JULY 1987/$2

AIR FORCE MAGAZINE

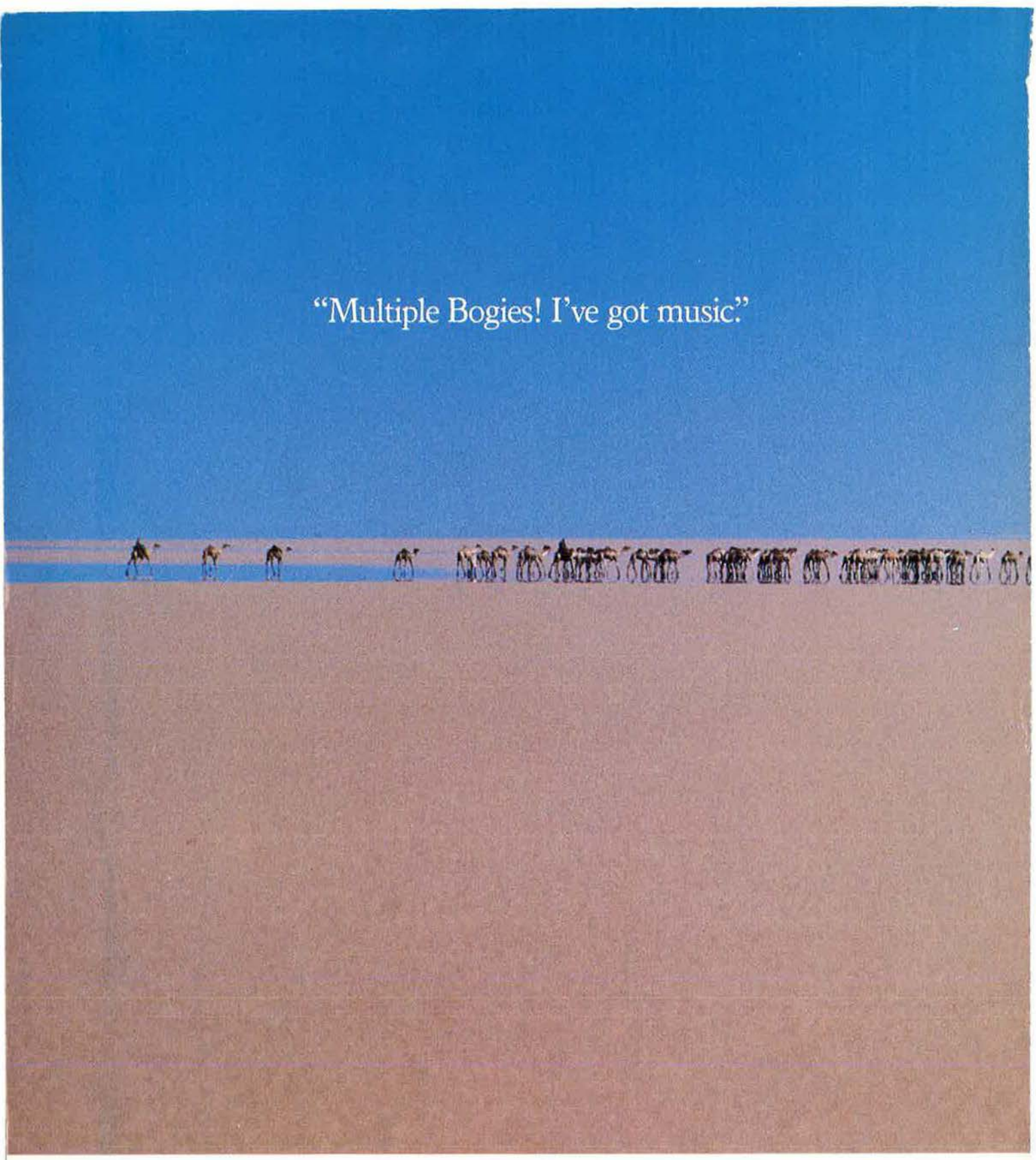
PUBLISHED BY THE AIR FORCE ASSOCIATION

Fundamentals of Strategic Airpower

The Future of the ICBM

SDI's Emerging Lineup

Eagles Over the Icecap



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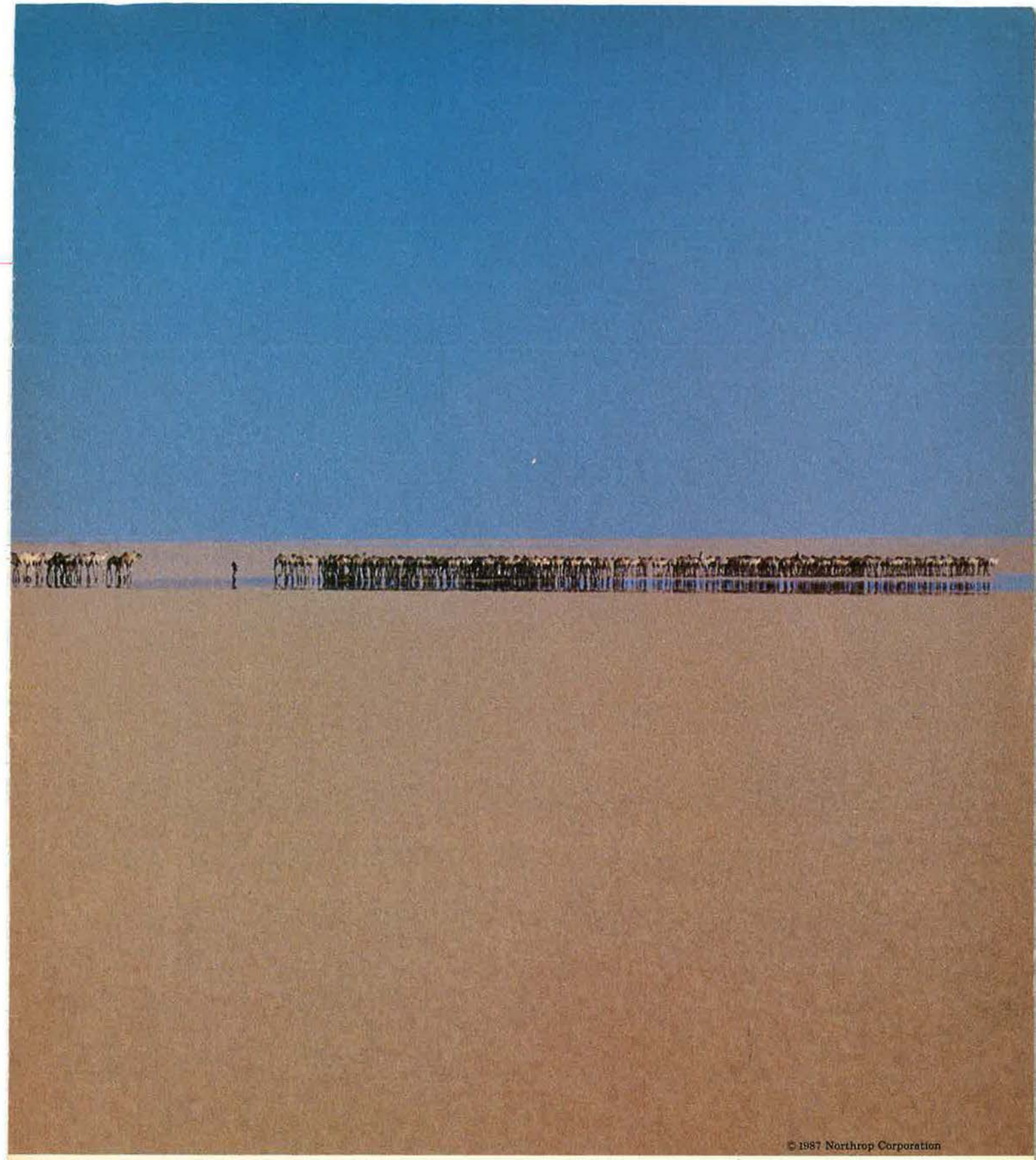

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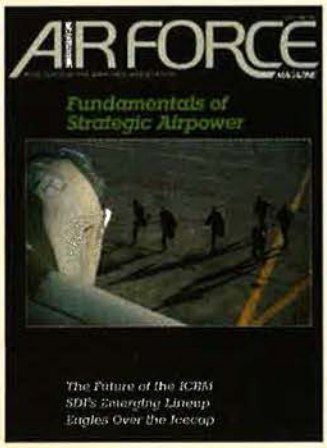

About the cover: An overhead photo of a B-52 crew sprinting toward its aircraft at a moment's notice vividly illustrates the urgency of the SAC mission. A special section on "Strategic Forces" begins on p. 40.

Special Section: Strategic Forces

Features

Departments

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AN EDITORIAL

The Linkages of Strategy

By John T. Correll, EDITOR IN CHIEF

WHEN theater arms-control negotiations slipped momentarily out of overdrive in May, Soviet Leader Mikhail Gorbachev complained that the West could ruin everything by persistence in forging "an endless chain of more and more linkages." He warned against bogging down the main issue—agreement on eliminating medium-range nuclear missiles from Europe—with such side concerns as the balance of conventional forces.

As Mr. Gorbachev knew perfectly well, the question was not really one of establishing the linkages. They existed already. The point was whether they ought to be recognized in the bargaining, and in the minds of many, that was more than a quibble. The Soviet Union and its Warsaw Pact allies grossly outnumber NATO in conventional forces. NATO's nominal strategy of Flexible Response has always relied heavily on the threat of escalation to nuclear conflict for much of its credibility. The Western concern in May was that the "Double Zero" arms-control option—removal of two categories of nuclear missiles, encompassing all with ranges of between 300 miles and 3,000 miles—might dangerously amplify the Pact's conventional advantage and leave Western Europe vulnerable to intimidation.

Surely Mr. Gorbachev could not have been that exasperated by the concept of linkages. The centerpiece of Soviet military thought is the "Correlation of Forces," the idea that the course and outcome of conflict depend not only on military and economic factors but also on politics, ideology, morality, science, psychology, and more other linkages than you can shake a dialectic at. The Soviets reject the Western notion of "flexible response" as being artificial. Their combined-arms tactics do not make a sharp distinction between nuclear and conventional warfare. They see nuclear and conventional forces as mutually reinforcing.

This doctrine is established by the Communist Party of the Soviet Union and has been reaffirmed by the Party's Defense Council. And until he ascended to his present position, Mr. Gorbachev was chairman of the Defense Council. We can assume that he is skilled in the art of linkage, and we might reflect on what linkages went into his urgent desire to reach a deal on nuclear weapons in Europe.

The comprehensive style of grand strategy has never had much appeal for Americans, who tend to ignore linkages when they are not oblivious to them altogether. There was a break in this pattern—on paper, at least—when the White House, with congressional prompting, produced its first "National Security Strategy of the United States." This document inventories the national interest at some length and explains how it is intertwined with military posture, diplomacy, economic and trade policies, budgets, and the scientific and industrial base.

These high-minded linkages got a nice round of applause when they were announced in January, but they were among the first casualties to fall when the federal budget season began. Administration and congressional combatants are battering each other about deficits and tax policies and percentage increases or decreases from last year's budget. They will most likely settle in due time on a budget that perpetuates the mismatch between defense requirements and defense resources. In this regard, attention to linkages has not improved much since 1980, when the Carter Doctrine committed the US to defend the Persian Gulf region "by any means necessary" without providing additional military forces for this sweeping new obligation.

It would be bad enough if the blindness to linkages ended with budgetary matters, but that is not the case. A recent Gallup poll found that seventy-eight percent of the American public believes that the US has a vital interest in Japan, but that only fifty-three percent would favor sending troops if the Soviet Union invaded Japan. If the inconstant twenty-five percent have an accurate understanding of what a "vital interest" is, there may not be much of a natural constituency for linkages, even when logic makes them unavoidable.

The national interest begins, according to the White House strategy, with ensuring the security of the United States from attack or conquest. That, essentially, is a straightforward military proposition, and the linkages are relatively unambiguous. It is the subsequent elements of the national interest that present greater complexity and more subtle linkages.

Among these are the security of US allies, a strong US economy, access to foreign markets and energy resources, curbing of terrorism and the international narcotics traffic, stable currencies, the promotion of democratic values and human rights, and preventing Soviet domination of the Eurasian landmass. The full list identified in the national strategy document is much longer and embodies a wealth of linkages, not all of which are specified.

For example, the inefficiency of Soviet agriculture is legendary. Left to do their own farming, the Soviets would have to allocate more of their resources to food production. Yet the US and other free world nations compete with each other to sell the USSR grain at bargain prices, skipping lightly by the fact that this enables the Kremlin to apply its resources instead to less bucolic purposes.

Significant linkages are often forgotten when advocates of some particular cause concentrate on their objective to the exclusion of all else. It is important to watch out for this in the arms-control process, where hopes and fears can lead to emotional motivations. Total solutions appear impossible, so there is a temptation to take the problem apart and try to work on the pieces independently. This, however, is the approach of a mechanic, and foreign policy and strategy should not be left in the hands of mechanics.

Mr. Gorbachev is not a mechanic, and he will remember the linkages for his side. The US and its NATO allies should take their time to consider the linkages, too, and not allow themselves to be rushed by Mr. Gorbachev's speechmaking. However much it may complicate matters, strategy, international relations, and sound diplomacy are, to borrow a phrase, "an endless chain of more and more linkages." ■

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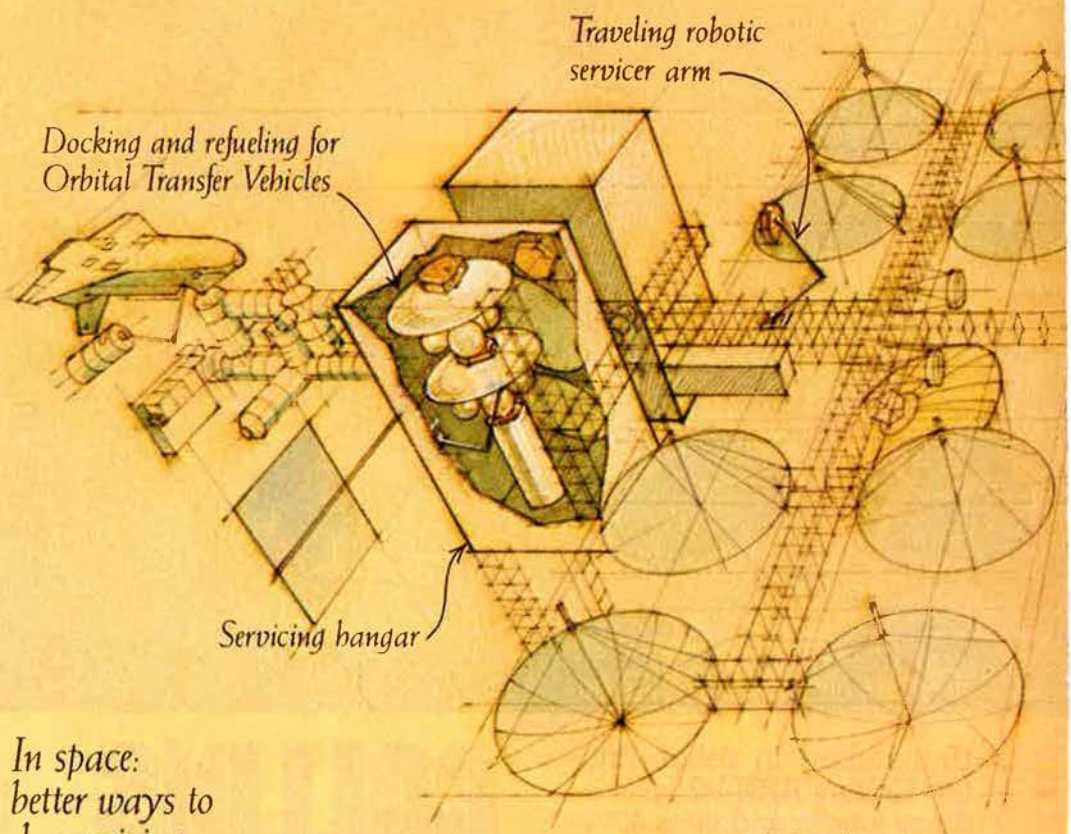
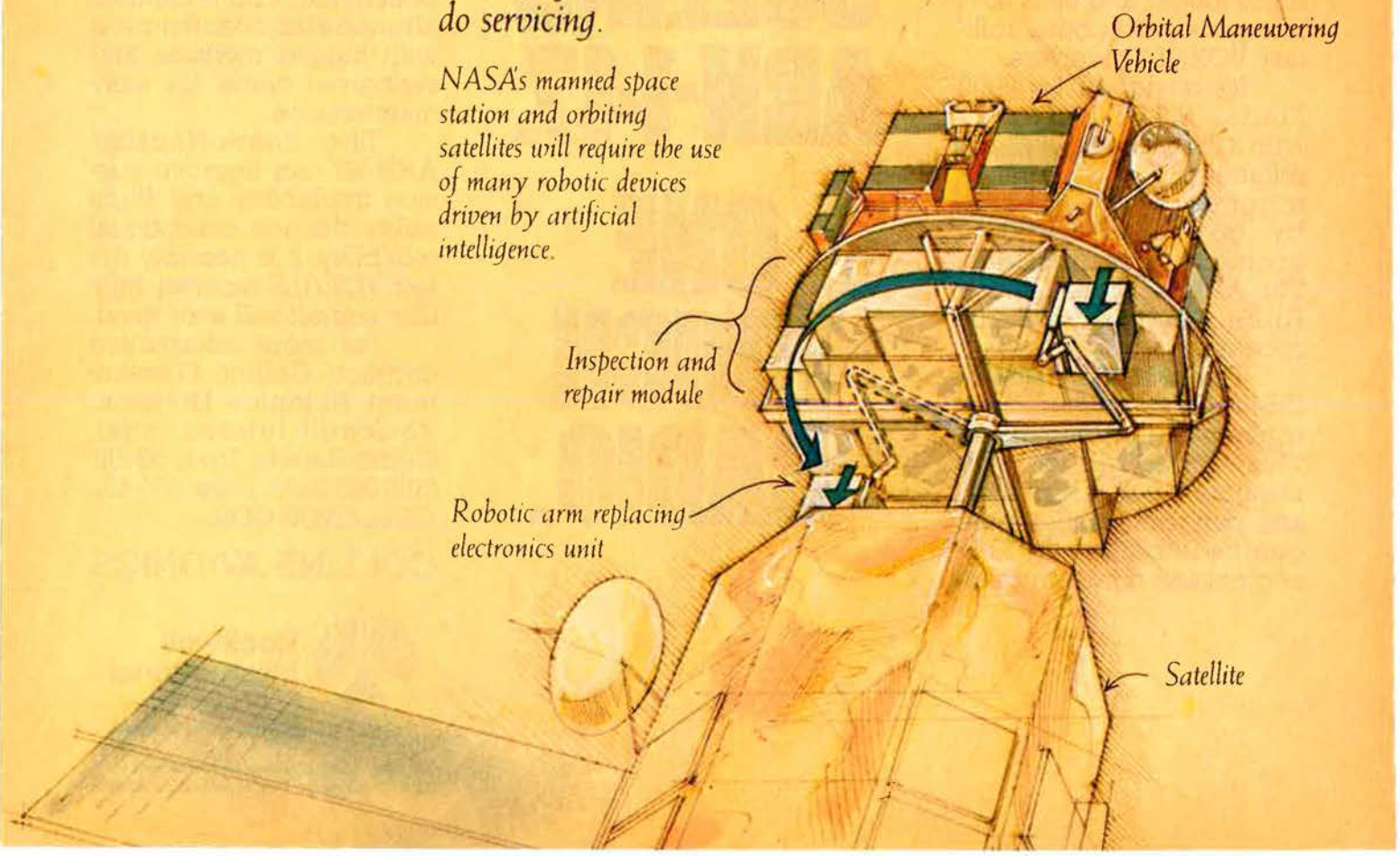
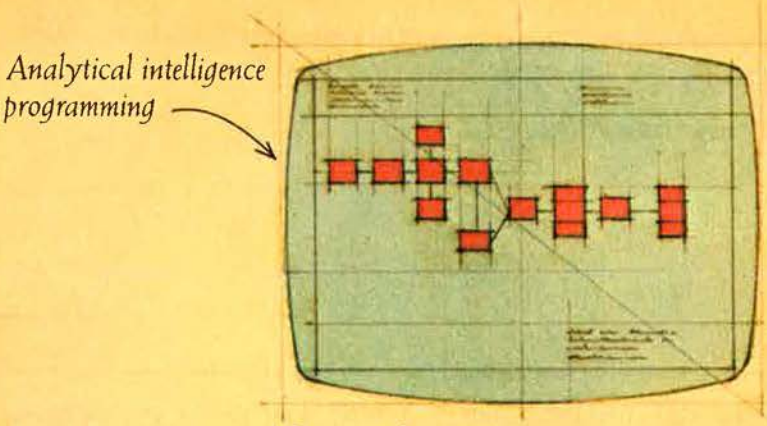
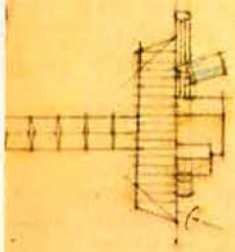


In space: better ways to do servicing.

NASA's manned space station and orbiting satellites will require the use of many robotic devices driven by artificial intelligence.







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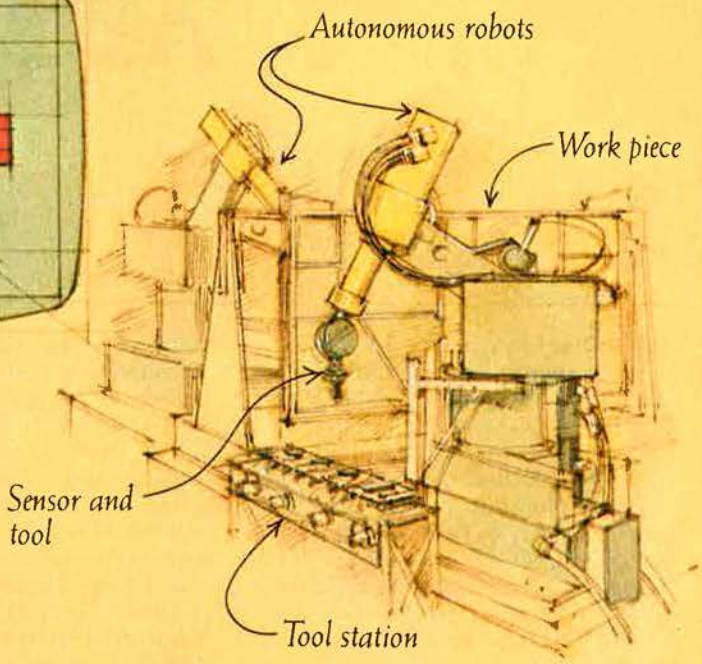
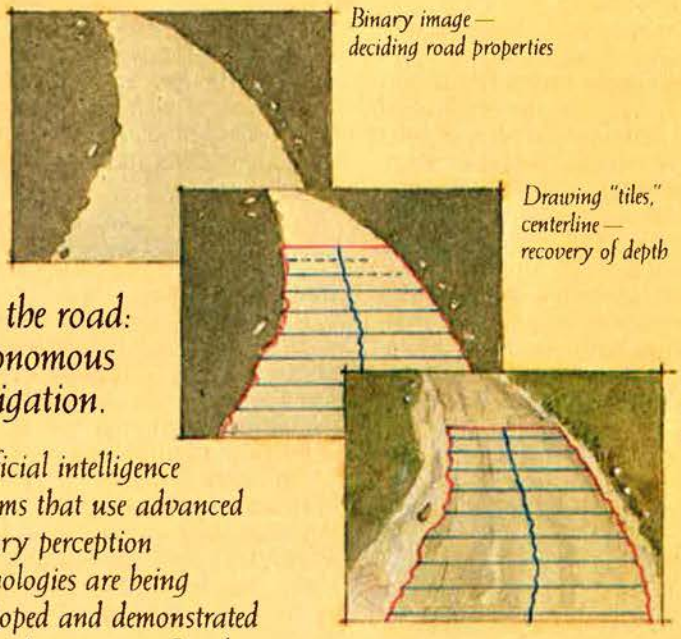
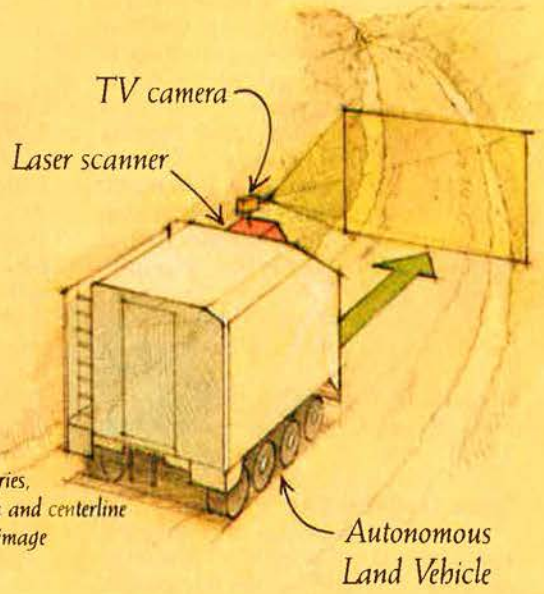




On the road: autonomous navigation.

Artificial intelligence systems that use advanced sensory perception technologies are being developed and demonstrated in the Autonomous Land Vehicle. Already able to follow roads, this mobile test bed will eventually be able to plan its route, avoid obstacles and even thread its way across country.



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The Perfect Ten

This civilian subscriber enjoys your magazine very much. I find the annual May issue "USAF Almanac" an excellent guide to the military units and aircraft that participate in air shows.

The photograph caption on p. 179 in the "Gallery of USAF Weapons" is not as perfect as "The Perfect Ten." The KC-10A Extender is manufactured by Douglas Aircraft Co., Division of the McDonnell Douglas Corp., not Boeing.

The KC-10A Extender is a beautiful ship to see and tour. I visited "The Griffin" of the 9th ARS at March AFB, Calif., during the 1986 Greater Peoria Airshow. I was much impressed by the KC-10's sophistication. My tour of her flight deck, cargo area, and boom station was much enhanced by her crew's expertise and professionalism.

I also have a side note on the May '87 article "What Has Happened to the Airlines?" I flew Ozark Air Lines on her last day of operation. It was a sad day for sure in the history of the fine "little airline that could." Even a KC-10A paid a visit to Lambert-St. Louis International Airport that day, as if to offer a fond farewell to her commercial cousins in the "swallow" livery.

Margaret Nowacki
Rolling Meadows, Ill.

• *Reader Nowacki is, of course, correct. We regret the error.*—THE EDITORS

Short Shrift for CAP?

I have just received and read the May 1987 "USAF Almanac" edition of AIR FORCE Magazine. I am appalled at the short mention that the Air Force Association continues to give the Air Force's auxiliary, the Civil Air Patrol.

Civil Air Patrol members, numbering approximately ten percent of the population of the active Air Force, provide a significant resource for the Air Force. Civil Air Patrol performs more than eighty percent of the search-and-rescue flight hours every year in the US, serves as a major recruiting force for the Air Force, and, in recent years, has become involved in day-to-day operations of the Air Force by providing courier flights to ferry critical spare parts, performing low-level training route survey, and filling a role in national defense strategy with communications support and safe-haven airfield support. All of this is in addition to our mandated roles of emergency services, aerospace education, and disaster relief.

The Air Force Association as well as personnel of the active Air Force should become more involved with Civil Air Patrol to provide for better understanding and cooperation in our mutually supportive missions. The traditional short shrift given to Civil Air Patrol and its members by both the Air Force Association and the Air Force in general does all organizations a disservice.

Capt. Richard A. DeCastro, CAP
Los Angeles, Calif.

Utter Nonsense?

While I have always viewed AIR FORCE Magazine as an inoffensive, uncritical, semiofficial house organ for the Air Force general staff, your May 1987 issue managed to sink below even this minimal level of journalism with your publication of Thomas Hajewski's "The Stuka Story." Dr. Hajewski consistently mistranslates German terms, fouls up his chronology, and foists on the reading public the groundless assumption that "propaganda and secrecy have clouded this interesting phase of aviation history. . . . " This is utter nonsense.

Before the good doctor or your editors try their hands at a historical piece again, I strongly urge that they examine the works of Francis K. Mason, William Gunston, William Green, and Gordon Swanborough. These gentlemen have cut through Dr. Hajewski's "cloud" for more than twenty years with a great deal of success. Had either your author or your editors availed themselves of Mason's *Battle Over Britain* or Green's *Famous Borders*, this collective embarrassment that you have visited on yourselves could have been avoided.

As an aside, there was no Luftwaffe Squadron 76, as Dr. Hajewski states. Squadrons were numbered sequentially 1–9 or 1–12 as subunits of a *Geschwader*, a unit that equated to the old Army Air Forces wing. The *Geschwaders* in turn were numbered in such a fashion that there may have been a "wing" 76.

L. Michael Bol
Arcadia, Calif.

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

Congratulations on "The Stuka Story" in the May 1987 issue. It was very entertaining and interesting.

This kind of article represents only two percent of your total magazine. I would like to see *more* of this type of thing.

Joe Lanser
Sedona, Ariz.

Close Air Support

The letters published in "Airmail" in the May 1987 issue in reference to the March '87 article "New Roadmap for AirLand Battle" as well as recent media coverage prompt me to clarify some of the issues raised.

Critics claim the Air Force is trying to avoid its responsibility for providing close air support (CAS) and that the CAS mission and aircraft have become the Air Force's homely stepchild. The facts are quite the opposite.

In 1984, as one of the Joint Force Development Initiatives, the Army and the Air Force Chiefs reaffirmed the mission of the Air Force to provide fixed-wing CAS to the Army. In April 1985, the Army and Air Force Secretaries and Chiefs signed a Memoran-

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dum of Agreement on follow-on CAS aircraft that reflected a coordinated joint position on the requirement for improved capability and the basic airframe characteristics and complementary systems needed.

Since that time, the Army and Air Force have continued to develop and refine the concept of operations and requirements for the A-10 replacement. The Air Force roadmap outlined in your March article accurately reflects a plan that has been approved by the highest levels of both services.

All critics seem to have an aircraft design that is markedly different than the one envisioned by the services. The problem is that they have neglected to include (or have ignored) the Army's current doctrine and concept of operations, threat capabilities and employment for the 1990s, the Air Force's concept of operations, and the contributions of other Army and Air Force systems.

AirLand Battle doctrine expands the battlefield support requirements to the rear battle, close-in battle, and deep battle. CAS is required well beyond the traditional forward line of troops (FLOT) to support deep and cross-FLOT operations. Thus, the traditional distinctions between CAS and battlefield air interdiction (BAI) begin to blur with respect to required aircraft capabilities. Additionally, the improved surveillance/sensor systems that are being developed and fielded will allow us to "see" the battlefield. The capability for the land force commander to see follow-on as well as engaged enemy forces will generate a requirement to focus tac-air support (CAS or BAI) with the same responsiveness that CAS can provide today.

The key to survivability on the battlefield of the 1990s comes from a combination of not being detected, not being shot at if detected, avoiding a hit if shot at, and making it home if hit. Designed for a lower threat environment, the A-10 generally concentrated on the last. The A-10's replacement must have a combination of these variables to survive.

While almost everyone would agree that higher speeds improve survivability, critics believe that you have to fly slow to do CAS. Pilots performing CAS/BAI will not roam around looking for targets. The Forward Air Controller (FAC) for CAS and Ground Attack Control Capability (GACC) for BAI will provide target information. Target acquisition is more a factor of where to look than it is of how fast you're flying.

The answer to target acquisition is accurate target information (from the FAC or GACC), accurate navigation systems, and improved acquisition systems rather than flying slow. Those who believe you have to fly slow to deliver weapons (including "dumb" bombs) accurately need only check the results of the "Gunsmoke" Air Force-wide bombing competition. The F-16's digital computing delivery system consistently beats the A-10, while the F-16 maintains higher speed and higher energy levels.

The requirement for an attack force modernization program to meet and beat the threat of the battlefield of the 1990s is well understood by the Army and the Air Force. We have a program; we designed it together. The speed of the A-10 is not the issue; survivability and lethality of an attack aircraft on both sides of enemy lines on a highly mobile battlefield is the issue.

Critics can assist us to refine our needs in a meaningful way if we start our discussion with what is needed rather than with a 1970s and 1980s description of what is available.

Maj. Gen. Jimmie V. Adams, USAF
Langley AFB, Va.

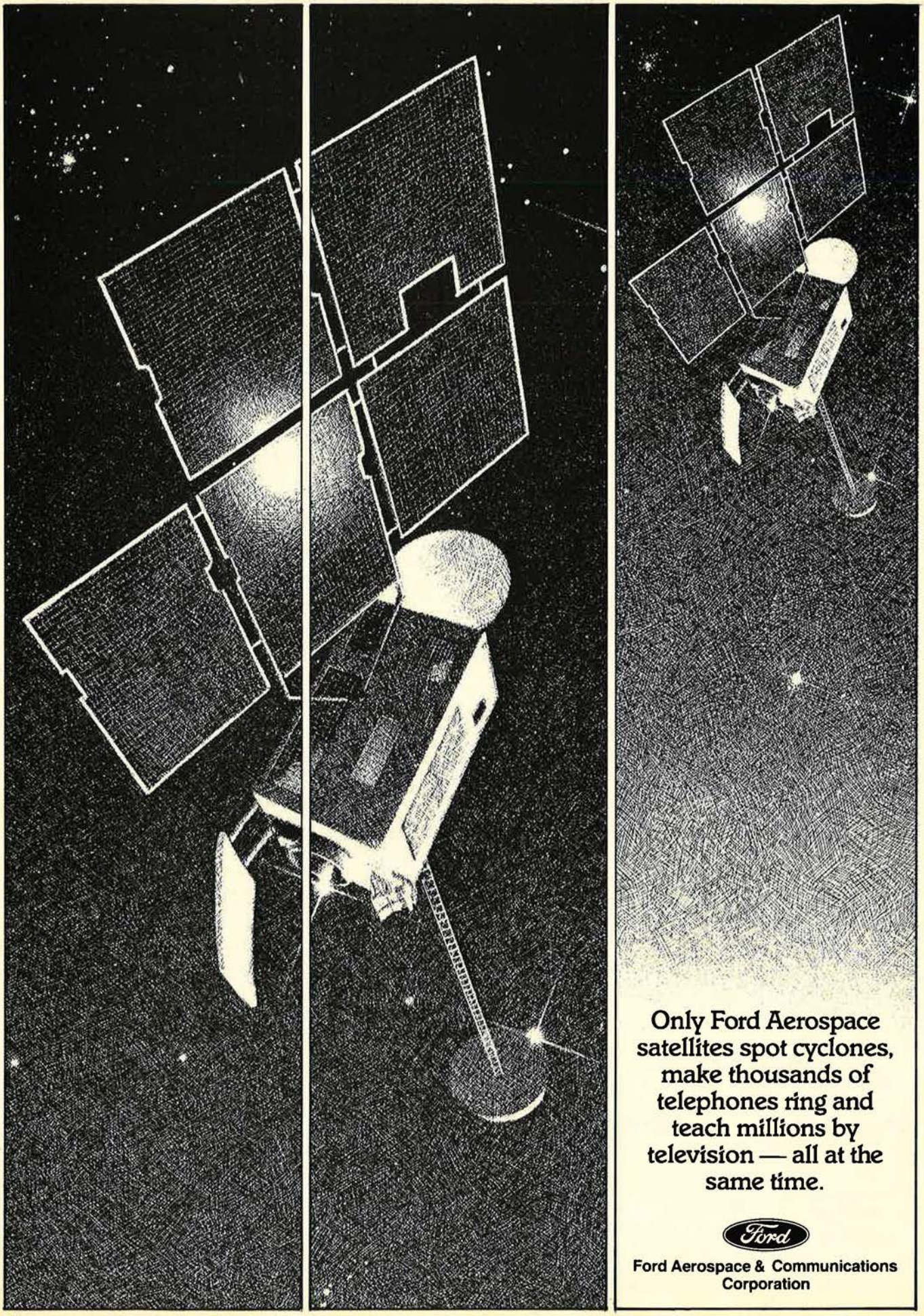
SDI and Deterrence

Re: The "Airmail" letter "Is SDI Necessary?" by Joseph Raintree in the May 1987 issue.

Mr. Raintree's vision of a strategic nuclear exchange is contrary to common sense. He states: "The Soviets will never risk nuclear attack. . . . We do not need SDI. . . . Our triad . . . cannot be nullified and is invulnerable. . . . There can never be such a thing as a successful first strike. . . . Within minutes, the other [side] will retaliate. . . . " Obviously, the Soviets do not agree, or they would not be seeking strategic superiority far in excess of their defensive requirements.

It has long been US policy *not* to retaliate until actual nuclear detonations have occurred on US soil. There is no such thing as "launch on warning." To be credible, our deterrent must be survivable. Without SDI, the fact is that two of our triad's legs are vulnerable to a Soviet first strike.

Only a fool would stake our future on the assumption that our deterrent is invulnerable. A first strike is virtually guaranteed to eliminate all our ICBMs and bombers. Only our SSBNs are considered safe, and that is constantly challenged by technological



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advances in ASW. The Soviets need not even destroy them, but merely to disrupt their communications. Mobile ICBMs are still vulnerable and too costly.

We need SDI to make our land-based triad components viable again. We do *not* need the prohibitively expensive, space-based, leakproof "shield" that the SDI proponents are pushing for. SDI need *not* protect our population. Deterrence works—it has kept the peace for forty years—but only a survivable deterrent works. We need a simple, relatively inexpensive, rapidly deployable point defense for our ICBMs and bombers. And it need not even be perfect. The Soviets will not attack our deterrent forces if there is any doubt that they can neutralize them.

Another possibility that no one has yet mentioned is placing part of our deterrent in earth orbit. Let's face it—space is already militarized, so why not do it right? Sure, there will be howls of protest from the international community, but I'll bet it's the Soviets who'll be howling the loudest!

Jeff Joseph
Minot AFB, N. D.

The Perfect Disguise

John C. Morton's letter "Locating Dolly Parton" in the May 1987 "Airmail" fails to address the principal feature of the rail-garrison concept for the MX—that is, mobility. I agree with Mr. Morton that one of the MX trains would be difficult to hide. Even if the missiles and erectors could be fitted into eighty-six-foot "Hi Cube" boxcars, the length and composition of the train would still make it suspect. The best solution would be not to attempt to disguise the equipment, but to design equipment to take advantage of rail mobility.

The twenty-four class-one railroads in the United States support daily freight operations at speeds of fifty mph to seventy mph. The only restrictions that could be placed on a properly designed and powered missile train's mobility would be clearances in some Eastern states and slow orders through congested areas, both of which could be waived during emergency situations.

The large geographical area that a missile train has available for deployment and the ability of the train to move 450 miles to 500 miles in a twelve-hour period make mobility the perfect disguise. Even if a Soviet surveillance satellite could locate a missile train and if Soviet computers could identify the train only minutes later, it would still take time to update a warhead's guidance system and deliver the warhead. In the intervening time, a stationary train could move, and a moving train could move farther or in a different direction.

I have some doubts that Soviet warheads are capable of tracking a moving train.

Charles L. Blevins
Trenton, Ill.

Elephant Walk to Hanoi?

The BUFFs went unescorted on Linebacker I and Linebacker II raids? Oh, really? That's what Capt. Roy E. Walker, Jr., said in his May 1987 "Airmail" letter "In Defense of Bombers," but that's not what I remember!

In light of his rank, Captain Walker must have gotten his information about the Linebacker missions from a history book; he certainly couldn't have experienced the times he talks about. I was working electronic warfare frag during my 1971–72 tour at Korat RTAFB in Thailand, and I remember quite well the effort that went into supporting the B-52s on their raids into North Vietnam. Maybe the BUFF crews couldn't see all the support, but there was a friendly crowd in ahead of them and out behind them every time they "went North."

Let's see now—as I recall it, there was MiG CAP and BARCAP, some of it even from the US Marine Corps. There was SAM suppression from the Wild Weasels, there was electronic warfare support from a small and hardy band of EB-66 crews, there were chaff bombers, there was RESCAP standing by, there was AWACS, and, on occasion, there were other strikes going on to saturate the defenses. I believe the US Navy was in on the act also. If I forgot anyone, I apologize.

There were complaints that nervous B-52 gunners were occasionally hos-

Air Force Association Balance Sheets

	December 31, 1986			December 31, 1985		
Assets	**General Fund**	**Life Membership Fund**	**Total**	**General Fund**	**Life Membership Fund**	**Total**
Current Assets						
Cash plus marketable securities at cost	$ 7,619,010	$5,391,149	$13,010,159	$ 6,963,777	$4,374,240	$11,338,017
Receivables, prepaid expenses, etc.	1,996,832	1,033,707	3,030,539	2,965,996	949,029	3,915,025
Fixed Assets (land, building, etc.)	7,030,406		7,030,406	6,608,702		6,608,702
Funds on Deposit and Other Assets	2,200,062		2,200,062	1,452,731		1,452,731
Total Assets	$18,846,310	$6,424,856	$25,271,166	$17,991,206	$5,323,269	$23,314,475
Liabilities and Fund Balances						
Current Liabilities (including payables, accrued expenses, etc.)	$ 2,967,975		$ 2,967,975	$ 2,932,284		$ 2,932,284
Deferred Revenue (including advance membership dues and magazine subscriptions)	1,863,128		1,863,128	2,775,145		2,775,145
Long-Term Debt	4,743,375		4,743,375	4,884,750		4,884,750
Fund Balance						
Unrestricted	7,118,780		7,118,780	6,399,027		6,399,027
Designated	2,153,052		2,153,052	1,000,000		1,000,000
Restricted		$6,424,856	6,424,856		$5,323,269	5,323,269
Total Liabilities and Fund Balances	$18,846,310	$6,424,856	$25,271,166	$17,991,206	$5,323,269	$23,314,475

ing down their escorts, but that kind of thing has happened since fighters first escorted bombers anywhere. I seem to recall complaints that the support wasn't effective, but the objective was to make things difficult for the defenders, not to prevent them from firing. And—oh yes—I do recall the free press publishing some strong comments from certain BUFF crew members about the immorality of war when the going got tough those first few days in December 1972.

