hostile first strike.

Basing: Boeing Aerospace and Electronics.

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 and Rockwell.

Warheads: ten Avco Mk 21 MIRVs (each 500 kilotons).

Dimensions: length 71 ft, diameter 7 ft 8 in.

Weight: approx 195,000 lb.

MGM-134A Small ICBM (SICBM)

Full-scale development of this single-warhead ICBM, unofficially called "Midgetman," is continuing, with further funding approved in the FY 1991 budget. Deployment on road-mobile, radiation-hardened truck launchers would enhance survivability, although the Pentagon has been requested to consider a silo-basing mode for the SICBM "while preserving a realistic option for subsequent mobile basing" if that becomes necessary. Despite its relatively small size, the SICBM is expected to have sufficient accuracy to ensure a high probability of damage to hard targets. IOC is planned for 1997, but the future of the SICBM is largely dependent on the outcome of US-Soviet strategic arms reduction talks. The first cold launch of an SICBM from an above-ground silo at Vandenberg AFB, Calif., in May 1989, was unsuccessful.

Contractors: Martin Marietta, General Electric (reentry vehicle), and Boeing Aerospace and Electronics (launch vehicle).

Power Plant: solid-propellant three-stage rocket motors.

Guidance: Northrop modified Advanced Inertial Reference Spheres system.

Warhead: single Mk 21 RV (500 kilotons).

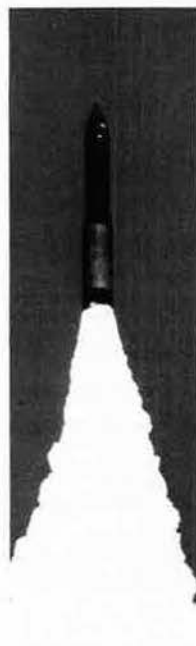
Dimensions: length 46 ft, body diameter 3 ft 10 in.

Weight: 37,000 lb.

Performance: range 6,835 miles.

AGM-69A SRAM

All AGM-69A short-range attack missiles arming SAC's bomber fleet sitting on ground alert were ordered to be removed last June because of doubts as to their safety. This defense suppression and primary attack missile was deployed initially with the B-52Gs of SAC's 42d Bombardment Wing (Heavy) 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.



**LGM-30G
Minuteman III**



**LGM-118A
Peacekeeper**

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. SAC B-1Bs can carry 24 AGM-69As internally; B-52Gs/Hs can carry eight AGM-69As on a rotary dispenser in the aft bomb bay, together with up to four nuclear bombs; and FB-111As can carry four AGM-69As on swiveling underwing pylons and two internally. FB-111As converted to F-111G standard retain their AGM-69A compatibility. When AGM-69As are carried externally, a railcone, 22.2 inches 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: W69 nuclear (170 kilotons).

Dimensions: length 14 ft 0 in, body diameter 1 ft 5 1/2 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-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



AGM-86B ALCM



AGM-129A Advanced Cruise Missile

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, AGM-86Bs improve the ability of manned aircraft to penetrate to major targets. Small radar signature and low-level flight capability enhance the missile's effectiveness. Delivery of the last of 1,715 production models was accomplished in October 1986. USAF completed deployment of AGM-86s on 98 (now 97) on-line B-52Gs in 1984, with 12 missiles fitted externally to each aircraft. B-52Hs are undergoing a similar conversion, which was scheduled for completion in FY 1990. Ultimately, each B-52H is intended to be modified further to have a bomb-bay common strategic rotary launcher (CSRL) for eight more ALCMs, eight SRAMs, or a mix of both. ALCM-equipped units are at Griffiss AFB, N. Y., Wurtsmith AFB, Mich., Fairchild AFB, Wash., Eaker AFB, Ark., Carswell AFB, Tex., Barksdale AFB, La., and Minot AFB, N. D.

Contractor: Boeing Aerospace Company.

Power Plant: Williams International Corporation/Teledyne CAE F107-WR-100 turbofan; 600 lb thrust.

Guidance: inertial plus Tercom, by Litton.

Warhead: W80-1 nuclear (200 kilotons).

Dimensions: length 20 ft 9 in, body diameter 2 ft 0 1/2 in, wing span 12 ft.

Weight: 3,200 lb.

Performance (approx): speed 500 mph, range more than 1,500 miles.

AGM-129A (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. In addition, McDonnell Douglas was awarded a contract in November 1987 for technology transfer leading to second-source capability for this advanced system and has flight-tested its first missiles. However, doubts now exist as to the feasibility of second-source acquisition for such a relatively low missile buy. The ACM has improved range, accuracy, survivability, and targeting flexibility compared with the AGM-86B, notably through embodiment of low-observability technology. Delivery of production AGM-129As began last June; it is expected to enter service in 1992. One hundred AGM-129As were funded in the FY 1991 budget. There are no current plans to deploy them on the B-1B.

Contractor: General Dynamics (Convair)/McDonnell Douglas Missile Systems.

Power Plant: Williams International F112 turbofan.

Guidance: inertial, with midcourse terrain update.

Warhead: nuclear (200 kilotons).

Dimensions: length 19 ft 8 in.

Weight: 2,750 lb.

Performance: range 1,865 miles.

AGM-131A SRAM II/AGM-131B SRAM-T

Full-scale development (FSD) has been under way since 1987 of this nuclear-capable air-to-surface missile intended to augment, and eventually replace, the aging AGM-69A. The AGM-131A SRAM II will arm B-1Bs and B-2s and will be capable of penetrating advanced defense systems from standoff ranges to strike hardened, heavily defended targets and mobile targets. It will use existing propulsion, guidance, and airframe technology to make possible significant performance improvements without unacceptable program risk. Major program activities include development of a new Hercules rocket motor to provide higher missile velocities and increased range; development by Litton of a guidance system that will ensure greater accuracy, even with extended range; and incorporation of a new digitally controlled warhead with modern safety features. Like the AGM-69A, SRAM II will be supersonic.

First live launch of the AGM-131A is expected in the late spring or early summer of this year. A low-rate initial production was scheduled to follow, during which time second-source subcontractors would be qualified. Planned procurement is for 1,633 missiles, with IOC originally scheduled for 1993.

A variant of the SRAM II for the tactical air forces, designated AGM-131B SRAM-T, entered full-scale development last year. This version will have a slightly different warhead as well as minor differences in computer memory cards and connectors, but will have 95 percent commonality with the A model. SRAM-Ts will equip F-15Es and (possibly), later, F-111s, F-16s, and allied Tornados. The first captive-carry tests on an F-15E were successfully completed last November. (Data for AGM-131A.)

Contractor: Boeing Aerospace.

Power Plant: Hercules solid-propellant rocket motor.

Warhead: Department of Energy W89 nuclear warhead.

Dimensions: length 14 ft 0 in, diameter 1 ft 3 1/2 in.

Weight: 1,920 lb.

BGM-109G Gryphon GLCM

All GLCM missiles and reactor launchers are scheduled to have been eliminated by May 31 this year, in accordance with the INF Treaty.

Airborne Tactical and Defense Missiles

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 was the original design, primarily for use by the F-4 Phantom. The AIM-7E-2 and E-3 are improved versions that provide 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 currently equips USAF and USN F-4, F-14, F-15, and F/A-18 aircraft and will equip the F-16 (ADF). 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 1980 and began operational service during FY 1983. AIM-7P/RIM-7P introduces improvements to the fuze and electronics, aimed at increasing lethality against sea-skimming antiship missiles and cruise missiles. Development began in 1987. Delivery of early production missiles is anticipated this year. AIM-7s, equipped with telemetry packages in place of warheads, are being used in a program, initiated by the Tactical Air Warfare Center (TAWC) at Eglin AFB, Fla., and linked with industry, to develop passive missile-warning systems for USAF tactical aircraft. (Data for AIM-7F)

Contractors: Raytheon Company/General Dynamics Pomona Division.

Power Plant: Hercules Mk 58 Mod 0 boost-sustain rocket motor.

Guidance: Raytheon semiactive Doppler radar homing system.

Warhead: high-explosive, blast fragmentation, weighing 86 lb.

Dimensions: length 11 ft 10 in, body diameter 8 in, wing span 3 ft 4 in.

Weight: launch weight 504 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 the USAF inventory:

AIM-9P: improved version of the AIM-9J, produced by Ford Aerospace by converting 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 as a result of fuze improvements and a new rocket motor, providing reduced smoke and increased range.

AIM-9P-4: improved version of AIM-9P-3 developed by Ford Aerospace. A new guidance control unit provides an increased target acquisition envelope. The AIM-9P-4 is for foreign military sales.

AIM-9L: third-generation Sidewinder for USAF and USN, with all-aspect intercept capability. Improvements include 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 offers self-defense capability for 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 1981 with an order for approximately 1,850 missiles; a tenth annual contract (FY 1990) for AIM-9M guidance and control systems has been awarded to Raytheon.

AIM-9R: development of AIM-9M with improved control and guidance section for greater target acquisition range and better resistance to ECM. FSD started in 1986, and captive-carry flights began in 1988. This version is expected to be in service in the early years of this decade, with many AIM-9Ms being converted to AIM-9R standard between 1992 and 1994.

AIM-9 missiles, equipped with telemetry packages in place of warheads, are being used by USAF's Tactical Air Warfare Center (TAWC) in an industry-linked program to develop passive missile-warning systems for USAF's tactical aircraft. (Data for AIM-9M.)

Contractor: Raytheon Company/Ford Aerospace and Communications Corporation.



AIM-7 Sparrow

Power Plant: Thiokol Hercules Mk 36 Mod 11 solid-propellant rocket 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; range more than 10 miles.



AIM-9L Sidewinder



AIM-120A AMRAAM



AGM-45A Shrike



AGM-65 Mavericks

AIM-120A (AMRAAM)

Intended as a replacement for the AIM-7 Sparrow, the Advanced Medium-Range Air-to-Air Missile (AMRAAM) is expected to provide an all-weather, all-environment capability for USAF's F-15, F-16, and ATF and the Navy's F-14 and F/A-18 fighters. Development has been under way since December 1981.

Designated AIM-120A, AMRAAM has inertial mid-course guidance and active radar terminal homing that provide launch-and-maneuver capability. 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.

A leader/follower program has been under way (Hughes/Raytheon), with the preproduction effort (productivity and qualification) in FY 1986 and low-rate initial production in FY 1987 (180 missiles). Hughes and Raytheon were awarded Lots 1 and 2 and will compete for subsequent lots. The first production AIM-120A was delivered by Hughes in 1988, with the 33d TFW at Eglin AFB, Fla., due to become the first operational unit to receive AMRAAM missiles. A preplanned product improvement (P³) program seeks to develop AMRAAM improvements, including rapid reprogramming, adjustable countermeasures, advanced counter-countermeasures, and options for smart ordnance packages and dual-mode fuzing. Funding for 450 more AMRAAMs has been approved for FY 1991; a decision regarding full-rate production will be made following the completion of the extended operational test program and reliability improvements.

Contractors: Hughes Aircraft Company/Raytheon Company.

Guidance: inertial midcourse, with active radar terminal homing.

Dimensions: length 12 ft, body diameter 7 in, span of tail control fins 2 ft 1 in.

Weight: 340 lb.

Performance: cruising speed approx Mach 4, range approx 31 miles.

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 defense suppression F-16Cs. Upgrading under the Shrike gravity bias modification program resulted in improved capabilities at low altitude.

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 the missile 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-111F, F-16, and F-15E, singly or in three-round underwing clusters, for use against pinpoint targets, such as tanks and columns of vehicles.

AGM-65B has a "scene magnification" TV seeker that enables the pilot to identify and lock on to smaller or more distant targets. Orders for AGM-65A/Bs totaled 19,000.

To overcome limitations of the TV Maverick, which can be used only in daylight clear-weather conditions, two further versions have been developed:

AGM-65D: with imaging infrared (IIR) seeker as well as a new lower-smoke motor. AFOTEC and TAC conducted operational flight testing with 25 live launches from A-7, A-10, F-4E, F-4G, and F-16 aircraft at Nellis AFB, Nev., in September 1986, resulting in 24 direct hits on a variety of vehicles. IIR Maverick became operational on A-10s at RAF Bentwaters, UK, in February 1986.

AGM-65G: uses the IIR seeker with an alternate 298 lb blast fragmentation warhead for use against hardened targets. Software has been modified to include options for targeting ships and large land targets as well as mobile armor. This version also has a digital autopilot and a pneumatic, rather than hydraulic, actuation system. First successful launch took place in November 1987; the version is now in production.

A total of 19,542 AGM-65D/Gs has been ordered for USAF through FY 1990, with the final order awarded to Hughes last year. Contract completion is scheduled for next year. Raytheon was second-source supplier. (Data for AGM-65A.)

Contractor: Hughes Missile Systems Group/Raytheon 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 4 1/2 in.

Weight: launch weight (AGM-65A) 462 lb, (AGM-65G) 662 lb.

Performance: range 0.6 to 14 miles.

AGM-84A Harpoon

USAF initiated a cooperative memorandum of understanding with USN to equip two 15-aircraft B-52G squadrons with the Harpoon all-weather antiship missile in support of maritime antisurface warfare operations. Compatibility testing began in the spring of 1983, and full operational capability was achieved that October. Currently, one full squadron of modified aircraft is located at Loring AFB, Me., for Atlantic operations. Each B-52G can carry eight to 12 missiles.

Contractor: McDonnell Douglas Missile Systems Company.

Power Plant: Teledyne CAE J402-CA-400 turbojet; 660 lb thrust.

Guidance: sea-skimming cruise monitored by radar altimeter, active radar terminal homing.

Warhead: penetration high-explosive blast type, weighing 488 lb.

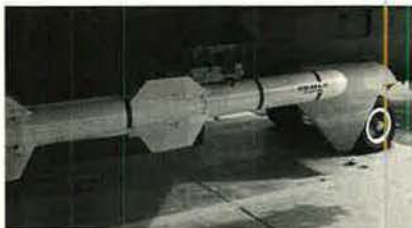
Dimensions: length 12 ft 7 1/2 in, body diameter 1 ft 1 1/2 in, wing span 3 ft.

Weight: 1,145 lb.

Performance: speed high subsonic, range more than 57 miles.

AGM-88A/B/C HARM

The lethality of USAF's F-4G Wild Weasel is greatly enhanced by the availability of **AGM-88A HARM** (High-speed Antiradiation 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 to 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. An integration program is ongoing to equip F-16s in the defense suppression role with HARM. The missile is also suitable for adaptation to the EF-111A and F-15. Current production version is the **AGM-88B**, with tungsten alloy cubes in the warhead rather than steel. EEPROMs (Erasable Electronically Programmable Read Only Memory) have been retrofitted on USAF, PACAF, and TAC HARMs, permitting changes to missile memory in the field. A Block IV upgrade will make the missile more effective against new-generation targets. In March last year, Ford Aerospace received a contract for the manufacture of 100 lower-cost seekers to equip a new USAF/USN variant of HARM, the **AGM-88C**. By the end of 1990, a total of 5,854 HARMs had been delivered. USAF plans to acquire over 10,000 by the time production ends in 1997. (Data for AGM-88A.)



AGM-84A Harpoon



AGM-88A/B/C HARM



AGM-142A Have Nap

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 8 1/2 in, body diameter 10 in, wing span 3 ft 8 1/2 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-130A

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. This capability was demonstrated to great effect when, on January 27 this year, an F-111-launched GBU-15 attacked the pipelines leading to the Sea Island terminal in the Persian Gulf in an effort to minimize the environmental impact of oil flowing into the sea from a war-damaged plant.

Development began in 1974, based on experience gained in Vietnam with the earlier Pavé 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, attaches to the rear.

The weapon offers two modes of attack. In direct attack, the weapon is locked on to the target before launch and flies a near line-of-sight profile to impact. In the indirect mode, 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. This profile uses a midcourse glide phase and extends standoff range. The GBU-15 is deployed with F-4E and F-111 aircraft and has been test launched from the F-15E and F-16D. The **GBU-15(V)1/B** TV-guided variant qualified for operational service in 1983, and production is now complete; the **GBU-15(V)2/B** imaging infrared (IIR) version entered service in 1987. An improved version, the **GBU-15-I**, is being developed to combine the accuracy of the GBU-15 with the penetration capability of the improved 2,000 lb BLU-109/B iron bomb.

Production of the **AGM-130** rocket-powered version of the GBU-15 was postponed under the amended FY 1988-89 budget requests. However, testing continued through completion of the originally contracted program, and the weapon has now been cleared for production. USAF is seeking funding for 960 TV-guided and 3,088 infrared-guided versions of the AGM-130, which have been certified for use with the F-4E and F-111 and are currently undergoing certification on the F-15E. (Data for GBU-15.)

Contractor: Rockwell International Corporation.

Guidance: TV or imaging infrared seeker.

Warhead: Mk 84 bomb (2,000 lb unitary).

Dimensions: length 12 ft 10 1/2 in, body diameter 1 ft 6 in, wing span 4 ft 11 in.

Weight: 2,450 lb.

Performance: cruising speed subsonic.

AGM-142A Have Nap

Under the Have Nap program, USAF began acquisition of the Israeli-built Popeye medium-range, inertial/TV-guided standoff missile. Initial Operational Test and Evaluation launches were completed in May last year, and a coproduction agreement has been entered into between Rafael and Martin Marietta.

The purpose of Have Nap is to provide long-range bombers with a conventional precision strike capability, in support of worldwide theater commanders. Primary carrier aircraft is the conventionally dedicated B-52G.

Contractor: Rafael Armament Development Authority.

Power Plant: solid-propellant rocket motor.

Guidance: inertial, with TV homing.

Warhead: high-explosive, weighing 1,975 lb.

Dimensions: length 18 ft 8 1/2 in, body diameter 1 ft 8 1/2 in, wing span 5 ft 1 in.

Weight: 3,300 lb.

Performance: range 50 miles.

Rapier

Rapier is unusual in that US landbased anti-aircraft 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 were deployed at seven USAF bases in the UK to protect Air Force installations. The last unit became operational in July 1986. 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 operates 14 US-owned fire units for the defense of US air bases in that country.

Contractor: British Aerospace PLC, Dynamics Division.
Power Plant: IMI two-stage solid-propellant rocket 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 4 in, body diameter 5 in, wing span 1 ft 3 in.
Weight: approx 94 lb.
Performance: max speed more than Mach 2, range 4 miles.

Launch Vehicles

Atlas E

Atlas E is a modified ICBM, used to launch various USAF and NOAA satellites. Four vehicles remain available for launch at Vandenberg AFB, Calif., with the last launch currently scheduled for FY 1992.

Prime Contractor: General Dynamics Corporation, Convair Division.

Power Plant: Rocketdyne MA-3 propulsion system, comprising central sustainer motor and two boosters; total thrust 387,000 lb.

Dimensions (Atlas stage): length 61 ft 8 in, body diameter 10 ft 0 in.

Launch Weight: 275,000 lb.

Performance: capable of putting 1,750 lb into a 100 nm polar orbit.

Atlas II

In May 1988, USAF selected General Dynamics to build an upgraded Atlas/Centaur vehicle, Atlas II, to meet its continuing medium launch vehicle (MLV II) requirement. The familiar "stage-and-a-half" configuration of the original ICBM is retained for the basic Atlas. Changes include lower-cost advanced avionics, an improved flight computer, booster engines with greater thrust, and longer propellant tanks. The engine and tank changes will be made to both the Atlas and Centaur stages. Eleven Atlas II vehicles have been procured, with the first flight scheduled for this year. Primary payload will be the Defense Satellite Communications System (DSCS).

Since their initial operation in 1957, Atlas and Atlas/Centaur vehicles have achieved a 90th percentile success rate in around 500 launches of military and commercial satellites, as well as manned spacecraft.

Prime Contractor: General Dynamics Corporation, Convair Division.

Power Plant: uprated Rocketdyne MA-5 propulsion system in Atlas stage, comprising central sustainer motor and two boosters; total thrust 414,000 lb.

Dimensions (Atlas stage): length 81 ft 7 in, max body diameter 10 ft 0 in.

Launch Weight: 412,000 lb.

Performance: capable of putting 11,200 lb into a low-Earth orbit and 6,100 lb into a geosynchronous transfer orbit.

Centaur

Centaur was the first US high-energy upper stage and the 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 used with the Atlas demonstrated widely ranging applications and capabilities. The nose section of Atlas was modified to a constant 10 ft diameter to accommodate the Centaur, which, in turn, provided most of the electronic command and control systems for the launch vehicle. A 10 ft diameter fairing protected payloads for Centaur D-1A.

The version of Centaur to be used on the new Atlas II will have modifications to its tanks and engines. The modified Centaur G-prime upper stage, with high-energy cryogenic propellants and multiple restart capability, will be used with the Titan IV, creating the greatest weight-to-altitude capability of any US launch vehicle, by placing a 10,200 lb payload into geosynchronous orbit. (Data for Centaur D-1A and G-prime.)

Prime Contractor: General Dynamics Corporation, Convair Division.

Power Plant: two Pratt & Whitney RL 10A-3 liquid oxygen/liquid hydrogen rocket engines; each 16,500 lb thrust.