To be sure, the B-52 strikes were morale crushers for the North Vietnamese, even as they were morale builders for our POWs. One of my acquaintances who was in the Hanoi Hilton told me of the effect those raids had; it was tremendously impressive to both friend and foe. It is my belief that if we had done in 1965 what we did in December 1972, we wouldn't have had our ten-year ordeal.

Captain Walker makes it sound as if it were just fifteen or twenty BUFFs on an elephant walk to Hanoi. If his history book told it that way, he should find a more complete history book.

Lt. Col. Gerald P. Hanner,
USAF (Ret.)
Papillion, Neb.

Re: Capt. Roy E. Walker's May 1987 "Airmail" letter "In Defense of Bombers" and Col. Peter Boyes's March 1987 "Airmail" letter "Bombers Obsolete?"

While my own operational experience places me in the Captain's corner in his spirited and knowledgeable defense of the bomber's penetration capabilities, I feel his gratuitous remark that Col. Peter Boyes had obviously "never set foot in a bomber cockpit" brings little credit to the remainder of his letter.

This "Airmail" feature allows each of us to voice concern or interest in Air Force matters. It should not be used to question the competence of fellow contributors. I feel that editorial discretion should be invoked to excise these lapses of good taste when contributors comment on the *bona fides* of fellow contributors.

In this instance, I can write knowingly of Pete Boyes's distinguished record in World War II heavy bombardment units and can claim knowledge of his flying skills, having experienced many flying hours with him.

Let's get back on the issues and leave off the gratuitous cracks that serve no purpose and detract from the professional status of "Airmail."

One last remark—lest the Captain draw a bead on me, I served in the 341st Bomb Wing at Dyess AFB, Tex., during the B-47 days.

Maj. Cyrus J. Merritt,
USAF (Ret.)
Springfield, Mass.

The Problem With MPC

Re: Bruce Callander's article "The Uncertain Art of Career Management" in the April 1987 issue.

Mr. Callander appears to have relied too much on the official MPC line. Having just separated from the Air Force, I would like to take issue with several points.

First, more than a "few" young pilots are plowed back to become First Assignment Instructor Pilots (FAIPs). In my experience as an FAIP at Williams AFB, Ariz., about twenty percent of each class was plowed back. UPT squadrons are primarily manned by FAIPs. For a young pilot, it is a very mixed blessing.

While you get tremendous flying experience, your chances of a desired follow-on assignment are slim. Despite graduating near the top of your class and three years of concentrated flying, as an FAIP you can expect assignment prospects no better than those for the least-talented new pilot—and usually worse. MPC will dispute this with statistics showing some astronomical "satisfaction" rate that is based on what MPC makes available to FAIPs, not on what was truly desired. The whole experience becomes very unmotivating.

Second, not everyone aspires to become Chief of Staff. To manage all officers as such when the average guy will be very fortunate to make O-6 (with MPC's "help") is ridiculous. So when MPC rejects an assignment preference because "it would not be of most benefit to the officer," they either presume to know our long-term goals better than we do ourselves or assume that we're just too stupid to

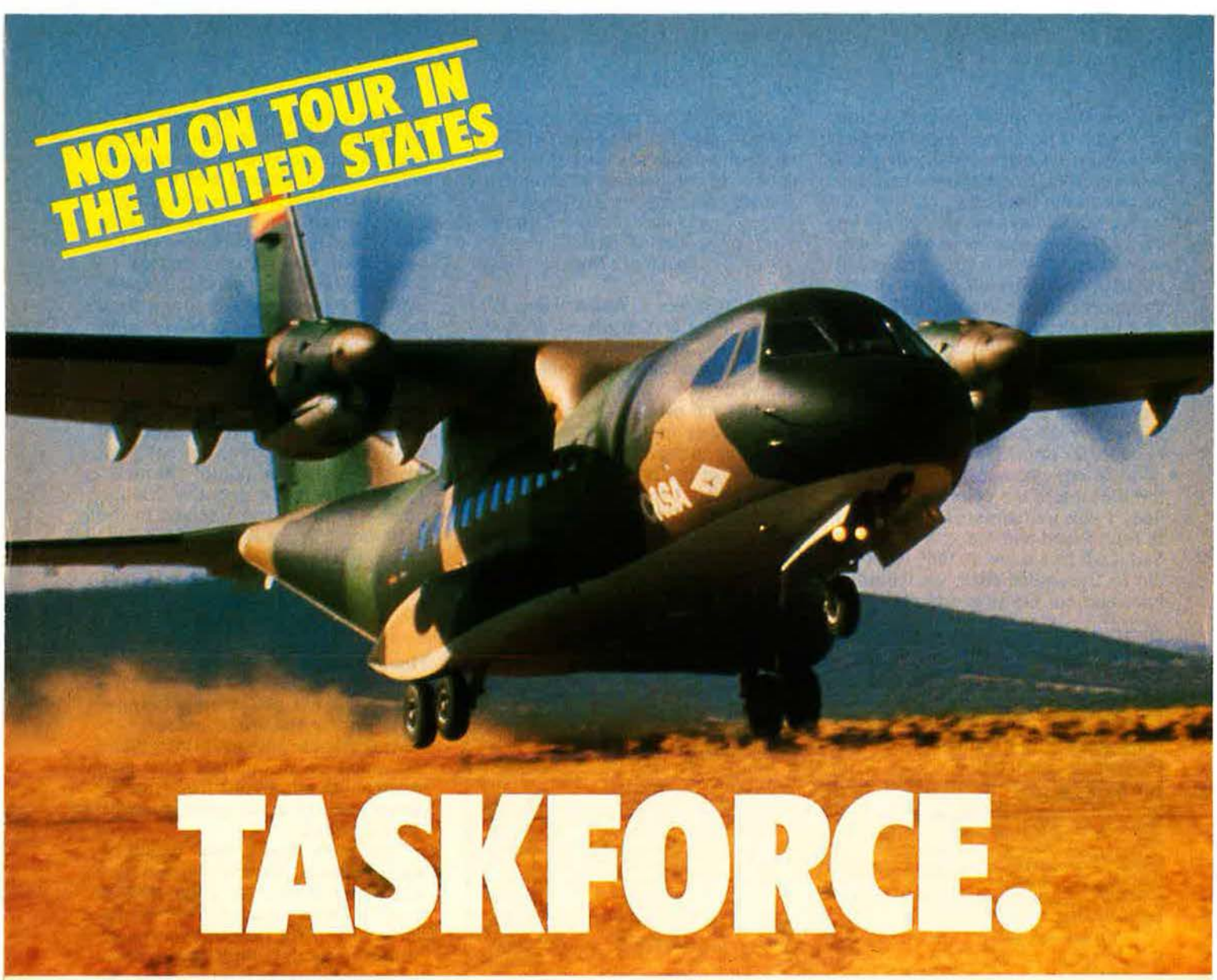
Air Force Association Statements of Revenues and Expenses

General Fund	Year Ended December 31 1986	1985
Revenues		
Membership	$ 3,049,931	$ 2,849,104
Patronship	254,913	254,074
Magazine	3,279,213	3,095,775
Industrial Associates Program	201,182	153,750
Data Processing Services	74,667	99,319
Insurance Programs—Administration	1,941,110	1,834,601
"Gathering of Eagles"	1,858,371	
Annual Convention	368,052	428,767
Aerospace Development Briefings	916,899	873,724
Other Income	589,059	152,495
Total Revenues	12,533,397	9,741,609
Expenses		
Membership	3,818,471	3,890,035
Patronship	289,485	276,947
Magazine	2,903,679	2,774,597
Industrial Associates Program	169,876	138,141
Data Processing Services	320,318	292,080
Insurance Programs—Administration	3,101,410	2,883,741
"Gathering of Eagles"	1,792,200	
Annual Convention	493,435	543,668
Aerospace Development Briefings	464,386	444,663
Total Expenses	13,353,260	11,243,872
Net (Loss) from Operations	(819,863)	(1,502,263)
Non-Operating Revenues		
Investment Income	788,457	707,219
Insurance Programs—experience credits and interest on reserves	1,894,951	1,081,897
Net Income—General Fund	$ 1,863,545	$ 286,853

Expenses include chapter commissions, state commissions, and other direct support for field units totaling $666,464 in 1986 and $623,174 in 1985.

Life Membership Fund		
Revenues from Investments	$ 425,402	$ 313,426
Less: Transfer to General Fund for annual dues and other costs	478,455	288,722
Net Income or (Loss)—Life Membership Fund	$ (53,053)	$ 24,704

Treasurer's Note: The figures reflected herein have been extracted from audited financial statements submitted previously to the Board of Directors of the Air Force Association.



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Versatility and can-land-anywhere ability are top priorities of the CN-235's design. Vast versatility from the ever-ready rear cargo-ramp door, thanks to which loading/unloading can be done in split seconds. And tactical vehicles can be driven on/off in the same way. And low-level cargo can be dropped midflight since the CN-235 operates perfectly with this rear door open (which also allows transport of long trailing loads other transports can't handle). The CN-235's list of can-do missions is endless.

Can-land-anywhere capability means exactly that. Any unprepared airstrip almost anywhere is all this tough STOL transport requires. Its rugged retractable landing gear plus high-wing construction make tough terrain no problem.

In fact, combat toughness is what the CN-235 is all about. Getting troops and material in and out fast. In ticklish situations. In tight places. That's what a true taskforce transport has got to do in combat. And that's what CASA-IPTN's CN-235 does to perfection. In war or peace.

Technical Characteristics:
Max. takeoff weight: 14,400 Kg. (31,746 lb.).
Max. payload: 5,000 Kg. (11,023 lb.).
Max. cruise speed: 245 Kt.
General or palletized (2 standard 88" pallets) cargo transport.
Troop transport for 48 soldiers or 41 paratroopers.
Light vehicle or logistic transport.
Maritime patrol and antisubmarine warfare versions.
Armed version: up to 3,500 Kg. of military load (missiles, machine guns, etc.).

CASA

IPTN

For further information, contact: Construcciones Aeronáuticas, S. A. Rey Francisco, 4. 28008 Madrid. Spain. Phone: 248 53 09. Telex: 44729. Or contact: CASA Inc.: 14102 Sullyfield Circle, Suite 200. Chantilly. Virginia 22021. Phone: (703) 378 22 72. Telex: 90-1109.

Gedung BPPT, JL. MH. Thamrin no. 8 Jakarta Telp. 021-322395, 021-336651; PO BOX 3752; Telex 46141

TAPSA/Ayer

realize when we're being shafted.

The Air Force does have a retention problem, especially with first-term pilots. The root of the problem is MPC. If they would work with these folks as individuals, with individual goals and aspirations, instead of treating them as a commodity, they would keep a lot more of them. Instead, they prefer to blame the airlines for hiring away their pilots. That is certainly confusing cause with effect. All the new, ex-military pilots whom I know at my airline didn't leave because the airline was hiring; they left because of the way they were treated by military personnel.

Robert G. McCallum
Naperville, Ill.

Under the Bridge

The celebrations this year of the fiftieth anniversaries of the Bay and Golden Gate Bridges calls to mind an incident that took place one afternoon in January 1944 in which I—with nerves at full stretch—took part.

We were four newly commissioned fighter pilots playing follow-the-leader in our P-39s. We dived down over Alameda, sped under the Bay Bridge at full throttle, cleared Alcatraz by fifteen feet, and then flew right out to sea under the Golden Gate Bridge.

This was not an authorized flight, to be sure. But we escaped detection and censure.

How many others in this big country have done this? We would like to begin locating these persons. Please write: Bridges Underflyers Club, P. O. Box 1284, Monterey, Calif. 93942.

Lt. Col. Wayne E. Rosenoff, USAFR (Ret.)
Monterey, Calif.

Colorado ANG History

As part of a nonprofit project, we're compiling a commemorative history book on the Colorado Air National Guard from 1924 to the present. This limited edition, nine-inch-by-twelve-inch book, called *Colorado Pride,* will have more than 200 pages and lots of photography dating as far back as the early 1920s, when the state acquired its first aircraft, an open-cockpit Jenny biplane.

The book will cost $30, and for another $5, a name can be embossed on the leather hardbound cover. The book is being sold on a prepublication basis only, so we are encouraging early orders.

We're also looking for any photographs or reference material that could be useful in making up *Colorado Pride.* All original material will be handled with care, returned, and credited in the book.

AIRMAIL

Any readers who are interested in this publication are invited to contact the address below.

Maj. Charles Whitley, ColoANG
140th TFW/PA, Bldg. 27
Buckley ANGB, Colo.
80011-9599
Phone: (303) 340-9431
AUTOVON: 877-9431

F-105G Wild Weasel

An F-105G, serial number 62-4425, is on display at American Legion Post 325 in Blissfield, Mich. Little is known of the history of this aircraft, which was assigned to Southeast Asia.

Information from readers on unit and base assignments, flight crews, maintenance crews, missions, photographs, etc., for -4425 would be greatly appreciated. Any correspondence should be sent to the following address.

Edwin D. Stoltz
25792 Highway 20A
Archbold, Ohio 43502

Air Commandos

I am seeking information on air commando involvement in World War II, especially any information on the 1st Air Commando Group. If you know someone who was in the Air Commandos, I would like to hear from you.

I am also looking for information on "Wingate's Raiders." Anyone with any information on these subjects is asked to contact me at the address below.

Joseph D. McLain
4159 Constellation Rd.
Lompoc, Calif. 93436
Phone: (805) 733-3461

Survival Stories

Do you have a survival story that you would like to share?

The USAF Survival School is looking for anyone who has experienced a survival episode, either military or civilian, that we could use to enhance our training curriculum. Your valuable experience will help us to teach others what to expect under similar circumstances.

Please contact us at the address below.

3636 CCTW/DOV
Fairchild AFB, Wash.
99011-6024
Phone: (509) 247-2371
AUTOVON: 352-2371

AIRMAIL

Charleston AFB

I am working on a complete history of fighter aircraft units stationed at Charleston AFB, S. C., from the very first days to the present. Any information about these units, the aircraft they flew, change of command dates, and facilities would be appreciated.

Please contact me at the address below.

TSgt. Stephan R. Kovacs, Jr., NYANG
Det. 1, 107th FIG
Charleston AFB, S. C. 29404-6437
Phone: (803) 554-3832

Enlisted Pilots

In conjunction with the Confederate Air Force Airsho 87 in October 1987 (dedicated to enlisted pilots of World War II), the CAF Museum will open a special exhibition on enlisted pilots of all services.

The Museum would welcome the loan or donation of any mementos from Navy, Marine, or Army Air Corps pilots who served in this capacity. Such items might include (but are not limited to) patches, uniforms, photographs, documents, etc.

Museum Curator
Confederate Air Force
P. O. Box CAF
Harlingen, Tex. 78551

AFROTC Det. 055

The cadets of AFROTC Detachment 055 at the University of California at Los Angeles are currently in the process of rebuilding our alumni association.

If you are a graduate of Detachment 055, please drop us a line and let us know what you are doing. A brief biography would also be appreciated, as would a unit patch from your current assignment.

Please contact the address below.

Alumni Association
AFROTC Det. 055
Room 210, Men's Gym
UCLA
Los Angeles, Calif. 90024-1611
Phone: (213) 825-1742

AFROTC Det. 305

The cadet staff at Detachment 305 is in the process of updating alumni files. Many of the addresses in our files are not current.

If you are a graduate of Louisiana Tech AFROTC and haven't heard from us in the past year, we may no longer have your current address. Please write us at the address below.

Alumni Officer
AFROTC Det. 305
Louisiana Tech University
Ruston, La. 71272

AFROTC Det. 430

AFROTC Detachment 430 is developing an alumni association. We need to hear from all past graduates. Even if you are no longer in the Air Force, we would like to hear from you.

We are proud of all Ole Miss AFROTC cadets and want present cadets to know of your accomplishments. Please write to us at the address below.

AFROTC Alumni
P. O. Box 0038
University, Miss. 38677-0038

AFROTC Det. 820

We would like to hear from the alumni, faculty, and staff of AFROTC Detachment 820 at Texas Tech University for the purpose of constructing a history of the detachment.

Please send us a short biography, briefly telling us what has happened in your career since graduation. Contact us at the address below.

AFROTC Det. 820
Texas Tech University
P. O. Box 4589
Lubbock, Tex. 79409

AFROTC Det. 850

We would like to hear from the alumni, faculty, and staff of AFROTC Detachment 850 at the University of Utah for the purpose of constructing a history of Detachment 850.

Please send us a short biography, briefly telling us what has happened in your career since you graduated or were reassigned from the University of Utah. Also, if possible, we would like to receive a current unit patch.

Please contact us at the address below.

AFROTC Det. 850
2009 Annex Building
University of Utah
Salt Lake City, Utah 84112-1107

Roll Call

I would like to make contact with anyone who was in the aircraft maintenance career field and was stationed at Little Rock AFB, Ark., in 1978–79. I am specifically attempting to locate Amn. Debbie Wilkerson, who was assigned there at that time. She was later transferred to Germany. She was the wife of my brother, Richard, whom I am also trying to locate.

Please contact me at the address below.

Joseph C. Wilkerson
620 Weaver Ave.
Fort Worth, Tex. 76114
Phone: (817) 738-8099

I am desperately trying to locate the whereabouts of Edward (George?) Dunn. He served with USAF at RAF Brize Norton in England during 1950–52. His home address in the US at that time was in Cleveland, Ohio.

Please contact the address below.

S. Hibbitt
24, Nelson Ave.
Downham Market
Norfolk, PE38 9JL
United Kingdom

I am attempting to locate a former friend of mine, Marshall Voorhees. His hometown was Keokuk, Iowa. He enlisted in USAF in May or June of 1953 and took his pilot training at Chandler AFB, Ariz., in the summer of 1953.

I would appreciate any help readers could give me in my effort to determine his present whereabouts.

Jim L. Johnston
1075 East Fort Lowell
Tucson, Ariz. 85719-2189

I am seeking information about Verne R. Hiskey, waist gunner on the B-17G *Due Back,* which served with the 447th Bomb Group in May to August 1944.

Anyone who could shed some light on this subject is asked to contact the address below.

Chris Bowers
3616 Lundie Lane
Petersburg, Va. 23805

I would like to contact members of my aviation cadet navigator training class, Class 56-17C, which trained at Harlingen AFB, Tex., in 1955–56. I am also looking for members of reconnaissance-bombardment Class 57G-RB at Mather AFB, Calif., in 1956–57.

Please contact the address below.

Clyde C. Anthony, Jr.
2812 Metz Dr.
Midland, Tex. 79705

I am trying to locate former students who graduated from Turner AAF in Albany, Ga., during World War II. We are seeking the names and addresses of students and instructors to compile a roster for a possible reunion.

Please contact the address below.

Lt. Col. William J. Peters, USAF (Ret.)
2413 Trace 24
West Lafayette, Ind. 47906

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For the Replacement Inertial Measurement System (RIMS), one team brings a solid background of experience and hands-on expertise to the task of upgrading the performance, reliability and maintainability of the Air National Guard's fleet of A-7's—LTV Aircraft Products Group and the Collins Government Avionics Division of Rockwell International.

LTV and Rockwell have designed an off-the-shelf MIL-STD-1553B solution to the A-7 RIMS requirement that offers reduced risk, lower cost, a logistics support network and significant growth capacity such as adaptability in the future to the Global Positioning System.

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Powering strategic missiles is just one of the strengths of Hercules.

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Hercules Aerospace Company
Wilmington, Delaware 19894

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IN FOCUS...

"Leapfrog" Technologies

By Edgar Ulsamer, SENIOR EDITOR (POLICY & TECHNOLOGY)

The USAF Chief says that headway in stealth and advanced munitions is pointing toward big gains in US conventional warfare capabilities.

Washington, D. C., June 3

Sparse funding notwithstanding, the Air Force is making considerable headway in "leapfrog" technologies that promise to amplify the US's conventional warfare capabilities and thereby raise the nuclear threshold, according to USAF Chief of Staff Gen. Larry D. Welch. At a recent meeting with defense writers, General Welch singled out stealth and advanced munitions in this context as the "possibly most exciting" technology areas. In the latter category, he explained, "we are right now on the leading edge of [fielding operational hardware], but we are still several years away from 'deliverables' in stealth technologies for conventional applications."

Pointing out that the Air Force has made sizable investments in technologies that boost the effectiveness and lethality of both air-to-air and air-to-surface munitions, he suggested that major payoffs are in sight. In the case of air-to-ground munitions now undergoing test, "we have the potential to destroy [several] tanks on a single pass," a high-priority objective the Air Force has been after for many years. In the air-to-air arena, the lethality and effectiveness of AMRAAM, the advanced medium-range air-to-air missile, can "double the capability of the F-15 for four percent of the cost of the aircraft." The air-to-air capability of the F-16 goes up "sixfold" with the help of AMRAAM, he added.

The Air Force is also pursuing stealth technologies across "a range of programs, both conventional and nuclear," because these technologies can create great difficulties for hostile air defenses. In the area of stealthy tactical aircraft, he called attention to the Navy's Advanced Tactical Aircraft (ATA), which is under consideration by the Air Force as "our follow-on to the F-111." Conversely, USAF's Advanced Tactical Fighter (ATF), another combat aircraft that capitalizes on stealth technologies, will not only serve as the Air Force's next-generation air-superiority fighter but is also intended to perform the same role for the US Navy.

Though General Welch stressed that significant progress is being made in bolstering US conventional warfare forces, he cautioned however that "there is no way of building great increases in conventional capability without great cost." Pointing out that there is much ado in Congress and the media about the trillion-dollar defense investments, he said the actual increase over 1982–86 in defense funding was "less than $20 billion" compared to the levels proposed by the Carter Administration. "So, the massive influx in dollars for conventional warfare for conventional [buildups] simply didn't happen."

In the case of ATF, USAF's Chief of Staff suggested that aerospace industry contractors involved in the prototype program have made "unusual" investments and commitments owing to their great interest in participating in the service's "number-one tactical program." He added that because of these commitments, he was confident that the product will be "the best aircraft for the least cost. . . . If you have five of the country's top airframe manufacturers intensely interested in a single program [and] both of the country's prime engine contractors . . . then you are in a very enviable position."

In recognition of the unusual financial exposure of the competing contractors involved in the ATF program, the Air Force encouraged teaming arrangements that in effect spread the risk, General Welch explained. As a result, the Air Force doesn't expect that potential financial overextension on the part of any competing contractor is likely to lead to circumstances requiring bailout by the government. The Air Force recognizes that the heavy out-of-pocket investments required by contractors to be accepted as competitors on the ATF program is not the "kind of business approach" that can be applied freely. "We can only apply this [formula] once in a long while to programs that particularly attract the interest of contractors."

According to General Welch, the Air Force's other major stealth aircraft program—the Advanced Technology "Stealth" Bomber, or ATB—gives no evidence of exceeding overall costs, notwithstanding congressional and media allegations to the contrary. "There are some increased costs in the development [portion of the] program [that have] to do with increased front-end investments in production capabilities." But the Air Force expects to "gain back" this seed money during the production phase in part by having "hard tooling" in place when production gets under way. "There have [been no increases] in the program cost of the aircraft, [but] there has been movement of money from production to front-end development," the Air Force Chief of Staff reiterated.

While the ATB program is well along in its development and is going very well, the Air Force does not yet "understand all the costs and risks associated with [ATB]." To say otherwise, he suggested, would be "very naive" in light of the complexity and immature state of the program.

Another reason why it would be "foolish" to make binding, long-term projections concerning the ATB program stems from the historic lesson that the "real cost" of military aircraft programs is often determined "by whether or not Congress provides the funding profile" requested by the Pentagon. So-called program cost overruns, he suggested, are more often than not the product of perturbations in the funding profiles of defense programs. He added glumly that "we are likely to see perturbations in the funding profile of the ATB

simply because of the budget problems that we are facing." He asserted that "you won't see any perturbations [of the ATB program's funding profile by] the Air Force." He did acknowledge, on the other hand, that the Air Force, rather than the ATB contractor team, was "responsible" for the hike in front-end development costs.

The Air Force is examining without prejudice recent recommendations by the House Armed Services Committee to alter the competitive provisions of the ATB program, according to General Welch. (The intent of the congressional language is somewhat murky, but seemingly could lead to the requirement to set up a second production line or, at a minimum, to the selection of a program integration contractor to ride herd on the prime contractor. The committee has been critical of the B-1B program structure on grounds that the Air Force itself performed the role of the integration contractor.)

General Welch pointed out that in the past the Air Force reaped major cost savings by setting up a second production source for programs involving "large volume buys." If the set of proposals drafted by the Chairman of the House Armed Services Committee, Rep. Les Aspin (D-Wis.), becomes law, General Welch pointed out, the Air Force's yardstick will be a straightforward matter of profit or loss.

By going out for bids on a second production line to determine whether or not there is contractor interest in such an endeavor as well as to establish the associated costs, the Air Force can gauge if it makes economic sense to "second-source" the ATB program. Because of the low-production rate of the ATB program—the total buy is pegged at 132 production aircraft—and the high cost of setting up a second production line, the congressional proposal might well lead to a cost increase rather than decrease, he warned. He acknowledged that "there are contractors that have both the capacity and capability to be a second source [for ATB production, assuming that] they can see an economic gain."

General Welch warned emphatically against letting congressional criticism of the B-1B program spill over into the Stealth arena: "However you feel about the B-1 program . . . the ATB is . . . different, [with a] different pace, different sets of risks, and a different set of management."

Turning to current superpower negotiations on theater nuclear forces, General Welch expressed "strong" opposition to the elimination of SNFs

IN FOCUS...

(short-range, or "battlefield," nuclear forces) and dual-capable aircraft. He pointed out that only INFs (intermediate-range nuclear forces), consisting of longer-range (LRINFs) and shorter-range (SRINFs) INFs, were "on the table" in Geneva. The so-called "Zero LRINF" proposal, he suggested, would not skew the nuclear balance in Europe to an intolerable degree, "provided we address the SNF issue at the same time."

One of the key challenges facing the Air Force, he complained, is caused by budgetary uncertainties. "There isn't anyone we can sign a contract with" in order to make the service's fiscal guidance assumptions come true. In the early 1980s, that guidance stipulated a real annual growth of between six percent and seven percent. In fact, "we wound up with considerably less than this," even though the White House's Office of Management and Budget had settled on these growth prescriptions in consultation with Congress.

Next came the era of an advertised three percent growth rate that looked plausible in light of the fact that Congress vociferously berated the European allies for not meeting this minimum standard, General Welch pointed out. But Congress reneged on this commitment, too, with the result that the Air Force once again had to adjust its programs downward and even cancel several, the T-46 trainer among them. "We delayed the ATF for five years [and] the C-17 for three years beyond where we were ready to go. . . . This year, we submitted a three percent [growth] budget [only to be told subsequently that] we would be lucky if we got 'zero growth.'" The result is that the Air Force as well as the other services "frankly don't know what to plan against."

Soviet Advances in Space

Even if it were not for the lengthy standdown of the primary US space launchers—the Space Shuttle and Titan III—the Soviets would still enjoy "tremendous advantages" in space because of their "multiple, reliable space booster options, which virtually guarantee them access to space," Gen. John L. Piotrowski, Commander in Chief of US Space Command, reported to Congress recently. By way of an example, he pointed out that "our launchpad turnaround times—the interval between launches from the same launchpad—are measured in months. The Soviets, on the other hand, can relaunch some boosters . . . in a matter of hours" and others—under even the worst of circumstances—in less than a month.

The Soviets, at the same time, are increasing the technological sophistication of their military spacecraft and upping the number of long-endurance satellites operating in deep space. About forty percent of all presently operational Soviet satellites are long-endurance, deep-space systems, compared to only twenty-two percent in 1980, General Piotrowski pointed out.

The Soviets also derive decisive pluses from having fielded the world's only operational ASAT system as well as from "probable capabilities to attack our satellites with other means, [such as] ground-based lasers and antisatellite missiles," he testified. The US, by contrast, decommissioned its operational ASAT in the early 1970s.

By operating—again without offsetting US equivalents—Radar Ocean Reconnaissance Satellites (RORSATs) and Electronic Intelligence Ocean Reconnaissance Satellites (EORSATs), the Soviets can instantly track and hence target "US troop reinforcements in ports and . . . US convoys and battle groups during their movement across the oceans," the head of US Space Command explained.

In combination with electronic intelligence and photoreconnaissance satellites—and in the absence of US ASAT capabilities—the Soviets could "seriously jeopardize our ability to project and sustain US forces and to fight once engaged," General Piotrowski warned.

Two primary US space objectives, General Piotrowski told a congressional panel, hinge on the ability to support launches on demand and on improved space surveillance. In connection with launch on demand, Air Force Space Command—a component of US Space Command—is "evaluating the merits of employing smaller, less complex satellites" that would be replenished frequently and "could result in improvements in our entire space infrastructure."

The current space surveillance network, made up of thirty different sensors, is a "predictive . . . rather than a constant surveillance system [that won't be able] to handle increased Soviet space activities, particularly Soviet shuttle operations." This melange of ground-based wide- and narrow-band conventional radars,

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phased-array radars, electro-optical sensors, and space infrared detection sensors is especially deficient at altitudes beyond 3,000 nautical miles, the "deep space" regime.

For a quick fix, US Space Command has plugged the "National Science Foundation Ultrahigh Frequency Radar [developed by MIT's Lincoln Laboratory] and the Electro-Optical Test Site at Socorro, N. M.," into its network of deep-space sensors. Over the longer term, General Piotrowski explained, his command is "investigating the feasibility of using an optical space-based system, a Deep Space Warning Radar, or the Space Surveillance and Tracking System [being] developed by the Strategic Defense Initiative Organization."

Washington Observations

★ An influential Senate Armed Services Committee panel recently took a biased stance with regard to strategic force modernization by assigning "the highest priority to ongoing surveillance, warning, and C^3 programs and the Advanced Technology Bomber." In order to preserve the momentum in this "core area," the "committee recognized that it would be unable to fund fully [strategic modernization efforts] to the requested level in other areas, including development of the Small ICBM (or Midgetman) and research on the proposed rail-garrison MX system."

★ Defense Secretary Caspar W. Weinberger recently warned that the "Soviets—already ahead in production of military systems—have outinvested us in all research and development activities over the last two decades." Pointing out that US technological superiority has slipped "significantly" in recent years, he explained that while Soviet investments in R&D jumped by eighty percent since 1959—as a share of that nation's gross national product—the corresponding US investments declined by about five percent. He added that the status of the US technology base compared to other nations is a matter of concern, especially with regard to electronics.

"In semiconductors, a prime component in almost all defense hardware, we are now facing the possibility that the next generation of improved capability may be developed and manufactured entirely outside of the US," Secretary Weinberger pointed out. Since the originators of breakthroughs in semiconductor technologies tend to protect new developments for extended periods, the US may find itself at the mercy of other nations "for the technological innovations that are fundamental to our defense," he suggested.

IN FOCUS...

★ US and Soviet arms-control negotiators meeting in Geneva have reached a tentative agreement on the establishment of Nuclear Risk Reduction Centers in Washington, D. C., and Moscow. The potential agreement was hailed immediately by the leadership of the Senate Armed Services Committee, among others. The committee's Chairman, Sen. Sam Nunn (D-Ga.), for instance, suggested that "this agreement demonstrates that the two superpowers can act together to advance their mutual interests in enhancing stability and reducing the risk of nuclear war."

★ The influential bipartisan Atlantic Council of the United States urged the Administration in a recently issued policy paper to be "cautious about deep, and especially rapid, arms reductions." (The Administration has reportedly just reinstated its original offer to eliminate all mobile ballistic missiles provided Moscow agrees to do the same.) The Atlantic Council's policy paper, which was coauthored by former White House National Security Advisor Lt. Gen. Brent Scowcroft, USAF (Ret.), recommends a combination of arms-control and force modernization efforts designed to deter "any other party's use of nuclear weapons, [discourage] a disarming first strike against our retaliatory forces, and also provide . . . a convincing measure of extended deterrence," among other purposes.

Specific key steps recommended by the bipartisan group include stepped-up survivability for the ICBM force, specifically the second fifty MX Peacekeepers and the SICBM, to "make them survivable enough to threaten prompt retaliation against critical hard targets of sufficient importance to assure that Soviet advantages in prompt, hard-target kill systems will not be exploited." Arguing that a decisive move toward mobility, and hence survivability, of the US ICBM force is "overdue," the Atlantic Council cites technical as well as political reasons that make such a step compelling: "Technically, it permits the land-based portion of the triad . . . to be a hedge against unfavorable trends—should these materialize—in regard to sea-based or air-breathing components of the force. Politically, by demonstrating to the Soviets our ability to make our forces more secure without their help, we have increased their incentives to bargain seriously about reductions."

A corollary, the Atlantic Council suggested, is the imperative to "improve Western conventional defenses and, more important, the balance between those of East and West and [to] revitalize the extended deterrence so essential to the security and well-being of our mutual security partners around the world [in order] to keep the prospect of nuclear war remote."

★ Congressional experts expressed surprise that the Administration has not highlighted publicly the importance of enhanced-radiation/reduced-blast weapons (colloquially referred to as the neutron bomb) in the context of current INF (intermediate-range nuclear forces) negotiations. Short-range, or "battlefield," nuclear weapons would take on added importance if the INFs are "zeroed." That would be doubly true in the case of battlefield weapons that reduce collateral damage to the civilian populations of European NATO countries in which these weapons might be used.

★ As mandated by law, President Reagan forwarded to Congress the Administration's report on "Soviet Noncompliance with Arms-Control Agreements" that in its unclassified version charged the USSR with four violations of its "political commitment" to observe SALT II:

- The development and deployment of the SS-25 missile, a prohibited second new type of intercontinental ballistic missile.
- Extensive encryption of telemetry during test flights of strategic ballistic missiles.
- Concealment of the association between a missile and its launcher during testing.
- Exceeding the permitted number of strategic nuclear delivery vehicles.

Beyond these four unambiguous violations, there is circumstantial evidence that the Soviets:

- Probably violated the prohibition on deploying the SS-16 ICBM;
- Took action inconsistent with their political commitment not to give the Backfire bomber intercontinental operating capability by deploying it to Arctic bases; and
- Evidently exceeded the agreed-upon production quota by producing slightly more than the allowed thirty Backfires per year. ■

CAPITOL HILL

By Brian Green, AFA DIRECTOR OF LEGISLATIVE RESEARCH

Washington, D. C., May 29

House Approves Defense Bill

The House of Representatives approved its version of the Fiscal Year (FY) 1988 defense authorization bill that reduces defense budget authority to the same levels as the House budget resolution—$289 billion in budget authority (BA) and $282 billion in outlays. The House Armed Services Committee (HASC) had earlier approved an authorization bill with $306 billion in BA and $294 billion in outlays. President Reagan requested defense BA of $312 billion and $297 billion in outlays. The House defense budget is about five percent less in inflation-adjusted dollars than the FY '87 budget.

The revised budget totals, introduced in an amendment by HASC Chairman Rep. Les Aspin (D-Wis.), cut deeply into procurement (down an additional nine percent) and research and development (cut more than ten percent). The Air Force took the deepest cuts of all the services. Air Force procurement was reduced twelve percent from the HASC recommendation and seventeen percent from the Administration request.

SASC Bill Stalled

The Senate Armed Services Committee (SASC) approved a defense authorization bill that includes $303.3 billion in budget authority for FY '88. The budget proposal represents inflation-adjusted growth of between zero and one percent over FY '87.

Senate Republicans, who object to a provision of the measure that would enforce the "narrow" interpretation of the Anti-Ballistic Missile (ABM) Treaty, have blocked consideration of the bill by the full Senate. The committee approved language, sponsored by SASC Chairman Sen. Sam Nunn (D-Ga.) and Sen. Carl Levin (D-Mich.), that would prohibit funding for "space-based or otherwise mobile ABM systems or components unless a joint resolution is enacted" to allow such funding. The practical effect of this provision would be to give Congress a veto over efforts by the Administration to use the so-called broad interpretation of the ABM Treaty to justify tests of Strategic Defense Initiative (SDI) technologies.

Presidential Veto?

The Administration objects to both the SASC and House versions of the defense authorization bill, raising the possibility of a veto. The Administration strongly opposes the House bill authorization level, SDI cuts, arms-control provisions, and many other program cuts as well as the SASC language limiting SDI development.

Ranking HASC Republican Bill Dickinson (R-Ala.) called the House bill "an all-out assault on [the] program to strengthen and maintain national security" and urged the President to veto any final defense bill resembling the House version.

Key Provisions

- *ICBM Modernization:* The SASC subcommittee on strategic forces places highest priority on command control and communications programs, the Trident II SLBM and Trident submarine, and the Advanced Technology Bomber. SASC recommended "that the pace of the Small ICBM program be significantly slowed" and argued that the Air Force still needed to answer key conceptual questions before "spending substantial sums on the rail-garrison [basing] approach" for the MX Peacekeeper. It approved $700 million of the $2.2 billion requested for the SICBM and $400 million of the $591 million requested for research on rail-garrison basing. The House approved $2.1 billion and $250 million respectively.
- *SDI:* The SASC approved $4.5 billion for SDI, a $1.3 billion cut from the Administration request. The House passed an amendment that reduced SDI funding to $3.1 billion.
- *C-17:* Both bills include authorization for procurement of the first two C-17 airlifters. By a lopsided vote of 321–92, the House rejected an amendment by Rep. Buddy Darden (D-Ga.) to delete all C-17 funding.
- *ASAT:* The House deleted all procurement funding for the F-15-launched antisatellite weapon and banned tests against objects in space if the Soviets refrain from testing their already operational ASAT system. The SASC supported the F-15-launched ASAT program, but noted that if such tests were prohibited again in FY '88, it would recommend restructuring or cancellation of the program.
- *Other Programs:* The SASC provided full funding for the Bigeye binary chemical bomb and procurement funds for the last increment of the ground-launched cruise missile, trimmed $200 million off the Advanced Cruise Missile, and provided $190 million of $220 million requested for R&D on the short-range attack missile (SRAM II). The House denied FY '88 funding for these programs.
- *Arms Control:* The House approved an amendment that prohibits the expenditure of funds on any program that would violate the unratified, expired SALT II Treaty and rejected an amendment that would enforce such a prohibition only after the Soviets complied with all provisions of SALT II. The House also limited underground nuclear tests to one kiloton so long as the Soviets show similar restraint and, as did the SASC, approved language that enforces the narrow interpretation of the ABM Treaty.

Senate Budget

The Senate approved a budget resolution that includes $301.5 billion in defense BA and $290.6 billion in defense outlays, an inflation-adjusted freeze compared to FY '87.

The resolution increased defense authority and outlays by $12 billion and $7 billion, respectively, compared to the resolution originally introduced by Senate Budget Committee Chairman Sen. Lawton Chiles (D-Fla.). Approval of the additional defense funding, however, is contingent on approval of a tax package that includes an additional $18 billion in revenues for FY '88 and $120 billion spread out over the next four years. If the taxes are not approved, defense spending levels would revert back to the five percent inflation-adjusted decrease in the original Chiles budget. ■

DEFENSE DIALOG

SURVIVABILITY. The U.S. Army-sponsored Survivability Technology Development Program allows Rockwell International's Autonetics Strategic Systems Division (ASSD) to develop weapon system hardening techniques against nuclear and other defense-suppressing threats. ASSD will define and support the development of survivability technologies for integration into ground-based SDI systems with minimal impact to their evolving designs. To achieve the overall objective, both systems-proven and state-of-the-art hardening techniques will be integrated through a combination of active and passive system designs and mechanizations.

THEATRE DEFENSE. ASSD is studying Theatre Missile Defense on the LTV team, defining a system architecture which could defend the European Theatre and other Theatres around the world from an attack—conventional, chemical and/or nuclear. ASSD will analyze the mission architecture tradeoffs, using the End-To-End Engineering Model (ETEEM) simulator. The division also assisted in the mission definition and threat analysis.

PEACEKEEPER RAIL GARRISON. Rockwell has been an integral part of the Peacekeeper missile development team from its inception and will continue to support the ICBM in its new Rail Garrison basing mode. The Rockwell team is combining a unique set of technical skills and experience —guidance and control, land navigation, launch control system integration, nuclear hardness and survivability, advanced strategic communications systems, railroad operations and control systems, and rail security operations—directly applicable to the new ICBM basing concept.

GIMADS. The Generic Integrated Maintenance Diagnostic System—GIMADS—is a program under development by Rockwell and prime contractor General Dynamics to assist the Air Force in institutionalizing the diagnostic process. ASSD will help develop a process for integrating maintenance diagnostics into the design, development and deployment phases of a weapons system procurement to improve and sustain weapon system readiness. GIMADS is a hierarchical maintenance approach for tomorrow's Air Force.

For more information, please call: Science and Technology, Rockwell International, Autonetics Strategic Systems Division, (714) 762-7775.

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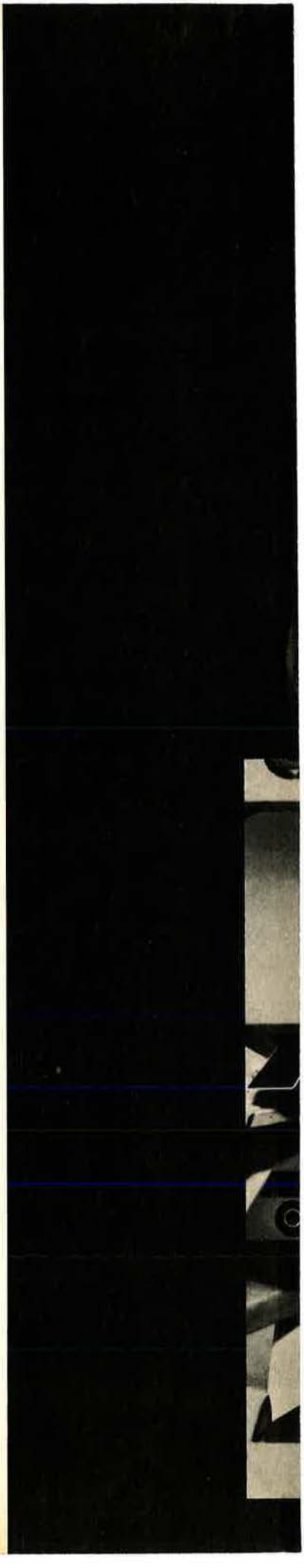

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The C-17 is now in development for first flight in 1990, when it will reach new highs for operational utility and new lows for cost of ownership.