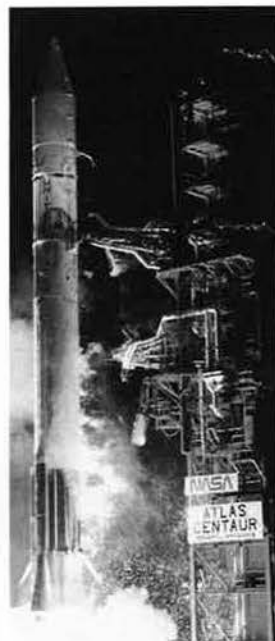
Guidance: inertial guidance system.

Dimensions (Centaur D-1A only): length 30 ft 0 in, diameter 10 ft 0 in.

Launch Weight: (D-1A, approx) 35,000 lb; (G-prime-mod, approx) 53,000 lb.

Scout

Scout was designed to enable NASA and DoD to conduct space, orbital, and reentry research at comparative



Atlas II



Titan IV



Delta II

ly low cost, using off-the-shelf major components where available. The basic current version, with fourth stage improved over earlier vehicles, 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. Only four Scouts remain in the inventory, and these will be succeeded by a new small launch vehicle.

Prime Contractor: LTV Missiles & Electronics Group (a unit 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.

Dimensions: height overall 75 ft 5 in, max body diameter 3 ft 9 in.

Launch Weight: 47,619 lb.

Titan IV

In February 1985, the Titan IV was selected to augment the space shuttle and to allow greater flexibility in launching critical military payloads. It is a growth version of the earlier Titan 34D, with stretched first and second stages, seven-segment solid boosters, a 16 ft 8½ in diameter payload fairing, and a modified Centaur G-prime upper stage, enabling it to place a 10,200 lb payload into geosynchronous orbit, 32,000 lb into low polar orbit, or 39,000 lb into low equatorial orbit. With an alternative Inertial Upper Stage (IUS), it can place 5,200 lb into geosynchronous orbit. It may also be flown with no upper stage. The addition of upgraded solid rocket motors this year will enhance performance by approximately 25 percent. USAF's original requirement of ten Titan IVs had increased to firm orders for 41 vehicles by mid-1989, with options on additional Titan IVs through 1995. First launch took place from Cape Canaveral, Fla., in June 1989; all three launches to date have been successful. Launches from the modified Space Launch Complex-6 at Vandenberg AFB, Calif., are scheduled to begin in FY 1996.

Prime Contractor: Martin Marietta Space Launch Systems.

Power Plant: first and second stages: Aerojet liquid hypergolic propellants; first stage 551,200 lb thrust; second stage 106,150 lb thrust; initially, two United Technologies solid rocket boosters, each 1,394,000 lb thrust, later two Hercules solid rocket boosters, each 1,700,000 lb thrust.

Guidance: Delco inertial guidance system; to be replaced by Honeywell digital avionics system from 24th vehicle.

Dimensions: first and second stages: height 119 ft 2½ in, diameter 10 ft.

Launch Weight: approx 1.9 million lb.

Inertial Upper Stage (IUS)

Used for the first time in October 1982, the highly reliable IUS serves as an upper stage for the Titan IV. 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 5,200 lb into geosynchronous orbit when used on Titan IV.

Prime Contractor: Boeing Aerospace.

Power Plant: aft-stage solid rocket motor 21,400 lb thrust, forward-stage solid rocket motor 18,500 lb thrust.

Guidance: inertial, plus star tracker.

Dimensions: length 17 ft, diameter 9 ft 2¼ in.

Launch Weight: 32,500 lb.

Delta II/SB-3A

In January 1987, McDonnell Douglas was selected by USAF to build 20 of a modified version of its Delta rocket to launch the Navstar Global Positioning System (GPS) satellites. Designated SB-3A, the Delta II is slightly larger than the earlier Delta in order to satisfy USAF's medium-payload requirement. The first launch took place in February 1989; to date, ten operational GPS satellites have been launched successfully. The current schedule calls for Navstar launches to take place at approximately two-month intervals. When complete in 1992, the Navstar constellation will consist of 21 operational satellites and three on-orbit spares, providing US and allied forces with worldwide, three-dimensional position and velocity information.

Delta II is a three-stage booster surrounded by nine solid-propellant, graphite epoxy motors (GEMs). The GEMs were not available for the first nine GPS flights, as they were still under development. These flights, therefore, employed a modified version of the original Delta's Castor IV engine, the Castor IVA. Delta II differs from the earlier version in having a 12 ft stretch in the first-stage tanks and, from flight number ten, an increased expansion ratio on the first-stage engine.

Additional Delta IIs are planned for procurement for GPS replenishment after the required constellation is achieved.

Prime Contractor: McDonnell Douglas Space Systems Company.

Power Plant: first stage: Rocketdyne RS-27A liquid-propellant engine, 237,000 lb thrust; second stage: Aerojet IT1P liquid-propellant engine, 9,400 lb thrust; third stage: Morton Thiokol SGS II derivative, 15,400 lb thrust; strap-on GEM solid rocket motors, 143,235 lb thrust.

Dimensions: length 130 ft, diameter 8 ft; bulbous payload fairing, max diameter, 9 ft 6 in.

Lift-off Weight: 509,000 lb.

Performance: 11,110 lb to 100 nm.

Advanced Launch Development (ALD)

This program encompasses development of the Space Transportation Main Engine (STME), a 600K class, gas-generator cycle, liquid oxygen/hydrogen engine; as well

as advanced avionics, manufacturing, structures, and all other space-launch systems. These advances will be fed into the evolutionary development by DoD and NASA of a new family of launch vehicles that will embrace the range of DoD mission requirements and the heavy-lift requirements of NASA. IOC for the first mission is approximately 2000.

Pegasus

The new Pegasus small launch vehicle made its maiden flight last year from Vandenberg AFB, Calif. This three-stage, solid-propellant winged vehicle is air-launched from a B-52 and is designed for maximum operational flexibility in delivering 500–800 lb payloads to low-Earth orbit. Conceived in 1987, Pegasus was developed jointly by Orbital Sciences Corporation and Hercules Aerospace Company as a private venture. The vehicle is currently under contract to the Defense Advanced Research Projects Agency (DARPA) for its first two flights. The Pegasus program will pass to USAF following its second flight, currently scheduled for the middle of this year. Pegasus will support the USAF space test program and SDIO.

Prime Contractor: Orbital Sciences Corporation and Hercules Aerospace Company.

Power Plant: three Hercules solid-propellant motors, developing 109,400 lb, 27,600 lb, and 7,800 lb thrust, respectively.

Guidance: inertial.

Dimensions: length 49 ft 0 in, wing span 22 ft 0 in, diameter 50 in.

Launch Weight: 42,000 lb.

Taurus

A more powerful version of the Pegasus space-launch vehicle is being developed, using an LGM-118 Peacekeeper missile first-stage addition. Taurus will be ground-launched from regular launch complexes; it may also be used to test a quick-readiness, mobile launch facility.

Aerial Targets

MQM-107B/D Streaker

A longer, reengineered 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.

Also in use with USAF, the **MQM-107D** is similar to the B version but is powered by a Teledyne CAE 373-8 engine (960 lb thrust). MQM-107B/Ds assigned to Tyndall AFB, Fla., and MQM-107Ds at Wallace AS in the Philippines are used to test and evaluate air-to-air missiles. (Data for MQM-107B.)

Contractor: Beech Aircraft Corporation.

Power Plant: one Microturbo TRI 60-2 Model 074 turbojet; 831 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 230–594 mph, operating height 50–40,000 ft, endurance 2 hr 18 min.

BQM-34A Firebee

Since initial development of the BQM-34A in the late 1950s, more than 6,000 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 AS in the Philippines and Tyndall AFB, Fla., are used in the testing and evaluation of a r-to-air missiles.

New reengineered BQM-34As are becoming USAF's standard subscale target drones. They are equipped with an updated General Electric J85-17C engine, which provides a thrust-to-weight ratio of 1:1, enabling this version to offer higher climb rates and 6g maneuvering capability. A new microprocessor flight control system (MFCS) provides a prelaunch and in-flight self-test capability. Since 1989, the new targets have been used for weapon system evaluation at Tyndall AFB. (Data for BQM-34A.)

Contractor: Teledyne Ryan Aeronautical.



MQM-107B Streaker



BQM-34A Firebee



QF-100



QF-106

Power Plant: one Teledyne CAE J69-T-29 turbojet; 1,700 lb thrust; later models have one General Electric J85-GE-7 turbojet; 2,450 lb thrust, or J85-GE-17C.

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 3/4 in, body diameter 3 ft 1 1/4 in, span 12 ft 10 3/4 in.

Weight: launch weight 2,500 lb.

Performance: max level speed at 6,500 ft 690 mph, operating height range 20 ft to more than 60,000 ft, max range 796 miles.

BQM-34M/L Firebee

Eighteen Firebee drones have been reactivated for tests of the Over-the-Horizon Backscatter (OTH-B) and North Warning Radar systems. The first was successfully tested in September 1987. The drones, which had been stored at the Warner Robins (Ga.) Air Logistics Center for ten years, are being used by the 6514th Test Squadron at Hill AFB, Utah.

Contractor: Teledyne Ryan Aeronautical.

Power Plant: one J69-T-41A turbojet; 1,920 lb thrust.

Guidance and Control: preprogrammed digital computer, with Doppler guidance system.

Dimensions: length 30 ft, body diameter 3 ft 1 1/4 in, wing span 14 ft 6 in.

Weight: max launch weight 3,113 lb.

QF-100

The last QF-100s were produced in September 1990. These converted F-100 fighter-bombers are used as full-scale aerial targets for air-to-air and ground-to-air missile evaluation at Eglin Gulf Test Range in Florida and White Sands Missile Range in New Mexico. Approximately 50 QF-100s remain in the inventory.

Contractor: initial deliveries (from 1981) Sperry Corporation; follow-on (from 1984) FSI.

Power Plant: one Pratt & Whitney J57-P-21A turbojet; 16,950 lb thrust.

Guidance and Control: Dual Vega command guidance and telemetry systems.

Dimensions: length 54 ft 3 in, height 16 ft 2 3/4 in, wing span 38 ft 9 1/2 in.

Weight: mission operational weight 31,000 lb.

Performance: max speed at altitude Mach 1.3, operating height range 200–50,000 ft, nominal range 138 miles.

QF-106

The QF-106 is replacing the QF-100 as USAF's FSAT. Advantages of the QF-106 over the QF-100 include higher supersonic speeds while under remote control and increased maneuverability. Approximately 194 F-106s will be converted to FSATs.

Contractor: Honeywell Inc.

Power Plant: one Pratt & Whitney J75-P-17 turbojet; 24,500 lb thrust with afterburning.

Guidance and Control: automatic flight-control system with digital backup.

Dimensions: length 70 ft 8 in, height 20 ft 3 in, wing span 38 ft 5 in.

Weight: mission operational weight 40,500 lb.

Performance: max speed Mach 2, service ceiling 50–55,000 ft, range (approx) 400 miles.

Unmanned Air Reconnaissance System

Unmanned Air Reconnaissance System

The Unmanned Air Reconnaissance System (UARS), developed under a USAF/USN agreement, will provide a real-time/near-real-time unmanned reconnaissance complement to current and projected manned reconnaissance platforms. The UARS consists of the medium-range unmanned aerial vehicle (UAV-MR), being built by Teledyne Ryan Aeronautical, and the Advanced Tactical Air Reconnaissance System (ATARS) sensor payload, being developed by Control Data Corporation. The UAV-MR, designated **BQM-145A**, is capable of being air- or ground-launched and will carry interchangeable mission payloads up to 350 nm at high subsonic speeds. The vehicle first flew in October 1988. The ATARS payload will consist of interchangeable electro-optical and IR sensors, recorder, and data link. The first production system is scheduled for delivery in FY 1996.

Contractors: Teledyne Ryan Aeronautical/Martin Marietta.

Power Plant: One Teledyne CAE 382-10 turboprop.

Dimensions: length 18 ft 0 in, span 10 ft 6 in.

By John L. Frlsbee, Contributing Editor

Forgotten Firsts

IT MAY surprise some readers that Eighth Air Force Bomber Command did not begin operations against occupied Europe with B-17s or B-24s. The very first bomber unit to arrive in the UK and to see action, several weeks before the heavies, was the 15th Bombardment Squadron (Light), which had trained in twin-engine Douglas A-20s, designed as attack planes to support ground troops, not for strategic air warfare.

There were A-20s in the Royal Air Force before the 15th Bomb Squadron arrived in May 1942. Beginning in 1940, several hundred had been transferred to the RAF, some under Lend-Lease arrangements. Close support of armies on the Continent lay some distance in the future; the first RAF A-20s, called Havocs, were modified as night fighters. Others, known as Bostons, were used as low-level bombers.

It was expected that the AAF squadron would operate as a night fighter unit with RAF "Turbinlight" Havocs, planes equipped with powerful searchlights to illuminate enemy aircraft for the fighters. Plans change. Before the 15th arrived, the RAF had given up "Turbinlight" tactics.

Lacking operational experience, 15th Bomb Squadron crews, who had arrived without their A-20s, prepared for bombing operations under the guidance of RAF 226 Squadron at Swanton Morley. That squadron had been flying against targets in France and the Low Countries for several months. The Boston's small, 1,200-pound bomb load demanded very accurate delivery; hence missions were conducted at minimum altitude, where ground fire tended to be lethal.

By the end of June, 226 Squadron leaders judged most of the 15th's crews ready for the war. On June 29, 1942, Capt. Charles Kegelman and his crew—2d Lt. Randall Dorton, TSgt. Robert Golay, and Sgt. Bennie Cunningham—flew the first combat sortie by a USAAF bomber crew in the European theater as part of a twelve-plane formation of 226 Squadron Bostons.

Independence Day, July 4, seemed an appropriate date for the 15th to en-

ter combat formally. Six American crews joined six RAF crews for a low-level attack on Luftwaffe airfields in Holland. Taking off early in the morning, the Bostons formed four flights of three aircraft each and headed east across the North Sea, skimming the waves. As they crossed the Dutch coast, greeted by heavy AAA fire, the flights separated to attack their respective targets.



Eighth Air Force heavy bomber crews were not the first USAAF airmen to bomb targets in Europe, nor was a heavy bomber crewman the first in the Eighth to be awarded the DSC.

The flight assigned to hit De Kooy Airfield was led by an experienced RAF pilot, with Captain Kegelman flying one wing and 2d Lt. F. A. Loehrl the other. They approached the airfield through intense enemy fire. Near their target, Lieutenant Loehrl's plane was hit and crashed in flames. Captain Kegelman's took a direct hit in the right engine, shearing off the propeller and setting the engine afire. Simultaneously, the bomb load was released.

As Captain Kegelman fought for control, the lightened bomber surged upward, then settled back, its right wingtip striking the ground. Then the tail hit the ground, ripping off part of the lower fuselage. Jamming full

throttle on the left engine, Kegelman pulled the bomber into the air and with his forward guns silenced a flak tower that had zeroed in on his battered Boston.

Through a combination of skill and luck, Captain Kegelman brought his crew home from their first brush with battle damage. Safely through the band of coastal flak and somewhere over that hundred miles of cold North Sea water, the fire in his left engine went out. Luftwaffe fighters, flushed out by strikes on three of the four intended airfield targets, failed to intercept Kegelman's lone and limping bomber, which would have been an easy target for the crack German pilots based along the North Sea coast.

The 15th's RAF tutors and Bomber Command were elated over the performance of AAF crews on their first mission. Captain Kegelman was awarded the Distinguished Service Cross and its British equivalent for his valor on that Fourth of July mission—the first Eighth Air Force man to receive the nation's second highest combat decoration. Promoted to major, Kegelman was later given command of the squadron.

In August, the 15th Bombardment Squadron got its own aircraft—former RAF Bostons and A-20s from the States. The squadron flew a number of missions with Bomber Command and in October was transferred to Twelfth Air Force for support of Allied landings in North Africa. Its crews were absorbed by the 47th Bombardment Group (Light), and the 15th was inactivated. Nevertheless, the 15th Bombardment Squadron and its last commander, Maj. Charles Kegelman, had earned a unique but sometimes forgotten place in Air Force history: the first AAF unit to bomb targets in Europe and the first Eighth Air Force man to be awarded the Distinguished Service Cross.

After completing a tour in North Africa and being promoted to colonel, Charles Kegelman returned to the States to command a base in Oklahoma. He later was sent to the Pacific, where he lost his life in a flying accident over the Philippines. ■

AFA State Contacts



Following each state name are the names of the communities in which AFA chapters are located. Information regarding these chapters or any of AFA's activities within the state may be obtained from the appropriate contact.

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By Daniel M. Sheehan, Assistant Managing Editor

Price Visits Mobile

National Chairman of the Board Jack C. Price visited the **Mobile (Ala.) Chapter** to be the keynote speaker at its annual Tribute to Cadets awards banquet. While there, he spoke to a reporter from the *Mobile Press Register*. Mr. Price had high praise for Air Force personnel in general and AF-ROTC cadets in particular. He also noted the "paradox" of reductions in Defense budgets while US forces are involved in their biggest war in the last twenty years.

At the awards banquet, Mr. Price spoke of the achievements of the Air Force in Operation Desert Storm; the future role for AFROTC, AFJROTC, and Civil Air Patrol cadets; and the importance of work at the chapter level to help AFA reach its goals. He presented awards to four outstanding cadets: Cadet Third Class Jeffrey Todd of AFROTC Det. 23, University of South Alabama; AFJROTC Cadet Maj. Sharon Wilson of Foley High School, Foley, Ala.; Cadet Sgt. John Lassiter of the Mobile CAP Composite Squadron; and Cadet MSgt. Michael Fedor of the Eastern Shore CAP Composite Squadron, Baldwin County, Ala. In addition to sponsoring the awards, the Mobile Chapter donated \$250 to each cadet's organization. Chapter President William Divin gave Mr. Price a copy of *Voyager*, by Jeana Yeager and Dick Rutan with Phil Patton, as a token of appreciation for his speech.

Bell Awards

In a Pentagon ceremony hosted by Air Force Secretary Donald B. Rice, National Director Charles G. Durazo presented the J. Raymond Bell Journalist of the Year awards to the winners for 1991. Honored were CMSgt. Vickie M. Graham, Print Journalist of the Year; TSgt. Fernando Serna, Photo Journalist of the Year; and SSgt. Brady C. Russell, Broadcast Journalist of the Year. Sergeant Serna, deployed in Operation Desert Storm, could not attend the ceremony. A US Savings Bond, a one-year membership in AFA, and an AFA pen accompany each award. The awards honor the memory of J. Raymond



National President Oliver R. Crawford (second from right) and Board Chairman Jack Price (left), assisted by Rep. G. V. "Sonny" Montgomery (D-Miss.) (right), present Rep. Beverly Byron (D-Md.) a special plaque in recognition of her role in the 1990 reprogramming of needed funds into the Military Personnel Account.



Air Force Cadet Officer Mentor Action Program Treasurer Capt. Robert Catlin (center), flanked by AFA/AEF Executive Director Monroe Hatch (left) and President Crawford, displays the \$3,000 checks donated to the nonprofit motivational program by AEF and the East Coast Chapter of the Tuskegee Airmen. With the ACFCOMAP members are Lt. Gen. Thomas Hickey (fourth from left), USAF Assistant Secretary J. Gary Cooper (in bow tie), and Tuskegee Airmen Chapter President Philip Lee (far right).

Bell, longtime AFA leader and pillar of the **Iron Gate (N. Y.) Chapter**.

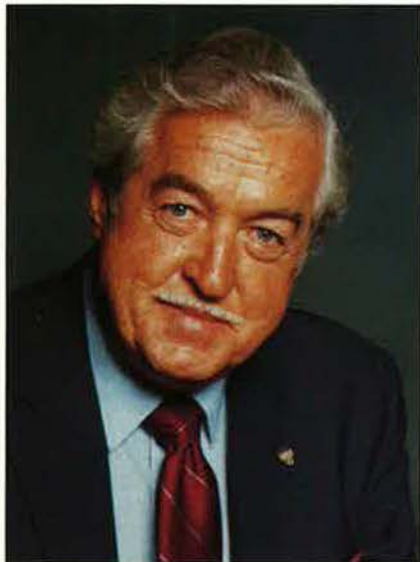
Chapter News

Members of the **Sacramento (Calif.) Chapter** gathered at McClellan

AFB, Calif., to get news of the progress of the B-2 Stealth bomber program from Bill Cassady, director of B-2 customer requirements for Northrop Corp. After the speech, chapter member Al Waters presented Mr. Cas-

sady with a commemorative sculpture, "Early Flying Man," in thanks for his presentation.

Also in California, members of the **Bakersfield Chapter** held their first annual awards dinner meeting to honor AFJROTC and CAP cadets. Cadet Sgt. Karen Anderson and Cadet SSgt. Gerald DeClaro of Bakersfield High School received the AFJROTC awards, and Cadet Maj. Alexander Gerrett and Cadet Lt. Col. Darin Mizner received the CAP awards. California State AFA Chairman of the Board John Lynch addressed the meeting,



The recent death of National Secretary Thomas W. Henderson dealt a blow to AFA. Mr. Henderson served with distinction for decades in many capacities, including national director and national vice president (Far West Region). President Crawford named National Director and Constitution Committee member Mary Anne Seibel to fill out Mr. Henderson's term.