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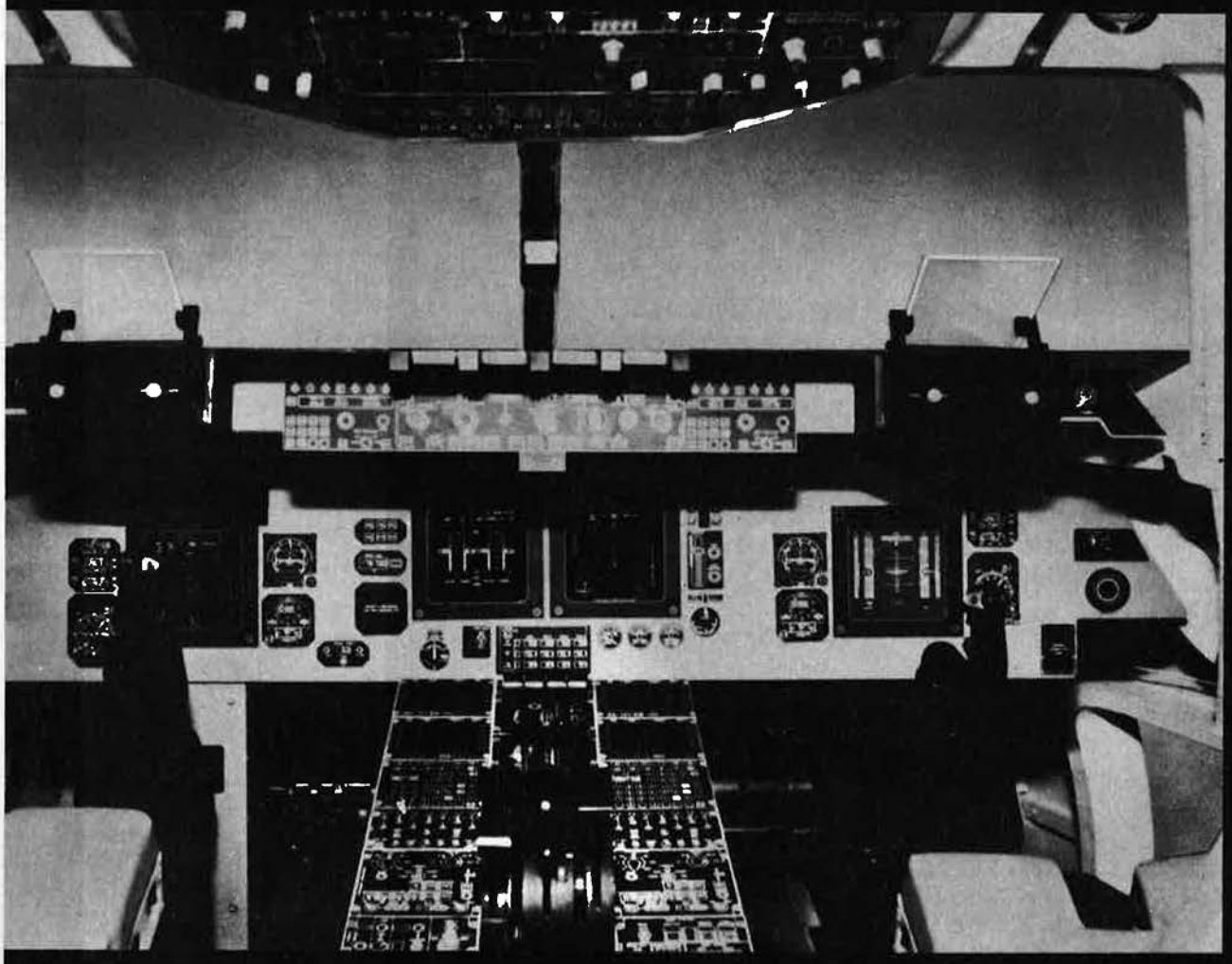

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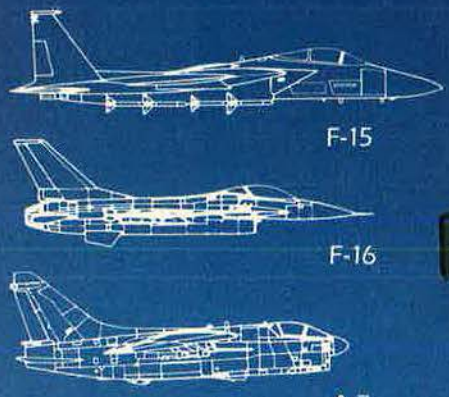

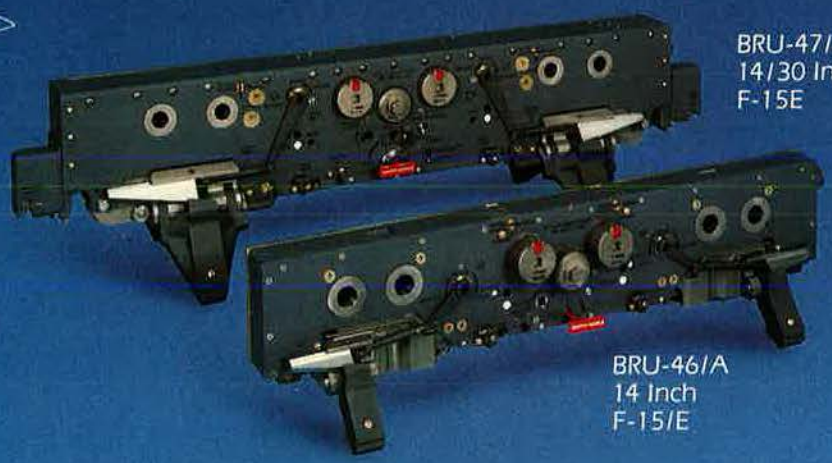

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AEROSPACE WORLD

. . . PEOPLE . . . PLACES . . . EVENTS . . .

By Jeffrey P. Rhodes, AERONAUTICS EDITOR

Washington, D. C., June 1

★ A six-man B-1B crew recently wrote a new definition for a "long day." Starting at 9:04 a.m. on April 14, the crew flew the plane continuously for the next twenty-one hours and forty-four minutes before landing back at Dyess AFB, Tex., at 6:48 a.m. the next day.

The marathon flight was conducted by the Air Force Operational Test and Evaluation Center's B-1B test team at Dyess to collect, verify, and challenge data on the new penetrating bomber's systems and capabilities. Other areas, such as crew comfort and provisioning for long-duration missions, were also checked.

The flight, which was flown at an average speed of 440 knots and covered a distance of 9,411 miles, went from Dyess to Seattle, Wash., on to Alaska, over the Beaufort Sea, and along a track above seventy degrees north latitude. The flight was flown so far north to check how well the plane's inertial navigational system (INS) performed near the magnetic pole. The plane turned back at Coronation Gulf, south of Victoria Island, and flew the same route home. At one point on the trip, the B-1B passed within 160 nautical miles of the Soviet Union.

The aircraft took off at 413,000 pounds, the maximum gross weight currently allowed. (Normal takeoff weight for operational training missions is between 330,000 and 350,000 pounds.) The plane was refueled five times to keep the plane heavy for data collection and performance evaluation.

The test data accumulated during the mission is still under study, but the sortie was regarded as a complete success.

This flight broke a six-month-old B-1B record of 5,940 miles covered in thirteen hours and twenty minutes. That record was set in a flight out of Edwards AFB, Calif.

★ A solution as simple as changing the way internal wing joints are sealed has eliminated a vast majority of the fuel leaks that plagued some of the early production B-1B bombers. The sealing process has gone through a three-stage evolution, with progressively fewer leaks at each stage, even though the wings were not where the worst of the fuel leaks occurred.

A triple-redundant wing-sealing process has eliminated many of the leaks that plagued some early production B-1B bombers. Here, Avco Aerostructures-Textron technicians do precision work on wingsets, which are reamed to a tolerance of two-thousandths of an inch to ensure exact matchup with fuselage during final assembly.

Avco Aerostructures-Textron, which builds the variable-geometry "wet" wings at its Nashville, Tenn., plant, originally sealed the parts between the fuel areas and the "dry" areas of the wing by means of fluorosilicone injected into an inverted U-shaped groove between the parts. Technicians would inject the silicone in one of the 65,758 fastener holes found on each wing pair, and the silicone would fill the groove until the sealant came out of the next hole four to five inches away. The first seven aircraft were sealed this way.

Aircraft numbers eight to forty-five were sealed with the injection system, too, but a polysulfide fillet seal was added in the fuel areas where the parts came together. A fillet seal is equivalent to the way a bathtub is caulked.

The final method of sealing the parts, which began with the wings for aircraft number forty-six, involves "smearing" polysulfide sealant along the length of a part (such as a stringer) before it is attached to the rest of the structure. The injection seal was dropped in favor of a prepacked polysulfide seal that fits snugly into the groove. Finally, the fillet seal is added.

Only three leaks have been detected since the wings have been sealed with this "triple-redundant" method, and all of these leaks have been caught and fixed while the wingsets, which hold 5,780 gallons of fuel, were in the plant undergoing a fuel check.

Additionally, Avco Aerostructures has started a "Leak Awareness Program," in which workers are informed of where and why leaks have developed on B-1Bs in the field. This is accomplished by means of bulletin boards at each wing assembly station. The company will deliver the 100th and final wing pair to Rockwell in October, and that last B-1B is scheduled to be completed in 1988.

AEROSPACE WORLD

★ Sweden unveiled its new multirole fighter, the JAS-39 Gripen, in April 26 ceremonies at Saab's plant near Linköping. The first of five prototype aircraft, the JAS-39 is scheduled to fly for the first time in the fall.

The Gripen (Swedish for Griffin) will be used for ground attack, as an air defense fighter, and—with both internal equipment and an external pod—as a reconnaissance aircraft. The plane has a wingspan of twenty-six feet, is forty-six feet long, and has a gross weight of 18,000 pounds.

The huge jaws of a C-5 easily engulfed this partially disassembled CH-46 helicopter at MCAS Tustin, Calif., as part of a Marine Corps Strategic Mobility Exercise (STRATMOBEX) last April. The loaded C-5s were then flown to McChord AFB, Wash., where the helicopters were unloaded, reassembled, and flown back to Tustin. The exercise, comprising nearly a week of hectic, twenty-four-hour-a-day activity, also included the unloading, staging, and reloading of more than 1,956 tons of cargo on forty-five aircraft sorties.

The fighter features delta wings and two intake-mounted canards that are used for both in-flight maneuvering and as speed brakes. Thirty percent of the Gripen's structure (including the wings, canards, vertical tail, and intakes) are made of carbonfiber composites.

The engine is a derivative of the General Electric F404-GE-400, which is used in the McDonnell Douglas F/A-18 Hornet. The engine, which will be built by Volvo Flygmotor and GE, is designated the RM12 and features thicker first-stage compressor blades to withstand birdstrikes better. The engine produces nearly 18,000 pounds of thrust.

The cockpit instrumentation is made up of three large cathode-ray tubes and a Hughes wide-angle head-up display. Only four conventional gauges are mounted as backups to the CRTs. The pilot's Martin-Baker zero-zero ejection seat is tilted twenty-eight degrees to withstand G forces better. A conventional center-mounted stick will be used rather than a side-stick controller because Swedish pilots want to be able to reach the controls with either hand.

The Gripen has a Mauser 27-mm internal cannon and seven hardpoints for 3,300 pounds of pylon-mounted ordnance. The JAS-39 can carry the AIM-9L Sidewinder and the Skyflash semiactive radar-guided version of the AIM-7 Sparrow. It will also be capable of carrying the AIM-120A AMRAAM.

Sweden has plans to procure 400 Gripens to replace the Saab J-37 Viggen that has been in service since 1972. The Gripen is scheduled to enter squadron service in 1992.

★ In yet another case of one man's trash being another man's treasure, a dozen obsolete C-5A radomes have found new life in quite an unusual role—as Spartan dorm rooms.

Members of the 2954th Combat Logistics Support Squadron at Kelly AFB, Tex., moved twelve of the nose cones from storage areas at the San Antonio Air Logistics Center to an inactive runway at Brooks AFB, Tex. There they set up the domes as shelters at their combat battle damage repair exercise facility.

After removal of the access panels, the radomes are large enough to accommodate six cots. Troops had been billeted in tents or the old base exchange building at Brooks.

The radomes were obsolete as the result of an improved and smaller radar system in the C-5As. Because the old domes were made of honeycomb and fiberglass, they were susceptible to birdstrikes and hail damage. The radomes currently in use are made of honeycomb and Kevlar, which is used as armor plating in some aircraft and helicopters.

Officials at the local Defense Reutilization and Marketing Office have been trying to find a use for the radomes for some time, but had met with little success until the need for the "Galaxy Hotel" came along.

★ On his first operational mission in a Lockheed U-2 in May a year ago, Capt. Jonathan D. George of the 9th Strategic Reconnaissance Wing at Beale AFB, Calif., overcame a severe in-flight emergency and was able to land his plane. For his quick thinking and actions in saving the aircraft, Captain George was awarded the Air Force's Koren Kolligian, Jr., Trophy for 1986 in ceremonies at the Pentagon on May 11.

The Kolligian Trophy is awarded annually to an aircrew member for displaying extraordinary skill, alertness, ingenuity, or proficiency in averting a flight mishap or keeping the seriousness of a mishap to a minimum.

After three hours of uneventful flight on this mission, Captain George's autopilot suddenly disconnected, and the trim pitch ran full nose down. The aircraft, which was flying at an altitude greater than 60,000 feet, nosedived, and the U-2 exceeded its maximum allowable speed.

Captain George regained control of the airspeed, but had to hug the steering yoke and exert manual pressure to counteract the plane's nose-down attitude. He had to maintain a constant pressure of thirty to fifty pounds on the yoke for nearly an hour until he could land.

He executed a no-flap approach, which is tricky given the U-2's eighty-foot wingspan and bicycle landing gear, and came to a full-stop landing. Overcome with fatigue, he had literally to be pulled from the cockpit and was admitted to the hospital for severe muscle strain and exhaustion.

The Koren Kolligian, Jr., Trophy was first presented in 1958 and was do-

nated by the Kolligian family in memory of their son, who was declared missing in the line of duty off the coast of California in 1955.

★ If the engineers working on the AIM-120A Advanced Medium-Range Air-to-Air Missile (AMRAAM) program were heard to utter an audible "whew" recently, they were perfectly justified. Over a twenty-three-day span in April and early May, six unarmed missiles were fired in four separate tests, including five in the space of one week. Five successes, including two direct hits, were recorded in the latest trials.

On April 9, an F-15 flying at Mach 0.9 at 15,000 feet above the White Sands Missile Range in New Mexico fired a single AMRAAM at a pair of QF-100 drones flying at different altitudes. The QF-100s were traveling at Mach 0.85; the target drone was at 10,000 feet, while the "escort" drone was flying at 12,000 feet. The F-15 made the nearly head-on shot while in the "track-while-scan" radar mode, which allows for multiple launches against multiple targets. The missile locked on to the target, but failed to pass within lethal range. Analysis of the failure determined that a software change was needed.

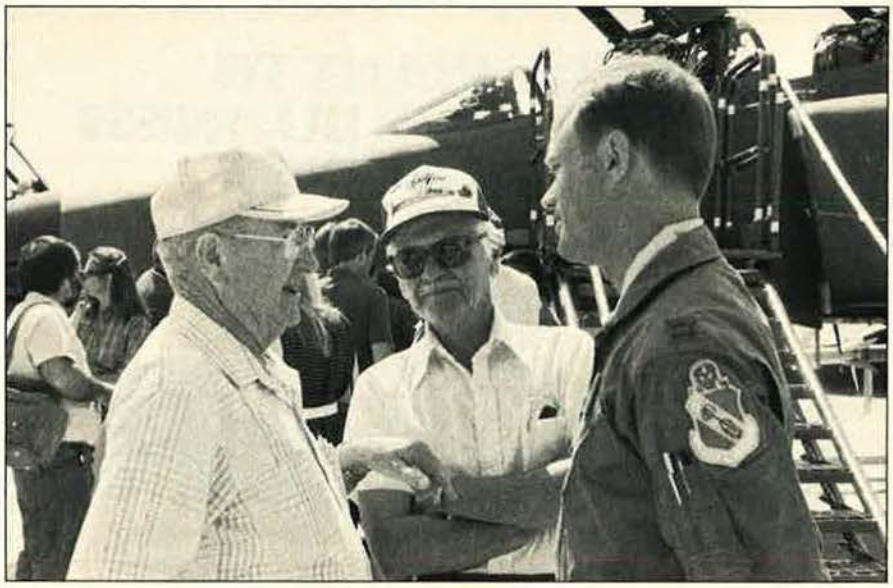
With the software change made, the next test on April 27 found an F-16 launching one of the nearly twelve-foot-long AIM-120s in an electronic countermeasures environment over the Gulf of Mexico near Eglin AFB, Fla. The F-16 was traveling at Mach 0.95 at 20,000 feet above the Gulf. The QF-100 was flying at Mach 0.70, but considerably lower (4,500 feet above sea level) than the shooter. The missile passed within lethal range of its target. This test was also notable because a British test pilot, Squadron Leader Simon Wood, fired the missile.

Two days later, two missiles attacked two separate targets while overcoming extensive radar jamming. An F-15C traveling at Mach 0.95 and 15,000 feet above ground level at White Sands fired the two 335-pound missiles head-on at the two QF-100s, which were flying at Mach 0.88 at 1,000 feet AGL. The first AIM-120 passed within lethal distance of the first drone, which was protecting itself with an internal jammer. The second AMRAAM scored a direct hit on the second drone, which was being protected by the jamming systems of another aircraft flying astern of the QF-100. This was a critical test, as Congress had mandated a successful test in this environment before full funding for the first production lot could be released.

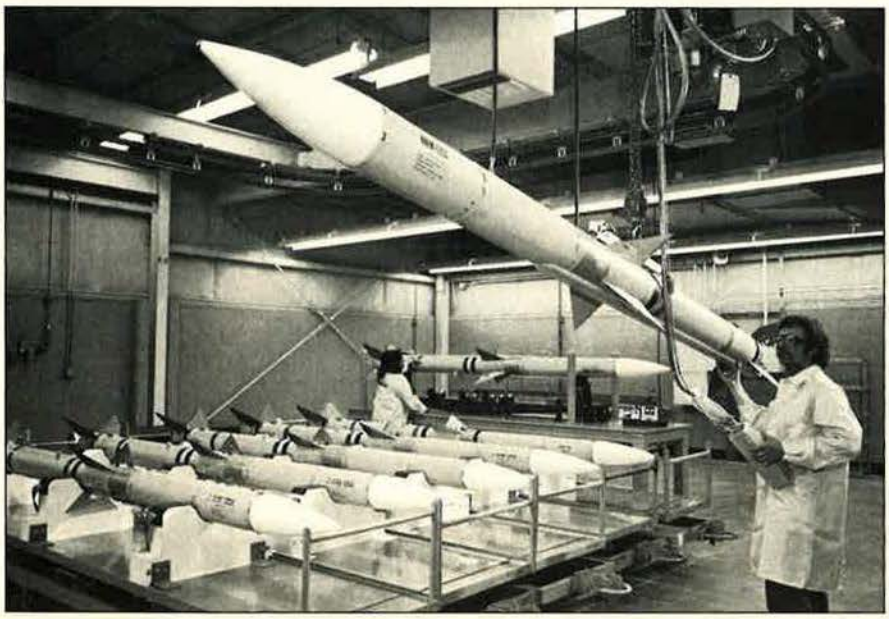
The final test of this busy week demonstrated that two AMRAAMs, fired almost simultaneously, could seek out targets without interfering with each other's radar guidance system. An F/A-18 traveling at Mach 0.90 and at 15,000 feet over the Navy's Pacific Missile Test Center at Point Mugu, Calif., fired two missiles at a QF-4 that was crossing in front of the shooter at Mach 0.85 at 10,000 feet. The first missile scored a direct hit and caused the Phantom II to explode. The second missile, following seconds behind, guided itself directly into the debris of the disintegrating aircraft. This was the first time a QF-4 had been used in an AMRAAM test.

These latest tests bring the AMRAAM scoreboard to twenty-nine successes in thirty-four tries in the full-scale development program. Also, five of the planned twenty-five Initial Operational Test and Evaluation (IOT&E) launches have been completed.

In all, a total of 24,000 AMRAAMs is



Don Smith, left, and Bill Slade talked with Capt. Donald A. Nelson at an Eagle Squadron Association reunion held at Seymour Johnson AFB, N. C., in May. The Eagle Squadrons were made up of American volunteers who flew combat missions with the RAF before America's entry into World War II. The veterans were feted by the 4th Tactical Fighter Wing, which traces its lineage to the Eagle Squadrons.



These AIM-120A AMRAAM missiles are being readied for delivery at the Hughes Aircraft Co. plant at Tucson, Ariz. Testing of the missile recently shifted into high gear, with six firings in less than a month. The missile has scored twenty-nine successes in thirty-four launches in the full-scale development program.

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wing strakes, an extended vertical tail, trailing edge flap augmentors, lift dump spoilers, and automatic maneuvering flaps. Avionics upgrades include the Low-Altitude Night Attack (LANA) system, which is made up of a forward-looking infrared radar and automatic terrain following for all-weather weapons delivery.

The two aircraft will be delivered in 1989, and testing will begin in April of that year at the Air Force Flight Test Center at Edwards AFB, Calif. The test program will last until 1990.

If the Air Force decides to proceed with the upgrade program, as many as 335 A-7Ds and Ks will be modified to the A-7 Plus configuration. All of the combat-coded A-7s are currently flown by Air National Guard squadrons.

★ Some highlights of recent congressional testimony given by Air Force officials:

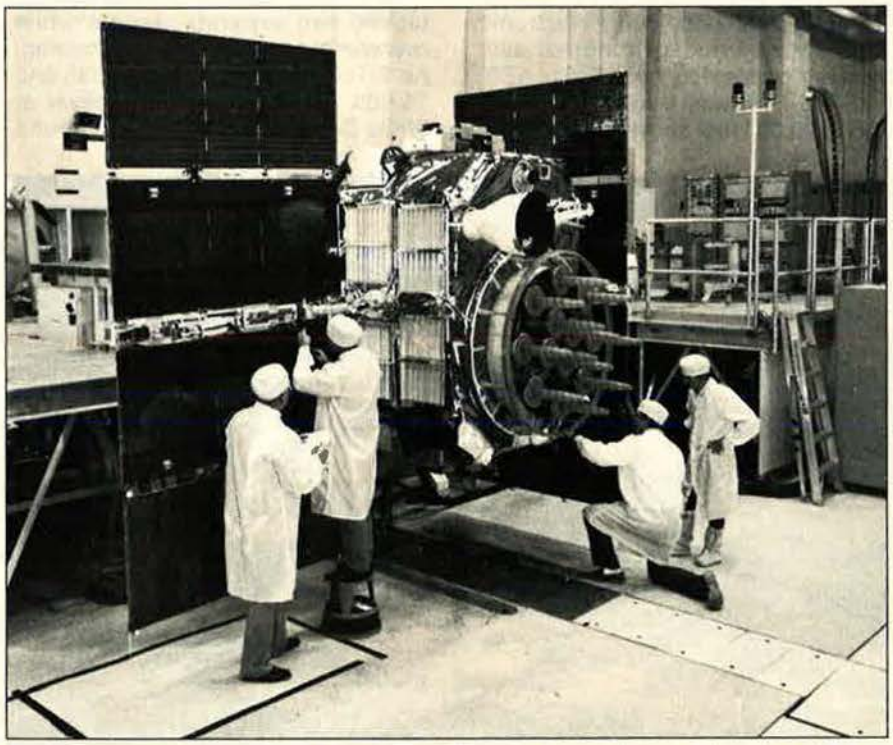
The Director of the Air National

planned for the Air Force and Navy, with additional deliveries scheduled for Germany and Britain. Hughes is the missile's prime contractor, while Raytheon is the second-source manufacturer.

★ As the first step toward an improved ground-attack capability for the Air Force, the LTV Aircraft Products Group of Dallas, Tex., will modify two A-7D Corsair II attack jets to an "A-7 Plus" configuration. The $133.6 million contract was awarded on May 8 by Air Force Systems Command's Aeronautical Systems Division at Wright-Patterson AFB, Ohio.

The two prototype aircraft will be equipped with a new afterburning F100-PW-220 engine that will give the venerable A-7 the capability to hit supersonic speeds. A kit to modify the plane to accept the longer GE F110 engine is also available, although there are no plans to test the A-7 Plus with that engine. Other modifications will include a fuselage stretch to accommodate the new engine, increased space for fuel, and an airframe-mounted accessory drive unit for self-contained ground operations.

Maneuverability will be enhanced by other changes that will include



Rockwell technicians perform final checkout on the first production Navstar Global Positioning System satellite. A total of twenty-eight of the satellites, designed to provide precise, worldwide, around-the-clock positioning information to a variety of users, will be built and delivered to USAF by Rockwell. Rockwell claims that the Navstar constellation, when in orbit, will be "twenty times more accurate than the next-best global navigation system."

Guard, Maj. Gen. John B. Conaway, reported to the Defense Subcommittee of the House Appropriations Committee that "at the end of FY '88, the Air National Guard will possess eighty-six percent of the total air defense interceptor forces, fifty percent of the tactical reconnaissance forces, thirty-five percent of the theater airlift forces, twenty-five percent of the tactical fighter forces, seventeen percent of the aerial refueling forces, sixteen percent of the rescue and recovery forces, nine percent of the Special Operations Forces, twenty-eight percent of tactical airborne command and control forces, and five percent of the strategic airlift forces."

In a similar vein, Maj. Gen. Roger P. Scheer, Chief of Air Force Reserve, described the combat support and mission support capability of the Air Force Reserve to the same committee, stating that "the Air Force Reserve provides seventy-one percent of the Air Force aeromedical evacuation units and twenty-two percent of the Air Force's tactical hospitals and clinics. Currently, Reservists contribute almost sixty percent of the depot-level aircraft battle damage repair capability with personnel in six Air Force Logistics Command-gained combat logistics support squadrons. Also, the Air Force Reserve represents twenty percent of the Air Force civil engineering force and equipment and nearly fifty percent of the aerial port squadrons. The majority of our combat support build from FY '86 to FY '87 is in civil engineering and medical forces."

★ A KC-135R crew from the 384th Air Refueling Wing at McConnell AFB, Kan., made a unique save during a recent naval fleet exercise in the Caribbean.

The tanker, configured with a drogue nozzle and flying out of NAS Roosevelt Roads, Puerto Rico, was orbiting thirty miles from the USS *Saratoga* to refuel the Navy fighters during one simulated strike mission. A Navy KA-6 (call sign "Sugar Bear") was also working the area.

Suddenly, one of the strike A-6s radioed that its fuel was draining out and that it could not make it back to the carrier or to Roosevelt Roads. Sugar Bear tried to refuel the crippled A-6, but the tanker's drogue nozzle broke. The KC-135 was at 20,000 feet and made a dash at 350 knots (the maximum allowable speed) to rendezvous with the Intruder.

When the McConnell crew got in position, they saw that the A-6 was venting fuel from both wings. The KC-135's boom operator, A1C Thomas C. Day, then made contact with the attack plane. After immediately taking on 12,000 pounds of fuel, the A-6 stayed on the tanker's boom until the coupled duo traveled the fifty miles to the *Saratoga*. The A-6 was able to make a normal landing on the ship.

During the week that the two McConnell KC-135Rs spent in Puerto Rico, the tankers refueled 173 Navy aircraft in eleven sorties and passed 461,000 pounds of fuel.

The work of artist William S. Phillips is the feature of a one-man show, "Into the Sunlit Splendor," at the Smithsonian National Air and Space Museum through December 31, 1987. Mr. Phillips, whose credits include four original AIR FORCE Magazine covers, has used everything from the Wright Flyer to the Space Shuttle Columbia as subject matter and has been called one of the few artists whose work tangibly expresses the exhilaration of flight. The work pictured above, "Hellfire Corner," depicts action over the English coast during the Battle of Britain.

★ **MILESTONES**—The **fourth and final Pave Paws phased-array radar** station at Eldorado AFS, Tex., **was activated** on May 8, Air Force Systems Command's Electronic Systems Division announced. The west central Texas facility was finished ahead of schedule and $9.5 million below projected cost. The ten-story, three-sided Pave Paws site features two 103-foot-diameter radar faces that are steered electronically through a 240-degree arc. The radar has a range of more than 3,000 miles and is used to detect submarine-launched ballistic missiles, to track intercontinental ballistic missiles, and to collect satellite data. All of the Pave Paws were built by Raytheon. The other radar sites are located at Cape Cod AFS, Mass., Beale AFB, Calif., and Robins AFB, Ga.

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MOTOROLA

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The **first F-16N,** a Navy variant of the General Dynamics F-16C, **was delivered** at NAS Miramar, Calif., in ceremonies on April 30. The Navy, which has ordered twenty-six F-16Ns, will use the aircraft in an adversary role as part of its "Top Gun" school curriculum at Miramar. The F-16N does not have the M61A1 20-mm gun of its progenitor, and rather than the Westinghouse APG-68 radar found on the C models, the N has the APG-66 radar found on the F-16A/B models. General Dynamics will deliver two F-16Ns per month to the Navy through April of next year.

An era ended on May 5 when the **last Martin Marietta LGM-25C Titan II ICBM came off strategic alert** at Little Rock AFB, Ark. Operational with Strategic Air Command since 1963, the Titan II carried a five-megaton warhead—the largest-yield warhead ever placed on a US missile. Crews will continue to man the site until mid-June to complete deactivation and remove the missile. Once removed, the 103-foot-tall missile will be refurbished and converted into a medium expendable launch vehicle for satellites. The silo will be dismantled. With 530,000 pounds of usable thrust in its two stages, the Titan II was chosen as the booster rocket for the US Gemini manned missions of the mid-1960s.

The first **two EC-130H "Compass Call" communications jamming aircraft** assigned to Europe **arrived at Sembach AB,** West Germany, on May 4. The planes will be assigned to the 66th Electronic Combat Wing. The Compass Call aircraft carry a flight crew of five and a mission crew of eight to operate the jamming equipment. Three other EC-130Hs will arrive at Sembach in September.

The **500th McDonnell Douglas F/A-18 Hornet built was delivered** to the Marine Corps on May 15. The milestone aircraft was flown to MCAS Beaufort, S. C., where it is assigned to VMFA-451. The US Navy and Marine Corps operate more than 375 F/A-18s in twenty-one squadrons. Hornets are also used by Canada, Spain, and Australia. Australia is building its F/A-18s under license in a plant near Melbourne. NASA is also using an F/A-18 aircraft in its High Alpha research program.

The **last Convair Atlas H** space-launch vehicle in the Air Force's inventory **successfully launched a classified payload** on May 15 from Vandenberg AFB, Calif. The Air Force has only Atlas E boosters remaining, and there are less than a dozen available. The Atlas H was capable of lifting 4,400 pounds of payload into low-earth polar orbit, but had no provisions for geosynchronous transfer orbit.

In mid-May, the largest flight of B-17s since World War II converged on Memphis to honor the dedication of the B-17 Memphis Belle on Mud Island, a Mississippi River park. Here, Phil Starcer, nephew of Joe Starcer—who painted the original nose art—puts the finishing touches on the Belle herself. The Memphis Belle, one of the most famous aircraft of the war, was restored to its former glory with money raised in a nationwide fund-raising campaign that collected more than $500,000.

The **second-stage solid propellant motor for the Small ICBM was successfully test-fired** for the first time on April 24 at the Arnold Engineering Development Center at Arnold AFS, Tenn. During the test, which lasted forty seconds and was conducted in a test cell that simulates high-altitude conditions, the motor developed almost 50,000 pounds of thrust. Aerojet General makes the motor, which is forty-six inches in diameter and ten feet long and weighs 7,000 pounds. The **first stage motor,** built by Morton Thiokol, **was successfully fired** April 3 at a site near Brigham City, Utah. The Small ICBM is expected to be fielded by 1992.

★ **NEWS NOTES**—The National Aeronautics and Space Administration announced on May 20 that the **first Space Shuttle flight since the January 1986 *Challenger* disaster has been rescheduled** for June 1988. The specific date was not revealed, but is thought to be toward the end of the month. The Orbiter *Discovery* will be flown on the mission, which will be the twenty-sixth Space Shuttle launch.

Twelve years ago, **Hoang Nhu Tran** had only thoughts of survival. Fleeing with his family from the invading North Vietnamese, Tran was one of the "boat people" who came to the US after the fall of Saigon. On May 27, though, Lieutenant Tran was the center of attention as the **valedictorian of the Air Force Academy's Class of '87** at graduation exercises at the Colorado Springs, Colo., campus. During his four years at the Academy, the biology and chemistry major made As in every subject except for four, and in those he made Bs. The twenty-one-year-old Lieutenant Tran is a Rhodes scholar and will be attending graduate school at Oxford for the next two years. After that, he will enter Harvard Medical School on a full scholarship to study surgery.

The American Society of Mechanical Engineers (ASME) has designated **the McKinley Climatic Laboratory** at Eglin AFB, Fla., **and the Icing Research Tunnel** at NASA's Lewis Research Center in Cleveland, Ohio, **as Historic Mechanical Engineering Landmarks.** The McKinley Climatic Laboratory, the eighty-fifth National Historic Mechanical Engineering Landmark, has been in operation since 1947 and has tested more than 350 aircraft, seventy missile support systems, and 2,000 equipment items at temperatures ranging from minus 105 degrees Fahrenheit to plus 165 degrees Fahrenheit. The Icing Research Tunnel, the twenty-first International Historic Mechanical Engineering Landmark, is the oldest active (in operation since 1944) as well as the largest refrigerated icing tunnel in the world.

The people of the Air Force are giving up their vices, as both **smoking**

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These rubber tank tracks are being inspected at Goodyear's St. Marys, Ohio, plant before shipment to an assembly facility where they will be installed on the US Army's M1 tank. Goodyear supplies both the tracks and the wheels for the M1, which is capable of speeds of up to forty-five miles per hour.

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and drug abuse levels in USAF are way down. The results of a survey of nearly 12,000 Air Force people indicated that 48,000 fewer people smoked in FY '86 than in FY '85. This is a 20.5 percent reduction in the amount of people lighting up. The Air Force also ran 139,999 more drug tests in FY '86 than the previous year, but the percentage of positive tests dropped from 4.9 percent in FY '85 to 1.2 percent in FY '86. More than 341,000 drug tests for cocaine and marijuana were run on Air Force people in the last year.

On April 30, **Boeing Aerospace Co.** of Seattle, Wash., was awarded a $214,438,014 contract **to develop a new Short-Range Attack Missile.** This contract was awarded by Air Force Systems Command's Aeronautical Systems Division after the Department of Defense concluded a study that compared the cost and effectiveness of reengining the present AGM-69A SRAMs against that of developing an entirely new missile. The contract calls for an advanced design phase, with options for full-scale development and production of the first 400 missiles. Current plans call for 1,633 of the new missiles to be procured.

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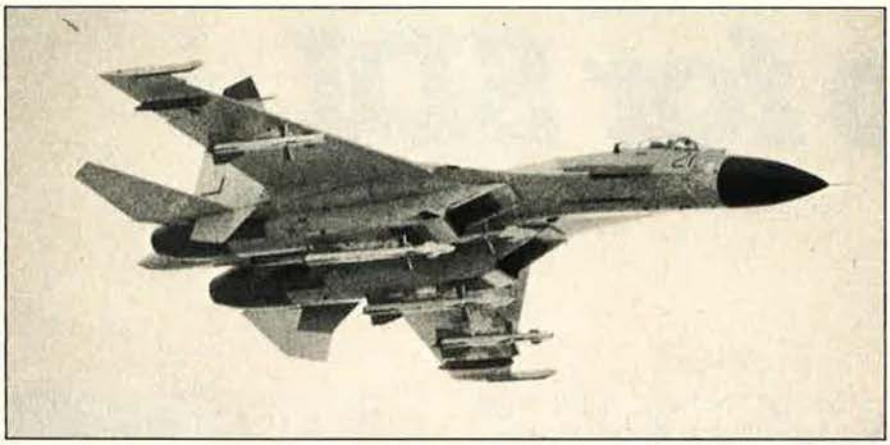


This is the first photograph of an operational Soviet Sukhoi Su-27 Flanker combat aircraft to be released in the West. It was taken from a P-3B Orion maritime surveillance aircraft from 333 Squadron, Royal Norwegian Air Force, operating out of Andoya AB in northern Norway. The Flanker, expected to fill primarily an air-to-air role, has recently entered service on the Kola Peninsula.

According to the FY '86 DoD Statistical Report on the Military Retirement System, **there are more than 550,000 Air Force retirees** residing in the United States and overseas. Of this figure, more than 159,000 are officers, and more than 389,000 are NCOs. One third of the total number of retirees live in Texas, California, and Florida.

The Navy carried out the **third successful test flight** of the Lockheed UGM-133A **Trident II** sea-launched ballistic missile on April 29. The Trident II, or D-5 as it is known, was launched from a flat pad at Cape Canaveral AFS, Fla., in a basic missile development test into the Eastern Missile Test Range in the Atlantic. The three-stage, forty-four-foot-tall, 120,000-pound missile will undergo approximately seventeen more pad launches before undersea test firings begin on the USS *Tennessee* in 1989. The D-5 has a range of greater than 4,000 nautical miles.

★ **DIED—Wing Commander Robert Stanford-Tuck,** one of Britain's most decorated World War II fighter aces, on May 5 at his home in Sandwich Bay, England. He was seventy. Officially credited with twenty-nine aerial victories, he also had six unconfirmed "kills," and he damaged an additional six German aircraft. After starting out in the British merchant marine, Wing Commander Stanford-Tuck transferred to the Royal Air Force in 1935. He flew cover during the May 1940 Dunkirk evacuation, and he later flew in the Battle of Britain. He survived two midair collisions, was shot down four times, crash-landed in the English Channel, and was wounded twice. Wing Commander Stanford-Tuck was captured after a forced landing in 1942, and he spent the next three years as a prisoner of war before escaping in 1945. He was feted and then questioned after his capture by then-Col. Adolph Galland, who later would command Germany's fighter forces. After the war, Stanford-Tuck questioned Galland, and the pair became friends. A recipient of the British Distinguished Service Order and the Distinguished Flying Cross with two bars, Mr. Stanford-Tuck became a mushroom farmer after the war. *Fly for Your Life,* a wartime biography of Commander Stanford-Tuck, appeared in 1956. ■

SENIOR STAFF CHANGES

PROMOTIONS: To be **Lieutenant General:** Michael J. **Dugan;** Charles C. **McDonald.** To be **AFRES Major General:** William C. **Roxby,** Jr.

RETIREMENTS: L/G Charles J. **Cunningham,** Jr.; M/G Thomas A. **LaPlante;** L/G Winston D. **Powers.**

CHANGES: M/G Jimmie V. Adams, from DCS/Requirements, Hq. TAC, Langley AFB, Va., to Cmdr., 1st AF, TAC, and Cmdr., CONUS NORAD Region, Hq. TAC, Langley AFB, Va., replacing M/G (L/G selectee) Buford D. Lary . . . **M/G (L/G selectee) Michael J. Dugan,** from Ass't DCS/P&O, Hq. USAF, Washington, D. C., to DCS/P&R, Hq. USAF, Washington, D. C., replacing L/G Merrill A. McPeak . . . **Col. (B/G selectee) Charles E. Fox,** from Spec. Ass't to Vice Cmdr., Hq. AFLC, Wright-Patterson AFB, Ohio, to Vice Cmdr., Ogden ALC, AFLC, Hill AFB, Utah, replacing B/G Dale W. Thompson, Jr. . . . **Col. (B/G selectee) Walter Kross,** from Cmdr., 436th MAW, MAC, Dover AFB, Del., to Vice Cmdr., Hq. AFMPC, and Dep. Ass't DCS/Pers. for Mil. Pers., Randolph AFB, Tex., replacing B/G Billy J. Boles.

AFRES M/G James E. McAdoo, from Cmdr., 14th AF (AFRES), Dobbins AFB, Ga., to Cmdr., 14th AF (AFRES), Dobbins AFB, Ga., and Member, Reserve Forces Policy Board, Washington, D. C., replacing AFRES M/G Alan G. Sharp . . . **M/G (L/G selectee) Charles C. McDonald,** from C/S, Hq. AFLC, Wright-Patterson AFB, Ohio, to DCS/L&E, Hq. USAF, Washington, D. C., replacing retiring L/G Leo Marquez . . . **L/G Merrill A. McPeak,** from DCS/P&R, Hq. USAF, Washington, D. C., to Cmdr., 12th AF, TAC, Bergstrom AFB, Tex., replacing retired L/G Charles J. Cunningham, Jr. . . . **Col. (B/G selectee) Joseph W. Ralston,** from Ass't DCS/Ops., Hq. TAC, Langley AFB, Va., to DCS/Requirements, Hq. TAC, Langley AFB, Va., replacing M/G Jimmie V. Adams . . . **B/G Dale W. Thompson, Jr.,** from Vice Cmdr., Ogden ALC, AFLC, Hill AFB, Utah, to DCS/P&P, Hq. AFLC, Wright-Patterson AFB, Ohio, replacing B/G Edward R. Bracken. ■

Kinetic-energy weapons are shaping up as the lead system as work continues on directed-energy and other strategic defense technologies.

The Emerging Lineup for SDI

BY JAMES W. CANAN, SENIOR EDITOR

In existence for only three and a half years, the Defense Department's Strategic Defense Initiative program is already coming up with the goods in its kinetic-energy weapons technology research.

SDI has shown that space-based and land-based projectiles will indeed be able to hit and kill ballistic missiles and reentry vehicles in all stages of their intercontinental flight. In coming months, it expects to demonstrate the capability of such weapons—which destroy their targets by impact rather than with explosives—even more convincingly.