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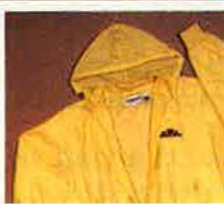
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AFA/AEF Report

presided over by Chapter President John W. Postgate, Jr.

The **Thunderbird (Nev.) Chapter** is already gearing up for the fiftieth anniversary of the Air Force, to be celebrated in Las Vegas in 1997. AFA Executive Director Monroe Hatch, Board

Coming Events

May 10-11, **Maryland State Convention**, Andrews AFB, Md.; May 10-12, **North Dakota State Convention**, Minot, N. D.; May 17-18, **Alaska State Convention**, Anchorage, Alaska; May 17-18, **South Carolina State Convention**, Myrtle Beach, S. C.; May 17-18, **Tennessee State Convention**, Arnold AFB, Tenn.; May 31-June 2, **Alabama State Convention**, Mobile, Ala.; May 31-June 2, **New York State Convention**, Niagara Falls, N. Y.; May 31-June 2, **South Dakota State Convention**, Rapid City, S. D.; June 1-2, **Arizona State Convention**, Sierra Vista, Ariz.; June 7-9, **New Jersey State Convention**, Atlantic City, N. J.; June 8, **Missouri State Convention**, Whiteman AFB, Mo.; June 14-16, **Mississippi State Convention**, Biloxi, Miss.; June 15, **Georgia State Convention**, Atlanta, Ga.; June 21-22, **Ohio State Convention**, Youngstown, Ohio; June 22, **New Hampshire State Convention**, Pease AFB, N. H.; July 12-13, **Louisiana State Convention**, Bossier City, La.; July 13, **Kansas State Convention**, Wichita, Kan.; July 19-20, **Colorado State Convention**, Lowry, Colo.; July 19-21, **North Carolina State Convention**, MCAS Cherry Point, N. C.; July 19-21, **Pennsylvania State Convention**, Pittsburgh, Pa.; July 19-21, **Texas State Convention**, San Antonio, Tex.; July 21, **Delaware State Convention**, Dover, Del.; July 25-28, **Florida State Convention**, St. Augustine, Fla.; July 26-27, **Arkansas State Convention**, Hot Springs, Ark.; July 26-28, **Virginia State Convention**, Crystal City, Va.; July 27, **Michigan State Convention**, Wurtsmith AFB, Mich.; August 2-3, **Minnesota State Convention**, Hinckley, Minn.; August 3, **Indiana State Convention**, Bloomington, Ind.; August 3, **Mid-America Ball**, St. Louis, Mo.; August 15-17, **California State Convention**, Edwards AFB, Calif.; August 22-24, **Utah State Convention**, Ogden, Utah; September 6-7, **Washington State Convention**, Seattle, Wash.; September 16-19, **AFA National Convention and Aerospace Development Briefings and Displays**, Washington, D. C.

Chairman Jack C. Price, and former Executive Director John O. Gray traveled to Las Vegas to begin coordinating plans for the big event with Scotty Wetzel, Las Vegas project officer for the fiftieth anniversary celebration, and P. K. Robinson, Jr., president of the Thunderbird Chapter. Mr. Price told a Las Vegas *Review-Journal* reporter that about 30,000 people will converge on Las Vegas for three days of air shows, historical and futuristic international exhibits, seminars and symposiums, and unit reunions.

A bit of history was refurbished thanks to members of the **Tennessee Valley (Ala.) Chapter**. An AFA Citation presented to famed rocket scientist Wernher Von Braun in 1970, on which the ink had since faded, was re-signed by the original signatories, former National Vice President (South Central Region) Jack T. Gilstrap and former Tennessee Valley Chapter Presi-

dent Moses H. K. Choo. The certificate was then placed in the exhibit honoring Dr. Von Braun at the Space and Rocket Museum in Huntsville, Ala.

Edward T. Nedder Dies

AFA notes with sadness the death of National Director Edward T. Nedder after a long illness. A prominent Boston attorney, Mr. Nedder served AFA with great distinction on countless committees during his long tenure. He is survived by his daughter Cecilia Bethoney. He had a family connection with AFA as well: His nephew Joe Assaf continues to serve as a permanent national director.

Have AFA News?

Contributions to "AFA/AEF Report" should be sent to Dave Noerr, AFA National Headquarters, 1501 Lee Highway, Arlington, VA 22209-1198. ■

Bulletin Board

Seeking contact with anyone who knew **Capt. Charles Joseph Caffarelli**, an F-111A crew member with the 474th Tactical Fighter Wing who was declared missing in action November 21, 1972. Also seeking contact with collectors to trade military aviation insignia. **Contact:** Joseph C. Caffarelli, 195 Prospect St., #102, East Orange, NJ 07017.

CAP Cadets seek donations of squadron or wing **patches**, stickers, photos, and other artifacts. **Contact:** John E. Odum, P. O. Box 1372, Lake City, SC 29560.

Seeking information on the whereabouts of **Cpl. Robert W. Clark**, of Giddings, Tex., who was a dental assistant with the 2799th Medical Squadron at Griffiss AFB, N. Y., in 1949-50. **Contact:** JoAnn Lloyd, 317 1/2 Mohawk St., Rome, NY 13440.

Seeking members of the **36th Bomb Squadron** who served in the Aleutians during World War II. **Contact:** Maj. Lester A. Smith, USAF (Ret.), P. O. Box 24, Canyon, TX 79015.

Seeking information on **William N. "Bill" Bate-man**, a navigator with the 450th Bomb Squadron, 322d Bomb Group. **Contact:** Elmer E. Broth-ers, 5805 Porcher Dr., Myrtle Beach, SC 29577.

Seeking information on **Elbert P. Fare**, a tail gunner on the B-24 *Patsy Jack*, with the 15th Air Force in Naples and Foggia, Italy, from December 1943 to August 1944. He also served on the B-26 *T-boy*, with the 90th Light/Night Bomb Squadron in Korea. I would like the tail numbers of both aircraft. **Contact:** Wade Fare, Rte. 4 Box 130, Dadeville, AL 36853.

Seeking contact with members of the **14th Liaison Squadron**. **Contact:** W. S. Gleason, 5621 Ashton Lakes Dr., Sarasota, FL 34231.

For a book on American warplanes delivered to Russia by way of Alaska under the Lend-Lease Act, I would like to hear from pilots of the **7th Fer-**

rying Group, ATC, or anyone assigned to the Alaska Division, ATC. Photos would be especially helpful. **Contact:** Blake W. Smith, 1153 W. 24th St., North Vancouver, British Columbia V7P 2J1, Canada.

Seeking contact with members of the **23d Tow Target Squadron** who served at Howard Field, Panama Canal Zone, during World War II. **Contact:** William L. Wilhelm, 729 S. 32d St., South Bend, IN 46615.

Seeking **missile unit patches**, both official and unofficial, for a booklet on the subject. I especially need old Thor, Jupiter, Snark, Atlas, and Titan I patches. **Contact:** Greg Ogletree, 4714 Steamboat Cir., Rapid City, SD 57702.

Seeking information on the **F-86 D/L squadron** that flew in the 1950s with the radio call sign "Scranton." They conducted Operational Readiness Inspections for the Air Defense Command. **Contact:** David R. McLaren, 1709 W. Fayette Ave., Springfield, IL 62704-2308.

Seeking a copy of **Bridge Busters**, by Guy Ziegler, the unit history of the 394th Bomb Group. **Contact:** Col. Elden G. Shook, USAF (Ret.), Research Div., USAF Museum, Wright-Patterson AFB, OH 45433.

Seeking photographs, pictures, and film of the **USAF Fire Department** in Vietnam, especially of fire equipment, stations, plane crashes, and rescues. **Contact:** Ken Caron, 47 Johnson Ave., Ronkonkoma, NY 11779.

The Legion of Valor seeks current addresses for winners of the Medal of Honor, the **Air Force Cross**, the Navy Cross, and the Army's Distinguished Service Cross. **Contact:** Charles R. Stephan, 500 S. Ocean Blvd., #704, Boca Raton, FL 33432.

Seeking contact with anyone associated with the **Army Specialized Training Program (ASTP)**, especially at the University of Kentucky and Ohio

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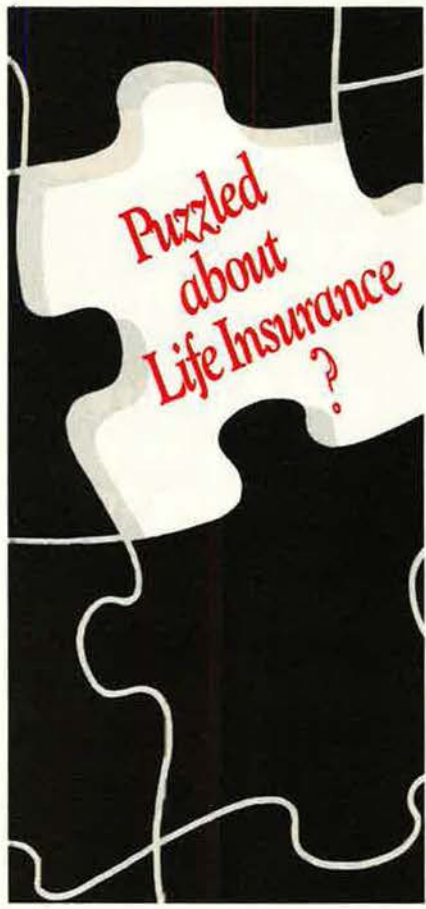
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Bulletin Board

State University. **Contact:** Clayton E. Grinage, Sr., 1910 Indiana St., Apt. #5, Houston, TX 77019-6513.

Seeking information on or contact with the 355th Tactical Fighter Wing pilot who ejected from F-105 aircraft #62-4243, based at Takhli AB, Thailand, in 1969. **Contact:** Ray Chatelain, 4806 Leeward Ct., Austin, TX 78731.

For a postgraduate thesis, I am seeking information on US servicewomen who served in Australia during World War II. Reminiscences, anecdotes, letters, diaries, and publications are all helpful. **Contact:** Nancy Lucas, 16 Elwin St., Strathfield, New South Wales 2135, Australia.

Seeking contact with **Capt. C. Ross Greening**, the armament officer on the Doolittle raid, or any other crew member familiar with the bombsight used on that mission. **Contact:** Marlin E. Osman, 117 Maple Ave., Hatboro, PA 19040.

Seeking information on **Paul Harold Hazelrigg**, a World War II AAF 2d lieutenant stationed in England. An artist, he was twenty-eight years old at the time of his marriage on October 29, 1943, at the Kensington Register Office. **Contact:** John Kay, 7309 Delfield St., Chevy Chase, MD 20815.

Seeking books and information on **nose art**. **Contact:** Lt. Col. Henry Delaney, USAF (Ret.), 68 Ave. of the Oaks, Beaumont, TX 77707.

Seeking information on the whereabouts of an American flyer stationed near Shelf, Halifax, West Yorkshire, England, who was shot down over Germany in 1945 or 1946 and knew **Margaret Anne ("Marg" or "Annie") Clublely**, in early 1945. **Contact:** Sally Edwards, 49 Granville St., Anlaby Rd., Hull HU3 6BB, England.

Seeking contact with **Susan Gaspard**, who was married to **Capt. Randy Gaspard**, who flew B-52s at Beale AFB, Calif., in the mid-1970s and F-111s in New York and England in 1977-79. **Contact:** Richard Lerner, 3745 NW Chinguapin Pl., Corvallis, OR 97330.

Seeking the whereabouts of **Fred P. Van Deren** and **Ernest P. Strange**, members of a B-24 crew of the 5th Bomb Group stationed in the Philippines in 1945. **Contact:** William Virts, 1048 S. Potomac St., Hagerstown, MD 21740.

Seeking contact with anyone who knew **Maj. Charles V. Thornton**, of the 552d Bomb Squadron, 386th Bomb Group, in England during World War II. **Contact:** Col. Paul S. Bechtel, USAF (Ret.), 400 Entrance Way, Melbourne, FL 32940.

Seeking contact with personnel of the 366th USAF Hospital, Da Nang AB, Vietnam, from March 1971 to March 1972. **Contact:** Albert "Big Al" Akens, 22650 Main St., #72, Hayward, CA 94541.

Seeking contact with the following B-24 crew members of the 33d Bomb Squadron, 22d Bomb Group, 5th Air Force: **Leonard Kosnik**, pilot; **Clayton Rickard**, navigator; **Francis Haggerty**, flight engineer; **Roy E. Moore**, tail gunner; and **William Dictor**, waist gunner. **Contacts:** Cliff Cox, 218 W. Main, Centerville, IN 47330. **Harold Failey**, 52 Twin Cedar Ln., Northport, NY 11768.

Collector seeks contact with pilots from World War II, Korean War, and Vietnam War interested in selling military aviation flight gear and memorabilia. **Contact:** Jeffrey D. Guidry, 114 Oak Leaf Dr., Slidell, LA 70461.

Seeking information and photos pertaining to

Fort Sumner AAF, N. M., Marfa AAF, Tex., and the advanced twin-engine pilot training schools of the Western Flying Training Command located there during World War II. Especially seeking unit (organization) numbers, base identification letters, and types of training aircraft. **Contact:** Kenneth A. Crist, 10220 64th Pl. W., Everett, WA 98204.

Seeking manufacturers' desk display models of military aircraft, any era. **Contact:** Dr. Michael Kosman, 504 E. Exchange St., Geneseo, IL 61254.

Seeking information on **Capt. Joseph Trapnell IV**, a bomber pilot in 8th Air Force in England during World War II. I would especially like to know his specific unit, base, and the name of his B-17. **Contact:** A. A. Beatty, 5645-A Harper's Farm Rd., Columbia, MD 21044.

For a biography of Lt. Col. Charles Tefler Howie, I am seeking a photograph taken by a member of the US 15th Air Force on September 22, 1944, of Colonel Howie (in civilian clothes); General Naday, emissary of Admiral Horthy of Hungary; Capt. John Majóros, the pilot; and the pilot's wife, standing in front of the crashed plane. **Contact:** C. Howie, 7 Ripple Close, Newlands 7700, South Africa.

Seeking information and photos from aircrews and maintenance crews of **Cessna O-2Bs** in Vietnam, especially from the 9th Special Operations Squadron, 14th Special Operations Wing, and 14th Airborne Control Wing to help in the restoration of aircraft 67-21443, 67-21446, and 67-21466. **Contact:** Lt. Col. Don Nieser, AFRES, 6221 Commodore Ln., Oklahoma City, OK 73162.

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SMSGt. William D. Mitchell, USAF (Ret.), P. O. Box 53688, Albuquerque, NM 87153.

I am seeking official **Alaskan Air Command** enamel crest pins. **Contact:** Clarence S. Duncan II, 811 Auk St., Apt. 1, Kenai, AK 99611.

Seeking reminiscences from people who knew **Maj. Zed Barnes**, 22d Bomb Squadron, 341st Bomb Group, in the China-Burma-India theater during World War II. **Contact:** Wilmer E. McDowell, 15601 S. E. 42d Pl., Bellevue, WA 98006.

Seeking contact with pilots or copilots of lead aircraft of the 394th Bomb Group who served between June 6 and September 14, 1944. **Contact:**

Col. Elden G. Shook, USAF (Ret.), Box 413, Enon, OH 45323.

Seeking contact with pilots who served with **Sandy Cortesio** on antisub patrol while stationed at Ellington Field, Tex., Galveston AAB, Tex., or New Orleans AAB, La. **Contact:** Sandy A. Cortesio, 906 Drake Ave., Centerville, IA 52544.

Seeking contact with military veteran **Roger P. Evans** (born 1923) to let him know about our upcoming fiftieth high school reunion. **Contact:** Col. Arnold J. Celick, USAF (Ret.), 5831 Arrowhead Dr., Todd Valley Estates, Foresthill, CA 95631.

Seeking **photos of military aircraft** and correspondence with pilots of these aircraft. **Contact:** Reinor F. S. Neto, Av. Rio Branco 2376/1003, CEP 36025 Juiz de Fora-MG, Brazil.

Seeking contact with anyone who knew **Capt. Dave Lewis**, a B-17 bombardier/navigator with the 486th Bomb Group, 3d Division, who may

have died in a midair collision over the target during Mission #606 to Brest on September 5, 1944. **Contact:** Don Goodenow, 3128 Sunnybrook Dr., Charlotte, NC 28210.

Seeking information on the circumstances surrounding the death of **Lt. Turner E. Savage**, a member of flying cadet class 41-F, who was killed off of Hawaii in February 1942 while flying a P-40. **Contact:** F. Clifton Berry, Jr., Air Power History, 2101 Wilson Blvd., Suite 900, Arlington, VA 22201.

Seeking information on the whereabouts of **Cpl. James Jay Nichol** of the 398th Bomb Group, based in Nuthampstead, England, in World War II. **Contact:** Lesley Anderson, 31 St. Johns Croft, Wakefield WF1 2RQ, England.

Seeking the whereabouts of **Lt. Robert H. McCoy** and **Lt. Robert E. Buck** of the 678th Bomb Squadron, 444th Bomb Group, 58th Bomb Wing. **Contact:** W. R. Cundell, 17 Brookway Dr., Greensboro, NC 27410. ■

Unit Reunions

Air Rescue Ass'n

The Air Rescue Association will hold its reunion September 11-15, 1991, in Breckenridge, Colo. **Contact:** Col. Roy E. Jacobsen, USAF (Ret.), P. O. Box 14225, Scottsdale, AZ 85267-4225. Phone: (602) 948-6660.

Berlin Airlift

Berlin Airlift veterans will hold a reunion September 29-October 2, 1991, at the Sheraton Valley Forge Hotel in King Of Prussia, Pa. **Contact:** Sam Curcio, Galaxy Tours, P. O. Box 234, Wayne, PA 19087-0234. Phone: (800) 523-7287 or (201) 922-2907.

Burtonwood Ass'n

Veterans who served at RAF Burtonwood, England, will hold a reunion October 7-13, 1991, in Frederick, Md. **Contact:** Roy L. Linton, 8658 Indian Springs Rd., Frederick, MD 21702. Phone: (301) 695-6563 or (301) 663-7264.

Coconut Heads

Veterans of World War II who served on Christmas Island (now part of Kiribati) in the central Pacific (all services) will hold a reunion in September 1991 in Cleveland, Ohio. **Contact:** Ernest Garrels, 402 Linn St., Benson, IL 61516. Phone: (309) 394-2273.

3d Strategic Air Depot

Members of the 3d Strategic Air Depot, 8th Air Force (Watton, England), World War II, will hold a reunion July 24-27, 1991, in Norfolk, Va. **Contact:** W. S. Noble, 7266 Goodwood, Baton Rouge, LA 70806.

Eagle Squadron Ass'n

The Eagle Squadrons of the Royal Air Force will hold a reunion October 10-13, 1991, at the Menger Hotel in San Antonio, Tex. **Contact:** James A. Gray, 7283 Kolb Pl., Dublin, CA 94568.

P-51 Mustang Pilots

P-51 Mustang Pilots will hold a reunion October 17-19, 1991, in Oklahoma City, Okla. **Contact:** George L. Budde, 3312 Meadowbrook, Midwest City, OK 73110. Phone: (404) 733-1449.

Wheelus AB

Personnel assigned to Wheelus AB, Libya (1948-51), will hold a reunion October 10-13, 1991, at the Holiday Inn Hotel in Cocoa Beach, Fla. **Con-**

tact: David E. Ryan, 7225 S. Depew St., Littleton, CO 80123.

1st Strategic Air Depot

The 1st Strategic Air Depot Association (Honington-Troston, England) will hold a reunion September 26-29, 1991, in Phoenix, Ariz. **Contact:** Warren L. Stanley, 3207 Myles Ct., #3, San Jose, CA 95117.

2d Emergency Rescue Squadron

Members of the 2d Emergency Rescue Squadron, 13th Air Force, will hold a reunion August 22-24, 1991, at the Bloomington Embassy Suites Hotel in Minneapolis, Minn. **Contacts:** Walter Ortman or Jim Hagman, 5353 Gamble Dr., Parkdale 4 Building, Suite 100, Minneapolis, MN 55416. Phone: (612) 545-5353 or (612) 544-2603.

8th Service Group

Veterans of the 8th Service Group, 11th and 482d Service Squadrons, and Headquarters Squadron (World War II) will hold a reunion September 20-22, 1991, in Lancaster, Pa. **Contact:** Col. John L. Heckler, USAF (Ret.), 76 E. Harbor Dr., Teaticket, MA 02536. Phone: (508) 540-1303.

8th Combat Cargo Squadron

Members of the 8th Combat Cargo Squadron will hold a reunion October 3-5, 1991, at the Holiday Inn in Fairborn, Ohio. **Contact:** Paul Vaughan, 4916 Wortser Ave., Sherman Oaks, CA 91423.