Lt. Gen. (Gen. selectee) James A. Abrahamson, Director of the Strategic Defense Initiative Organization, claims that the technologies of kinetic-energy weapons (KEW) and supporting sensors and computers are coming along so well that "by the early 1990s, we believe we could make a reasonably low-risk decision to go ahead" in deploying them—should strategic and arms-control situations warrant such deployment.

Deployment could take place "in the mid-1990s, maybe a little earlier if it were a Manhattan-type project," General Abrahamson says.

The cost, he says, might range from $40 billion to $60 billion, which "is not out of line" with costs of other weapon systems being deployed today.

Much has yet to be done in developing the KEWs. Among other things, they must be made light enough for abundant deployment on space platforms called garages.

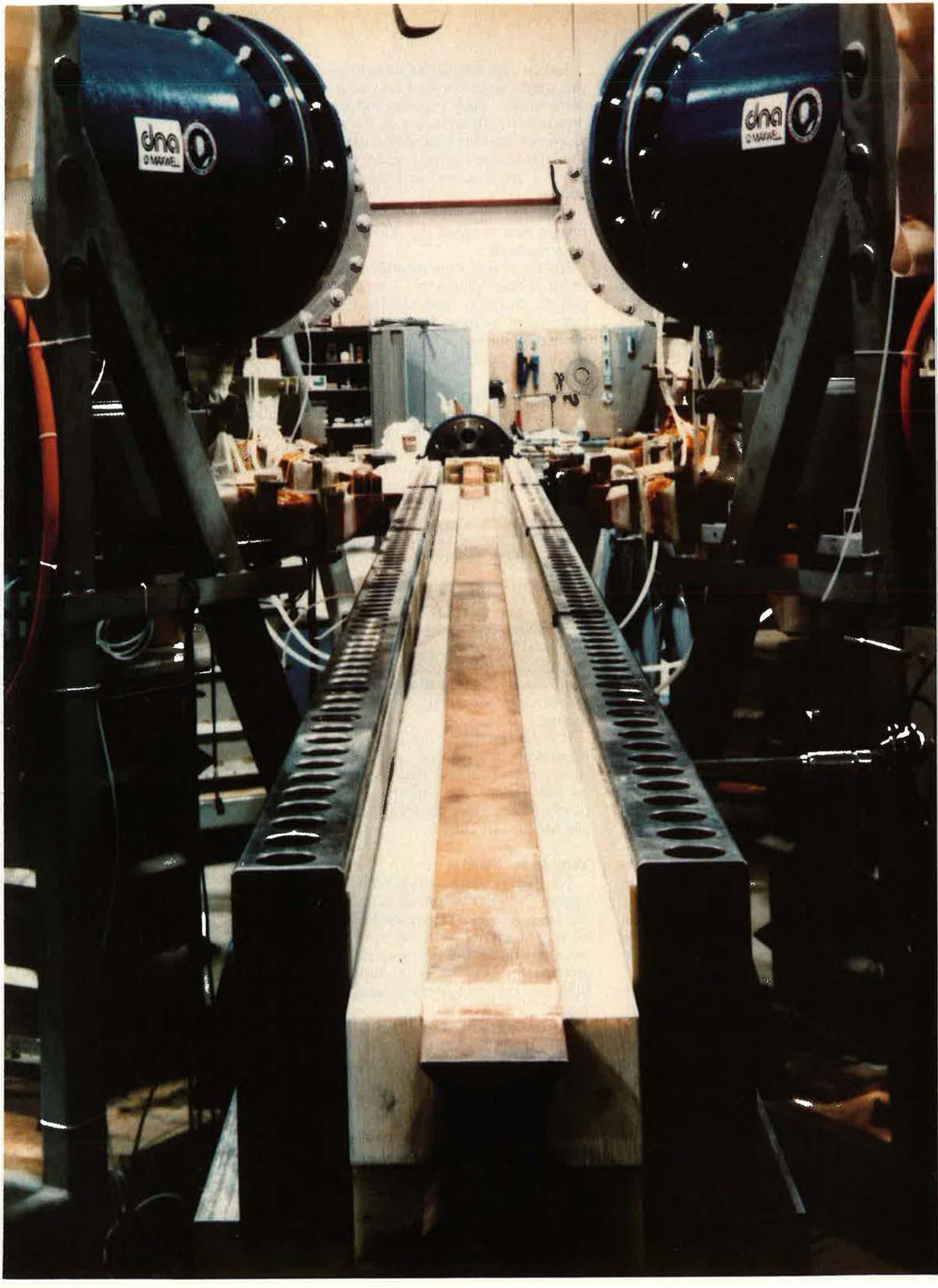
Even so, KEW military and industrial researchers are becoming ever more bullish. Their growing optimism is grounded in data derived from highly successful tests. Many more are in the offing, and hopes are high.

Such tests could well make or break the increasingly beleaguered SDI program. They will be crucial elements in SDIO's campaign to convince the American people and Congress that the program is not pie in the sky.

So the spotlight is on the KEWs. SDIO has settled on them as its weapons of choice for the first fully operational SDI system. Subsequently, that system would also embody directed-energy weapons (DEW) that apparently need much lengthier technological upbringing to reach maturity.

SDIO believes that the KEWs

ABOVE: In a recent kinetic-energy weapons test at the General Motors/ Delco facility in Santa Barbara, Calif., a seven-gram Lexan projectile was fired from a light gas gun at 23,000 feet per second at a cast aluminum block. A similar projectile is pictured in front of the damaged block. Such promising test results are fueling SDIO's enthusiasm for KEW technologies. RIGHT: Electromagnetic launchers, or "rail guns," are also being explored for kinetic-energy weapons applications. This rail gun at the Maxwell Laboratories in San Diego, Calif., has fired small plastic projectiles at velocities of 7,000 mph. Rail guns are theoretically capable of firing projectiles at velocities of 46,000 mph.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dna

would be able to do the whole job in all layers of a multitiered defense against ballistic missiles.

They would be deployed in space and combined with surveillance and targeting sensors in geosynchronous orbits to catch ICBMs in their boost and post-boost stages. They would also be deployed on land and teamed with ground-launched "probe" surveillance sensors and others to intercept RVs in their late midcourse stage—from the time that the RVs leave their ICBM "buses" to the time that they penetrate the lower atmosphere at an altitude of about 100 kilometers.

Best Mature Technologies

Last April, in its annual report to Congress, SDIO described kinetic-energy weapons as being, "at present, the most mature advanced technologies available for the mission" of defense against ICBMs and as being "suited for all phases of defense—boost, post-boost, midcourse, and terminal."

SDIO's KEW technology work focuses on space-based, rocket-launched projectiles, ground-launched endoatmospheric and exoatmospheric interceptors, miniature projectiles for launching from land or in space, weapons to intercept tactical ballistic missiles, and the testing of all such.

The KEW program has scored impressive successes in several "technology evaluation experiments."

In one, called the Flexible Lightweight Agile-Guided Experiment (FLAGE), small missiles using millimeter-wave radar seekers and multiple thrusters hit three targets in three tries. The most recent of those tests, late last year, culminated in the destruction of a target simulating a reentry vehicle traveling at more than 3,000 miles an hour.

SDIO plans two or three more FLAGE tests by the end of this year, each to be more demanding than the one before. All are aimed at mastering the technologies of seekers and guidance-and-control systems for "a short-range interceptor against complex radar-signature threats at low altitudes," says the SDIO report.

SDIO's Delta 180 experiment of last September also did its KEW program proud.

In that test, two Delta rocket upper stages were boosted into near-earth orbits. They maneuvered independently, flying apart as far as 140 miles, and took infrared and ultraviolet sensor readings on one another's "hardbodies" and thruster plumes.

Then, on command, one of them rushed and rammed the other, destroying both.

SDIO officials were exultant. The Delta 180 test, which had been conceived, designed, and executed in little more than a year, "accomplished all scientific objectives beyond expectations," says the SDIO report.

Defense Secretary Caspar W. Weinberger declared that the test "firmly established the principle that a moving target can be hit with a kinetic weapon from space."

The test reportedly added impetus to USAF's investigation of ultraviolet sensors. They have the advantage of not requiring the large optics and cryogenics needed by IR sensors.

SDIO is getting ready to stage a sequel—the Delta 181 test—next November. That "thrusted vector" test will be concentrated on "gathering signature data on objects at close range" and will not involve an intercept, according to the SDIO report.

It is believed that the Delta 181 experiment will involve a Hughes sensor called "Janus" that is based on the technologies of the company's Maverick air-to-ground missile for the Air Force.

Vehicle for Space

The Delta experiments are fundamental to SDIO's work in defining "a major SBKKV (space-based kinetic-kill vehicle) space experiment" by the end of this year in the aftermath of "end-to-end simulations and ground testing of components."

According to SDIO, key SBKKV technologies are those of propulsion, sensors, seekers, fire control, and guidance. SDIO claims "considerable progress" in technologies needed to produce "lighter missile components, advanced propellants and motors, and high-performance missile seekers."

SDIO officials acknowledge that SBKKVs incorporating state-of-the-art technologies would be too heavy for adequately abundant deployment in space. Consequently, much technology work is geared to getting their weight down and to exploring the development of "miniature projectiles."

These "might be used in both the ground-based and space-based modes," says the SDIO report, "possibly" with the ground-launched exoatmospheric reentry vehicle interceptor subsystem (ERIS) being developed by Lockheed and with the high endoatmospheric defense interceptor (HEDI) being developed by McDonnell Douglas.

ERIS and HEDI kinetic-kill weapons would be the mainstays of the last-ditch layer of any foreseeable SDI system, including one involving directed-energy weapons in space.

"Small projectiles," said the SDIO report, "also have applications as ground-based tactical weapons for the US Army and possibly as an antitactical ballistic missile defense system."

This is how a laser beam tracking an orbiting Space Shuttle appeared to Shuttle astronauts. Precision tracking will be crucial for SDI systems.

Such projectiles would need exquisitely accurate guidance and control and a rapid fire-control system.

In this regard, a major endeavor is the LEAP (Lightweight Exoatmospheric Advanced Projectiles) program. Its "advances in component technology and supporting

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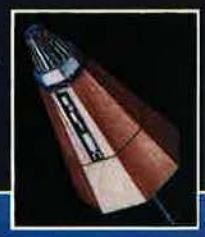

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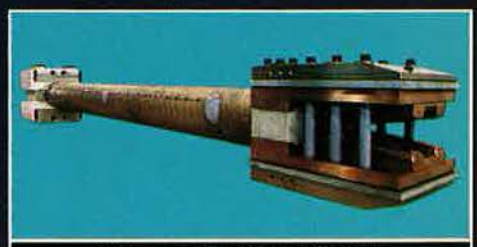

Advanced railgun barrels

Ion sources

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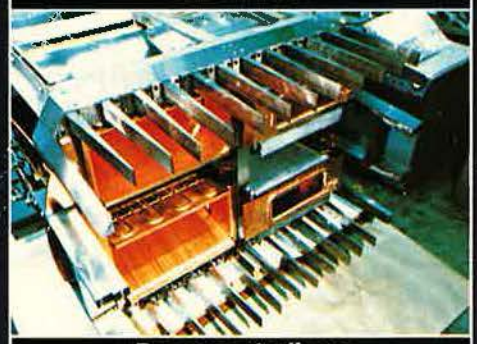
GA experience includes development and operation of 3 megawatt neutral particle beam systems in fusion research.



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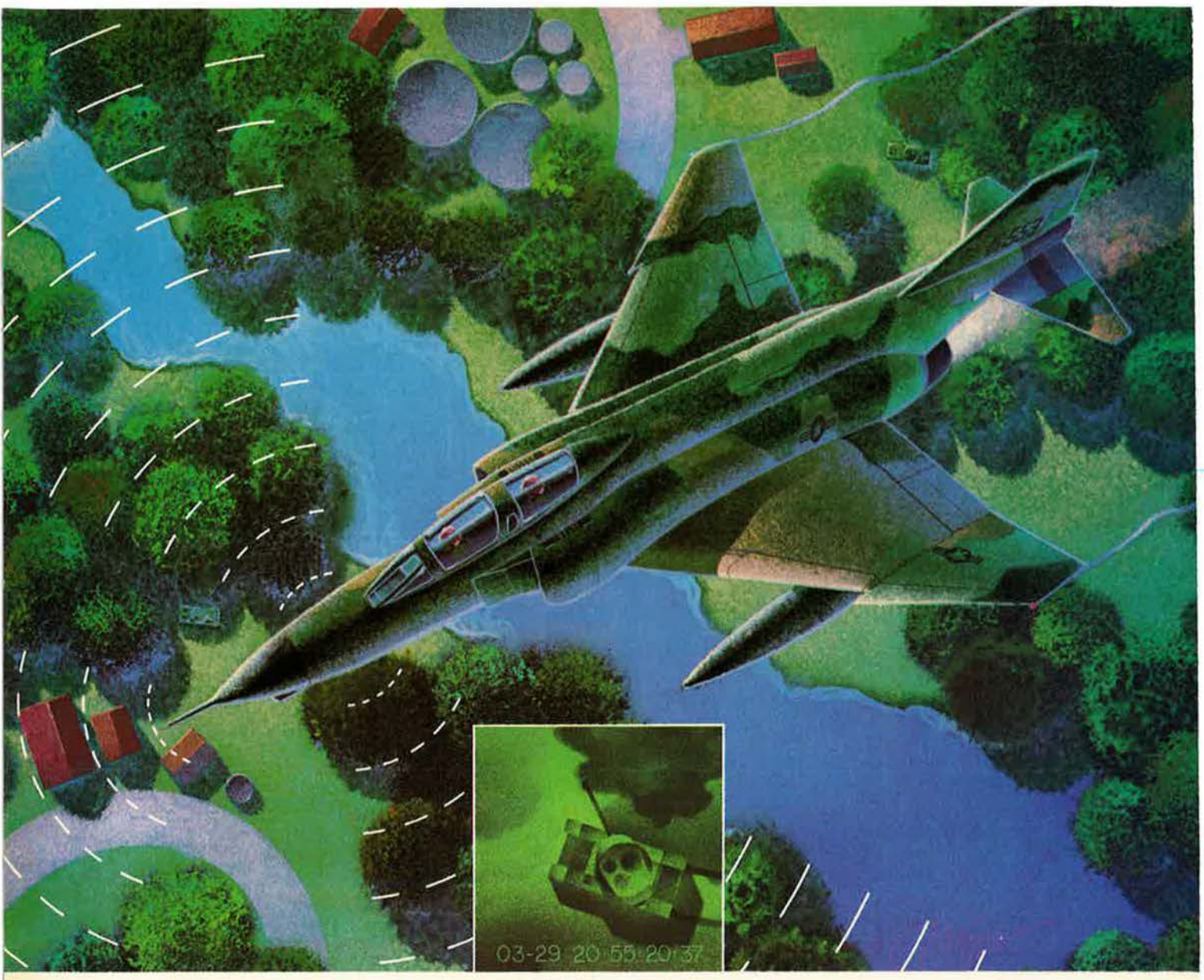

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CONTROL DATA

software strongly suggest that a lightweight projectile is closer to development than originally thought [possible]," says SDIO.

The goal of the LEAP program, which combines SDI's former Sagittar and Gremlin programs, is to build and test lightweight projectiles by 1990.

Air Force Systems Command's Aeronautical Systems Division at Wright-Patterson AFB, Ohio, is at work on "smart bullet" technology for space-based weapons, with emphasis on their fire-control sensors and computer software algorithms. Principal contractors are United Technologies and General Electric.

The project encompasses fire-control technologies for kinetic weapons to be propelled by rockets or by electromagnetic launchers.

AFSC's Armament Division at Eglin AFB, Fla., is designing and building SDI's Mark IV hypervelocity gun. This is part of an SDI program to increase the density and velocity of HVG projectiles—those that fly at speeds greater than ten kilometers per second—and to make their launchers perform efficiently.

Allied Teamwork

In this fast-gun arena, SDIO's teamwork with allied governments and industries is beginning to pay off.

The United Kingdom is researching switches, barrels, projectiles, and instrumentation of electromagnetic railguns and the effect on them of electromagnetic pulse (EMP).

The UK is developing railgun barrels made of advanced composite and ceramic materials.

Israel is working on chemical means of increasing the velocities of railgun projectiles and, thus, making it possible to build light railgun barrels and small railgun powerplants for deployment in space.

Italy is developing a pop-up antenna for a millimeter-wave radar system to acquire and track RVs for KEW guns and rockets to rip into in space.

Lockheed's ERIS, says SDIO, is based on "mature technologies" for intercepting ICBMs over the longest stretch of their ballistic trajectories—the midcourse stage.

By next fall, the conceptual design of an operational ERIS weapon system will have been completed and signal processing will have been brought along to the point that ERIS seekers can be simulated against "complex target suites"—SDIO parlance for big bunches of RVs and decoys.

Technologies of ERIS midcourse guidance—involving laser, IR, and UV sensors and millimeter-wave command links—will also have been taken firmly in hand by the end of this year, says SDIO.

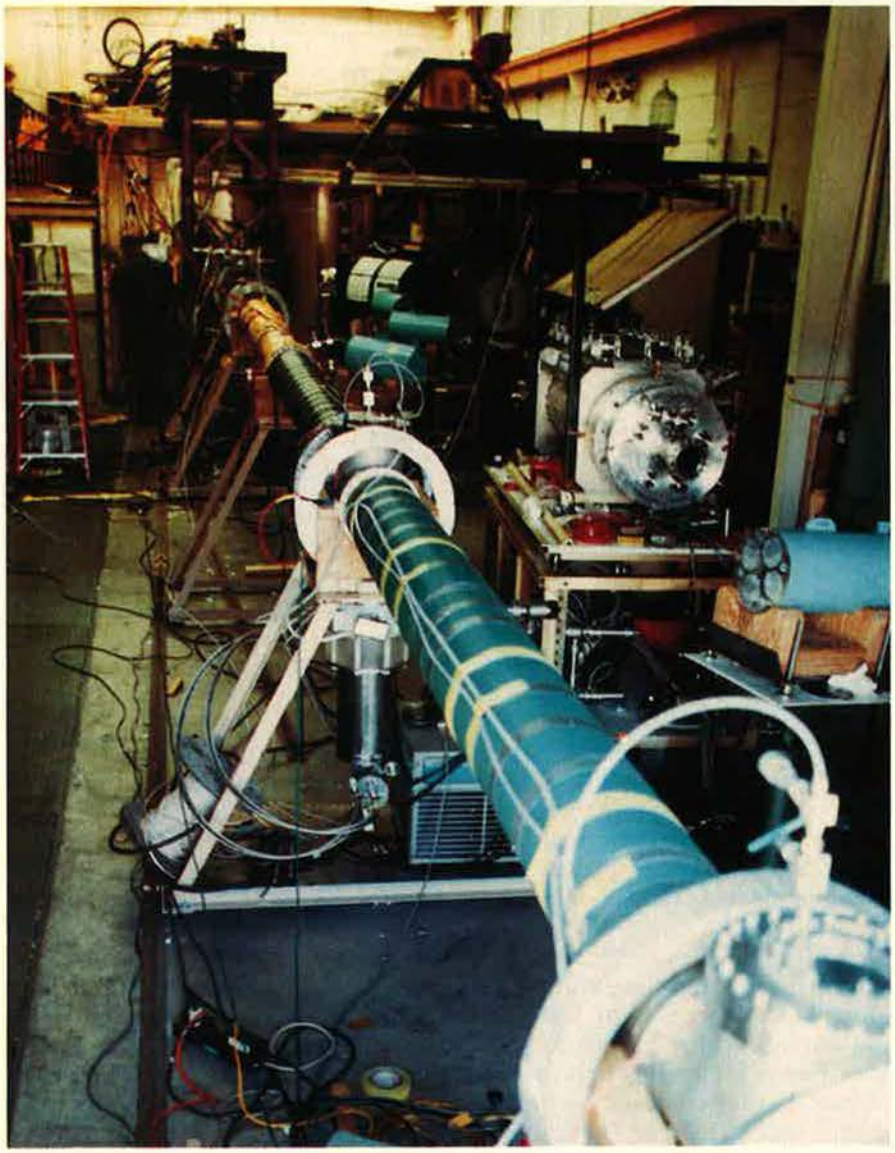
First launch of an ERIS missile is scheduled to take place early in 1990.

The McDonnell Douglas HEDI program is nurturing the technologies of weapons that would intercept RVs at the end of the midcourse leg of their flight and at the outset of their final leg, the terminal stage.

"In Fiscal Year 1987," says the SDIO report, "HEDI made significant progress, particularly in wind-tunnel tests." Results were "very encouraging" in tests of "window cooling, boresight error, shroud removal, and preliminary verification of the interceptor's aerodynamic characteristics."

HEDI wind-tunnel tests are now being conducted at higher speeds and greater pressures all the time. Actual flight experiments will begin next year.

Lockheed and McDonnell Douglas officials told Congress last March that their respective ERIS and HEDI weapon systems will easily be in shape for operational deployment by the mid-1990s and could be ready to go much sooner if funding is stepped up.



SDI scientists are also pursuing directed-energy weapons concepts. This accelerator is being used for electron-beam research.

© 1986 Attila Hejja

Both systems will depend on the successful development of an SDI long-wave infrared (LWIR) sensor concept for "Probe" satellites. These could be launched into space on short notice and would take midcourse fixes on RVs and decoys for the interceptor weapons.

SDIO aspires to a defensive system that would destroy up to eighty percent of ICBMs in their boost and post-boost stages. The RVs of the remainder—the "leakers"—would have to be intercepted by land-based ERIS and HEDI interceptors, together with some SBKKVs.

McDonnell Douglas and Science Applications International Corp. were expected to complete Probe sensor definition work by this summer. SDIO planned to request industry proposals for Probe design concepts shortly thereafter.

Elaborate Surveillance Net

No single system could do all the surveillance tasks required in a multilayered defense against ICBMs. Probe sensors would be but one element of an elaborate surveillance network embodying SDI's boost surveillance and tracking system (BSTS), space surveillance and tracking system (SSTS), airborne optical surveillance system (AOS), and terminal imaging radar (TIR).

SDI would rely on its BSTS to detect the hot rocket exhausts of ICBMs in their boost stage, on SSTS to detect them in midcourse and also to warn of ASAT (anti-satellite) attacks, on AOS to pick up the RVs as they pass from their midcourse flight into their terminal flight, and on TIR to take over in detecting them as they plummet toward the planet.

The technologies of all such systems are being developed in SDI's surveillance, acquisition, tracking, and kill assessment (SATKA) program, in which "important advances" have been made, according to this year's Defense Department annual report to Congress.

"Particularly noteworthy are the increased capabilities demonstrated in the areas of infrared detectors and signal processors," said the report.

The more recent SDIO report cites advances in the technologies of LWIR detectors for "a wide variety of SDI spaceborne and airborne sensors currently being developed," of wide-field-of-view IR sensors, of laser radars, and of signal processing—with emphasis on the development of radiation-hardened, gallium arsenide very-high-speed integrated circuitry (VHSIC).

SDI's space-based sensors would have to send data to one another in a twinkling, and the data would have to be processed by computers in infallible fashion at quicksilver speeds all the while. Consequently, great demands will be made on SDI's software for battle management and command control and communications (C^3) signal and data processors.

"We've made a great deal of progress in software," General Abrahamson asserts. "I think we'll have to have more than 10,000,000 lines of [software] code, but it doesn't have to come together in one supercomputer. It will be a highly distributed system that will be manageable. We're already testing many of the algorithms, and we've demonstrated that they work."

Orbiting directed-energy battle stations could well become reality in the latter stages of SDI deployment. SDI officials stress that work on directed-energy weapons should continue as a backstop to kinetic-energy weapons development. Pictured on this page are two artist's concepts of how such laser stations might look.

Harris Corp. is under contract to the Rome Air Development Center

(RADC) of Air Force Systems Command's Electronic Systems Division for a design of how the full-up SDI communications network would work.

Pessimistic Views

Shortly before SDIO issued its annual report last April, an American Physical Society panel of highly reputable physicists expressed pessimism about SDIO's prospects for developing directed-energy weapons powerful enough to destroy ICBMs any time this century, if ever.

SDIO acknowledged the quality and objectivity of the APS report, but described it as too downbeat in its conclusions about the DEWs. SDIO also claimed great progress in DEW research in the interval between completion and publication of the APS report and noted that the report had not even addressed the promising kinetic-energy weapons.

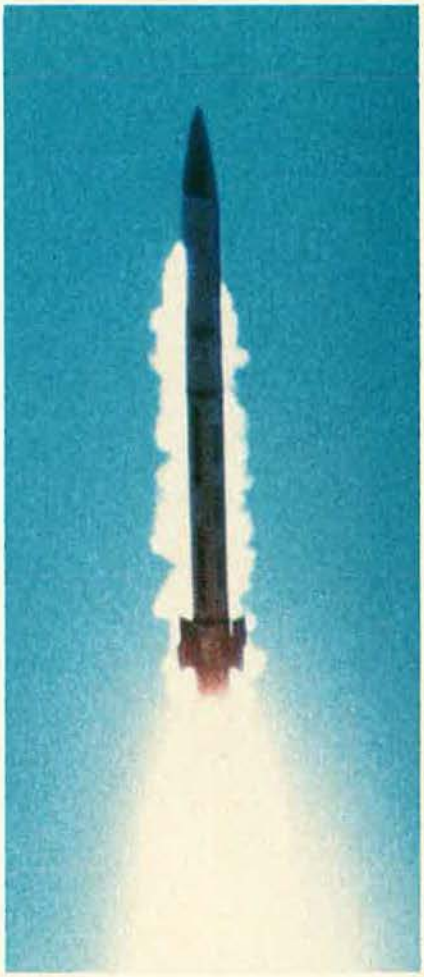
Even so, the APS report was seized upon as ammunition by SDI critics in Congress, where the SDI program is taking deeper budget cuts this year than ever before.

General Abrahamson claims that those cuts are forcing him to curtail many promising programs, including the development of excimer lasers once considered promising for space basing. The cuts, he said, are severely distorting his program, which involves research on a welter of technologies for twelve to fourteen interdependent systems that are slated to be integrated as an SDI "system of systems."

The SDIO director also claims that SDIO cannot afford to give up on, or to slight, research on directed-energy weapons—even though they may not be deployable until the next century—because Soviet countermeasures may someday neutralize the KEWs.

Lasers and particle beams that make up the DEW program are also being considered for nearer-term roles as sensors. SDIO sees them—in particular the particle beams—as performing "interactive discrimination" of real targets amid such false ones as decoys and penetration aids.

SDIO is now working up experiments "to demonstrate interactive discrimination." It is impelled by "dramatic advances in particle-beam accelerators and the verification of a technique for determining the position of the particle beam relative to the target," says its report.



For terminal antiballistic missile defense, the Army is working on lightweight, agile flight vehicles for nonnuclear kill of reentry vehicles in the atmosphere. This test took place at White Sands, N. M.

Brookhaven National Laboratory, which began operating its new particle-beam testing facility last year, will play a big part in such experiments.

Meanwhile, at this writing, Lockheed and McDonnell Douglas are competing for an Air Force contract to design a neutral particle-beam weapon for SDI. Grumman and Science Applications International are on the Lockheed team. Boeing and TRW are teamed with McDonnell Douglas.

The weapon is expected to be ready for testing in the early 1990s.

Laser Possibilities

Among lasers, SDIO is concentrating most heavily on developing the free-electron variety and has reduced its emphasis on developing the chemical, excimer, and X-ray varieties.

Chemical lasers are still considered to be the most conducive to deployment in space, however.

"Major achievements in chemical laser technology include experiments that have yielded the brightest laser outputs in the free world," the SDIO report declares. "Precision-optics fabrication for very large mirrors and complex [mirror] shapes have been exhibited. These advances, plus new experiments in combining chemical laser outputs in optical phased arrays, have provided substantial new evidence of the feasibility of . . . high-brightness, space-based lasers."

Free-electron lasers may be too massive for space deployment. SDIO is leaning toward basing them on land.

Ground-based lasers would be situated at several locations, each with a beam generator and subsystems for acquisition, tracking, pointing, and beam control. Such control would involve conditioning the beam by means of "adaptive optics" to compensate for atmospheric distortion on its way into space.

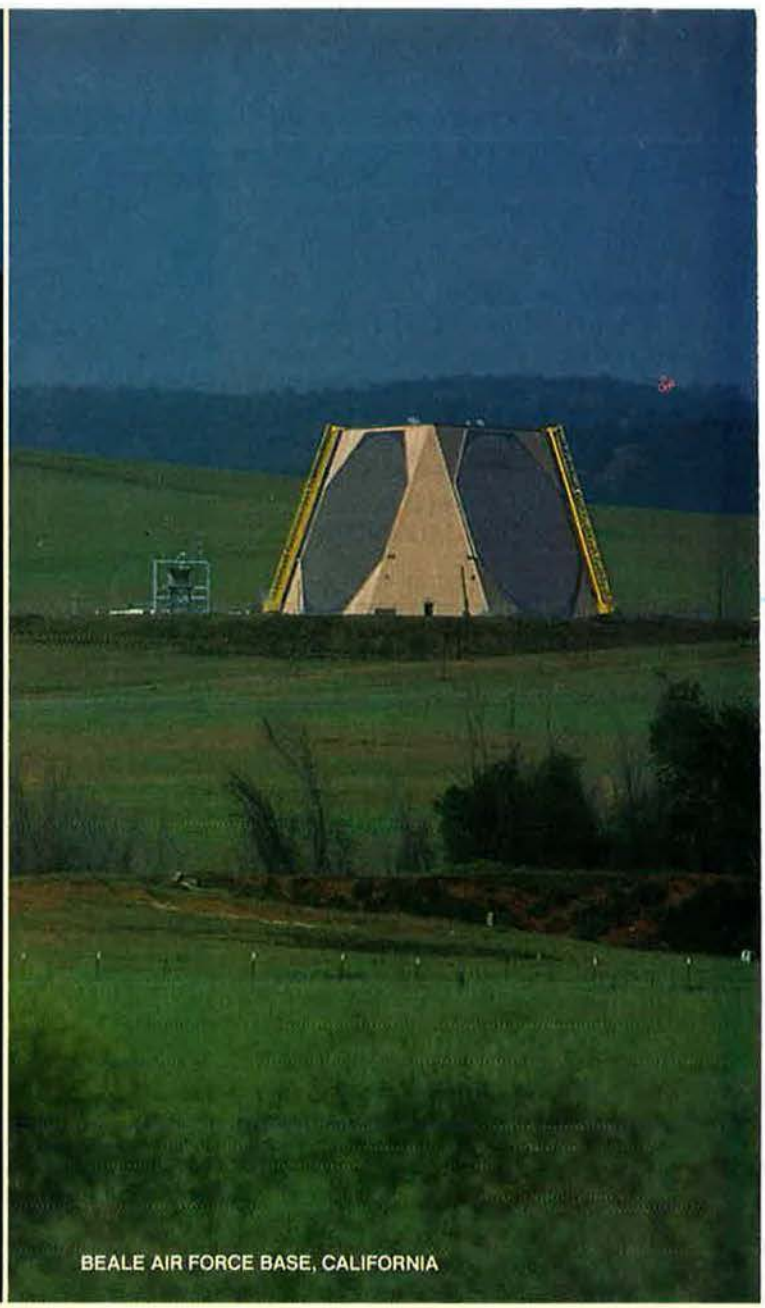
The beams would be projected onto space-relay mirrors, probably in geosynchronous orbit. These would redirect the beams to "mission mirrors" at lower orbits. The mission mirrors would acquire and track the targets, point the beams, focus them, and hold them on the targets long enough for thermal destruction.

SDI's LAMP (Large Advanced Mirror Program) is well along in mastering the optics and fabrication technologies of the mirrors that laser weapons must have. A four-meter segmented mirror, the largest ever produced in the US, is now being assembled.

SDIO has gained a great deal from beam-control and atmospheric-compensation tests. In one, laser beams generated at RADC's facility at Maui, Hawaii, "successfully tracked US Navy sounding rockets fired from the nearby Barking Sands Missile Range," notes the SDIO report.

The beams retained their quality even while penetrating turbulent air and stayed on their targets throughout. ■

CAPE COD AIR FORCE STATION, MASSACHUSETTS



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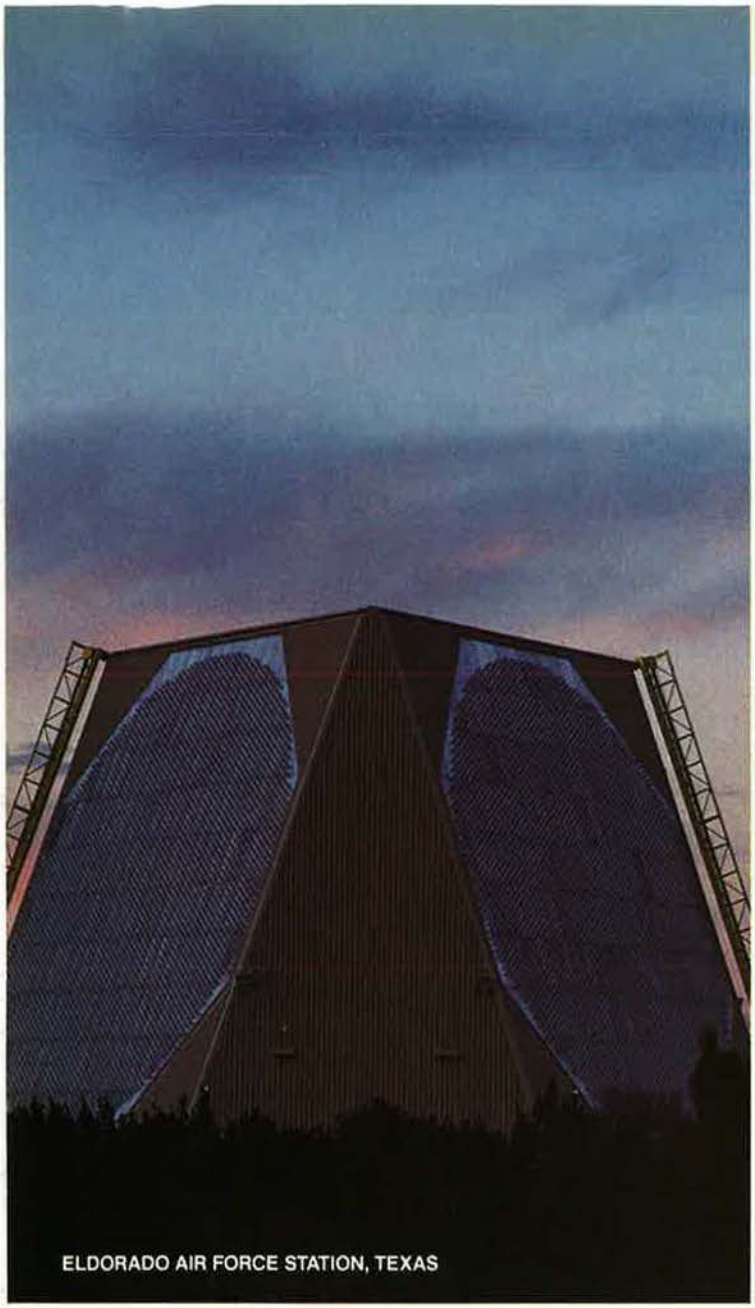
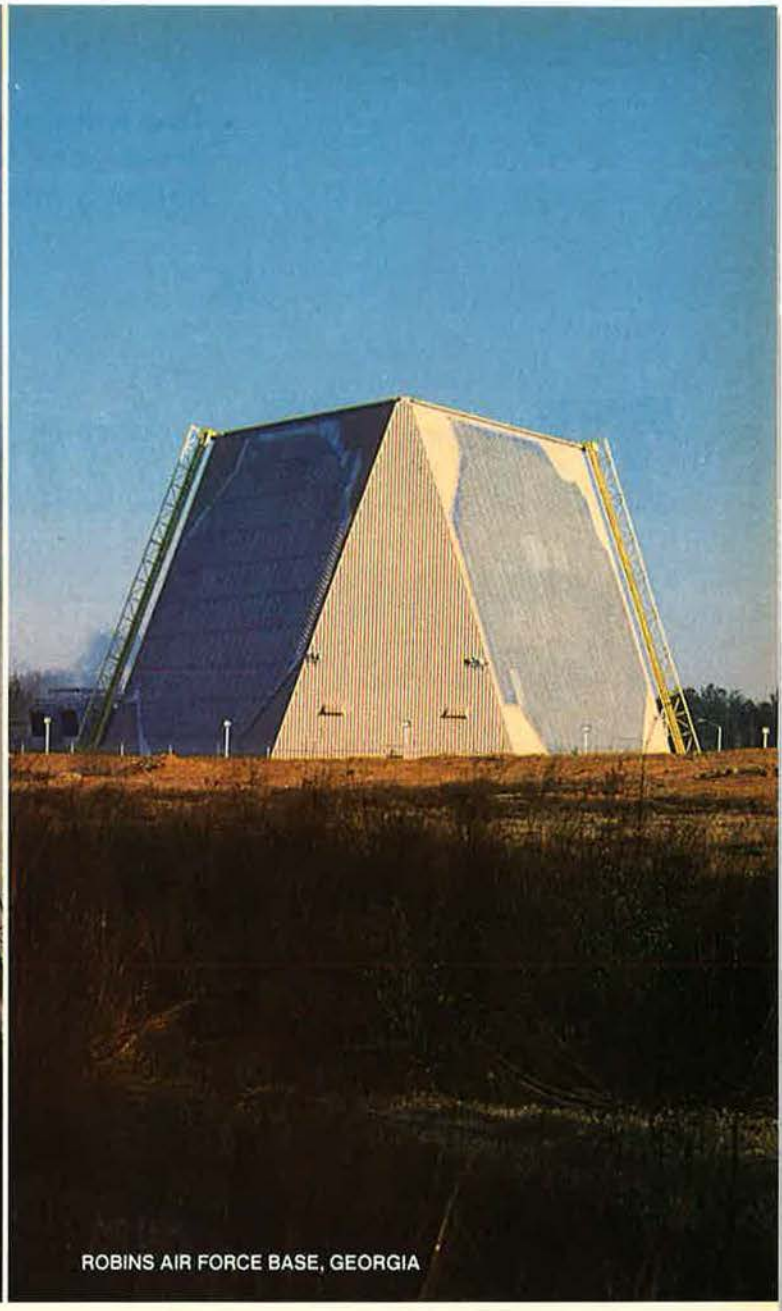


ELDORADO AIR FORCE STATION, TEXAS



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Where quality starts with fundamentals

The Administration and Congress have gone back to basics in their debate about ballistic missiles.

The Future of the ICBM

BY JOHN T. CORRELL, EDITOR IN CHIEF

THIRTY years into the age of intercontinental ballistic missiles, US policymakers are grappling again with the basic question of what part ICBMs should play in future defense strategies.

The question arises from several concerns. New generations of Soviet missiles, more accurate and more powerful than their predecessors, are a threat to US missiles in fixed silos. Vulnerability to attack is only part of the problem, though. The Soviets have gone to great lengths in hardening their own ICBM sites, and the capability of US missiles to hold these threatening weapons in check has diminished progressively.

Three courses of action are currently being pursued to redress this imbalance. Both the Air Force and the Navy are well along with programs to modernize their nuclear missile forces. Meanwhile, research continues on defensive technologies that promise to inhibit the general effectiveness of ICBMs. *(See "The Emerging Lineup for SDI," p. 40 of this issue.)* The Reagan Administration is also attempting to reach an arms-control agreement that would require deep reductions in US and Soviet strategic missiles.

The Administration and Congress, however, are not fully in accord on the proper mix of strategic missiles or the best basing modes for them. The degree of reliance to be placed on ICBMs is not yet settled. And behind it all lies uncertainty about budgets for defense programs of any sort in the years ahead.

An Aerospace Education Foundation Roundtable in Washington on April 22 took measure of the situation from four perspectives. Panelists were Sen. Albert D. Gore, Jr. (D-Tenn.), Gen. Larry D. Welch, Chief of Staff of the US Air Force, Lt. Gen. Brent Scowcroft, USAF (Ret.), Chairman of the President's Commission on Strategic Forces, and Dr. William J. Perry, Under Secretary of Defense for Research and Engineering in the Carter Administration. The moderator was Dr. Arnold Kanter of the Rand Corp.

General Welch emphasized the importance of being able to strike promptly against hardened ICBM silos and Soviet command centers. The Air Force says that it presently has less than half the capability required to hold these classes of targets at risk. Others on the panel, however, saw the vulnerability of

PERRY:
Lethality and vulnerability are a dangerous combination.

GORE:
Mutual invulnerability to first strike.

—Photos by Al Sevilla

US missiles as a problem of at least equal, or perhaps greater, significance. All, however, believed that ICBMs would be needed, along with manned bombers and missile-launching submarines, in the strategic triad of the future.

The ICBM, Senator Gore said, has "advantages in capability in deterring the Soviets by holding particularly valuable targets at risk that the other two legs of the triad cannot match."

The entire panel also saw advantages to having at least part of the ICBM fleet in a mobile configuration to lessen its vulnerability to attack. Senator Gore, particularly, has been a leading advocate of the mobile-basing concept.

The Unstable Combination

When the ICBM was introduced thirty years ago, its striking power was recognized immediately. "On the other hand," Dr. Perry said, "even at its first deployment, this lethality was coupled with a very high degree of vulnerability. The first ICBMs were deployed on bare pads, and therefore they were highly susceptible . . . to attack."

The Air Force solved this problem in the 1960s with Minuteman, using advanced propulsion and guidance technology to package the missile for basing in silos, where it was protected from attack. This solution lasted for about two decades. Then, Dr. Perry said, technology overtook it from various directions. Improved guidance systems increased the accuracy of ICBM attack by a factor of between three and five. Greater destructive yield became possible with smaller warheads, a number of which could be carried on a single missile as multiple independently targetable reentry vehicles (MIRVs).

Taken together, these developments made the ICBM a formidable counterforce weapon that could be used to attack other ICBMs. "This combination of very great lethality and very great vulnerability to attack was extremely unstable and dangerous," Dr. Perry said, citing that as "the present dilemma we face."

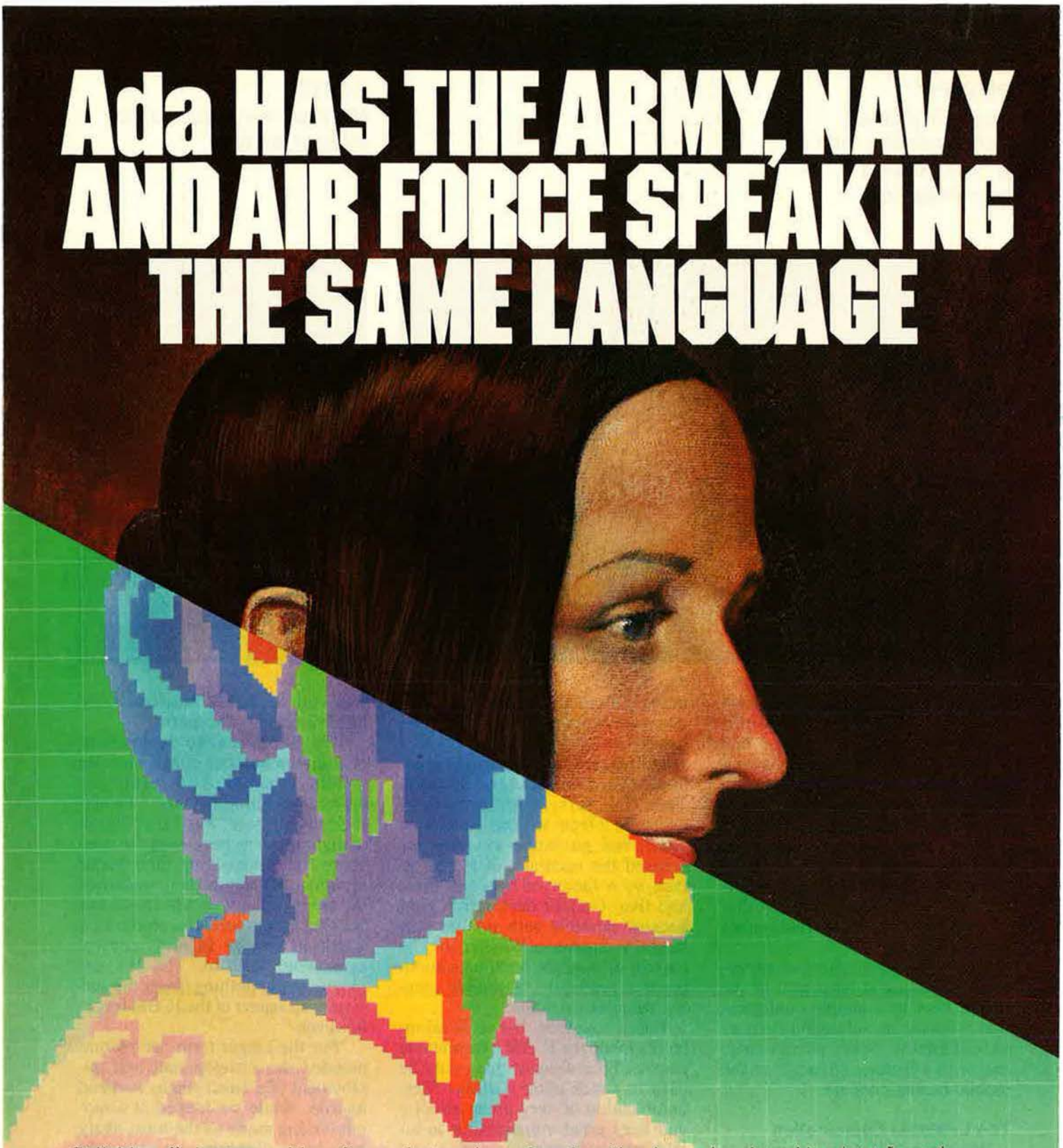
In its comprehensive 1983 study of strategic modernization, the Scowcroft Commission concluded that it is not feasible today to duplicate the success of Minuteman, which provided survivability and maximum striking power in the same system. Instead, the Commission said, the ICBM mission should be divided into two parts.

"We recommended deployment of a limited number of MX missiles in Minuteman silos to rectify the hard-target kill imbalance," General Scowcroft said. The Commission thought this was necessary "to convince the Soviets that their major systems, the things that concerned us most—like the SS-18—were wasting assets and, therefore, they ought to engage in arms-control agreements with us. The MX deployment did nothing about the survivability aspect of the ICBM force, however.

"For the longer term, we recommended the development and deployment of a small single-warhead missile. While we looked at a mobile-basing mode as the most likely near-term objective, we thought that the smaller the missile was, the more options one would have in the future for basing it. The single warhead [would make the small missile] an unremunerative target to attack, even if it could be located."

Along the way, these two systems took on political colorations, with the Administration seen as favoring Peacekeeper and Congress more inclined toward the Small ICBM

Ada HAS THE ARMY, NAVY AND AIR FORCE SPEAKING THE SAME LANGUAGE



Reliable, efficient, reusable software that can be operated on computers in the Army, Air Force and Navy is essential if America is to afford the defense it needs to remain a viable, formidable deterrent.

But, until recently, each of the armed services used a different computer language, creating massive software inventories and making system maintenance complex, expensive and sometimes impossible.

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(SICBM), or "Midgetman." Opponents of MX claim that its ten warheads make it a provocative and destabilizing weapon, one that the Soviets would be tempted to go after early in a crisis and one the US might feel pressured to employ before the Soviets could attack it. Congress has threatened several times to stop the MX program at a partial deployment and still has not approved the full complement of 100 missiles.

Critics of Midgetman, on the other hand, say the small missile is inefficient and unnecessary. Why, they ask, build 500 launchers to field 500 warheads when fifty Peacekeepers could carry the same payload? Sniping continues from both sides, but the President's current program appears to have established a base for consensus.

General Welch said there is no reason—either financial or technical—to force a showdown of choice between the missiles. MX deployments have already begun. And, he said, "we fully funded the Small ICBM in the Air Force budget within the three-percent guidelines [the level of requested growth, after inflation, for defense in the President's FY '88 budget]. We did that at the expense of a lot of other programs that are very high priority."

Triad Within a Triad

The strategic missile modernization program is proceeding along the lines envisioned by the Scowcroft Commission. The lead system is Peacekeeper. To begin filling the hard-target-capability gap as soon as possible, the first fifty missiles will be deployed in Minuteman silos. The Air Force achieved initial operational capability last December with ten missiles on alert at Francis E. Warren AFB, Wyo. It proposes to deploy another fifty Peacekeepers in a "rail-garrison" mode. Twenty-five trains, each carrying two missiles, would remain in secure air base garrisons for normal peacetime operations. In times of national need, the trains would disperse on railroad tracks.

The single-warhead Small ICBM is in full-scale development. It will weigh 37,000 pounds, which is considerably heavier than prescribed in early designs. The plan is to base the small missile initially in hard, mobile launchers at existing Minuteman facilities, from which it could disperse rapidly in a crisis. The Air Force figures that this force mix—the Small ICBM and MX in two basing modes—is, in effect, a "triad within a triad."

Moreover, a modernized SLBM force will complement the land-based ICBM leg of the triad. The Navy conducted the first test firing of its Trident II (D-5) missile in January. The D-5 has better accuracy and a larger payload than present submarine-launched missiles and is billed as "effective against most of the hardened military targets, including missile silos and launch control centers."

ICBMs and Arms Control

At the Reykjavik summit last year, President Reagan proposed that the United States and the Soviet Union make "deep cuts" in strategic weapons. Dr. Kanter asked General Welch how the sublimits of such an agreement might affect strategic modernization plans.

"The JCS [Joint Chiefs of Staff] certification as to the adequacy of the deep reduction assumed exactly the modernization program we've been discussing," General Welch said. "It assumes the 1,500 modernized ICBM warheads—that is, 1,000 Peacekeeper and 500 Small ICBM warheads. It assumes the Trident submarines with the D-5 missiles. All of those numbers fit within the deep reduction numbers, so there is no basic restructuring of the modernization program required to coincide with the arms-control regime that we're contemplating."

Dr. Perry said that as modernization proceeds, especially if the strategic forces are to be brought down in size, "the principal criterion we should have for deciding how to restructure the force is one of emphasizing survivability."

General Welch agreed that survivability is important, but said that capability is even more so. "The essence of deterrence is to be able to hold at risk those things the Soviets must have to succeed in an attack, and that's done with *capability.*"

"I don't think we ought to set capability and survivability so far apart," General Scowcroft said. "Capability goes to deterring the Soviets from the kind of risk-taking in crisis that they might otherwise be tempted to engage in. The survivability aspect deters them from any notion of surprise attack, which could give them a significant military advantage. So I think [capability and survivability] go to different points, and they're both very necessary."

The US has not revised the part of its arms-negotiation position that calls for a ban on mobile ICBMs. It took this stance some years ago when the Soviet Union had a monopoly on mobile systems. Now, with the SICBM intended for mobile deployment and the Soviets even farther along on their mobile missiles, General Welch said the proposed ban has become "an absolute nonissue" in any practical sense.

General Scowcroft agreed that the proposal is a dead issue except on Capitol Hill, where it "leads to deep suspicion about the sincerity of the Administration's belief in the small missile." SICBM supporters warn that an attempt to dump Midgetman could lead to a complete collapse of support in Congress for ICBM modernization.

WELCH: Survivability important—but capability more so.

—Photo by Al Sevilla

Senator Gore said that clinging to the proposed ban on mobile missiles is "a mistake." Even if it has some tactical value in extracting information or concessions from the Soviets, "the clock is running out on the Reagan Administration so far as the START talks are concerned."

Senator Gore explained that a significant transition in strategic policy has begun, leading "toward a future relationship [between the superpowers that] would be characterized by mutual invulnerability to a first strike. One of the ways to get that outcome is for both sides to have mobile forces that can be counted for purposes of verification [but that are] extremely difficult for the other side to target on a time-urgent basis."

Trends in the Triad

General Scowcroft said that a fundamental feature his Commission sought in the ICBM was "a different failure mode from any of the other legs of the triad." The weakness of the bomber force, he said, is that it is subject to surprise attack, so that is a kind of vulnerability to be avoided with missile forces. He acknowledged the remoteness of danger from a "bolt out of the blue" surprise attack, but added that "you can make it either more or less remote, depending on what your preparations are."

Technology and time have affected not only the ICBM but also the bomber and submarine legs of the strategic triad, Dr. Perry said. The most significant development with the manned bomber, in Dr. Perry's opinion, has been low-observable, or "stealth," technology. His judgment is that the bomber, "particularly when coupled with cruise missiles, is able to penetrate air defenses with a high degree of confidence. The vulnerability of the bomber is limited pretty much to the vulnerability at its base."

He cited two technological trends working against each other on vulnerability of missile-launching submarines. Today's submarines run quieter—which would make them more difficult to detect, except for "dramatic improvements" in sonic-detection systems. On balance, he said, improvements in detection outweigh gains in quietness, and the "unfavorable trend" of the past decade has been toward greater vulnerability of the submarine force.

SCOWCROFT: No single system does it all.

—Photo by Al Sevilla

Within the mobile ICBM portion of the triad, Dr. Kanter observed, there are significant differences in response time. The small missile will need only fifteen minutes warning, while rail-garrison Peacekeeper would take about three hours to disperse, he said. General Welch pointed out that, of all the preparatory steps possible in response to a crisis, "the least provocative is putting Peacekeeper on the rails." This could be done on the softest of warning indications.

Senator Gore disagreed, saying that rolling out the missiles would change the equation of power and confront the Soviet Union with a limited window of time to strike without losing advantage. A single-warhead mobile missile could be ready with less warning and without the risk of destabilizing the crisis, he said.

General Scowcroft acknowledged the possibility of exacerbating the crisis, but said that "one of the frustrating aspects of our ICBM force has been that you can't demonstrate resolve. You put them on alert, and nobody sees anything." He pointed out that bombers can be launched as a cautionary signal to a potential enemy and that mobile ICBMs, used properly, could achieve the same result.

Elimination of any element of the triad—the ICBM, the missile-launching submarine, or the manned bomber—would make attack planning much easier for the Soviet Union and allow the Soviets to concentrate their defenses, General Welch said. The historic rationale for the strategic triad is that each family of systems compensates for the limitations and weaknesses of the other two.

The special advantages of the ICBM are high alert rates, relatively low cost, and rapid strike against the most difficult targets. The hard-target aspect of this capability needs improvement, but General Welch noted that "ICBMs have the full respect of the Soviets. Some seventy-five percent of their warheads are found on ICBMs." The combination of Peacekeeper and the small missile, he said, is "well harmonized to capitalize on the strengths of ICBMs." ■


To seize and hold
the skies, the U.S.
Air Force relies on
F100-PW-220 engines
so durable their over-
haul interval will
double from four to
eight years. Reliable,
maintainable and
cost-effective power
by Pratt & Whitney
technology.
UNITED
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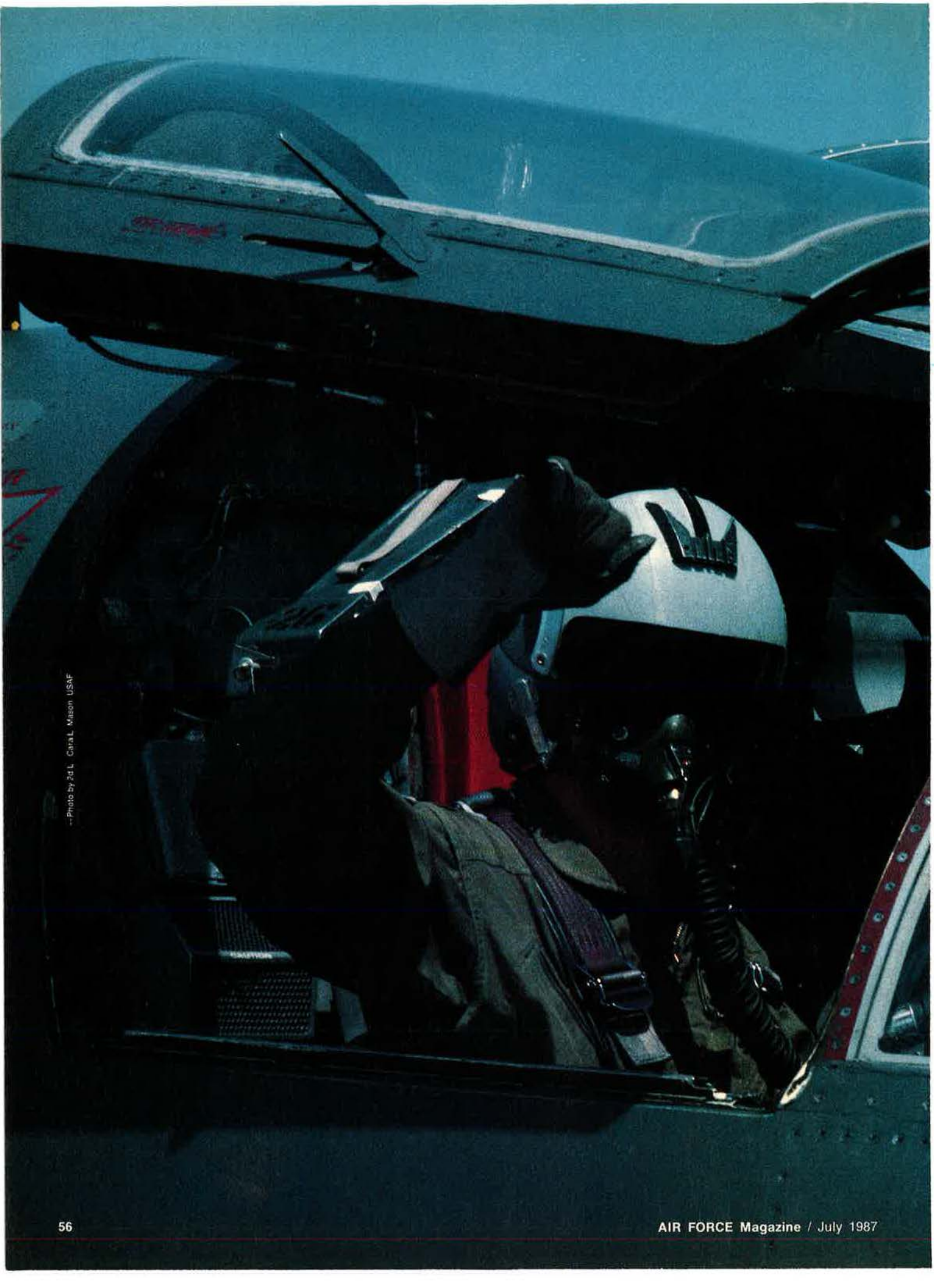

-- Photo by 2d Lt Carol L. Mason USAF

Power on Alert

A STAFF REPORT

The Strategic Air Command looks forward to the systems and capabilities of tomorrow, but its first concern is today. SAC bomber and missile crews provide much of the awesome power that gives credibility to the US strategy of nuclear deterrence. The current force has been improved considerably in recent years and is fully prepared for missions ranging from execution of the Single Integrated Operational Plan (SIOP) to conventional support of theater commands.

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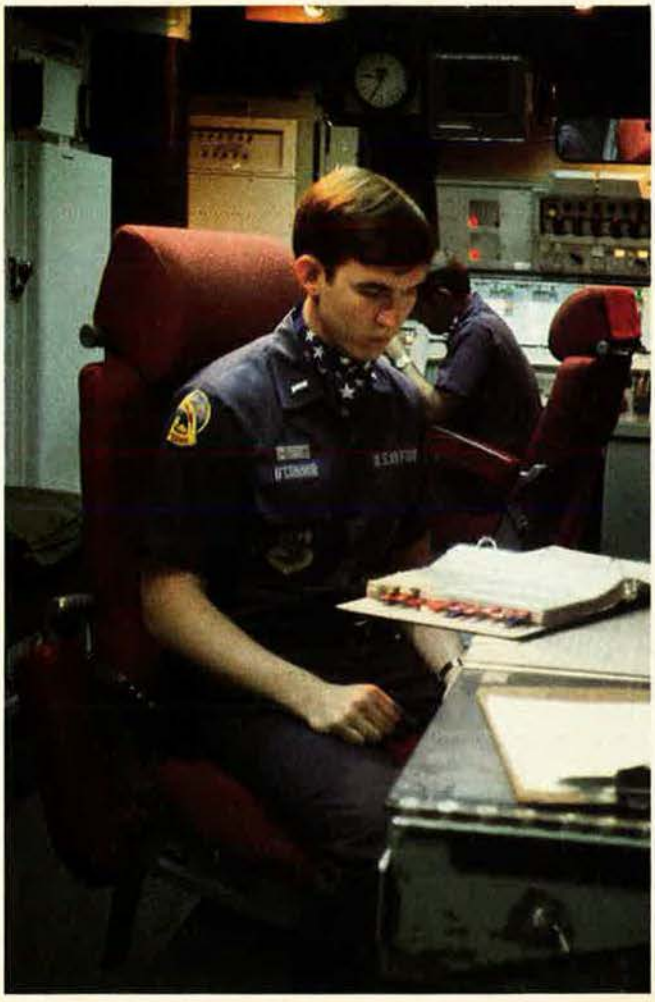
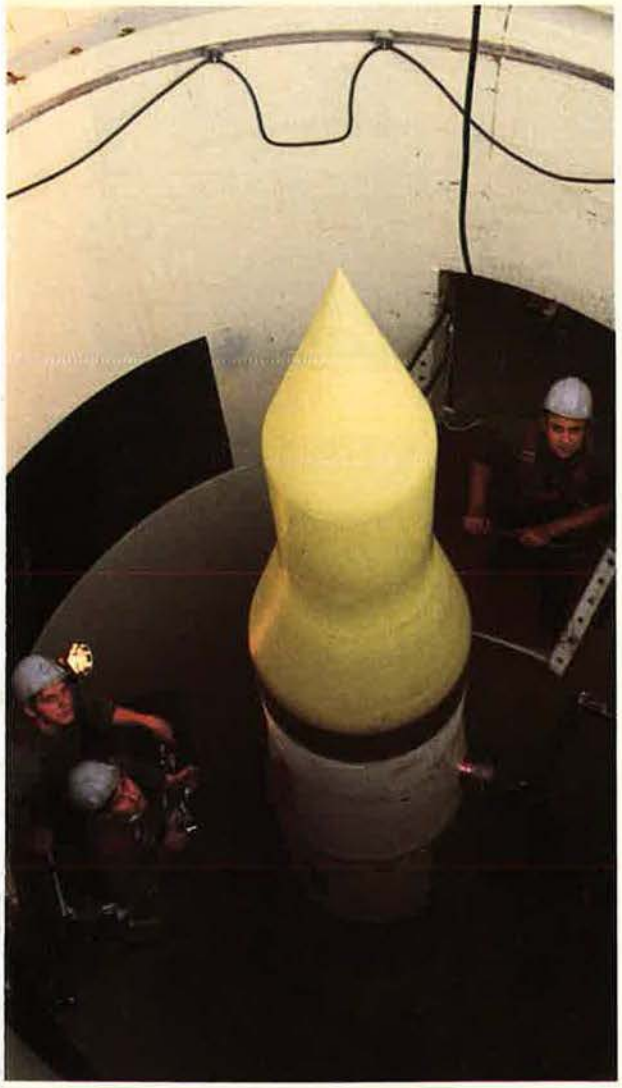
People

SAC—109,000 military members and 13,000 civilians strong—is the Air Force's largest major command. Behind the jokes about being "SACumcized" is the fact that strategic troops are indeed held to special standards—carefully selected and then monitored constantly. At the slightest indication of a problem, the Personnel Reliability Program decertifies them for nuclear-related duties.



Positive Control

Movies may fantasize about accidental nuclear war, but the reality is "Positive Control." Bombers might take off on warning, but would return to base unless they got a specific "go code" from the National Command Authorities. ICBM launch orders must be validated independently by two officers on the missile crew, and two physically separated stations have to proceed together through the activation sequence.



Missiles

The MX Peacekeeper is coming on line, and the Small ICBM is in development, but the backbone of the missile fleet today is still Minuteman. A refurbishing and upgrade program, currently under way, should make Minuteman an effective part of the force into the next century. The last of the old liquid-fueled Titans, once the heavyweights of the ICBM world, was retired this year.

—Photo by Erik Simonsen

B-52

The B-52 began life in the 1950s as a high-altitude bomber, but now does most of its work at low level. Much modified and still being upgraded, the B-52 carries a heavy load in the SIOP mission and is taking on additional tasking in the theater conventional role. It appears to have years of service ahead of it as it transitions to primary cruise-missile and conventional missions in the 1990s.

Cruise Missile

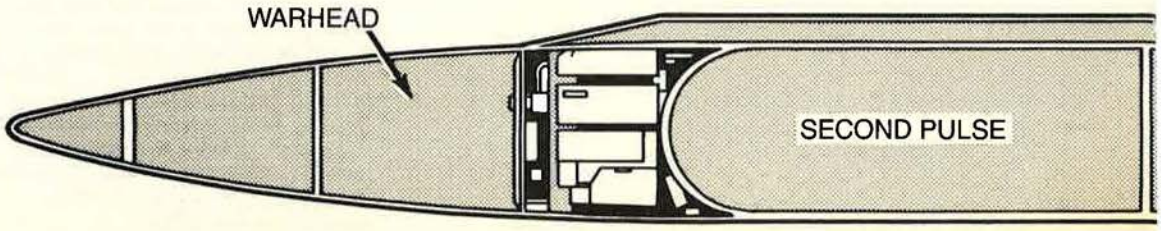
The Air-Launched Cruise Missile (ALCM), operational since 1982, adds flexibility and reach to the bomber force and reduces its exposure to enemy defenses. ALCM has a range of more than 1,500 miles, and each missile can be targeted independently against a hardened target. The Advanced Cruise Missile, the AGM-129A, is in development and should be fielded by 1990.

Bomber Modernization

The B-1B, now deploying, has taken heavy flak in Congress and in the news media, but the Air Force and SAC stand staunchly by their new bomber. The 100th and final B-1B should roll off the assembly line next spring. Work is also under way on "Stealth," the Advanced Technology Bomber (ATB), but little information about it has been made public.

Bomber Munitions

SAC bombers can carry a variety of nuclear and conventional weapons, including bombs, ALCMs, and Short-Range Attack Missiles (SRAMs). The current SRAM, in use since 1972, was designed to attack terminal enemy defenses, such as SAM sites. SRAM II, capable of striking hardened and heavily defended targets from standoff distances, should be operational by the early 1990s.

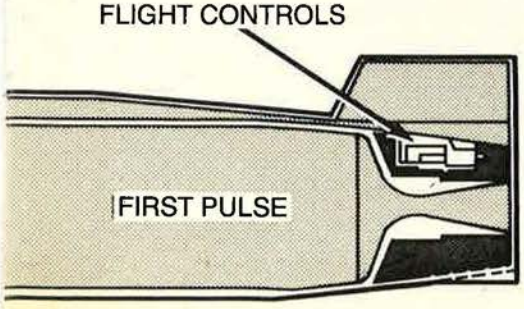


—Photo by Erik Simonsen

Tankers

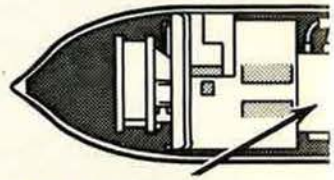
Strategic missions get first priority with SAC's tankers, but nearly half of the daily refueling is for aircraft of other commands, other services, or allied nations. Additional tankers and modifications have increased the volume of fuel that SAC can pump, but demand still exceeds supply. The fleet consists of about fifty KC-10As—growing toward a total of sixty by 1988—and 638 KC-135s.

—Photo by A1C Tracy L. Santee, USAF



FB-111

Sometimes overshadowed by their heavy stablemates are SAC's sixty-one FB-111 medium-range bombers, able to operate at night and in all weathers with great precision. New bombers joining the strategic force will allow transfer of the -111s to Tactical Air Command in the 1990s. Improved avionics and electronic countermeasures are adding to the aircraft's bag of tricks, which was already impressive.



RADAR ALTIMETER

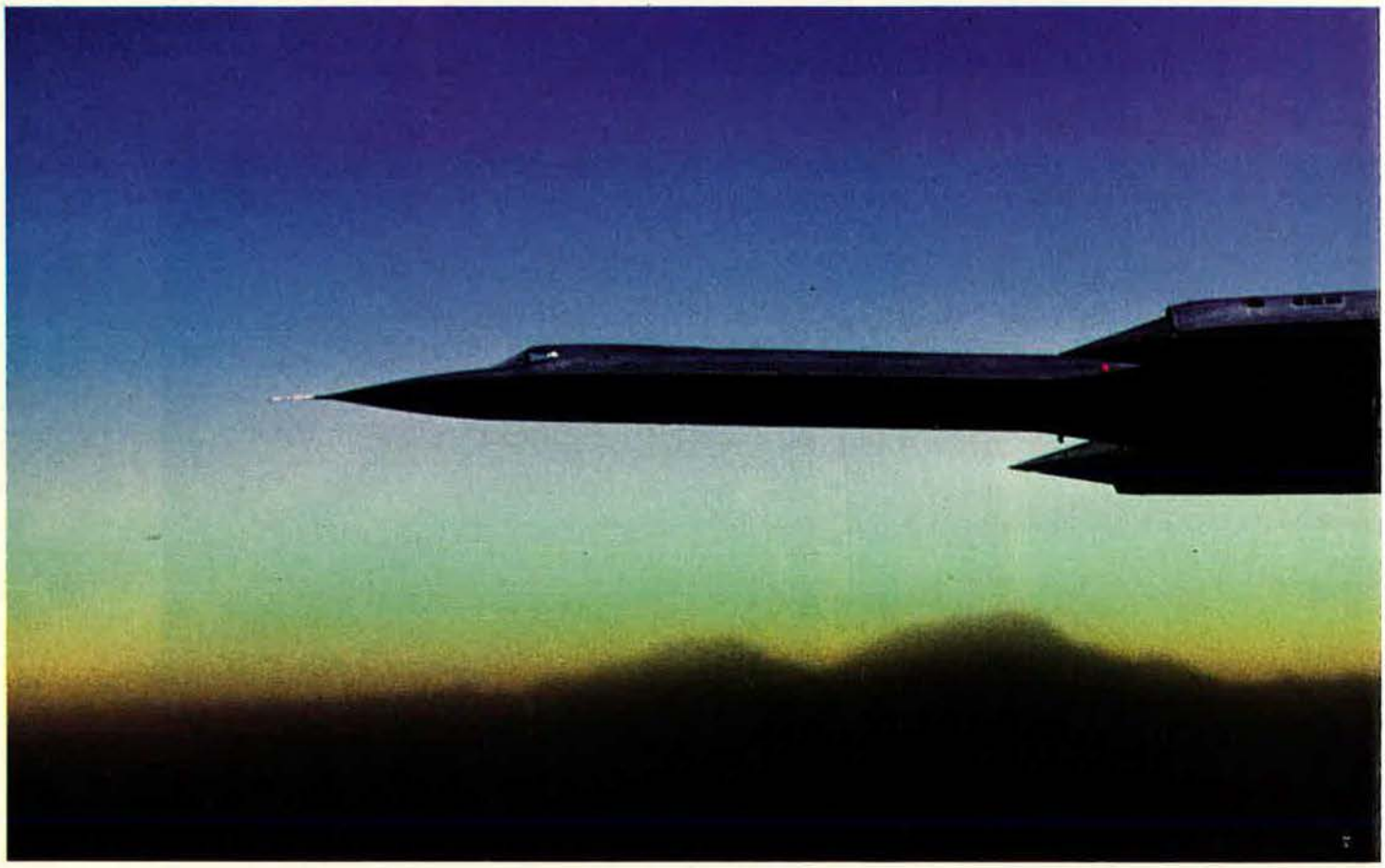
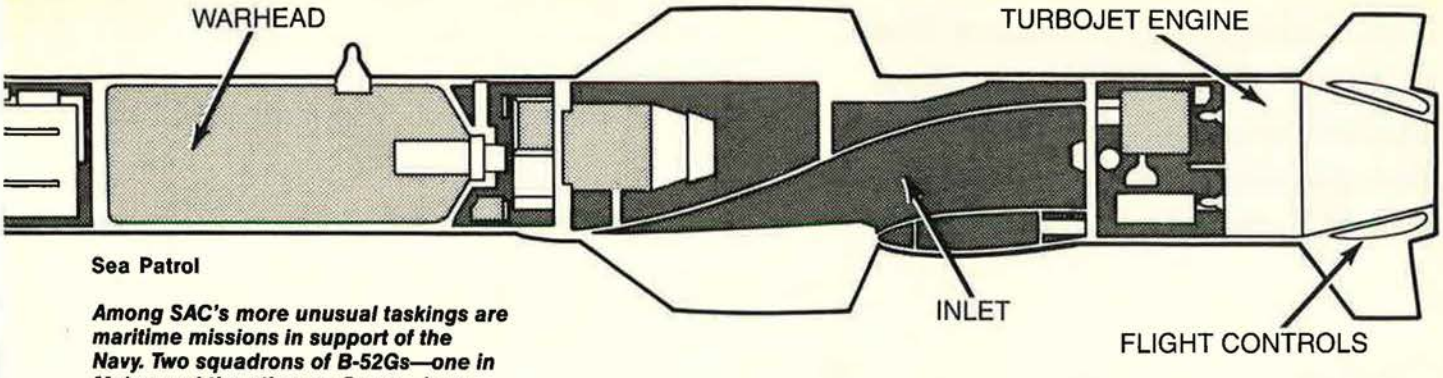


Photo by Erik Simonsen

Reconnaissance

The SR-71 Blackbird remains the pride of the strategic reconnaissance fleet. Operational since 1966, it can fly higher than 80,000 feet and at speeds in excess of Mach 3 and can photograph more than 100,000 square miles of territory per hour. The TR-1, an upgraded reincarnation of the high-flying U-2, performs battlefield surveillance, and the RC-135 conducts a number of electronic reconnaissance missions.



Sea Patrol

Among SAC's more unusual taskings are maritime missions in support of the Navy. Two squadrons of B-52Gs—one in Maine and the other on Guam—have been modified to carry the AGM-84 Harpoon antiship missile. SAC also performs sea surveillance and aerial minelaying.

—Photo by Erik Simonsen

C³

The red telephone is the most famous part of SAC command control and communications. When a controller in the command post picks up a receiver, every missile launch control center, every bomb wing, and every tanker wing is on the line instantly. As a backup to the underground center, aerial command posts have been on duty constantly since 1961. With better satellite communications, the Ground Wave Emergency Network (GWEN), and other improvements, SAC's reins of command will be even more certain and secure in the years ahead.

The CINCSAC reviews the nuclear capabilities of the superpowers and outlines the strategies and weapons the US needs to deter war.

Strategic Fundamentals

BY GEN. JOHN T. CHAIN, JR., USAF
COMMANDER IN CHIEF, STRATEGIC AIR COMMAND

ONE of the first things I did after coming to Strategic Air Command was to conduct a back-to-basics review of the guidance given to us about what our mission is and how we are to carry it out. I wanted to "begin at the beginning" and see what we've been told to do, why we were told to do it, and where we stand in terms of being able to accomplish the tasks assigned to us. Not surprisingly, this review reinforced my understanding that SAC has the principal and fundamental responsibility to provide this nation with a nuclear combat capability strong enough to deter even the thought of a nuclear attack on the US or our allies. The task may sound simple, but carrying it out is difficult—and awesome in its importance.

During my review, I also realized that we often use terms not commonly understood by the public (throw-weight, damage expectancy, delivery vehicles, MIRVs, and rideout) and thereby have made our task "un-understandable" to many. We often make it sound so complicated that only those directly involved with the strategic nuclear mission can carry on a substantive conversation about it. Understandably, there are many others who also participate in open discussions concerning strategic forces and strategy; however, their comments and statements are often based on partial knowledge or limited understanding at best. Thus, even though they mean well, they cause confusion or simply obfuscate the issues.

What I would like to do in this article, therefore, is to return to the basics and try to explain what we are trying

to do in the strategic nuclear world and why we are trying to do it. To do that, I am going first to discuss Soviet objectives and initiatives, then provide a quick review of the evolution of US strategy to meet the Soviet challenge, and then discuss the force requirements that are necessary to carry out US strategy. I'll close with a downstream look and some comments about where I think we need to go in the future and how we can get there.

From what the Soviets say and write, it appears their objectives are fairly straightforward. The Soviets seek to steadily expand the Marxist-Leninist form of communism throughout the world and become the world's preeminent power. They would prefer to accomplish these objectives while avoiding an armed conflict with the United States. Although the Soviets have said much about peaceful competition to achieve their goals, realistically, they lack the economic power to compete with the West. Consequently, the Soviets' alternative means to achieve their objectives are through political persuasion or military power—or a combination of both.

That makes military superiority enormously useful to them. With it, they could increase their pressure on Western alliances, expand their support of groups and countries that are anti-Western, and more effectively carry out their policy of expansion. Thus, in the Soviet view, nuclear strength is a key element in enabling them to attain their national objectives.

What the Soviets Are Doing

Soviet military goals and objectives have not changed in the post-World War II era, nor has their quest for military superiority. Beginning in the early 1960s, the Soviets began a concentrated effort to field forces needed first to match and then exceed US military strength. In the following years, they have been successful in building an effective offensive nuclear force and coupling it with significant defensive capability as well.

Soviet strategic offensive forces consist of three primary groups of weapons: intercontinental ballistic missiles, submarine-launched ballistic missiles, and bombers. They have expanded and improved their forces in each of these categories.

The Soviets have built a variety of very large intercontinental ballistic missiles (ICBMs), most of which carry several nuclear warheads. The Soviets now have slightly fewer than 1,400 ICBMs. More than 6,000 weapons sit atop those ICBMs, and each is capable of striking individual targets in the United States. As the Soviets pursue additional technological advances, they continue to construct new types of ICBMs, each more efficient than the systems they replace.

Additionally, the Soviets have deployed several classes of submarine-launched ballistic missiles (SLBMs) that can be launched from submerged submarines in waters anywhere from those adjacent to the Soviet Union to those just off US coasts. The time of flight for submarine-launched missiles, therefore, could vary from being similar to that of their land-based ICBMs to just a few short minutes if the submarine were close to our shores. As with their ICBMs, Soviet submarines have been upgraded and replaced through the years. The Soviets now operate a very large, effective, and efficient underwater fleet.

In the case of nuclear bombers, the Soviets have the Backfire bomber, which has the range to fly from the Soviet Union to the United States. The Backfire would have to land in Cuba or another Western Hemisphere country friendly to the Soviets to refuel before returning to the Soviet Union. They are also developing a new bomber called the Blackjack, which looks similar to the US B-1B bomber but is larger and faster. It will have intercontinental range, thus enabling it to return directly to the Soviet Union after an attack on the United States. Additionally, they are producing the Bear-H, a turboprop bomber with intercontinental range that carries air-launched cruise missiles as its primary weapon. The combination of these three aircraft gives the Soviets an effective offensive bomber capability.

The Soviets have committed themselves to a long-term, persistent military buildup of unprecedented size and momentum. Against a background in which the quantity of Soviet forces has always been impressive, significant quality improvements are now in evidence as well.

For example, their primary ICBM missile forces (SS-17, SS-18, and SS-19) are positioned in underground silos encased in steel and concrete—which we call hardened silos—that preclude their destruction in any attack that has less than "bull's-eye" accuracy. Their newest missile, the SS-25, is moved around on a large truck and thereby can be quickly dispersed around the Soviet countryside. Soviet facilities that would safeguard political and military leadership personnel and command and control capabilities during a nuclear conflict are also protected by hardening or mobility. These survivability measures are largely intended to support a war-winning strategy that would "guarantee" (in their minds) Soviet nuclear superiority in a postwar world.

They also have in place a strategic air defense program—with new radar warning systems, lethal surface-to-air missiles, combat-effective fighter interceptors, and an antiballistic missile system ringing Moscow. Although their defensive system is already massive in scope, it is being expanded even further to limit the effects of possible US retaliation and to protect Soviet forces, leaders, and war-sustaining industries.

A review of where the Soviets have been and where they are going shows that Soviet goals have remained consistent and uncompromising over the years. They have devoted enormous amounts of money and effort toward building the forces necessary to achieve their political and military objectives.

What We Need To Do

What we have to do, then, is to ensure we have a logical strategy and sufficient combat capability to deter the Soviets and thereby deny them any plausible opportunity for achieving their politico-military objectives. In other words, we must have a strategy—and forces to support our strategy—to preclude any Soviet perception that they could successfully attack the United States or its allies. Our strategy and forces must also be sufficient to prevent the Soviets from attaining military superiority, which they could use to accomplish their objectives short of war by intimidating us or our allies.

A review of the past forty years shows that from the late 1940s through the 1950s, the United States had

superior nuclear forces. Our strategy was called "massive retaliation" and was backed by sufficient strategic muscle to inflict a massive blow against the enemy if he attacked. However, beginning in the late 1950s, the Soviets began a massive buildup of nuclear arms. As a result, our strategy of relying on a single, massive, nuclear response to deter all types of aggression against us or our allies was no longer credible.

To deal with the multifaceted Soviet threat, the Kennedy Administration introduced in 1961 a new strategy called "flexible response," which means the President needs to have forces available that permit him to have a range of effective response options. The response options dictated by our strategy require forces with counterforce capabilities. This means that the President has to have the right balance of forces so that he can direct effective attacks against the full range of critical Soviet assets: military forces, political and military leadership, and their war-sustaining industrial base. Today, twenty-five years later, that strategy remains fundamentally unchanged.

Unfortunately, a gap began to widen between US strategy and US capability to carry out the strategy, whereas the Soviet strategy-capabilities gap began to narrow for them. By the beginning of this decade, it had become obvious that the Soviet military buildup had caused the balance of nuclear power to shift in their favor. Starting in the late 1970s, US strategy underwent adjustments realistically to address the issue of how to deter the Soviets. The reassessment led to the reaffirmation of the strategy and the development of the President's Strategic Modernization Program, intended to reinvigorate our forces so that they might meet the demanding requirements of flexible response.

Given sufficient weapon systems with flexibility and credible counterforce capabilities, we can be confident that a nuclear war would be too costly for the Soviets ever to consider. If the Soviets believe we can execute our strategy, there will be no conflict, since they will be deterred from initiating one—and that is our objective.

Capabilities and Forces

Our capability to achieve prompt retaliatory damage against the hardest Soviet targets is improving, but to do the job right, we need better accuracy than our current fully upgraded Minuteman missiles can technically provide. Our ballistic missiles can arrive promptly in the target area, and our bombers have hard-target capability, but neither weapon system has *both* attributes—both prompt *and* hard-target capability—and that is what we need to hold this target set at risk.

With regard to the manned bomber, I consider the human presence in the manned bomber crucial to detecting, identifying, and attacking the growing number

Chain on the B-1B

It makes me mad when the American people are not given the truth. A case in point is the reporting about the B-1B. Most of the news stories you have read have trashed the B-1B and have left you with the false impression that it is an "Edsel," a "disaster" or a "lemon."

Bah!

As the Commander in Chief of Strategic Air Command—who had no responsibility for the research, development, or acquisition of the system—I have a hard time correlating most of what I read and see reported about the B-1B with what I know to be the facts. The SAC crews who fly the warplane daily are the ones who should be the most concerned if the B-1B were bad, and they also say "Bah!" to the B-1B critics.

Allegation: The B-1B has fuel leaks.

Fact: The first planes delivered had some seeps and leaks. That situation was corrected. Fuel leaks never jeopardized the ability of the aircraft to perform its wartime mission and are not a problem now.

Allegation: The B-1B is overweight.

Fact: We added 8,000 pounds to the basic airframe by beefing up the structure so that we could add 50,000 pounds of bombs and 24,000 pounds more fuel. This significantly increases our combat capability.

Allegation: The B-1B cannot fly high.

Fact: So what? The B-1B wasn't built to be a "high flyer." The B-1B's attack profile is to fly very low at more than 600 mph—which it does.

Allegation: The terrain-following radar doesn't work.

Fact: There was a software problem, and until it was fixed we did not use the system for peacetime training. It's been fixed, and we are training with it now. We've always been able to use it in a wartime situation.

Allegation: The electronic countermeasures system does not work.

Fact: It does not do what we contracted for. We need the equipment. We have held up payments to the company that makes it until they fix it. Fortunately, because of other inherent capabilities, the B-1B can still do its wartime mission better than any other bomber in the world today. It will be able to do it even better with improved ECM.