8th Fighter Group

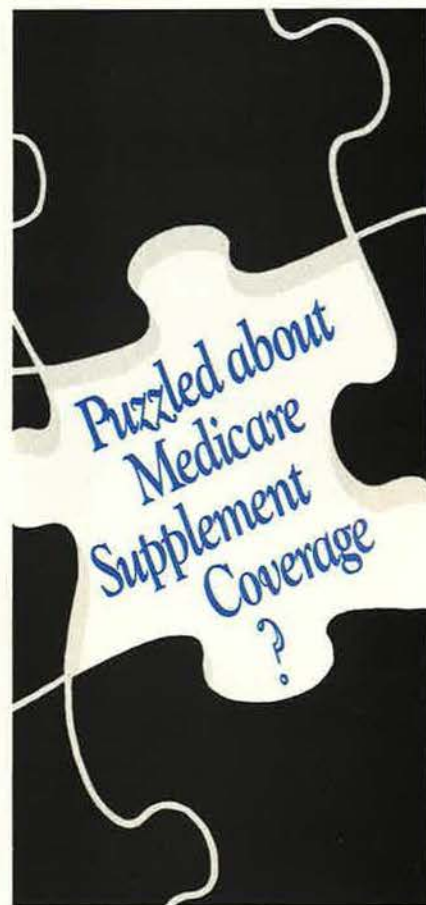
The 8th Fighter Group, 5th Air Force (World War II), will hold a reunion October 24-26, 1991, at the Hilton Inn Hotel in Tampa, Fla. **Contact:** Robert H. Davis, 8726 Elmwood Ln., Tampa, FL 33615. Phone: (813) 886-1396.

9th Photo Recon

Members of the 9th Photo Reconnaissance Squadron will hold a reunion October 9-12, 1991, in San Antonio, Tex. **Contact:** John E. Bufin, 303 Laramie Dr., San Antonio, TX 78209. Phone: (512) 826-6693.

13th Bomb Squadron

Members of the 13th Bomb Squadron who served in Korea will hold a reunion August 28-September 1, 1991, in St. Paul, Minn. **Contact:** Maj. Allan E. V. Scholz, USAF (Ret.), W 71 N 918



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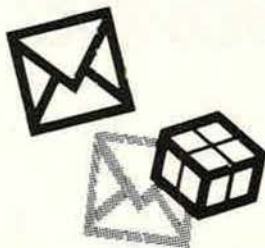
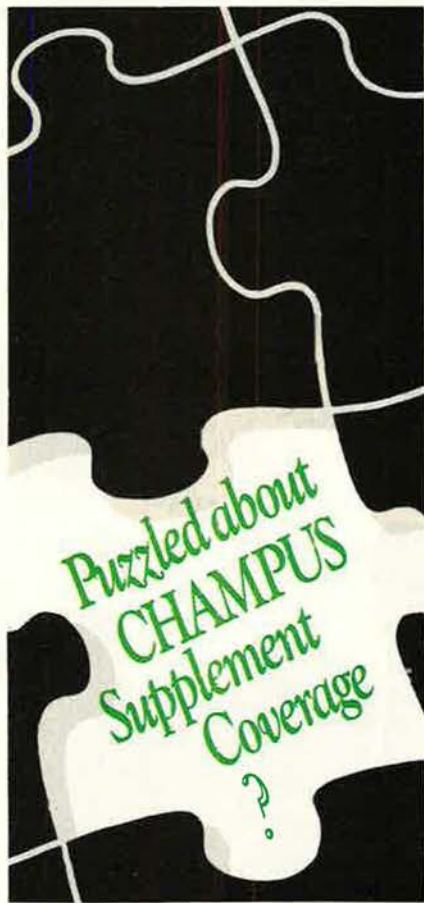
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Unit Reunions

Harrison Ct., Apt. 101, Cedarburg, WI 53012. Phone: (414) 377-6770.

16th Fighter Squadron
Veterans of the 16th Fighter Squadron, 51st Fighter Group, 14th Air Force, will hold a reunion October 10-13, 1991, in Fort Walton Beach, Fla. **Contact:** Bob Liles, 201 Manatee Rd., Winter Haven, FL 33884.

21st Weather Squadron
Members of the 21st Weather Squadron and 40th Mobile Communications Squadron will hold a reunion September 12-14, 1991, in Charleston, S. C. **Contact:** Irvin J. Kirch, 34 W. Hoss Rd., Indianapolis, IN 46217. Phone: (317) 786-6858.

22d Bomb Squadron
Veterans of the 22d Bomb Squadron, 341st Bomb Group (World War II), will hold a reunion October 17-19, 1991, in Kansas City, Mo. All veterans of the 341st Bomb Group (11th, 490th, and 491st Squadrons) are also invited. **Contact:** Dave Hayward, 6552 Crista Palma Dr., Huntington Beach, CA 92647. Phone: (714) 842-8478.

24th Special Operations Wing
The 24th Special Operations Wing, USAF Southern Command, will hold a reunion September 27-29, 1991, at the Red Lion Inn in Colorado Springs, Colo. **Contact:** Col. Leslie E. Gaskins, USAF (Ret.), 2200 N. W. 21st St., Gainesville, FL 32605. Phone: (904) 377-6892.

Readers wishing to submit reunion notices to "Unit Reunions" should mail their notices well in advance of the event to: "Unit Reunions," AIR FORCE Magazine, 1501 Lee Highway, Arlington, Va. 22209-1198. Please designate the unit holding the reunion, time, location, and a contact for more information.

30th Bomb Group
The 30th Bomb Group will hold a reunion in October 1991 in San Antonio, Tex. **Contact:** Jose A. Garcia, P. O. Box 485, Charleston, SC 29402-0485.

33d Air Division
The 33d Air Division will hold a reunion September 19-22, 1991, at the Holiday Inn Hotel in Midwest City, Okla. **Contact:** Nester E. Cole, 2732 Warwick Dr., Bloomfield Hills, MI 48304. Phone: (313) 338-1551.

34th Bomb Group
The 34th Bomb Group, 8th Air Force, will hold a reunion September 26-29, 1991, in Louisville, Ky. **Contact:** Ray L. Summa, 2910 Bittersweet Ln., Anderson, IN 46011. Phone: (317) 644-6027.

39th Fighter Squadron
Members of the 39th Fighter Squadron, 35th Fighter Group, 5th Air Force (World War II, Korea, or Vietnam), will hold a reunion August 30-September 2, 1991, at the Marriott Hotel in St. Louis, Mo. **Contact:** CMSgt. Nelson C. Thompson, USAF (Ret.), 9170 E. 8th St., Tucson, AZ 85710. Phone: (602) 885-9782.

Class 41-G
Members of Class 41-G will hold a reunion September 25-29, 1991, in Colorado Springs, Colo. **Contact:** Hal Ebbeler, P. O. Box 5208, Albuquerque, NM 87185. Phone: (505) 296-9417.

Class 43-A-1
Members of Class 43-A-1 will hold a reunion September 4-8, 1991, at the Marriott Hotel in Seattle, Wash. **Contact:** Owen L. Skan, 4111 S. W. 325th St., Federal Way, WA 98023. Phone: (206) 874-2832.

49th Fighter/FIS Ass'n
The 49th Fighter/Fighter-Interceptor Squadron will hold its fiftieth-anniversary reunion October 3-6, 1991, in Newport Beach, Calif. **Contact:** Sheril D. Huff, 3200 Chetwood Dr., Del City, OK 73115-1933. Phone: (405) 677-2683.

54th FIS
The 54th Fighter-Interceptor Squadron will hold a reunion August 23-25, 1991, in Rapid City, S. D. **Contact:** Bill Newell, Rte. 2, Box 361, Neche, ND 58265. Phone: (701) 886-7779.

57th Bomb Wing
Members of the 57th Bomb Wing will hold a reunion October 7-13, 1991, at the Hilton Hotel in Huntsville, Ala. **Contact:** Robert E. Evans, 1950 Cunningham Dr., Speedway, IN 46224-5341. Phone: (317) 247-7507.

74th/75th/76th Fighter Squadrons
Members of the 74th, 75th, and 76th Fighter Squadrons, 23d Fighter Group, 14th Air Force (World War II), will hold a reunion October 10-13, 1991, in Fort Walton Beach, Fla. **Contacts:** Charlie Cook, 6305 N. Ocean Blvd., Myrtle Beach, SC 29577. Myron D. Levy, 11933 Claychester Dr., Des Peres, MO 63131 (75th Fighter Squadron). William B. Evans, 1297 86th Terrace N., Saint Petersburg, FL 33702 (76th Fighter Squadron). Phone: (813) 576-3558.

86th/72d Air Service Squadron
Members of the 86th/72d Air Service Squadron, 52d Air Service Group (World War II), will hold a reunion in October 1991 in Orange Beach, Ala. **Contact:** W. E. Fleming, P. O. Box 1509, Orange Beach, AL 36561. Phone: (205) 981-6314.

86th Fighter-Bomber Group
The 86th Fighter-Bomber Group, which included the 525th, 526th, and 527th Hq. Squadrons (World War II), will hold a reunion August 15-17, 1991, in Omaha, Neb. **Contact:** Gilbert Hurt, 4920 Montcrest Dr., Chattanooga, TN 37416. Phone: (615) 344-6077.

90th Bomb Group
The 90th Bomb Group "Jolly Rogers," 5th Air Force, will hold a reunion October 2-5, 1991, at the Red Lion Sacramento Inn Hotel in Sacramento, Calif. **Contact:** William M. Martin, 5144 Ridgevine Way, Fair Oaks, CA 95628. Phone: (916) 965-8119.

98th Bomb Group/Wing
Veterans of the 98th Bomb Group/Wing and the 98th Air Refueling Squadron and Group will hold a reunion September 22-26, 1991, in Las Vegas, Nev. **Contact:** Sam Wareham, 639 Mulder Dr., Lincoln, NE 68510.

107th Tactical Recon Squadron
The 107th Tactical Reconnaissance Squadron (World War II) will hold a reunion September 15-19, 1991, in Las Vegas, Nev. **Contact:** Ted Dunmire, 7909 Hanson Ave., Citrus Heights, CA 95610.

246th Signal Operations Company
The 246th Signal Operations Company will hold a reunion August 2-3, 1991, in Chattanooga, Tenn. **Contact:** Johnnie Huggins, 30031 S. W. 169th Ave., Homestead, FL 33030. Phone: (305) 247-0150.

305th Airdrome Squadron
Members of the 305th Airdrome Squadron will hold a reunion June 9-12, 1991, at the Sheraton

Inn in Philadelphia, Pa. **Contact:** John H. Salomon, 4107 Hellerman St., Philadelphia, PA 19135-2520. Phone: (215) 338-3914.