Allegation: The Air Force needs an additional $4 billion in repairs to enable the B-1B to perform its mission.

Fact: We do not need, and have not asked for, either the $3 billion referred to in reports or the $4 billion reported by ABC News. The Air Force said it would build 100 B-1Bs for $20.5 billion in baseline 1981 dollars. Because the program progressed so well initially, considerable savings were realized. Congress capitalized on these savings by removing more than $1 billion from the B-1B account, with the promise the money would be restored if needed. The Air Force has asked for some of the withheld money to get some problems fixed, particularly the ECM. The B-1B will be within the original cost guidelines everyone agreed to.

The question then is: Why didn't we speak up and tell the critics the facts? We did, but they ignored them.

Let me give you four examples of when the Air Force tried to get the truth out. The Chief of Staff of the Air Force, Gen. Larry D. Welch, met with the Pentagon news corps on January 16 and gave an in-depth report on the B-1B. No substantive article appeared. On February 4, Gen. Larry Skantze delivered a twenty-two-page speech to the National Press Club. A film clip of a sentence and a half of the speech appeared on national TV, coupled with a flagrantly biased report completely misrepresenting the facts. On February 23, I spent two and a half hours testifying in open session to a Senate Armed Services subcommittee along with three B-1B crew members. Although three cameras and a number of print media representatives attended the hearing, the coverage and reports were minimal. On March 23, a number of media representatives visited Dyess AFB in Texas, the first B-1B base. Our crews and airmen were completely candid. The Texas papers wrote honest stories. However, most of the national news stories continued to trash the B-1B through a mixture of truths and outright falsehoods.

Can you imagine the frustration of the officers and airmen who fly and support the B-1B when they see so much junk in the "news"?

of Soviet relocatable targets. (Relocatable targets refer to the increasing numbers of Soviet warfighting assets that could disperse and relocate, primarily to avoid detection and destruction.) The capability of the manned bomber to penetrate enemy airspace and search out and destroy relocatable targets, particularly the highly threatening mobile ICBMs, is essential.

Finally, we can never allow the Soviets to believe they could fight a nuclear war and emerge with a preeminent balance of power. To dispel any Kremlin visions about postattack Soviet coercion, we must ensure that we hold in reserve a sufficient number of nuclear weapons with different ranges and lethality capabilities to carry out flexible response options.

Near-term strategic modernization programs are specifically designed to meet the requirements of US strategy and increase our flexibility to adapt to changing future conditions. After fifteen years of effort, we are bringing our first fifty Peacekeeper missiles up on alert in upgraded Minuteman silos. Peacekeeper substantially increases our ability to hold the Soviet warfighting structure at risk because of its accurate, prompt hard-target capability.

Bomber modernization is also very important to our strategy. The B-1B has reached its initial operational capability. It is a highly capable, multirole bomber. Its capabilities assure that we can penetrate enemy airspace well into the 1990s. Later, we will deploy the Advanced Technology Bomber (sometimes dubbed the "Stealth," which is a low-radar observable airplane). In the late 1980s, the Advanced Cruise Missile will come on board. Its greater range will permit bombers to stand off and launch from beyond future Soviet defenses. And because of its very small radar signature, it will be very successful in penetrating enemy defenses and effectively attacking targets assigned to it.

Most important, we must convey to the potential enemy a convincing capability to respond immediately to an attack of any magnitude and duration. A number of ongoing command control and communications (C^3) initiatives will ensure we can meet this objective. For example, the Ground Wave Emergency Network, or GWEN, will use an array of ground relay sites to provide high-confidence relay of messages from warning sensors to the National Command Authorities (NCA) and from the NCA to the forces. Many other C^3 systems are coming on board that will provide great confidence in our ability to direct the operation of our forces—even under the most severe circumstances.

We're making excellent progress in improving our deterrent capabilities during this decade. We will enter the 1990s significantly better off than we were.

Modernization for the 1990s

Continuing the Strategic Force Modernization Program into the mid-1990s with an additional fifty Peacekeepers, the Small ICBM, the Trident D-5, and the Advanced Technology Bomber will allow us to carry out our strategy fully. The systems called for in the President's Strategic Force Modernization Program will provide several very important capabilities.

Follow-on Peacekeeper missiles deployed in the rail-garrison basing mode will improve the flexibility and endurance of the ICBM leg of our triad. In the rail-garrison basing concept, specially designed railcars would transport and serve as launchers for Peacekeeper missiles. Day to day, the Peacekeeper trains would be on alert in secure garrisons (similar to current bomber alert areas) on existing Air Force bases. In a crisis, the trains would be moved onto the more than 200,000 miles of commercial rail track, thereby posing an unsolvable attack problem for the Soviets. Rail-garrison basing for Peacekeeper will add significantly to deterrence, is cost-effective, and is easily understood by the public.

The Small ICBM will contribute measurably to US force survivability and strategic flexibility. The Small ICBM combat crew will be able to drive their hardened mobile launch vehicle to a new position, safe through dispersal from enemy targeting, and sustain their weapon system's effectiveness for an extended period. As directed, we will have the ability to retarget and launch the missile from the deployed location.

D-5 missiles deployed in Trident submarines will be highly accurate weapons in a survivable basing mode. The combined response of D-5 and Peacekeeper missiles against hardened Soviet silos and leadership facilities will achieve the required level of prompt damage.

Additionally, the highly flexible Advanced Technology Bomber, with a low-observable design, will penetrate enemy airspace and hold all types of targets, both fixed and relocatable, at risk. This is tremendously important given the growing portion of the Soviet target base that will be relocatable in the next decade.

Finally, as the quality and endurance of our forces improve, we can remedy the imbalance between the US and Soviet postattack capabilities by adding such weapon systems as the D-5 and the Small ICBM to our strategic reserve. Such programmed C^3 enhancements as the Survivable, Endurable Command Center and the Milstar communications satellite system will provide the capabilities needed for more effective planning and control of these new weapon systems.

I'm convinced flexible response continues to be the right strategy at the right time. The means to support that strategy fully are well within our grasp. We can ensure that no Soviet leader could believe that Soviet war aims are attainable. That is the essence of credible deterrence. That means a world free of conflict between major powers. It means keeping Americans alive and free and at peace.

My back-to-basics review illuminated several important considerations. Some of the forces we need to carry out our strategic tasks are already operational; more will be coming on line in the near future. The remaining programs are progressing well. Much of the needed investment has already been made. What remains is to stay the course, to complete within the next decade what we set out to do fifteen years ago—to implement fully our strategy of flexible response, a strategy that will keep the peace. Our nation and the people of our great country deserve nothing less. ■

Gen. John T. Chain, Jr., is Commander in Chief of Strategic Air Command and Director of the Joint Strategic Target Planning Staff. A command pilot and master parachutist, he has accumulated more than 4,000 hours of flying time in thirty-four different aircraft. He assumed his present position in June 1986.

With improved accuracy, penetration, and survivability features, the ICBM can be an effective weapon well into the next century.

Missiles and Targets

BY EDGAR ULSAMER
SENIOR EDITOR (POLICY & TECHNOLOGY)

FATEFUL decisions are pending on what Air Force leaders so aptly term the "premier military force between nations," the ICBM. Congress is busily dissecting the White House's integrated ICBM modernization package, which is made up of the rail-garrison Peacekeeper and the Small ICBM (SICBM) programs. The Soviets, meanwhile, are systematically modernizing and restructuring their vast ICBM force by—as Strategic Air Command's Commander in Chief, Gen. John T. Chain, Jr., puts it—"making mobile whatever they can and hardening what they can't."

The pervasive importance of the ICBM to the strategic offensive mission, in the view of USAF's Chief of Staff, Gen. Larry D. Welch, stems from the fact that they "provide the most effective retaliatory warheads for the least cost due to low operating cost and a near 100 percent alert rate. They are, at present, our only prompt hard-target capability for the foreseeable future." There is no question, General Welch points out, "about the Soviets' regard for ICBMs, since some seventy-five percent of their warheads are on ICBMs."

Because of these traits, which prevail today and which by means of the Air Force's ICBM modernization program can be made to prevail well into the next century, these weapons are central to the strategic deterrence task: To create insurmountable and incalculable uncertainty about the success of a Soviet attack and *calculable* certainty about the inevitability of an effective retaliatory attack that would threaten the survival of the Soviet state and its ability to dominate the postattack world.

Survivability *and* Capability

Brig. Gen. Edward P. Barry, Jr., Commander of AFSC's Ballistic Missile Office (BMO), which is the Air Force organization responsible for developing, acquiring, and modifying US ICBMs, is sanguine about the long-term effectiveness of these CONUS-based weapons. These systems capitalize on both the unexcelled economy of silo-based ICBMs and the survivability of land-based ballistic missiles that results from the mobility inherent in the rail-mobile Peacekeeper and the on-road and off-road mobile SICBM.

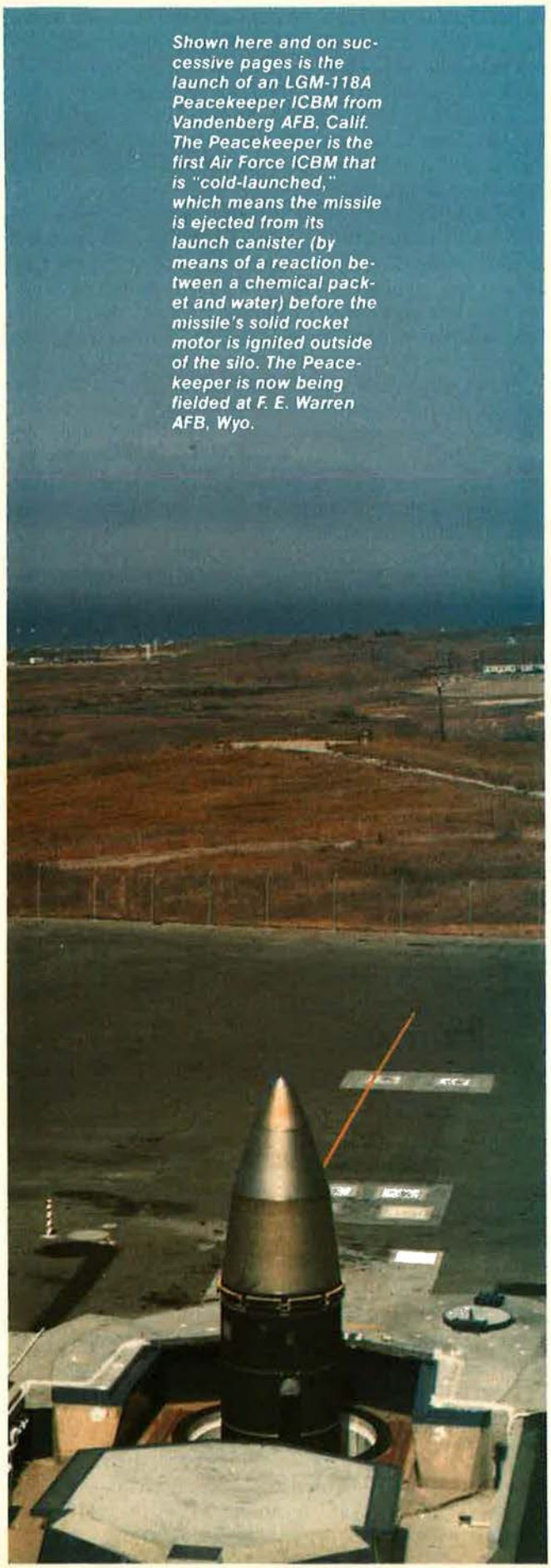
The fate of the ICBM modernization program over the past decade has been closely intertwined with questions about survivability. General Welch, talking to a group of defense writers recently, suggested that "survivability has been overplayed. The real issue is capability." There can't be any question about the imperative of deterring the Soviets from contemplating "a bolt-out-of-the-blue attack," even though without a preceding crisis or confrontation, there would be "very little pressure" on the Soviets to do so. Also, in General Welch's view, even under a worst-case scenario—meaning that the Soviets launch a "total surprise attack" in the absence of an incipient crisis that would provide some strategic warning—"we would still have one-third of the bomber force, about forty percent of the SLBMs, and a lot of land-based ICBMs that will survive and retaliate."

In the case of the latter strategic triad component, Soviet decision-makers would also have to allow for the fact that this country could launch the ICBMs from their silos before significant numbers are destroyed. Thus, Soviet war planners cannot count on neutralizing the retaliatory capability that resides in the silo-based US ICBMs. The Air Force Chief, therefore, argues that because the price the Soviets would have to pay for a bolt-out-of-the-blue attack is so high and the pressures to mount an attack of this type so low, the current deterrence mechanism is "adequate."

A circumstance that "worries" him a great deal more than a no-warning Soviet first strike centers on the "pressures to do something" that might arise at the onset of a crisis. These pressures might be sufficiently severe to "overcome the rationale that prevents a [Soviet] bolt-out-of-the-blue attack. So what we need is a strategic force that [can be made] more and more survivable" as a crisis builds up toward a flashpoint. General Welch stressed that the ability to shift deterrence into high gear is built into the bomber forces, which can be generated at a 100 percent alert rate, the SLBMs, whose deployment rate can be stepped up, and the rail-garrison Peacekeepers, which can fan out over the US rail network as the crisis deepens.

The Challenge of Soviet Relocatable Targets

The intensifying Soviet shift toward mobile deployment of ICBMs has heightened concern over deterring strategic forces comprised of what the Pentagon now refers to as "relocatable targets." General Welch be-



Shown here and on successive pages is the launch of an LGM-118A Peacekeeper ICBM from Vandenberg AFB, Calif. The Peacekeeper is the first Air Force ICBM that is "cold-launched," which means the missile is ejected from its launch canister (by means of a reaction between a chemical packet and water) before the missile's solid rocket motor is ignited outside of the silo. The Peacekeeper is now being fielded at F. E. Warren AFB, Wyo.

lieves that these concerns need to be put into proper perspective.

RTs, he points out, did not burst on the scene overnight. SLBMs have been around for years; so have tanks on the battlefield. Major efforts have been under way for a long time to cope with these RTs, notwithstanding the fact that these are "very difficult tasks. I feel the same way about [mobile Soviet] ICBMs."

While the Air Force Chief of Staff "sees no prospects" of ever being able to locate and attack relocatable ICBMs with the same certainty as fixed-silo ICBMs, he emphasizes that holding at risk even a fraction of the Soviet mobile ICBM force "would increase the uncertainty [about being able to realize their war aims] in the minds of the Soviet leaders, [which] is what deterrence is all about." He cautioned nevertheless against getting "boresighted" on relocatable targets: "Of much greater concern to me than RTs are the very heavy SS-18s in superhard silos that remain, far and away, a . . . greater threat for years and years to come." He added that he wasn't "playing down the importance of RTs; I am playing up the importance of [Soviet ICBMs] that we already have to deal with today."

The Pentagon, in light of the importance of denying the Soviets a free ride in terms of such relocatable targets as mobile ICBMs, associated C^3 systems, and long-range bombers, formulated a Defense Department-wide RT Master Plan that is keyed to the development of sensors, C^3I architectures, and force structure necessary to put at risk these Soviet targets in the future. The DoD plan is largely an extension of the Air Force's RT Capability Program—overseen by AFSC's Aeronautical Systems Division (ASD)—that pursues upgrades of sensor and avionics systems for strategic bombers to help locate and target RTs.

Augmenting this work are endeavors by the Defense Advanced Research Projects Agency (DARPA), in concert with BMO's ASMS (Advanced Strategic Missile Systems program) organization. These efforts are exploring various operational concepts for holding RTs at risk, including by means of ballistic missiles. A fringe benefit that DoD expects to fall out from this research is a clearer understanding of the survivability of this country's own mobile ICBMs. (ASMS, somewhat of a misnomer, covers almost all of BMO's technology programs, centered on but not confined to RVs and penetration aids.)

The prospects for transforming US ICBMs into autonomous counterweapons to mobile ICBMs are not bright, at least for the near term. The head of the ASMS program, Col. Ted Kehl, recently told an AFA-sponsored technical symposium at Norton AFB, Calif., that, as yet, "we have nothing that comes close to a good solution" with regard to providing ballistic missiles with an effective RT detection and kill capability. ASMS, therefore, has let four "sizable" study contracts to find innovative approaches to the RT challenge. This research, he added, is being carried out in concert with ASD at Wright-Patterson AFB, Ohio.

Earth Penetrators and MaRVs

Another major requirement in the field of strategic deterrence, according to General Chain, is the timely development of deep earth penetrators to put at risk

Soviet superhardened targets. Two approaches to an earth-penetrating warhead that can dig to deeply buried targets are being pursued under ASMS. In one case, the focus is on a MaRV (maneuvering RV) design that is "larger than the current design MaRV concept" and optimized for packaging a "rigid earth penetrator." The other centers on a "shallow" earth penetrator that BMO is working on jointly with the Defense Nuclear Agency.

Making sure that ICBM warheads can get through sophisticated Soviet ABM defenses is one of ASMS's primary concerns. As Dr. Lawrence W. Woodruff, Deputy Under Secretary of Defense for Strategic and Nuclear Forces, recently told Congress, ASMS's "vigorous" R&D effort in the area of penetration aids is impelled in part by the fact that the Soviets are deploying an upgraded ABM system around Moscow "that will reduce the capability of the present generation of penetration aids on the Minuteman system." In response, ASMS launched the development of a new chaff system and the "so-called passive decoy for Minuteman III [that] replicates the signatures of the Minuteman RV."

Pointing out to a congressional panel that the Soviets over the past ten years have spent "billions of dollars" on these upgraded defenses, Dr. Woodruff underscored the leverage that accrues from Minuteman penetration aids that, "at much less cost," neutralize these defenses. ASMS is probably capable of continuing this cat-and-mouse game because even more potent penetration aids are in the works in case the Soviets succeed in deploying even more advanced or proliferated defenses: "For the radar threat, these include active decoys that have already been flight-tested." He added that for advanced defensive threats, "we are developing a new maneuvering reentry vehicle that could evade interceptor missiles." Initial technology demonstration flight tests of this MaRV are planned for 1990 and 1991.

While there is no hard evidence of significant Soviet strides toward ABM systems using optical sensors, the US intelligence community believes that "adjunct systems for exo- and endo-optical [inside and outside of the atmosphere] discrimination are within Soviet capabilities," according to the Pentagon expert. Should the Soviets deploy such a system, he added, the most promising US response would be "to use a MaRV and a thrusted replica decoy. The ASMS program is developing these counters, with a flight test of the replica decoy expected in FY '90," according to Dr. Woodruff. The Defense Department seeks R&D funding of its penetration aids work under the ASMS, Minuteman III, and Trident programs to the tune of $215 million in FY '88 and $287 million in FY '89.

Increased Coordination

Because of the pressing, and growing, need to provide ballistic missiles with advanced penetration aids, the Defense Department is increasing oversight over relevant individual efforts by the services. As a result, Secretary Woodruff testified that "we are now organizing a panel—which I will chair and which will have representatives from the Navy, Air Force, Army, and SDIO—to coordinate all DoD efforts in ballistic missile penetration aids technology."

BMO officials applaud the Pentagon's and Congress's increasing awareness of the importance of the various ICBM front-end improvement efforts that are being lumped together under ASMS. But, at about $150 million annually, ASMS's funding remains circumscribed. Of major concern is the need for a comprehensive plan keyed to MaRV technologies. To date, interest in MaRVing has been concentrated on evasion of high-performance ABM interceptors while maintaining or even improving accuracy.

For the time being, BMO's planners acknowledge that there is little incentive to spend money and increase technical complexity to boost the "already staggering accuracies" demonstrated by the past seventeen flight tests of Peacekeeper. As General Chain points out, Peacekeeper's CEPs are such that the missile could "win any SAC bombing competition."

But in the case of future deep earth penetrators and anti-RT warheads, even greater accuracies may be called for. The same is true for "smart RVs." Key here are vehicles that can dodge layered defenses, including kinetic kill vehicles, yet still maintain accuracies as good or better than Peacekeeper's in order to put at risk difficult future target sets.

Within three or four years, ASMS is expected to demonstrate MaRV approaches that can confirm the ability of IMUs (inertial measurement units) and other instrumentation to maintain Peacekeeper-like accuracies. Because of funding constraints, it is not likely that new vehicle designs will be available for these demonstrations, with the result that existing MaRVs will have to be modified. Funding constraints also kept BMO from integrating the Terminal Fix Sensor (TFS) technology into a MaRV for actual flight tests. BMO is carrying out captive flight tests using aircraft to validate two different TFS concepts, especially in terms of accuracy potentials.

Money shortfalls are not the only problems plaguing BMO's efforts to pioneer new ICBM front-ends. The accuracy of radar measurements is too coarse to gauge the accuracy levels already achieved with TFS and other similar projects. Even the use of Navstar GPS (global positioning system) receivers has not fully solved this problem.

While ASMS's findings strongly suggest that ICBMs will be around for years to come, there are hints that, as Colonel Kehl puts it, the "son of Peacekeeper II" might not be a conventional ballistic missile, but rather a hypersonic glide vehicle (HGV) boosted into the fringes of the atmosphere by a ballistic missile. *(See "In Focus," May '87 issue.)* ASMS is in the midst of modifying Minuteman Is to fly the missile with a "hammerhead up front" and in upside-down fashion to keep the glide vehicle in the upper atmosphere. The flight will be from Vandenberg AFB to Kwajalein.

ASMS is providing direct support for the Peacekeeper program through its Penetration Aid Deployment System (PADS), which has already passed proof-of-concept demonstration. Over the longer term, ASMS's penaids efforts will concentrate on optical decoys and means for neutralizing directed-energy weapons attacks on RVs.

ASMS, according to General Barry, is the key to the future of the ICBM force not only in terms of exotic concepts but in such mundane areas as improved, cheaper propulsion systems, guidance, and nozzles that can be incorporated into future ICBMs as well as be

BMO's Associate Missileers

The Ballistic Missile Office at Norton AFB, Calif., uses an "associate contractor" approach to systems acquisition. Under this method, BMO integrates the activities of several major contractors who build portions of missile systems. It differs from the "prime contractor" method in which a single civilian firm has overall engineering responsibility for a system.

Peacekeeper Associate Contractors

Name	Purpose	Location
Aerojet General	Stage II	Sacramento, Calif.
Avco	Reentry System Integration	Wilmington, Mass.
Boeing	Basing Operational Support Equipment; Assembly and Checkout	Seattle, Wash.
General Electric	Mk 21 Reentry Vehicle; Arming and Fuzing	Philadelphia, Pa.
GTE	Launch Control System	Westborough, Mass.
Hercules	Stage III	Magna, Utah
Honeywell	Specific Force Integrating Receiver; Third-Generation Gyroscope	Clearwater, Fla.
Lockheed	Ordnance	Sunnyvale, Calif.
Logicon	SAC/Peacekeeper Software Analysis; Operational Targeting Program	San Pedro, Calif.
Martin Marietta	Assembly, Test, and System Support; Production Support Equipment	Denver, Colo.
Morton Thiokol	Stage I; Ordnance	Brigham City, Utah
Northrop	Third-Generation Gyro	Norwood, Mass.
Northrop	Inertial Measurement Unit (IMU)	Hawthorne, Calif.
Rockwell International Autonetics	Guidance and Control System; ICBM Code-Processing System	Anaheim, Calif.
Rockwell International Rocketdyne	Stage IV	Canoga Park, Calif.
TRW	Systems Engineering and Technical Assistance	Redondo Beach, Calif.
Westinghouse	Launch Canister; Launch Ejection Gas Generator	Sunnyvale, Calif.

Small ICBM Associate Contractors

Name	Purpose	Location
Aerojet	Stage II	Sacramento, Calif.
Boeing	Hard Mobile Launcher FSD; Weapon Control System FSD	Seattle, Wash.
Charles Stark Draper Labs	Guidance Technical Support	Cambridge, Mass.
Earth Technology	Geotechnical and Siting Studies	Long Beach, Calif.
General Electric	Alternate Inertial Navigation System	Pittsfield, Mass.
General Electric	RV Adaptation Program	Philadelphia, Pa.
Hercules	Stage III; Ordnance Firing System	Magna, Utah
Litton	Alternate Inertial Navigation System	Woodland Hills, Calif.
Martin Marietta	Assembly, Test, and Systems Support	Denver, Colo.
Morton Thiokol	Stage I; Flight Termination Ordnance System	Brigham City, Utah
Northrop	Inertial Measurement Unit (IMU)	Hawthorne, Calif.
Rockwell International Autonetics	Guidance and Control Integration	Anaheim, Calif.
Tetra Tech	Environmental Impact and Assessment	Pasadena, Calif.
TRW	Systems Engineering and Technical Assistance	Redondo Beach, Calif.

used to upgrade Minuteman missiles and the SICBM. But in order for ASMS to pay off in optimal fashion, funding of the program ought to be maintained at stable levels, in the $200 million a year range, he suggested. The roller-coaster funding profile of ASMS in the past few years, the BMO Commander stressed, has impaired effectiveness and driven up costs.

Extending Minuteman's Service

The Minuteman family of ICBMs has been the heart and backbone of US strategic deterrence for more than twenty-four years, as corroborated by 638 test flights. Nevertheless, SAC, along with AFSC and AFLC, believes that this mature weapon system can be kept in the active inventory for another twenty years or longer.

Key to Minuteman's life extension is MLRP, the Minuteman Long-Range Plan. Its objective is to pin down long-term mission and logistics requirements for the weapon system and to catalog technical options for meeting these goals. As a first step, MLRP spawned the ICBM integrated electronics upgrade and Launch Control Center (LCC) integration effort.

The central objective of this effort is to optimize the ability of SAC combat crews to meet requirements associated with carrying out emergency war orders (EWO). This three-pronged project got under way in FY '87 in the areas of LCC integration, computer-aided message processing (CAMP), and rapid retargeting (RRT). Full-scale development contracts are to be let this fall, with initial operational capability expected in mid-1992 and completion of the program three years thereafter. Two of the key benefits of the program are real-time status information on the weapons and associated communications nets and the ability to initiate all commands and message traffic from the crew members' new consoles.

Upgraded penaids are under development to extend the combat effectiveness of Minuteman ICBMs, especially against heavily defended targets. In August of this year, the Defense Acquisition Board is expected to authorize the procurement of new penaids, including passive decoys and chaff, that should meet IOC late in 1991.

Peacekeeper Off to a Fast Start

By December 1988, the full complement of fifty MX Peacekeeper ICBMs will be deployed in improved Minuteman silos at Francis E. Warren AFB in Wyoming. By December 1989, management responsibility over the program will pass from AFSC's BMO to Air Force Logistics Command. The first ten Peacekeepers—constituting IOC of the program—went on alert at the end of last year ahead of schedule. To date, seventeen flawless test flights from Vandenberg AFB to Kwajalein have demonstrated an accuracy level of the weapon system's ten MIRVed warheads significantly and consistently greater than that required in the design specs.

Peacekeeper is seventy-one feet long and ninety-two inches in diameter and weighs 195,000 pounds. The weapon can carry ten independently targetable reentry vehicles over distances in excess of 6,000 miles. Congress, so far, has authorized the acquisition of sixty-six Peacekeeper ICBMs, twenty-one each in FY '84 and FY '85 and twelve missiles each in FY '86 and FY '87. In addition to the fifty missiles that are replacing a like

number of Minuteman IIIs in hardened silos, sixteen others were earmarked for operational flight test.

In addition, the Administration seeks $2.7 billion for continued deployment of Peacekeeper in Minuteman silos and for procurement of the next forty-two missiles—twenty-five for the flight-test program and, if Congress agrees, an additional seventeen to start up rail-garrison deployment. Also, the new two-year budget request seeks about $590 million in FY '88 and $1.2 billion in FY '89 for the development of rail-garrison basing. Overall, the new defense budget request pegs all efforts associated with ICBM programs at $4.49 billion in FY '88 and at $5.3 billion in FY '89.

One of the Peacekeeper program's few blemishes—widely trumpeted by congressional investigators and subsequently by the press—involves the IMU, a complex, state-of-the-art component of the ICBM's guidance system. The unit, manufactured by Northrop, performs in accordance with the design specifications, but encountered producibility problems, according to BMO spokesmen. As a result, fewer sets are available than scheduled.

Senior Air Force officials informed Congress that the service became concerned more than a year ago about the producibility issue, with the result that some progress payments were withheld from Northrop and Rockwell Autonetics was awarded a second-source contract for these devices. In March of this year, "based on little or no progress in IMU delivery rates, the Air Force began to withhold all progress payments to Northrop" to enforce satisfactory contract performance.

While the tardy delivery of IMUs has not held up SAC's activation of the Peacekeeper force, the Air Force lowered the force's alert rate to ensure an adequate number of spare IMUs for alert missiles. USAF's report to Congress states that "until IMU delivery rates are recovered, we decided to put only a portion of the missiles being turned over to SAC on an alert status." The report suggested that this issue would not delay Peacekeeper's full operational capability—meaning fifty missiles deployed and operational in modified Minuteman silos—in December 1988.

In another change from original plans that is not related to the IMU delivery rates, the Air Force informed Congress that the schedule for completing the missile's initial flight-test program may be stretched out. Pointing out that the last half of the twenty-missile flight test is quite compressed, the Air Force's report to Congress explains that increasing the intervals between the last three flights could lead to further improvements in accuracy, fuzing performance, and certification of second-source suppliers. Stretching out the remaining RDT&E flight tests would also dovetail with BMO's work on rail-garrison Peacekeeper, which will involve an additional flight-test series consisting of five missiles off the Peacekeeper production line. These tests are to take place in 1990 and 1991. Lastly, the proposed stretchout would narrow the gap between the end of the RDT&E tests and the start of SAC's operational flight tests.

Rail-Garrison Basing

In 1986, Congress mandated that only fifty Peacekeepers be deployed in Minuteman silos, alleging that this basing mode lacked survivability. At the same time,

Congress specified that deployment of an additional fifty missiles would be contingent on the approval by relevant committees of a more survivable basing mode.

President Reagan, in December 1986, selected the so-called rail-garrison mode for development as the most cost-effective way to achieve both survivable basing and military utility. This concept beat out other alternatives because of its relatively low cost and great flexibility.

The Peacekeeper rail-garrison system, according to BMO's assistant program director Col. Glenn H. Vogel, consists of twenty-five missile trains, each of which carries two Peacekeeper ICBMs. Under peacetime conditions, the twenty-five trains will be parked inside of special "igloos" located on military installations. Under crisis conditions, meaning after strategic warning, the trains could fan out over the nation's 150,000-mile rail net and thus attain within hours extremely high survivability.

Each train has a minimum of seven cars, counting the locomotive. In addition to the two missile launch cars, there are two security cars, a maintenance car, and a launch control car. The design of the railroad cars will be based on existing equipment, except for the missile launch cars, which will weigh in excess of 500,000 pounds and be about eighty-nine feet long. The Peacekeeper's standard launch control and communications support systems will be modified for use aboard railcars.

Each "garrison" will consist of about forty-five to fifty acres of land on existing military installations and in turn use three or four igloos to house the trains. The security at the garrisons will be similar to bomber security operations at SAC bases, with between fifteen and twenty security personnel supporting each garrison around the clock.

Two special training trains that perform no wartime role will be used to maintain the proficiency of the Peacekeeper rail-garrison system. These trains will operate between the garrisons and throughout the nation's rail network to hone the skills of the operations, maintenance, and security personnel. Studies are under way to establish whether or not military personnel should operate these trains.

The Air Force's first contract associated with rail-garrison basing is to be let this summer and will involve basing test and system support. By March of next year, the remaining two full-scale development contracts—involving the missile launch car and the launch control system—are to be awarded. The Peacekeeper rail-garrison program's system design review is scheduled for August 1988 and could lead to IOC by December 1991. Construction of the actual garrison sites is to get under way in early 1989. Of the announced ten potential garrison locations—either SAC bases or bases with a SAC mission—probably only seven will be developed and put into operation.

The SICBM Program

Development of the Peacekeeper rail-garrison system is to proceed in tandem with the complementary SICBM. The SICBM is rooted in the recommendations of the President's Commission on Strategic Forces, known popularly as the Scowcroft Commission. In April 1983, that commission called for the development of a small, single-RV ICBM. Such a missile represents a relatively low-value target, on the one hand, and on the other exacts a high price of attack. In addition to hard-target-kill capabilities and responsiveness levels comparable to those of Peacekeeper, the SICBM will be mobile, highly survivable, and stabilizing and, as a single-RV weapon, will provide what General Chain calls "post-SIOP [single integrated operational plan] targeting flexibility." (A single-warhead missile is obviously more "economical" than one carrying ten for going after single surviving targets in a protracted series of nuclear exchanges.)

The SICBM will be about fifty-three feet long and forty-six inches in diameter and will weigh about 37,000 pounds. The missile will be based in mobile launchers, called Hard Mobile Launchers (HMLs), that are about 100 feet long and about fourteen feet wide. Initially, HMLs will be located within fenced areas of Minuteman facilities at Malmstrom AFB, Mont.

After IOC in 1992, follow-on systems could be deployed at other Minuteman facilities at F. E. Warren AFB, Wyo., and Ellsworth AFB, S. D. If Soviet strategic capabilities continue to grow, additional HMLs could be deployed for random movement on large tracts of land in Arizona, New Mexico, and Texas, covering an area of up to 8,000 square miles. The number of SICBMs to be deployed has not yet been determined in binding fashion, but the "baseline" envisions a force of 500 missiles.

The HMLs can operate at speeds in excess of fifty-five mph on paved roads and at around fifteen mph off-road. This mobility, combined with the hardness of the transporter, provides the SICBM with a high degree of operational flexibility and survivability. USAF's "price-to-attack" analyses—meaning calculations of how many weapons Moscow would have to expend to neutralize the US SICBM force—suggest, according to General Barry, that the Soviets don't have enough warheads to carry out that task and "still be able to accomplish what we think are their other 'must missions.' " The same condition applies to the rail-garrison Peacekeepers, once these weapons have deployed over the commercial rail network.

In combination, the rail-mobile Peacekeeper and the SICBM provide an effective hedge against attacks involving only tactical or limited strategic warning and, at the same time, backstop the operational viability of the fixed-silo-based Minuteman and Peacekeeper forces. The SICBM's lethality, expressed as P_k (for probability of kill), is expected to approximate that of Peacekeeper, according to the BMO Commander. BMO is running tests to gauge the effects on SICBM accuracy of changes in gravity fields that result from the weapon's mobility, but initial indications suggest that once the SICBM is stabilized and ready to launch, "it should be able to retain the same accuracy inherent in Peacekeeper."

SICBM Cost Considerations

By deploying the SICBM on Minuteman facilities, with the option of subsequent random mobility in the Southwest, the Air Force is using SAC's existing infrastructure in terms of C^3I and support functions. Moving off the Minuteman reservations eventually would require building another infrastructure from scratch. Cost is obviously a key factor driving the design of the

SICBM. As Dr. Woodruff told Congress, the life-cycle costs of the baseline 500-missile force, expressed in FY '86 dollars, is pegged at about $45 billion. This figure, he pointed out, is "about three times the cost of the Peacekeeper rail-garrison system providing the same number of RVs."

The FY '88/FY '89 defense budget request for the SICBM includes $4.5 billion for R&D and some $100 million for long-lead procurement starting in FY '89. These funds cover design of the missile, HML, and weapons control system; development and first flight of the missile in 1989; selection of the guidance system; initial fabrication and testing of an HML engineering model; and long-lead procurement for a FY '90 production start. The SICBM program entered its FSD (full-scale development) phase following White House approval last December of the Air Force's ICBM modernization plan.

The SICBM program, according to its assistant director, Col. Ralph Tourino, is proceeding "extremely well." A simulated nuclear airblast test conducted jointly with the Defense Nuclear Agency—codenamed "Misty Picture" and involving one-sixth-scale models—confirmed the required blast resistance of the design. Also, BMO's strategy of developing a family of radiation-hardened piece parts, using Peacekeeper and Trident SLBM components wherever possible, is contributing to the survivability of the weapon system.

The baseline guidance and control system of the SICBM is the Peacekeeper's AIRS unit. Two alternative technologies (AINS, or alternative inertial navigation system) are being pursued to provide technical and cost competition, according to Colonel Tourino. One involves a ring-laser gyroscope that is being developed by Litton. The other AINS option is a stellar update system derived from the Trident SLBM's unit, which GE is building. The AINS units are being tested on Minuteman IIIs, one of which flew in April of this year. Another AINS test aboard a Minuteman III is scheduled for this summer. The Air Force plans to decide early next year whether AIRS or the better of the two AINS systems should be selected as the SICBM's guidance and control unit.

Two Myths

After more than a decade of backing and filling, the US ICBM modernization program seems to be back on track. But as General Welch points out, two myths need to be laid to rest before a national consensus in support of these upgrades can be forged.

One is predicated on the notion that the prompt hard-target-kill capability intrinsic in modern ICBMs, which is required to attack the opponent's hardened offensive weapons, contributes to a first-strike capability and is therefore destabilizing. The notion that accurate prompt weapons are destabilizing is, in the words of USAF's Chief of Staff, "nonsense. Those weapons hold at risk those assets most essential to Soviet war aims and are therefore a more powerful deterrent and [hence] stabilizing."

The other myth is that land-based ICBMs are vulnerable to a Soviet first strike and therefore invite attack. BMO's rail-garrison Peacekeeper and SICBM are clearly pulling out the rug from under this paralogism. ■

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MANAGING THE COURSE OF CHANGE

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CHANGING THE COURSE OF MANAGEMENT

There was a wreck on the runway, and visibility was nil. But if the KC-10 tanker crew didn't launch quickly, four airplanes would run out of fuel and go down in the water.

In Good Hands With Gold 11

BY MAJ. MICHAEL B. PERINI, USAF

A KC-10 Extender aircrew of the 68th Air Refueling Wing at Seymour Johnson AFB, N. C., has earned special recognition in the annals of Air Force airmanship.

In daring fashion, the ten-man aircrew saved another KC-10 and three Marine Corps A-4 attack aircraft on a transatlantic mission that taxed the flying skills and tested the courage of all concerned.

For its risky work in averting tragedy, the aircrew of Gold 11—the KC-10's radio call sign for the mission—won the 1986 Mackay Trophy, awarded annually by the Air Force and the National Aeronautic Association for the most meritorious flight of the year.

The men of Gold 11 join a long line of illustrious Air Force flyers who have won the trophy since its inception in 1915.

Sixteen Harrowing Hours

Gold 11's transoceanic ordeal took place on March 5, 1986. It began as a five-hour "routine fighter-drag mission," recalled Capt. Marc D. Felman, the aircraft commander, that became—over more than sixteen harrowing hours—anything but.

Captain Felman's crew belonged to a tanker unit temporarily operating out of Pease AFB, N. H., while Seymour Johnson was undergoing runway repairs. Two of the unit's KC-10s—Gold 11 and Gold 21—were tasked to refuel nine Marine A-4s on a flight from Cherry Point MCAS, N. C., to Bodö, Norway, with a stopover at Lajes Field, Azores.

Having been briefed on teaming up with the KC-10s, the Marine pilots, as one put it, "felt we were in good hands—all we had to do was join up, shut up, and hang on."

It turned out that they were in better hands than they may have realized.

Excellent weather was in prospect for Lajes when the KC-10s and A-4s took off. "Absolutely no hazards were foreseen," Captain Felman said. "I remember the weather briefer asking us if we had brought our golf clubs."

The aircrews were in for a nasty surprise, however. After they had crossed the "no return" line en route to Lajes, the weather there quickly and unexpectedly began to deteriorate. By the time Gold 11 and its A-4s arrived in advance of Gold 21 and its A-4s, fog and rain had cut airfield visibility to near zero-zero.

Gold 11 held south of the field while its A-4s prepared to try to land. Gold 21 and its six A-4s were still forty-five minutes from Lajes—and the weather was worsening all the time.

One of Gold 11's A-4s landed safely during a freakish break in the weather, but was almost hit by a follow-me truck while taxiing in resurgent fog. The other two A-4 pilots could not find the runway and had to climb out and rejoin Gold 11.

The three aircraft then headed for Rota NAS, Spain, in the expectation that a Spain-based, strip-alert

KC-10 would come out to meet them and replenish their fuel, which was running low.

Running Out of Options

This was not to be. Lajes radioed Gold 11 that the KC-10 would not be coming from Spain and instructed Gold 11 to take its A-4s to the Portuguese island of Santa Maria more than 150 nautical miles southeast of the Azores.

"I remember the lump in my throat," Captain Felman said. "Fuel was becoming critical not only for what we could offload to the A-4s but what we could use for ourselves."

The fuel problem was compounded by others. "Not only were weather conditions at the [Santa Maria] island marginal, we were not familiar with the airfield," said Capt. Tom Ferguson, who, as Gold 11's copilot, was on his first fighter-drag mission.

"I thought we might be running out of options," Captain Ferguson recalled.

What Gold 11 had to deal with as it neared Santa Maria were airport voice-radio equipment and navigation equipment that were not compatible with equipment aboard the A-4s.

This, said Captain Felman, meant that "the only available approach was a nonprecision approach using a nondirectional beacon on the ground." He described the situation as "not optimum even on a clear day."

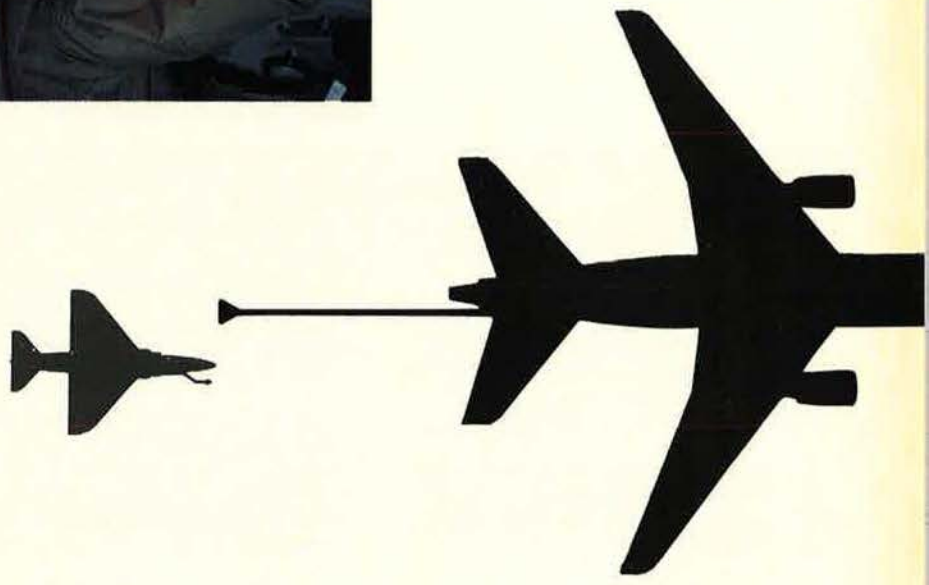
Gold 11 flew a procedure turn to line up on the runway in accordance with the radio frequency of Santa Maria's civilian instrument landing system, which was no help at all to the A-4s.