305th Bomb Group

The 305th Bomb Group, 8th Air Force (Chelveston, England), will hold a reunion September 25-28, 1991, in Indianapolis, Ind. **Contact:** Abe Millar, P. O. Box 757, Sanger, TX 76266. Phone: (817) 458-3516.

306th Bomb Group

The 306th Bomb Group will hold a reunion September 19-21, 1991, at the Holiday Inn in Coraopolis, Pa. **Contact:** James F. Macry, P. O. Box 158, New Brighton, PA 15066. Phone: (412) 728-6779.

316th Troop Carrier Squadron

Members of the 316th Troop Carrier Squadron (World War II) will hold a reunion October 10-14, 1991, in Charleston, S. C. **Contact:** Wally Crain, 314 Serenade, San Antonio, TX 78216.

319th Bomb Group

Veterans of the 319th Bomb Group (World War II) will hold a reunion September 12-15, 1991, at the Clarion Hotel in New Orleans, La. **Contact:** Joseph Madrano, 8308 Springtown, Converse, TX 78109. Phone: (512) 659-4237.

354th Fighter Group

Members of the 354th Fighter Group, which included the 353d, 355th, and 356th Fighter Squadrons, are planning to hold a reunion September 18-22, 1991, at the Hilton Hotel in Colorado Springs, Colo. **Contact:** Robert M. Halferty, P. O. Box 88, Valentine, NE 69201. Phone: (402) 376-1834.

367th Fighter Group

Veterans of the 367th Fighter Group, 9th Air Force (World War II), will hold a reunion October 24-27, 1991, in Memphis, Tenn. **Contact:** Col. Allen J. Diefendorf, USAF (Ret.), 25985 Holly Vista, San Bernardino, CA 92404.

376th Heavy Bomb Group

Members of the 376th Heavy Bomb Group will hold a reunion September 19-24, 1991, at the Doubletree Hotel in Tucson, Ariz. **Contact:** Joe Lynn, Rte. 1, Box 89, Stonington, IL 62567. Phone: (217) 325-3327.

381st Bomb Group

The 381st Bomb Group will hold its reunion September 4-8, 1991, in Nashville, Tenn. **Contact:** Howard N. Kesley, 5908 Manor Pl., Brentwood, TN 37027. Phone: (615) 371-8573.

410th Bomb Group

Members of the 410th Bomb Group, 9th Air Force, will hold a reunion September 26-28, 1991, in Dayton, Ohio. **Contact:** Bill Keim, 6 Laurel Ln., Syosset, NY 11791. Phone: (516) 921-1016.

440th Signal Battalion

Members of the 440th Signal Battalion will hold a reunion October 8-10, 1991, in San Antonio, Tex. **Contact:** Grover K. Smith, 627 St. Louis St., Lewisburg, PA 17837. Phone: (717) 524-5915.

440th Troop Carrier Group

Veterans of the 440th Troop Carrier Group, which included the 95th, 96th, 97th, and 98th Troop Carrier Squadrons, will hold a reunion September 27-29, 1991, at the Fountain Plaza Hotel in San Antonio, Tex. **Contact:** Courtland G. Mabee, 14106 Heatherfield, Houston, TX 77079. Phone: (713) 497-5455.

444th FIS

The 444th Fighter-Interceptor Squadron will hold a reunion October 4-6, 1991, at the Airport Holiday Inn in North Charleston, S. C. **Contact:** Wallace Mitchell, 535 Mimosa Rd., Sumter, SC

29150. Phone: (803) 469-3297 or (803) 775-1281.

450th Bomb Group

The 450th Bomb Group (World War II) will hold a reunion October 17-20, 1991, in St. Louis, Mo. **Contact:** Doid K. Raab, 5695 Ireland Rd., N. E., Lancaster, OH 43130. Phone: (614) 536-7635.

452d Bomb Squadron

Members of the 452d Bomb Squadron, 322d Bomb Group, will hold a reunion in October 1991, in South Padre Island, Tex. **Contact:** B. E. Forrest, 3213 Oakbrook Dr., Del City, OK 73115. Phone: (405) 677-0458.

453d Bomb Squadron

Veterans of the 453d Bomb Squadron, 323d Bomb Group (World War II), will hold a reunion October 10-14, 1991, at the Landmark Hotel in New Orleans, La. **Contact:** C. R. Sochocki, 1314 N. Brookfield St., South Bend, IN 46628-3074. Phone: (219) 233-6044.

459th Bomb Group

The 459th Bomb Group will hold its reunion September 26-29, 1991, at the Marriott Hotel in Springfield, Mass. **Contact:** Don Stevenson, P. O. Box 337, Somers, CT 06071. Phone: (203) 749-6505.

475th Fighter Group

The 475th Fighter Group "Satans Angels" will hold its reunion October 10-13, 1991, at the Inn at the Falls in Niagara Falls, N. Y. **Contacts:** George or Nancy Rath, 134 Attridge Rd., Churchville, NY 14428. Phone: (716) 293-3846.

483d Bomb Group

Members of the 483d Bomb Group (World War II) will hold a reunion October 1-5, 1991, in Tampa, Fla. **Contact:** Jack Noble, 4555 E. Hillsdale Ln., Inverness, FL 32652-9057. Phone: (904) 726-1082.

484th and 461st Bomb Groups

Veterans of the 484th and 461st Bomb Groups (World War II) will hold a reunion September 26-29, 1991, in Kansas City, Mo. **Contact:** Bud Markel, 1122 Ysabel St., Redondo Beach, CA 90277. Phone: (213) 316-3330.

485th Bomb Group

The 485th Bomb Group will hold a reunion September 11-14, 1991, in Little Rock, Ark. **Contact:** Earl L. Bundy, 5773 Middlefield Dr., Columbus, OH 43235-7598.

487th Bomb Group

Veterans of the 487th Bomb Group, 8th Air Force, will hold a reunion September 25-29, 1991, at the Holiday Inn Hotel in Buellton, Calif. **Contact:** Pete Riegel, 409 N. 3d St., Lompoc, CA 93436.

504th Bomb Group

Members of the 504th Bomb Group will hold a reunion September 19-22, 1991, at the Hyatt Regency Hotel in San Antonio, Tex. **Contact:** Tom Schoolcraft, Rte. 3, Box 720, Seguin, TX 78155. Phone: (512) 379-9667.

507th Fighter Group

Members of the 507th Fighter Group (World War II), which included the 463d, 464th, and 465th Fighter Squadrons, will hold a reunion August 29-31, 1991, at the Red Lion Hotel in Seattle, Wash. **Contact:** J. H. Mosbey, Jr., P. O. Box 163, Watkinsville, GA 30677. Phone: (404) 769-6236.

756th Troop Carrier Squadron

Members of the 756th Troop Carrier/756th Military Airlift/756th Tactical Airlift Squadrons, which have operated from Andrews AFB, Md. since 1954, are planning to hold a reunion in October 1991 in Dayton, Ohio. **Contact:** Bert Stewart, P. O. Box 8396, Temple Hills, MD 20757. Phone: (301) 899-7470. ■

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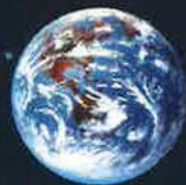


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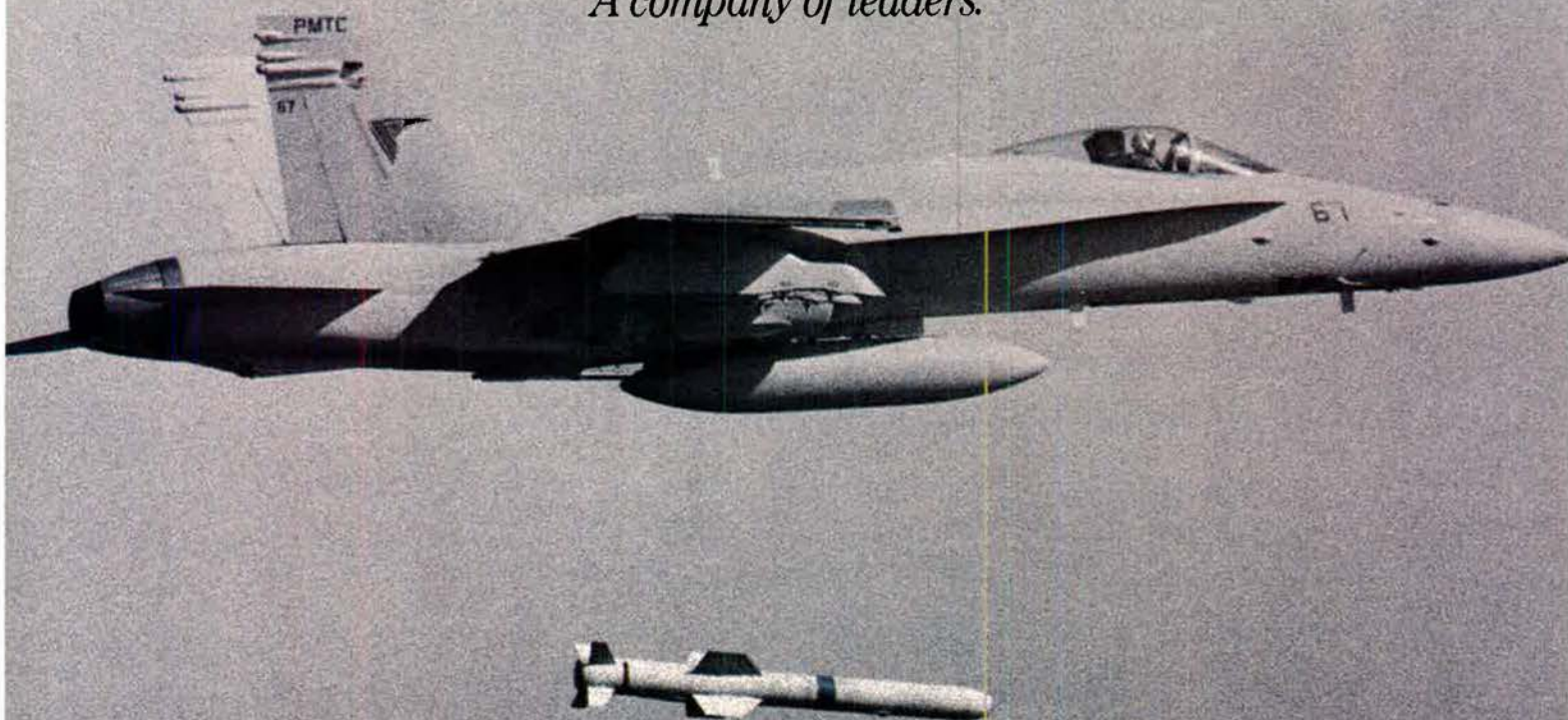
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