The idea, Captain Felman explained, was for the A-4s to fly on Gold 11's wing "while we flew a low approach" and then, having spotted the runway, to land.

It was tough going. "On the approach, we encountered thick clouds, fog, and heavy rain that almost completely obscured the KC-10 from sight of the A-4s," the KC-10 commander said.

It took three tries for Gold 11 and the three A-4s to make their landings. "The runway was the greatest sight I had ever seen," Captain Felman said.

Gold 11 aircraft commander Capt. Marc D. Felman expected a "routine fighter-drag mission," but he and his crew ended up battling weather and time in an extraordinary effort to avert what could have been a fatal catastrophe. For their actions, the KC-10 Extender crew was awarded the Mackay Trophy. (USAF photo by A1C Dale K. Dotson)



Worst to Come

Gold 11's work had only just begun. The worst was yet to come.

Gold 21 and its six A-4s had also been weathered out of landing at Lajes and were now heading for Santa Maria. They had received some help. Lajes officials had ordered a Marine KC-130 tanker into the air in an emergency launch to free Gold 21 of the need to refuel three of the Marine jets. The KC-130 stayed with the flight to Santa Maria.

Once over the island, the KC-130's three A-4s attempted to land in formation on its wing. The Marine tanker took them in on a low approach in the soup and then climbed out, its own fuel load now marginal, to head back to Lajes.

"The weather was so bad that the tower couldn't see the [landing] aircraft," Captain Felman recalled.

Two of the A-4s landed on the money. The third was not so lucky. It hit one of the VASI (Visual Approach Slope Indicator) lights, and its right main gear sheared off, scattering debris on the approach end of the runway.

The A-4 pilot stayed with his battered aircraft until it came to rest on its right drop tank. He walked away uninjured.

"We [the Gold 11 aircrew on the ground] called the fire trucks because the control tower could not see the incident [in the weather]," Captain Felman said.

Meanwhile, Gold 21 and its three A-4s were still airborne over Santa Maria and pushing their luck. Completely shrouded in zero-zero conditions and cluttered by debris, the runway was closed to landings. The orbiting aircraft had no place to go.

Gold 21 radioed Gold 11 on the ground that its fuel situation was "potentially disastrous."

"We saw the situation clearly," Captain Felman said. "If we didn't launch quickly, there would be three A-4s and a KC-10 in the water. Using sign language between our crew chiefs and the Portuguese

With only minutes of fuel left aboard the Marine A-4s, Gold 11 boom operator MSgt. Patrick S. Kennedy "had to go get them and stay with them while climbing and descending." The A-4s refueled and continued on safely to Spain. (USAF photo by A1C Dale K. Dotson)

The Mackay Winners

Gold 11's aircrew members who won the 1986 Mackay Trophy are:

- Capt. (Maj. selectee) Marc D. Felman, aircraft commander.
- Capt. Tom Ferguson, copilot.
- MSgt. Clarence Bridges, Jr., evaluator flight engineer.
- MSgt. Patrick S. Kennedy, boom operator.
- MSgt. Gerald G. Treadwell, evaluator boom operator.
- TSgt. Gene Bouler, instructor flight engineer.
- TSgt. Gerald M. Lewis, crew chief.
- SSgt. Samuel S. Flores, maintenance specialist.
- SSgt. Scott A. Helmes, maintenance specialist.
- SSgt. Gary L. Smith, crew chief.

The Mackay Trophy is the nation's oldest aviation award exclusively for Air Force people or organizations. A silver cup, it is displayed at the National Air and Space Museum in Washington, D. C.

ground crews, we safely loaded 100,000 pounds of fuel in less than thirty minutes."

Time was running out. As the Gold 21 crew and the A-4 pilots aloft began preparations for ditching at sea, the Gold 11 crew "stopped refueling, pulled up the ladders, left our two crew chiefs in base ops, and didn't pay for the gas," Captain Felman said.

The commander had needed the two crew chiefs to remain on the ground to backpedal ahead of the aircraft and give him steering signals by hand as he taxied the KC-10 through the murk into rollout position on the runway. Once the aircraft was poised for rollout, he could not take the time—given the urgent situation of Gold 21 and the A-4s overhead—to drop his ladders and take his crew chiefs back onboard.

Gold 11 taxied out for takeoff from a runway that was now considerably foreshortened. The debris scattered on the strip from the crash-landed A-4 had seen to that.

On the move, the Gold 11 aircrew radioed rendezvous arrangements to Gold 21 and computed takeoff performance requirements on the basis of runway length from where the wreckage left off.

"We were working on a fine line, but I knew the distance was right, and the aircraft does have some pretty big engines," said TSgt. Gene Bouler, the Gold 11 crew's instructor flight engineer.

"We thought we could succeed," said Captain Ferguson. In any case, he said, "we knew there was only one chance to save our fellow airmen, and we had to take it."

The takeoff was hardly normal. "We didn't align our inertial navigation system, nor did we get a takeoff clearance," Captain Felman said.

A Royal Greeting

It was hold-your-breath time down that runway, but the KC-10 went airborne just fine, broke out of the clouds at 4,000 feet, and—within seven minutes of takeoff—began refueling Gold 21 and the three A-4s.

The Marine jets had fewer than ten minutes' worth of fuel aboard when Gold 11 arrived.

Gold 11 pumped gas into the A-4s in a decidedly freehand manner. MSgt. Patrick S. Kennedy, Gold 11's boom operator, described it this way:

"With pilots on bingo fuel, you can't wait to be in the best position. I had to go get them and stay with them while climbing and descending."

Finally, all the aircrews could breathe easy. On their way to Spain, another KC-10 from there met them and gave them more than enough fuel to make it to Rota NAS.

Gold 11 got a royal greeting. "At Rota, it was the first time another crew volunteered to take our bags off the plane," Captain Felman said.

He had been qualified as an aircraft commander for only three months and, as such, had flown only ten missions prior to the one of extraordinary adventure across the Atlantic. For the ten Gold 11 airmen, that mission also marked their first flight together as an aircrew.

"The crew did their duty in the face of impossible odds," Captain Felman said. "I have nothing but the greatest respect for all."

With a bow to the aircrew's training and teamwork, the commander added: "We stuck to what we knew, and we had positive attitudes and confidence in each other."

Captain Felman called the Mackay Trophy award "a great honor." At this writing, he and his aircrew are still at Seymour Johnson AFB and are still conducting fighter drags across the pond. ■

Maj. Michael B. Perini, USAF, a recent graduate of the Armed Forces Staff College, Norfolk, Va., is now Deputy Director of Public Affairs at Hq. PACAF, Hickam AFB, Hawaii. During 1982–83, he was an Education With Industry trainee with AIR FORCE *Magazine and has been a regular contributor since then. He joined the Air Force in 1972, commissioned through AFROTC, and has served in a variety of public affairs assignments, including Deputy Chief of the Operational Forces Branch in the Secretary of the Air Force's Office of Public Affairs in the Pentagon.*

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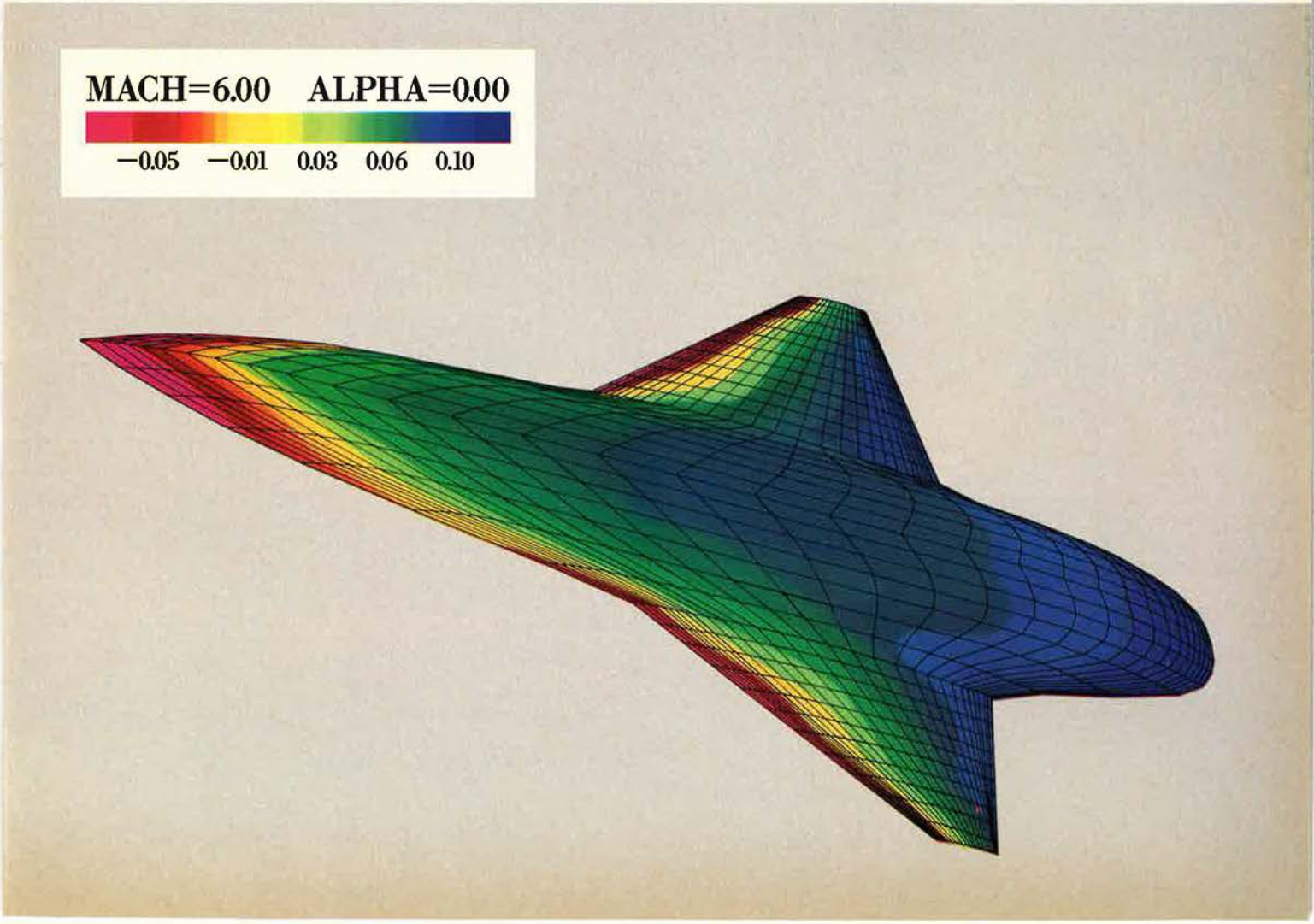
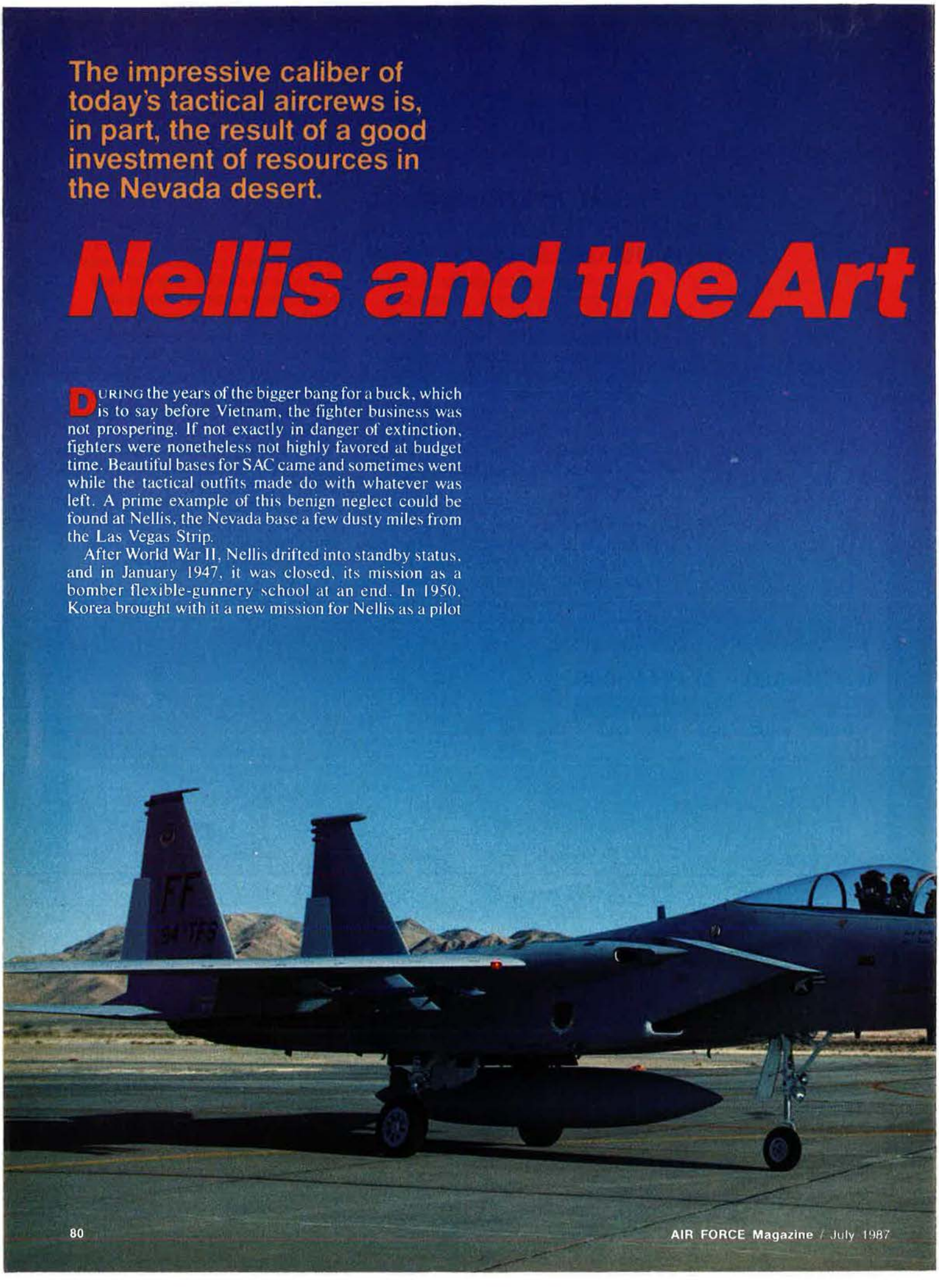


The impressive caliber of today's tactical aircrews is, in part, the result of a good investment of resources in the Nevada desert.

Nellis and the Art

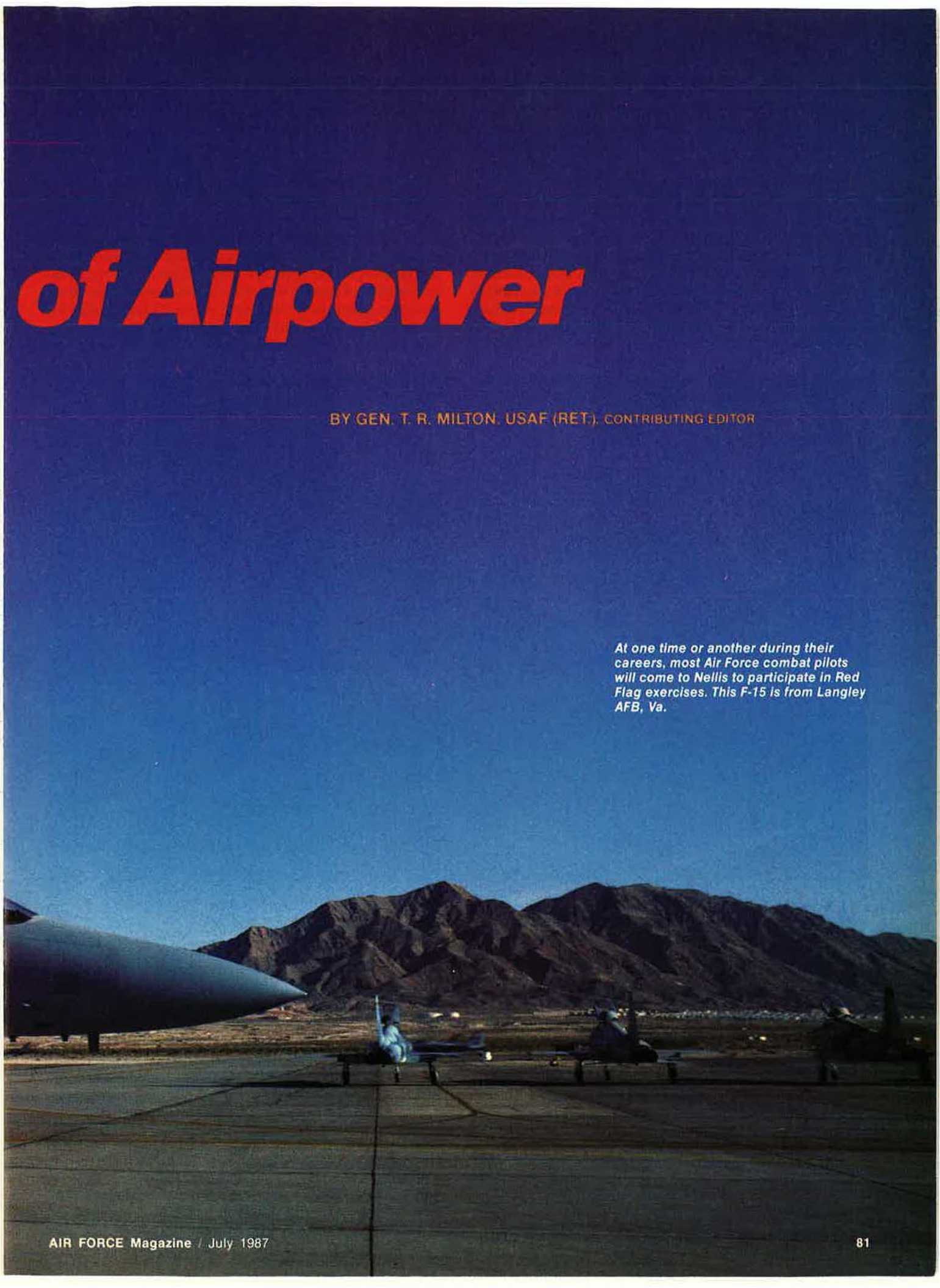
DURING the years of the bigger bang for a buck, which is to say before Vietnam, the fighter business was not prospering. If not exactly in danger of extinction, fighters were nonetheless not highly favored at budget time. Beautiful bases for SAC came and sometimes went while the tactical outfits made do with whatever was left. A prime example of this benign neglect could be found at Nellis, the Nevada base a few dusty miles from the Las Vegas Strip.

After World War II, Nellis drifted into standby status, and in January 1947, it was closed, its mission as a bomber flexible-gunnery school at an end. In 1950, Korea brought with it a new mission for Nellis as a pilot



# of Airpower

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



At one time or another during their careers, most Air Force combat pilots will come to Nellis to participate in Red Flag exercises. This F-15 is from Langley AFB, Va.

training center, and its future began, although there was renewed talk of its closing from time to time. Nevada political clout in the 1950s may have had as much to do with keeping it open as interest in fighter tactics did. For whatever reason, however, Nellis survived, and the Air Force today would be substantially poorer had it not.

Nellis has not only survived but has positively bloomed, to the point of being chosen 1985's best Air Force base. The old shanties and World War II buildings have either been camouflaged with paint and attractive facades or replaced. Even the Officer's Open Mess, scene of many a hand-talk replay of air combat encounters, is scheduled for demolition and a modern replacement. It is not up to present-day Nellis standards, though in days gone by almost any fighter base would have loved to have had such a club.

Earning the Patch

The new buildings at Nellis are the most obvious signs of the Air Force's renewed interest in tactical proficiency; the high technology within those buildings is the real measure of that interest. While students were once taught in spartan classrooms furnished with a blackboard and a few models as the only props, teaching aids now, like the students themselves, are products of the electronic age. And while fast reactions and great eyes may once have been a good fighter pilot's principal assets, he needs more than that today, for the modern fighter pilot is in charge of a multimillion-dollar computer complex. Fighter Weapons School instructors, were they not customarily wearing flying suits, could pass for the professionals of any technical occupation. Articulate and obviously well educated, they bear no resemblance to some of the colorful characters from the Air Force's past.

Keeping track of all that is going on at the various ranges at Nellis and the airspace above them is the charge of the technicians who man the Range Control Center.

A few years ago, the Fighter Weapons School (FWS), a postgraduate institution for professional fighter pilots, moved from its dingy accommodations to a splendid new building. The first thing one sees on entering the lobby is a statue of Robinson Risner, perhaps the ultimate fighter pilot and a man who emerged with honor from seven long years in the Hanoi Hilton. Fittingly, Risner's name is given to the trophy awarded each year's outstanding graduate.

The school library is named for Gen. Bill Creech, who more than any single individual is responsible not only for Nellis's modernization but for the general improvement in the whole tactical air domain. General Creech, who headed Tactical Air Command from 1978 to 1984, preached decentralization, delegation of authority to the lowest practical level, and pride in the tactical mission. It is clear he also knew how to lay his hands on the construction and fix-up money.

The criteria for admission to the FWS are, on the face of it, not exacting: rank of captain, no more than nine years rated, 300 hours in fighters, and fifty hours with an instructor rating. But the real criterion is leadership. The FWS wants leaders as students, and thus the onus for selecting the right people finally rests with the squadrons. On the evidence available, the choices have been good ones over the years.

The academic curriculum shows that the FWS is looking not only for good fighter types and good leaders but for ones with a high IQ. The graduates are, after all, expected to go home and spread the word, in a knowledgeable and competent way, about a wide variety of subjects. Students are required to prepare a lesson and deliver an hour's lecture on a chosen theme, and they learn the role of the weapons officer and how to project

that role effectively; in the meantime, they are bombarded with lectures and study assignments on the entire array of weapons associated with their particular airplane as well as on such general subjects as infrared missile theory.

By the time the academic course is finished and the examinations have been passed, the student will have a thorough grasp of fighter weaponry along with the newly acquired ability to instruct others in what he has learned. And then, of course, there is the flying phase of the curriculum, in which he puts into practice what he has learned in the classroom. The fighter weapons course continues to be an exclusively male province in view of the legal proscription against women in combat.

An interesting development took place a few years ago when the entire tactical school establishment was placed under the supervision of the FWS. F-4 courses at McConnell AFB, RF-4 training at Boise, the A-7 course at Tucson International, and all Reserve and Air National Guard crews, along with the Air Weapons Controller Course, were brought under the aegis of the Fighter Weapons School.

The graduation ceremonies of all these schools are held on the same day, and the occasion is celebrated by flying a Red Flag graduation exercise. There are a great many reasons for feelings of wistfulness as one grows old. Looking back, an FWS patch on the flying suit would have been a tremendous source of satisfaction. When the suit went into mothballs, the patch would doubtless have turned up in a frame.

Aggressors and Thunderbirds

The activity at Nellis covers a broad spectrum of tactical air warfare, perhaps even the entire spectrum. A group of accomplished airmen—pilots and navigators—is tied in closely with the FWS and charged with the development of tactics and the concurrent evaluation of systems, armament, ordnance, and whatever else the engineers come up with for the harried fighter crews. It is important to see whether something that works well enough in the test environment at Edwards will work in an operational environment with everyday ground and air crews. And, if it does work, it is likewise important to know how best to use it.

—Photo by William A. Ford

The average fighter pilot doesn't stand nearly so tall after his first encounter with the F-5E pilots of the Aggressor Squadron (above). Pilots of other nations, such as this Jaguar pilot from Britain (above right), also train at Nellis.

Next, there is the Aggressor mission and the job of teaching USAF pilots how to behave in the air as if they were from Gorky. Aggressor squadrons, trained at Nellis, operate not only at home but all over the world, wherever there is a USAF fighter unit. Initial air combat engagements with inexperienced pilots are usually won by the Aggressors, but the learning curve is a steep one, and it doesn't take long to reverse the outcome. An F-16 or F-15, after all, should not lose too often to an F-5E, once the lessons have been learned.

The Aggressor F-5s are, of course, getting old, a fact that raises speculation as to the value down the road of having Aggressors so overmatched. In the years since the inception of this type of training, there has been full agreement on the use of dissimilar aircraft, Aggressor airplanes not in the Air Force operational inventory. Since it has been impractical to furnish Aggressor squadrons with the latest Soviet models, the F-5E has been a good substitute.

Budgetary problems stand in the way of a new Air Force Aggressor airplane, so the F-5Es are being given an electronics upgrade and the theoretical ability to fire the latest air-to-air weapons, which should make them a pretty fair opponent in this nonlethal form of air combat. The Navy, convinced of the value of this sort of training, is refurbishing its Aggressor fleet with stripped-down F-16Cs, having experimented with Israeli Kfirs. On the face of it, the Navy appears to be one up.

At the very end of the flight line is the Thunderbird hangar, a spotless home for the star-spangled F-16As of

the demonstration team. When the last T-38 exhibition ended in unprecedented tragedy, there was a momentary fear that someone in Washington would panic and close down the operation. In years past, the occasional accident, coupled with money worries, had certainly raised that possibility. This time, however, the Thunderbirds simply reformed and traded in their T-38s for F-16As.

The F-16s provide a splendid show—eighty times a year, in fact, and before millions of people. No one will ever know exactly how many young people join the Air Force because of the Thunderbirds or how many others develop a warm spot in their hearts for the military once they have seen these pilots perform, but the numbers must be high. Whatever the cost, the Thunderbirds are a great investment. They and their Navy Blue Angel counterparts give citizens a rare look at what their airmen can do. It is too bad the citizenry can't see the rest of the show.

Realism and Risk

The Red Flag exercise is a spectacular performance, carried out as routinely at Nellis as the Folies Bergère down the road in Las Vegas. It stands in remarkable contrast to the tactical training of the 1950s and '60s when flying safety was paramount—remember that inhibiting slogan?—and fighter tactics were largely confined to nuclear deliveries.

In the first years of Red Flag's history, accident rates soared. In 1976, for instance, the rate was an alarming thirty-two per 100,000 hours and fifty-two per 100,000 sorties. It reflected the fact that proficiency in flying realistic air combat maneuvers had sagged. The mishap rate was high enough, under ordinary circumstances, to get everyone fired. The truly remarkable thing about Red Flag, however, is that Air Force leaders in the early days of these exercises had the conviction and courage to keep them going.

A Red Flag takeoff more resembles rush hour on the freeway than it does a "normal" airfield. Here an Aggressor F-5E waits to take off behind an A-10 from the Fighter Weapons Center.

As time went on, the accident rate steadily declined until, in 1985, with 22,606 exercise sorties, the rate was 2.4 per 100,000 hours, the sort of figure that won trophies in the 1950s.

This is, nevertheless, a highly stressed period for participating pilots, the nearest thing to actual combat, and so there will always be accidents. Typically, the most vulnerable missions involve low-altitude maneuvers, and the most vulnerable pilots are those with less than 500 hours of flying time, just as would be the case in combat.

Although mishaps connected with Red Flag exercises are never going to disappear, they have been reduced, through careful supervision, to a realistically acceptable level. That having been accomplished, the focus is on realism within sensible bounds.

Over the Playground

The war takes place over a stretch of Nevada desert, ninety miles by forty miles, referred to locally as the Playground. It is rough country, similar to parts of the Sinai or the Israeli Negev, an inhospitable landscape. Scattered about the Playground are simulated airfields, truck convoys, missile sites, and bunkered defensive positions. The enemy controlling the area has electronically simulated missiles, jamming devices, and the photography to register simulated kills. Ground attacks, therefore, have to be carefully planned and are the responsibility of the visiting fighter units.

The enemy air force—the Aggressor squadrons, often augmented with Navy and Marine units flying F-14s and F/A-18s—makes life even more interesting. Aerial refueling is generally part of the scenario, as is help from a safely distant E-3 AWACS airplane.

Meanwhile, back at Nellis, the headquarters for Red Flag exercises—housed in still another splendid new building—is complete with what must be the last word in computer technology. One can sit in a comfortable theater and pry into the very cockpit of an airplane engaged in simulated mortal combat. Through signals transmitted from aircraft pods, computer symbology identifies the aircraft type, its position, and precisely what it is doing.

This new management paraphernalia, the RFMDS—Red Flag Mission and Debriefing Systems—has four times the capacity of ACMI, an earlier computer monitoring system. The entire action is taped for later use at the critique, a debriefing a far cry from the sessions held in the old days. With RFMDS, the action is recreated on a large screen. Bombs, either live or simulated, are scored precisely. Aircraft kills were recorded earlier, in real time, and electronically removed from the battle. Everything is played back to the participants at the critique, with perceptive comments from the Red Flag staff. It is without question the most advanced approach ever to exercise analysis.

Nellis AFB is also home to the 474th Tactical Fighter Wing, but the unit is being deactivated (above). Even with the departure of the 474th TFW's F-16s, the ramp at Nellis will continue to host a beehive of activity (below).

Red Flags go on almost continuously, involving ninety to 100 aircraft. One of the fine sights for an airplane buff is to watch the planes come home. The intervals between are just what is needed and nothing more, as British Jaguars, F-14s, F-15s, and F-16s—anything in the friendly inventory—crowd Nellis's one runway.

An added layer of sophistication to Red Flag is the annual exercise called Green Flag. The emphasis here is on electronic warfare in all its various modes: Army jammers, EF-111 airborne jammers, F-4G Wild Weasels, Navy EA-6 jammers—in short, the entire electronic combat arsenal. To add realism, the Aggressor force is increased by USAF, USN, and USMC interceptors to balance the air-to-air ratio. Kills, both in the air and against ground targets, are registered by the omnipresent RFMDS. The casualties are then withdrawn from the battle, a lesson to aircrews and commanders alike in the unforgiving nature of air combat.

Every so often, the war goes north to Cold Lake in Canada's Alberta Province, where it also undergoes a name change to Maple Flag. Cold Lake offers a good approximation of NATO Europe, both in climate and topography but without Europe's air traffic and noise restrictions. There is nothing like the range sophistication found at Nellis, although there are plans for technical improvements. In any case, Cold Lake is a realistic environment and splendid training for ground crews who might one day find themselves on a wintertime European hardstand.

The Reasons Why

These past six years have been good ones for the readiness state of our forces, as is evidenced by the activities at Nellis. Readiness takes in a lot of ground. Spare parts contribute, adequate munitions certainly are necessary, and all the other logistic bits and pieces play their part. Most of all, readiness involves an ability to do the job. If the maintenance people can't provide ready airplanes, combat-ready crews become superfluous. And if the crews can't shoot straight, or bomb accurately, or do the myriad other things a modern fighter crew must do, then they are not ready.

The first F-100 strike in Vietnam sent out the signal that the Air Force was not ready, at least not for that kind of war. The work going on at Nellis is insurance against another fiasco such as that first effort in Vietnam. And while a few things went wrong in the attack on Tripoli last year, it was, on the whole, a remarkable and highly professional venture. It is almost inconceivable that the tactical air forces of twenty years ago could have managed that nighttime odyssey from England to North Africa and back, meanwhile hitting a difficult target precisely on time.

The mock wars and other training at Nellis are an expensive business. Unlike aircraft programs or SDI, readiness training generates few jobs. In a way, it simply burns up money. It follows, then, that the constituency for this part of the budget tends to be small and knowledgeable, those who truly understand what national security is all about.

There are disquieting signs that, in the forthcoming budget struggle, readiness funds may give way to the big ticket items. It wouldn't be the first time, and there are some very expensive and well protected hardware bills coming due.

With the budget deficit mounting, the dollar sinking, and Gramm-Rudman and other inhibitors looming, the whole defense budget is likely to undergo extensive surgery. In that case, readiness training can expect to share the pain. The results the Air Force has achieved at Nellis, however, represent a long and hard struggle—nothing came easy—and now that training for air combat has reached the highest standard ever achieved in our military history, it would be not only a great folly but a tragedy to allow it to slip back. ■

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

Never before had fighters out of Alaska operated so far north. Among other things, they proved there's less roaming room in the Arctic than Soviet cruise-missile carriers may have thought.

Eagles Over the Icepack

BY RANA PENNINGTON

MARCH 18 was a record-breaking day in Alaska. The eyes of most Alaskans were on Nome, a small town on the west coast and end point of the Iditarod, the state's most famous dogsled race. Susan Butcher was about to win the race for the second year in a row, setting a new time record in the process.

About the time Ms. Butcher swept across the finish line, Capt. Rick von Berckefeldt was starting the engines of an F-15 in Deadhorse, a single-runway airport on the Arctic coast, preparing to help Alaskan Air Command break a few records of its own.

Ms. Butcher and her team had covered more than 1,000 miles in just over eleven days. Captain von Berckefeldt and three other AAC pilots were preparing to fly nearly twice that distance in less than four hours—and to do it over the featureless pack ice of the Arctic Ocean, going more than halfway to the North Pole.

"We're really making history here," said Col. Stuart Alton, commander of the Elmendorf-based 21st Tactical Fighter Wing. "Our mission is to meet the threat. In Alaska, the F-15s of the 21st TFW are the first line of strategic defense for North America. The cruise-missile threat makes it imperative for us to be able to project our forces as far north as possible."

An exercise in force projection—Cobbler Freeze '87—was the reason the men and women of AAC deployed to Deadhorse for a week in March. They were there not only to support the farthest-north operations in the history of AAC but to do it under some of the most challenging weather conditions possible. On the first day of the deployment, the ambient temperature was minus fifty-one degrees Fahrenheit. Wind chill factors brought the apparent temperature down to 100 below zero.

Alaskan Air Command pilots routinely fly in subzero temperatures from bases at Elmendorf, Eielson, King Salmon, and Galena. They are no strangers to the cold. Still, flying at the state-owned airport at Deadhorse, 250 miles north of the Arctic Circle, demands special considerations. The 21st had already made one deployment to Deadhorse in August to test its capability to conduct bare-base operations. Now it had returned to the isolated airstrip

Cobbler Freeze '87 lived up to its name, as even simple tasks were made difficult by the harsh conditions under which Alaskan Air Command conducted the exercise. Here TSgt. Robert Smith of the 43d Aircraft Maintenance Unit fumbles with a safing pin from an F-15.

USAF photo by TSgt Edward Boyle

to practice bare-base operations under Arctic winter conditions. Preparations began well in advance of flying operations.

"We knew that the facilities at Deadhorse were pretty austere," said Captain von Berckefeldt, a flight commander with the 43d Tactical Fighter Squadron. "So we prebriefed most of what we were going to do [while] back at Elmendorf prior to the deployment, so that when we got there, we could keep briefing time to a minimum. As it was, we had to brief in a hotel room, which we used as a makeshift briefing room."

Conducting operations 250 miles north of the Arctic Circle under severe weather conditions at the austere base at Deadhorse, Alaska, required some special considerations and much planning. For both the ground crews (far right) and for the pilots (right), this exercise was a real testament to teamwork.

Frozen Eyelashes

The pilots used standard Alaska flight gear, except that snorkel hoods were installed on their winter-weight flying jackets, and they wore heavy-duty "bunny" boots rather than the lighter mukluks or Sorels.

"Probably the biggest problem we had with flight gear was with the helmets—the mask more than anything else," Captain von Berckefeldt recalled. "It was so cold that if you didn't wear your flight helmet out to the airplane, it was like sticking your head into a block of ice when you put it on. But if you did wear the helmet to the plane, then the rubber oxygen mask [which hangs from the side of the helmet] would hit your face and freeze to your skin."

The pilots learned to wrap wool scarves across their faces, tucking them up under their helmets until the cockpit warmed up enough to allow them to hook up the oxygen masks. However, the scarves could cause other problems.

"Initially, it worked fine," said Captain von Berckefeldt. "But after a while, the scarf freezes up in front of your mouth. Then when you exhale, your breath goes up across your cheeks. One time I was in the airplane just before engine start, and I blinked once, and I couldn't open my left eye. I reached up and found that my eyelashes had frozen together."

The cold weather was tough on the pilots. However, as Lt. Gen. David L. Nichols, AAC Commander, pointed out, "They were the privileged ones. The pilots were on the pointed end of the spear, so to speak. But it was the team effort and the dedication of the ground crews, who were exposed to the cold weather much longer than the flyers, that really made everything possible."

"We were working under the barest of bare-base conditions," said CMSgt. James Helms, 21st TFW maintenance supervisor. "We had absolutely no aircraft hangaring facilities. So all maintenance, no matter how extensive, had to be performed on the flight line. In order to maintain the aircraft, we had to do some innovative things.

"For example, we had a breakdown on the secondary power system of one aircraft, which took several hours to repair. In order to prevent the people being exposed to the wind all that time, yet still be able to accomplish the repair, we borrowed some parachutes from the fire department and rigged a shelter around the bottom of the aircraft. We used cargo straps to pull the chutes across the aircraft wings, then put sandbags around the bottom. Then we piped heat in with a hose. It was surprisingly warm; the kids could take off their parkas and work barehanded to complete the repairs."

Before deploying to Deadhorse, maintenance personnel received in-depth briefings about the hazards of working in extreme cold weather. They seemed to take the warnings to heart; there were no serious cold weather injuries during the deploy-

ment. In fact, the only people who experienced any appreciable frostnip were audiovisual personnel who were exposed to the cold for long periods while filming flying and maintenance operations. In fact, one photographer's nose was frostbitten from contact with his metal camera.

Nor did Chief Helms escape unscathed. "My concern was to make sure the troops would get in out of the cold. They were so gung ho that I had to go out and make them go over to the heaters," said the Chief. "Therefore, I was outside more than I intended and ended up getting frostbite on my ears and nose."

—USAF photos by TSgt. Ecward Boyce

Although the extreme temperatures caused fewer problems for the people than expected, there were unforeseen difficulties with equipment. Engines and motors, once started, generally had to be left on continuously. Rental trucks were left idling throughout the day. The security police vehicle ran twenty-four hours a day during the deployment. When the vehicles were turned off, they had to be plugged in immediately to avoid freezing fuel, oil, and batteries.

The cold also caused some problems with the aircraft. "We had little leaks everywhere," said Chief Helms. "Fuel leaks, hydraulic leaks, pneumatic leaks. There was exaggerated metal shrinkage due to the cold, and any seals that were getting a little worn couldn't compensate. We had fuel leaks in areas where we never get leaks at Elmendorf."

Despite the challenges, the F-15s kept flying. "You've got to be as innovative as possible and make do with what you've got," pointed out Chief Helms. "You can't just say, 'Let's wait until it's summer.'"

Cold Weather Advantages

In many ways, the F-15 performs even better in the cold than in more moderate temperatures. At Deadhorse, an F-15 with three external fuel tanks could clear the runway in only 3,000 feet without using afterburner. At Elmendorf, at least 4,000 feet would be required. The cold air is so dense that lift is greatly increased. Density altitudes of minus 9,000 feet—the equivalent of what air pressure would be 9,000 feet below sea level—have been reported at Deadhorse.

Alaskan Air Command pilots already know about many of the unique demands of extreme cold weather flying. At twenty below or colder, afterburners become difficult to use during takeoffs. At those

—USAF photo by TSgt. Edward Boyce

Things that are normally taken for granted, such as being able to jump in the cockpit and proceed right to strap-in and reading checklists, became involved processes during Cobbler Freeze '87. Here ground crewmen are warming up the cockpit with a portable heating unit.

temperatures, there is a high rate of "hard lights"—similar to a automobile backfire, though more dramatic. A flame shoots out of both ends of the engine—the intake and engine nozzle—snuffing out the afterburner and nearly knocking the pilot's feet off the rudder pedals. However, it's only a problem on takeoff, and only for the lead pilot. Apparently, the lead aircraft warms up the air for his wingman; trailing aircraft have no trouble starting the afterburner.

The objective of all the hard work at Deadhorse was not only to test AAC's ability to conduct Arctic bare-base operations but also to perform long-range polar intercepts against simulated enemy bomber aircraft. A multicommand team effort was required to make the exercise work.

Strategic Air Command supplied B-52 bombers to act as targets, and SAC and Alaska Air National Guard supplied KC-135 tankers to provide aerial refueling. An Elmendorf-based E-3 from TAC's 962d Airborne Warning and Control Squadron provided the command control and communications necessary to coordinate the exercise. AAC HH-3s and an HC-130 from the 71st Aerospace Rescue and Recovery Service formed the necessary search-and-rescue safety net. The exercise provided excellent training for all the forces involved.

Around the Pole

"As far as the B-52s were concerned, they were the good guys and we were the bad guys, and they were practicing penetrating," said General Nichols. "Of course, we looked in a different mirror. They were surrogates for enemy cruise-missile-carrying bombers, and we were demonstrating the capability to go out and intercept them over the Arctic. I think that's significant."

The people of AAC were not content just to conduct the farthest-north intercepts in the command's history. After the second day of practice intercepts, a three-plane contingent of F-15s, led by General Nichols, continued north to become the first Alaska-based jet fighters to reach the North Pole during operational training. After circling the Pole, the F-15s returned directly to Elmendorf. Refueled by KC-135 tankers, the fighters relied on both tankers and the airborne E-3 to provide the necessary radio links and radar coverage for the six-hour flight.

General Nichols says the exercise was a milestone in AAC history. "This is the farthest north that AAC fighters have ever operated. However, in technical terms, it was not difficult to do at all, because the aircraft that we have are very capable. It was not an astounding feat by any means; it was a very practical, reasonable-to-do kind of operation. It's just that we haven't done it before."

"We pushed pilots, aircraft, and support people to the limits of their capabilities," said Colonel Alton. "We've proven that with adequately trained and supported people, the F-15 is capable of operating literally anywhere in the world." ■

—USAF photo by TSgt. Edward Boyce

While flying in the extreme cold had many disadvantages, such as leaks resulting from exaggerated metal shrinkage, the F-15s were able to perform better in the dense air. Cobbler Freeze '87 tested AAC's ability to conduct bare-base Arctic operations and also the command's ability to perform polar intercepts. Here SSgt. Manuel Munoz marshals an F-15 during the deployment.

Rana Pennington, until recently an active-duty Air Force captain, is a Soviet specialist who has written on Soviet matters for this and other publications. Her Air Force assignments included tours as the Aggressor intelligence officer and as a Soviet air tactics analyst for the Defense Intelligence Agency, and more recently she served as the chief of the threat analysis division for Alaskan Air Command Intelligence. Her most recent offering for this magazine was "Yukon Lightning" in the March '87 issue.

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The Military Personnel Center tries to look beyond the data and remember the people it is assigning, promoting, sending to school, separating, or otherwise controlling.

Half a Million Destinies

BY BRUCE D. CALLANDER

IN THE early 1960s, Air Force leaders "determined that the military personnel function would better serve the Air Force if it were moved outside the Washington, D. C., area." That is the official explanation now given for the creation of the Air Force Military Personnel Center (AFMPC), which opened for business at Randolph AFB, Tex., on July 25, 1963.

There was at least one other reason for moving what had been a substantial portion of the Office of the Deputy Chief of Staff for Personnel (DCS/P) from Washington to San Antonio. Congress had long been critical of the large concentration of military personnel in the Pentagon and throughout the Washington metropolitan area. With the Vietnam War heating up, congressional critics complained, as they often do today, about the services' sorry tooth-to-tail ratios—the disproportionately large number of office workers supporting the combat forces.

The services, under the gun to reduce their presence at the seat of government, faced the choice of actually cutting their headquarters staffs or making them less visible to the lawmakers. Whether it was a direct result of the congressional pressure or a happy coincidence, the Air Force surgically removed large portions of DCS/P and transplanted them to the Southwest. The operation was intended to leave the policymaking elements of personnel under the Deputy Chief of Staff for Personnel in Washington and to group the operating elements in the Center at Randolph.

MPC remained a Headquarters component, and a few years after it was created, its commander was given the second hat of Assistant DCS/P for Military Personnel. In 1971, it became a separate operating agency, but maintained its close ties to Hq. USAF. The division of labor between the Pentagon and Randolph has been the subject of some debate over the years as officials tried to decide where policymaking leaves off and operating functions begin.

One early MPC commander appeared to have settled the question in his own mind when he had a sign

erected over the front door to the Center. The words "Headquarters, United States Air Force" appeared in large letters with the name "Military Personnel Center" in much smaller print underneath. When word reached the Pentagon, the sign came down, and a new one identified the Center as part of the USAF Headquarters, not the whole thing.

Improved communications between MPC and the Pentagon and almost twenty-five years of experience have mellowed the partnership and eliminated most such turf battles. The fact that a number of Center commanders have moved on to become DCS/P has doubtless helped smooth the working relationship.

While the Pentagon may make personnel policy, it is the Military Personnel Center that breathes life into that policy and translates it into action.

MPC Touches Them All

As a practical matter, however, most Air Force members are probably more familiar with MPC than with its parent organization in Washington. The Center helps to bring them into the service, makes their assignments, maintains their records, monitors their physical fitness, issues their medals, provides for their recreation, shepherds their career development, oversees their skill training, manages their promotions, tries to convince them to stay in service, and handles the paperwork when they separate or retire. If the Pentagon makes the policies that govern the careers and the lives of Air Force members, it is the Center that brings the policies to life and translates them into actions.

In a sense, MPC is a child of the computer age. Until automatic data processing was refined, managing the force was a laborious process of counting noses at the unit level, passing the information up the chain of command, and trying to make some sense of it at headquarters. The Air Force's theoretical needs often bore little relationship to the realities of its resources.

Any hope of giving people a say in their assignments was often frustrated by the lack of current information on requirements, particularly in the case of airmen. Recruits could express preferences for specific career fields and locations, but there was no assurance that a desired job would be open at the chosen base when they got there. Short-notice assignments and diversions were common. Attempts to work out skill imbalances with promotion controls were damaging to morale and largely ineffective. Retraining became a never-ending battle of directing people into shortage areas that might be surplus by the time they arrived.

When it set up shop at Randolph, MPC literally built itself around one of the largest, most complex computer systems available at the time. The center of its new headquarters building was a factory of whirling tapes and clattering printers. The data system has been refined many times since then and is now undergoing a complete overhaul, the original machines being replaced with state-of-the-art hardware.

A parallel development in the field has seen unit personnel shops consolidated into central base offices with their own computers and data links to the Center. Some years ago, the morning report, the local headcount that was as old as the musket and leggings, fell victim to technological advancement. The computer systems now give a real-time picture of the force, showing not only where people are but also what they know, what they have done, and how well they have done it.

Today, some 2,000 military and civilian members at the Center help direct the destinies of more than half a million active members and serve their families and a growing number of retirees. With Air Force Recruiting Service, MPC helps to bring in some 8,000 new officers and more than 57,000 new enlisted members per year. Online computer links give recruiters a running reading on job openings and the types of people needed to fill them. Another system tracks the thousands of people in the training pipeline at a given time.

Once members are trained, MPC matches them with appropriate assignments. Line officers through the grade of lieutenant colonel are handled individually, with the Center supplying career guides and counseling by assignment specialists in each major professional area. A special office handles the assignments of top noncommissioned officers. Another separate group assigns colonels. Another manages the Air Force's health professionals.

Counting assignments into and out of schools, to and from overseas, and to special duties and between major units, the number of moves per year equals almost half the Air Force strength. Sharp cuts in travel funds have made it vital that no one be moved unnecessarily. Assignments cover everything from routine moves to selection for highly specialized training to humanitarian reassignments for members with serious personal problems.

The Military Personnel Center is charged with the task of keeping records on close to 1,750,000 active, retired, reserve, and civilian members.

Selection Boards

The Center is host to an almost continuous round of selection boards. Some pick officers and senior NCOs for professional military schools. Others select candidates for flight training, test pilot school, or the manned space program. Still others consider members for disability retirement and other forms of separation. Probably the most familiar are the promotions boards for the officer and senior NCO grades.

In the enlisted grades, only senior and chief master sergeants are selected by human boards. But MPC also manages promotions to grades of staff, technical, and master sergeant under the Weighted Airman Promotion System (WAPS). While WAPS is a numerical point system, it is designed to consider the same factors—seniority, test scores, performance ratings, and awards—that a human board would examine. And the weights given each factor are the same as boards traditionally have given them.

The Center also touches the careers and the lives of members in other ways of which many may not even be aware. It oversees some 270 officer and NCO clubs, for example, along with about 350 libraries, 200 sports programs, 200 bowling facilities, and more than 440 recreation, youth, and child-care centers. It manages equal-opportunity and substance-abuse programs.

It conducts attitude surveys to measure the likes and dislikes of members and relays the findings to the Air Staff and commanders, often sparking major changes in policy. It is responsible for awards, decorations, and other forms of recognition for service, achievements, and courage. It develops programs to help newcomers cope when they arrive at new bases. It keeps a wary eye on retention trends and manages programs to influence members to stay through full careers. It operates an around-the-clock command post to help next of kin when a member is killed, injured, seriously ill, or missing.

The Human Element

And, as it has from the beginning, the Center keeps records on close to 1,750,000 active, retired, reserve, and civilian members. More than half a million are the master records of active-duty members, and they are kept in a sophisticated storage and retrieval system. With all the records and the statistics and all the state-of-the-art systems the Air Force has assembled to deal with them, it would be easy to forget the human element. MPC tries consciously not to.

The Center is the lineal descendant of the personnel action offices, the "people shops" created when the Air Force was established forty years ago. During its early years, many of its elements were scattered among World War II temporary buildings and rented offices around Washington and in neighboring Virginia. Even with the best of intentions, it was hard to look beyond the mountains of paperwork and see the people.

The move to Randolph gave MPC breathing room. Technology gave it the means to get on top of the numbers game. Experience has given it the ability to use impersonal data to improve the lives of the people the figures represent.

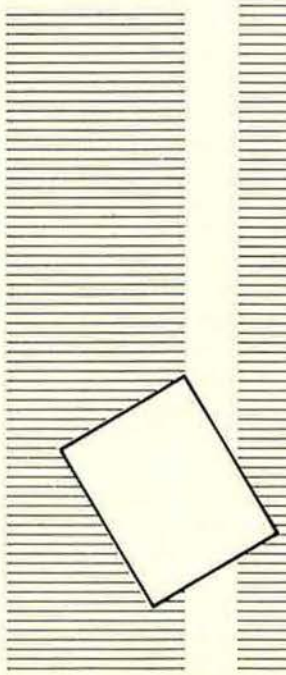
In the late 1970s, the Center gained an added function and, for the moment, may have lost some of the personal touch. Manpower and Personnel were combined on the Air Staff, and MPC became the Air Force Manpower and Personnel Center. In the mid-1980s, the manpower function was removed from personnel, and on January 1, 1986, MPC reassumed its original title. Fortunately, its initials remained intact, and a minimum of publications had to be changed as a result. ■

Bruce D. Callander is a regular contributor to Air Force *Magazine; his other feature for this issue, "The Wright Stuff," may be found on p. 100.*

The PC-III system, now in testing, may eliminate middlemen and let orderly rooms tap directly into the central personnel data bank.

Leveling Personnel's Paper Mountains

BY CAPT. (MAJ. SELECTEE) NAPOLEON B. BYARS, USAF



GETTING the right people in the right place at the right time isn't easy. The responsibility for getting it done lies with commanders, who are supported by a personnel system extending from the Air Force Military Personnel Center at Randolph AFB, Tex., to Consolidated Base Personnel Offices (CBPOs) at bases around the world. The direction of the Air Force personnel system—and how well it matches people against missions—is being shaped by a new program called Personnel Concept-III (PC-III).

PC-III is an enhancement of an already existing automated information system consisting of hardware, software, and communications. It allows authorized users direct access to the personnel data system through small computers and other equipment located in orderly rooms and other such work areas.

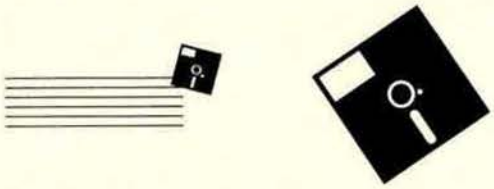
"PC-III is designed to eliminate much of the middleman-associated paperwork done at CBPOs," said Maj. Ronald E. Rupp of the 3700th Personnel Resources Group, Lackland AFB, Tex. "Once PC-III is fully operational, that work can be accomplished by personnel specialists who will be assigned to the orderly room."

In July 1986, the Air Force began a concept test at Lackland to examine and refine the concept and work out the bugs in the software. A full-scale PC-III test that includes an assessment of manpower impact is scheduled to begin at Moody AFB, Ga., this fall. There will be two years of testing and evaluation in all before a decision is made whether or not to implement PC-III throughout the Air Force. Target date for completed implementation is 1992.

The Problem It Solves

Today, personnel actions generate mountains of paperwork, and great stretches of time elapse while information is being processed and shuttled around. The current personnel system, while automated, requires the transfer of numerous forms and rosters between offices and units for input and retrieval of information. Furthermore, increased emphasis on personnel quality and readiness have added to the Air Force's information needs.

"Commanders will have immediate access to information [with PC-

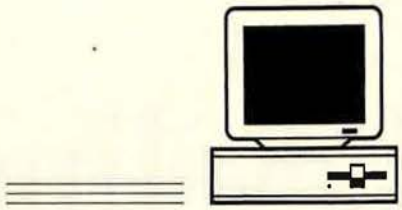


III], so decisions can be made without delays," said one personnel official. For example, a "change of reporting official" action might take up to two weeks to accomplish with the current system. PC-III could see it done in minutes at an orderly room computer station. Air Force officials are quick to point out that adequate safeguards to prevent unauthorized access are part of the system's design. And commanders will retain the same approval authority for personnel actions that they have today.

The leveling off of active-duty end-strengths in FY '86–87, the programmed manpower decrease of approximately 9,000 in FY '88, and the introduction of newer weapon systems that require manning combine to create pressure on the Air Force to find innovative ways to put its manpower where the needs are greatest. Program officials report that when PC-III is implemented, the Air Force can reduce the personnel field by 1,537 authorizations—a seventeen percent reduction in the number of people presently assigned to active-duty base-level personnel offices.

Another driver behind PC-III is cost. The PC-III program has been funded by the Air Force at $152 million. Considering the potential for manpower savings and improvements in information processing, officials maintain the price tag is affordable and reasonable.

The hardware for PC-III consists of what personnel officials call "gateway" computer systems in CBPOs and computer terminals located in orderly rooms and other work areas, all connected through electronic communications and tied in to base and Hq. AFMPC mainframe computers.



User-Friendly

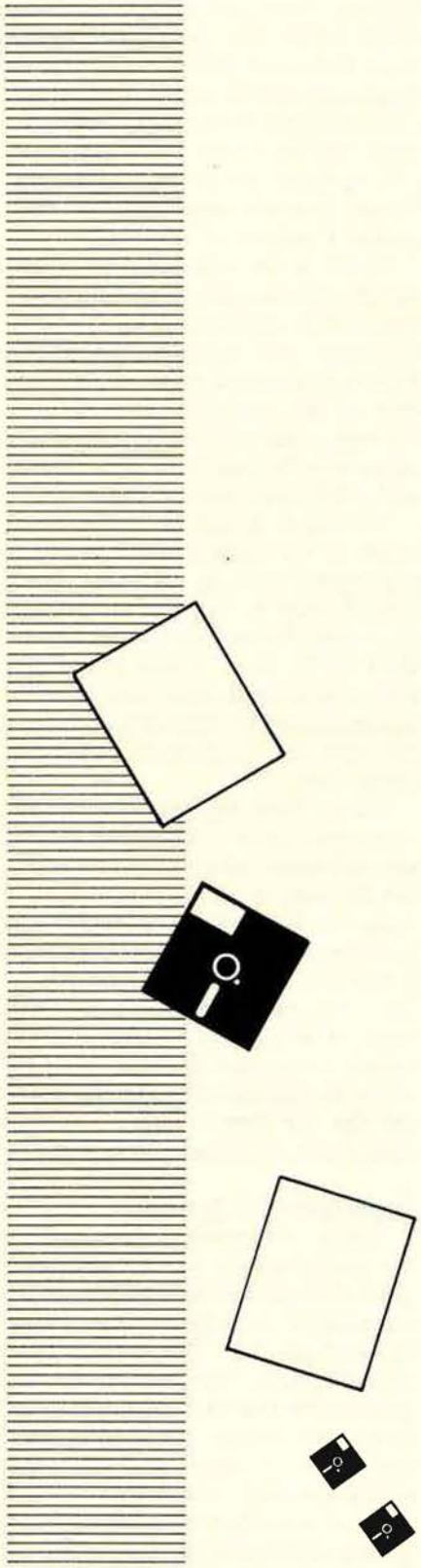
The software of PC-III is user-friendly. "You don't have to be a genius to operate it," Major Rupp said. "Once you turn the system on, it's as simple as following the instructions on the screen."

Systems applications include everything from reporting the change of a supervisor and viewing a promotion list to selecting someone for a temporary duty assignment. Interactional aids include menus and screen-formatted data input, online edits, tutorials, online retrievals, store and forward capability, and many other features.

For long-distance communications, PC-III will rely primarily on the Defense Data Network. The system is also designed to operate locally on telephone lines or standard local area networks.

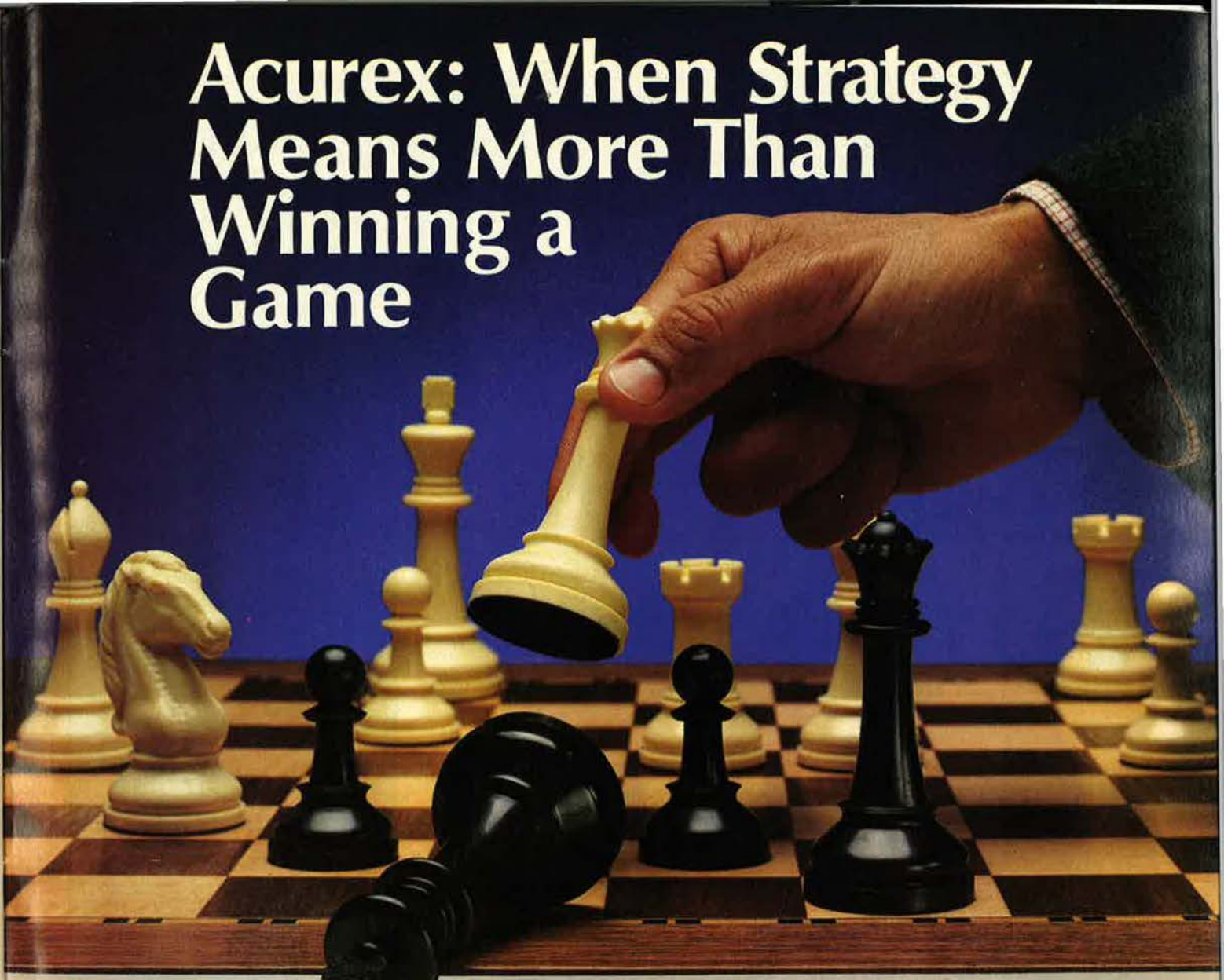
PC-III will greatly reduce personnel paperwork. Program officials say that it will help level the paperwork mountain and also support commanders faster and better.

"The final look of PC-III won't resemble what we have here," said Lt. Col. Denis P. Delaney, Chief of the CBPO at Lackland. "The system will be modified to take advantage of the extensive testing and evaluation [being] done here." ■



Capt. (Maj. selectee) Napoleon B. Byars, USAF, is currently assigned to the Secretary of the Air Force Office of Public Affairs. He holds a bachelor's degree in journalism from the University of North Carolina and a master's degree in communications from the University of Northern Colorado. He was a Contributing Editor to AIR FORCE *Magazine in 1984–85 under the Air Force's Education With Industry program and continues to write regularly for this magazine.*

Acurex: When Strategy Means More Than Winning a Game



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If you've got a spare Beaufighter in the basement, Jack Hilliard would like to talk with you.

WANTED:

Yesterday's Airplanes

BY C. V. GLINES

JACK B. Hilliard, curator at the Air Force Museum, Wright-Patterson AFB, Ohio, has a problem. He's looking for some planes that are missing. Actually, the search has been going on for a long time—ever since the Museum was established at Wright-Pat after World War II—in order to extend its collection. Many of the planes formerly missing and now in the inventory have been located and acquired in the past through publication of a "Want List."

Mr. Hilliard has published a new "Want List," and it has some surprising aircraft on it—surprising because one would think they would already be in the Air Force collection. Many World War I planes were destroyed in a fire in 1930, which created a gap that has not been fully bridged. "That's why we would like to have *any* World War I aircraft, US or foreign, in any condition that we can get it," Mr. Hilliard said.

Mr. Hilliard is also looking for some more recent planes, such as the North American P-51A, and other World War II aircraft, such as the Douglas A-24, Curtiss A-25, and Vultee A-31. The Fairchild C-82 is also missing from the Museum's roster.

The Museum's "Want List"

World War I
Any WW I aircraft (US or foreign)

1919–1941
A-8 or A-12 (Curtiss)
AT-5 (Curtiss)
B-2 (Curtiss)
B-3, B-4, B-5, or B-6 (Keystone)
B-9 (Boeing)
BT-2 (Douglas)
C-2 (Atlantic)
C-3 or C-4 (Ford)
C-36 (Lockheed)
F-1 (Fairchild)
O-1 (Curtiss)
O-2 (Douglas)
O-11 (Curtiss)
O-19 (Thomas-Morse)
O-25 (Douglas)
O-43 (Douglas)
OA-1 (Loening)
P-1 or P-2 (Curtiss)
P-16 (Berliner-Joyce)
P-26 (Boeing)
P-37 (Curtiss)
PB-2 (Consolidated)
PT-12 (Consolidated)
PW-9 (Boeing)
YG-1 (Kellett)
YG-2 (Pitcairn)
Ford Trimotor
Lusac-11 (Packard-LaPere)

World War II
A-24 (Douglas)
A-25 (Curtiss)
A-28 or A-29 (Lockheed)
A-31 (Vultee)
A-35 (Vultee)
P-43 (Republic)
P-51A (North American)
P-70 (Douglas)
P-79 (Northrop)
XF-81 (Vultee)
Beaufighter VIF
He-162
Hurricane IIa
Me-109G
Me-110
Me-163
Mitsubishi Betty
Mitsubishi Zero
Spitfire V
Other Japanese WW II aircraft

Postwar
C-82 (Fairchild)
MiG-19
MiG-21

Air Force Museum Curator Jack Hilliard, left, is once again on the prowl for military aircraft to add to the Museum's collection. He is shown here conferring with Ernie Harsanyi, an exhibits specialist with the Museum, who is undertaking restoration work on the rudder of the C-54 Sacred Cow.

And there are about twenty aircraft from between the world wars that the Museum would like to have. There's no Ford Trimotor there, and the Museum staff would like to get their hands on a Boeing P-26, Douglas O-43, and such ancient trainers as the Douglas BT-2, Consolidated PT-12, and Curtiss AT-5.

Foreign World War II aircraft are also wanted, including the British Hurricane, Spitfire V, and Beaufighter VIF. German fighters are on the list, too—Me-109G, Me-110, and Me-163. The Mitsubishi Zero, Betty, and other Japanese aircraft would be valuable additions. The Russian MiG-19 and MiG-21 of more recent years are also wanted to round out the foreign collection.

"We realize that many of the aircraft on our list are, in all probability, no longer in existence," Mr. Hilliard said. "However, they are included because there is always the possibility that one or more or parts thereof might be discovered in some out-of-the-way place either in the States or a foreign country. If anyone knows of any old Air Force or foreign military aircraft that might be 'rescued' from oblivion, we'd like to know about it.

"Many of the planes in our collection were found in strange locations, such as buried under the snow in Alaska, in a junkyard in Central America, or in the jungles of the Pacific. Foreign countries to which surplus military aircraft were sold in years past are always possible sources."

If you acquire or know of an oldie that the Museum wants, would the government buy it from you?

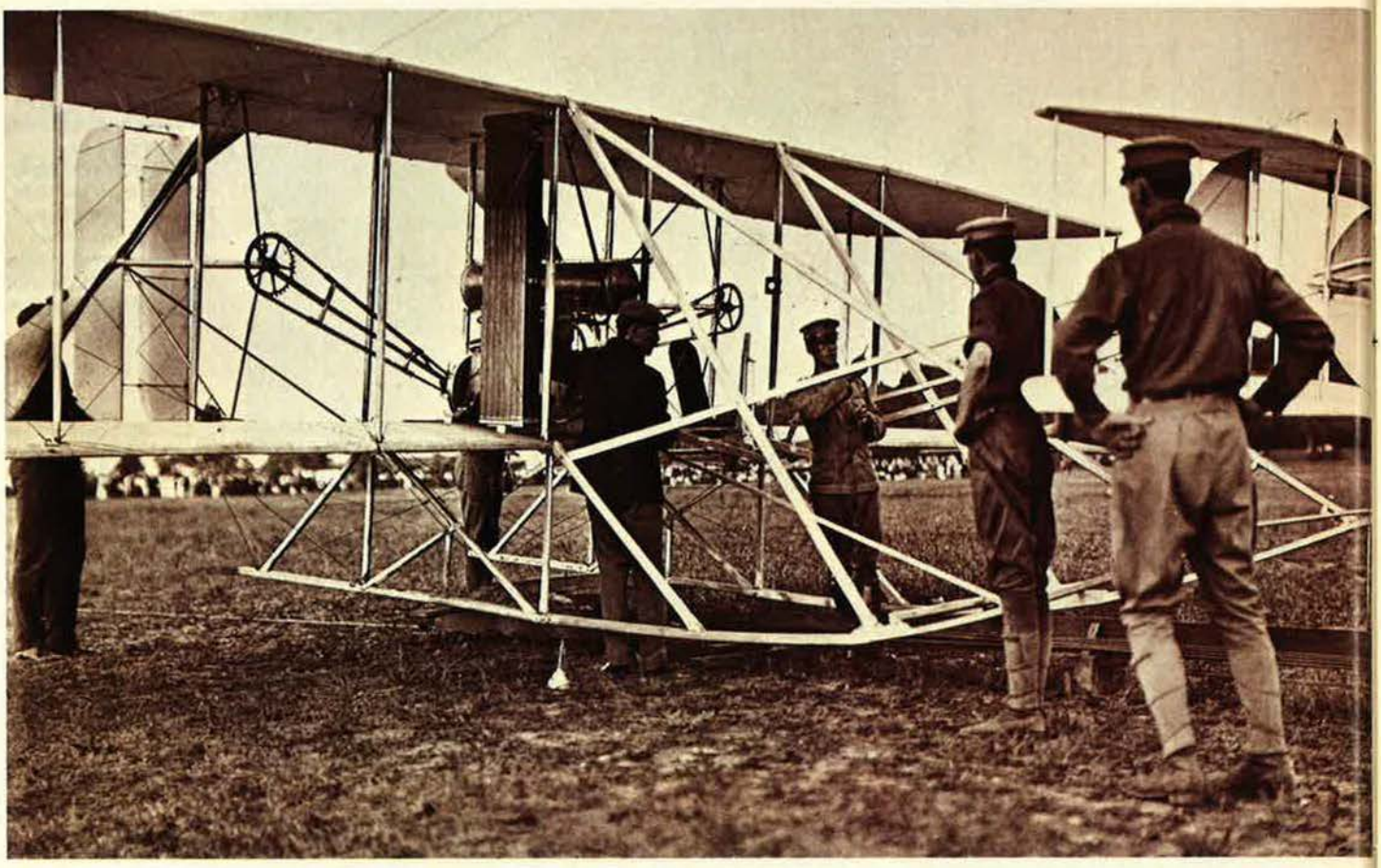
"No," Mr. Hilliard says. "Government funds cannot be expended to buy old aircraft. Items for the Museum must be donated unconditionally—no strings attached. A suggested gift will be reviewed by our accessions committee, and if it is accepted, the donor will receive a letter of acceptance. This letter might be used as evidence of the donation if the donor should wish to take a tax deduction on it. That would be a matter between the donor and the IRS. Museum staff members are forbidden by regulation to put a monetary evaluation on any item."

There are about 1,425 planes in the Air Force Museum inventory, but not all are displayed at Wright-Patterson AFB. The USAF Museum Program, operated by the Air Force Museum, supports thirty additional museums throughout the Air Force that are approved by the Secretary of the Air Force. Donated items may be displayed on loan from the Air Force Museum at any of them.

"While we greatly appreciate donation offers," Mr. Hilliard says, "problems arise when donors expect, and occasionally demand, that donated items be placed on exhibit or returned. We cannot be bound by such requirements, because it would tie our hands in regard to changing or modifying our displays."

If you know the whereabouts of an old military aircraft or other memorabilia you think the Air Force Museum might be interested in, write or call Jack B. Hilliard, Air Force Museum, Wright-Patterson AFB, Ohio 45433. The phone number is (513) 255-3284. ■

C. V. Glines, a retired Air Force colonel, is a free-lance writer, a magazine editor, and the author of numerous books. A frequent contributor to this magazine, his most recent offerings have included "Brain Buckets" in the August '86 issue and "What Has Happened to the Airlines?" in May '87.



Early aviators tested experimental aircraft at the same time they learned to fly. Wright pilots could not operate the Curtiss machine, and vice versa.

BY BRUCE D. CALLANDER

THE WRIGHT STUFF

WHEN 2d Lt. Henry H. Arnold was learning to fly, he rode in the left seat, and his instructor sat on his right. Later, when he taught Capt. Charles de Forest Chandler to fly, Arnold continued to sit on the left. Arnold became a "left-seat" pilot, and Chandler became a "right-seat" pilot.

Today, those terms would suggest that Arnold was aircraft commander and Chandler was his copilot. In 1911, however, they had a different meaning. The early Wright machines did not have full dual controls. Each flyer had an elevator lever to his right or left, depending on where he sat. The other controls were positioned between them and had to be shared. A pilot had to relearn the whole system if he switched seats.

Before the Aeronautical Division of the Army's Signal Corps bought its first airplane, the craft had to prove it could fly a ten-mile cross-country flight from Fort Myer, Va., to Alexandria, Va., and back. On July 30, 1909, with Orville Wright at the controls, the Wright Military Flyer met the test, and military aviation in this country began. In this picture, Orville Wright (in dark coat) inspects the plane with Lt. Benjamin Foulois (in riding boots) before the historic flight.

The Army's second machine was built by Glenn H. Curtiss and had an entirely different set of controls. Wright pilots could not fly the Curtiss machine nor vice versa. It would be several years before the Army developed a standardized cockpit arrangement. Before such refinements were made, however, many Army officers and several enlisted men received what passed for flight training in that first decade of powered flight. Most crashed at least once, and several paid with their lives for the experience.

The first to fly were three lieutenants. Lanky Frank Purdy Lahm was a cavalryman who shared his father's enthusiasm for ballooning. Handsome, boyish Thomas E. Selfridge was with the field artillery, but developed an early interest in aviation. Both were graduates of West Point. Short, feisty Benjamin D. Foulois rose through the infantry ranks, earned a battlefield commission, and transferred to the Signal Corps.

Frank Lahm was at least partially responsible for sparking the Army's interest in flight. In 1906, he and Lt. Henry B. Hersey flew from Paris to southern England to win the first international balloon race. Their victory caused a sensation in the United States. The Army ordered its own balloon and ordered Lahm to make a survey of aeronautics in Europe. While there, he met Orville and Wilbur Wright and learned something about heavier-than-air flight.

The Army too was becoming aware that there was something to flying beyond floating around in balloons. It had become interested a steerable dirigible that its builder, Thomas Baldwin, was flying at air meets. And although the Wrights had been reluctant to disclose details of their flying machine, they now seemed ready to demonstrate it to the military.

Airship and Airplane

In August 1907, the Army organized within the Signal Corps an Aeronautical Division to look into "all matters pertaining to military ballooning, air machines, and kindred subjects." Captain Chandler was picked to head it.

That December, the Signal Corps invited bids on an airship and, a few days later, on a heavier-than-air flying machine, both of them to be tested on the parade ground at Fort Myer, Va., the following summer. Baldwin and the Wrights won the contracts, and Lahm, back from Europe with his report on foreign aviation, was detailed to the board appointed to observe the trials.

Tom Selfridge arrived at Fort Myer by a different route. In January 1907, he volunteered to work with the Wrights. When they refused, he made a similar offer to Dr. Alexander Graham Bell, who was making aerial experiments in Nova Scotia. Bell persuaded President Theodore Roosevelt to have Selfridge detailed to work with his Aeronautical Experiment Association. The group also included Glenn Curtiss, a motorcycle and engine builder who had furnished the engine for Baldwin's airship and who made an unsuccessful offer to supply one to the Wrights.

The AEA built three machines in the spring of 1908, using hinged ailerons to produce the banking effect that the Wrights had accomplished with what they called "wing warping." The Wrights later would claim that the aileron was an infringement on their patents. Selfridge designed the group's first plane and flew its second. Curtiss designed and flew the third. That July, both men were at Fort Myer, Curtiss to fly in the dirigible with Baldwin and Selfridge to observe its trials.

Ben Foulois had no flying experience, but he caught the Army's attention in 1907 with a thesis on aviation. In it, he predicted that aerial machines would make the cavalry obsolete in future wars. The paper angered some cavalry officials, but impressed the Signal Corps. Foulois was assigned to the office of the Chief Signal Officer in Washington and to the Baldwin and Wright trials.

Rivals at Fort Myer

The dirigible arrived first, in late July 1908. It was a huge gas bag with a sixty-six-foot catwalk suspended beneath it for the crew. Baldwin steered from the rear, and Curtiss sat up front to run the engine and control the elevators. By mid-August, the airship had passed all its tests, including a two-hour endurance flight, and only one condition of Baldwin's contract remained. It called for him to train two Army officers to fly the airship. He agreed to instruct three. Selfridge, Lahm, and Foulois each made several flights with Baldwin and continued to practice on their own.

While the airship tests were in progress, Orville Wright arrived. He was pleased to see Lahm again and took a quick liking to the enthusiastic Foulois. But he was suspicious of Curtiss and Selfridge, suspecting both of trying to pump him for information.

Orville began his preliminary flight tests on September 3 and on September 9 carried Lahm on a short flight. The trial had barely begun, however, when Foulois and Selfridge were ordered to St. Joseph, Mo., to show off the new Army dirigible at a state fair. Foulois left immediately. Selfridge was to stay a few days longer to participate in the Wright tests and then follow. He never made it.

On September 17, 1908, Orville carried Selfridge as his passenger. They had circled the field three times when one of the propellers cracked and set up a vibration. The other propeller fouled in a stay wire

leading to the tail. Orville seemed to regain control, but the machine suddenly dived into the ground. Orville was seriously injured, and Selfridge, his skull fractured in several places, died three hours later. The tests were called off for the year.

Lahm, replacing Selfridge, joined Foulois and the dirigible in Missouri. Later, they trained three other officers to pilot the airship, but, by this time, Foulois had become disillusioned with lighter-than-air flight. Back in Washington, he argued that the dirigible had no military potential, a view that was at odds with those of his superiors and one that marked him as a troublemaker.

By June 1909, however, Orville was ready to complete the trials, and both Foulois and Lahm were on hand to witness them. On July 27, Orville set a new two-man endurance record of an hour and twelve minutes with Lahm as his passenger and with the new President, William Howard Taft, among the spectators. Three days later, Orville completed the acceptance tests by carrying Foulois on a ten-mile cross-country flight to Alexandria, Va., and back. For $25,000 plus a $5,000 bonus (because the machine exceeded the speed requirement), the Army had bought its first flying machine.

Like Baldwin, however, the Wrights had agreed to train two officers to operate their machine. Lahm and Foulois were chosen, but before the training could begin, Foulois was ordered to Europe for an international congress on aeronautics. He was convinced that the trip was a reprimand for his criticism of the dirigible. Lt. Frederic E. Humphreys, an engineering officer, was named to replace him as the second student.

Not User-Friendly

The training began at College Park, Md., on October 8, 1909, with Wilbur Wright as instructor. It was a laborious process. For each flight, the machine had to be placed on a wooden rail facing into the wind. A rope hooked to the front frame led to a weight suspended on a derrick. With the engine running, the operator released a trigger mechanism, the weight fell, and the machine shot forward. With luck, it became airborne. It landed on skids and had to be taken back to the rail for the next takeoff.

Learning to control the machine in the air was even more challenging. The Wright brothers apparently did not give much thought to what later designers would call the "human factor." In the machines they flew themselves, Orville used one system of controls and Wilbur another quite different arrangement. Fortunately, they settled on a single system for their training machines, but it still required a series of movements, most of which did not come naturally.

Only the action of the elevator lever could be called "instinctive" in the sense that the machine went up when the lever was pulled back and down when it was pushed forward. The rudder lever was largely mechanical. It was pulled back for a right turn and pushed forward for a left turn. Moving the rudder control also produced some bank, but banking was accomplished mainly by a third, smaller lever hinged to the top of the shared rudder control. The operator moved it to the right or left with a wrist action. This twisted or "warped" the tips of the wings in opposite directions to tilt the machine to one side or the other.

The engine had no throttle as such, but a foot lever advanced or retarded the spark to regulate the power. On landing, the operator pulled a string to cut off ignition and stop the engine. There were no instruments, but another string dangling from the wing gave the operator some idea whether he was banking, climbing, or diving.

Humphreys and Lahm made about a dozen flights each with Wilbur, and both soloed October 26. They continued to practice on their own until November 3, when the

Even before the first airplane was purchased, the Aeronautical Division suffered what today's Air Force Inspection and Safety Center would call a Class A mishap. On September 17, 1908, Lt. Thomas E. Selfridge was killed and Orville Wright was seriously injured when the plane they were flying over Fort Myer dove into the ground after one propeller cracked and the other fouled in a stay wire. Selfridge ANGB, Mich., is named in honor of the US military's first aviation-related fatality.

two flew together with Lahm as pilot. He made a low turn, caught a wingtip on the ground, and wrecked the machine. Neither man was hurt, but the crash ended the Army's flying for the year.

It also ended the two officers' flying careers for the present. Humphreys was ordered back to the engineers and was so disappointed that he resigned from the Army a few months later. Lahm was ordered back to the cavalry, but soon would return to flying.

The Return of Foulois

With its only airplane smashed and its only qualified pilots ordered to other duties, Army aviation might have ground to a halt right there but for Foulois. He had returned from Europe while the other officers still were in training. Wilbur had taken him up three times. Humphreys also had given him a couple of rides. Foulois had not soloed, but he was the closest to being trained of any available officer.

The Wrights repaired the broken machine at no charge to the government, and Foulois was packed off to Fort Sam Houston, Tex., with the airplane, eight enlisted men, and orders to teach himself to fly. On March 2, 1910, he began flying from the parade ground. Within a few months, he had survived a number of crashes and mastered the machine.

The next year, Foulois joined the troops who were putting down an uprising along the Mexican border. By now, the Army's airplane was barely serviceable, but publisher Robert J. Collier lent the Army his own Wright B model for the operation. The Wrights sent one of their own pilots, Philip O. Parmalee, to help with the flying. The two made a number of flights along the border looking for the "enemy" (whom they never found) and carrying messages.

Although Foulois's one-plane air force scarcely changed the nature of warfare, Congress at last was beginning to see some potential in aviation. It approved a Fiscal Year 1912 appropriation of $125,000 for aeronautics, enough to buy a few more planes and train more pilots.

The Curtiss Grass-Cutter

By this time, Glenn Curtiss had set up a flying school in San Diego and was offering to train military flyers. The Army sent Lts. Paul W. Beck, George E. M. Kelly, and John C. Walker, all of whom began training in February 1911.

The airplanes built by Glenn Curtiss were entirely different from those built by the Wright brothers. As a consequence, a flyer trained on one type of plane could not pilot the other type. This 1911 picture shows Curtiss at the controls of one of the four-cylinder "grass-cutter" instructional planes at Hammondsport, N. Y. Mr. Curtiss is flanked by a group of trainees.

The early Curtiss planes were single-seaters, so all the instruction had to be given on the ground. Training began in a "grass-cutter" machine in which the power was limited so it could taxi but not leave the ground. The student drove it to one end of the field, got out, turned the machine around, and drove back again. When he was able to steer in a straight line, the throttle was adjusted to give him enough power to get about ten feet off the ground. When he had learned to take off and land successfully, he was allowed more power so he could practice turns. Finally, he was permitted to make unlimited flights.

When they graduated, Beck, Walker, and Kelly were assigned to Fort Sam with Foulois. There, the Army formed a Provisional Aero Company and made Beck, the senior in rank, its commander. Soon afterward, the Army bought its next machines, a Curtiss Model D and another Wright Flyer. The Curtiss had a more powerful engine than earlier models and room for a passenger to ride behind the pilot. The Wright machine was also improved by moving the elevators from the front to the rear and by adding wheels to the skids.

Despite the changes, the two machines remained so different that a pilot trained on one could not fly the other.

Where the Wright machine had separate rudder and elevator levers, the Curtiss machine had a single control column with an automobile-type steering wheel on it. The pilot pulled the wheel back and pushed it forward to raise and lower the machine and turned the wheel to steer to the right or left. The ailerons, which were small, separate planes between the two wings, were worked by a shoulder yoke. The pilot leaned one way or the other in the yoke to bank the plane. This was a more natural movement than twisting the Wrights' wing-warping lever, but a Curtiss pilot who moved around too much could find himself in an unintended bank.

A natural rivalry developed between the Army's Wright and Curtiss pilots at Fort Sam. The less-experienced Curtiss pilots, eager to show off, tried maneuvers that Foulois considered dangerous. Soon after he arrived, Walker came in in a low, steep bank. The machine stalled and made a very hard land-

ing. Walker was unhurt, but never flew again. The next day, Beck went hedgehopping and came in too low and too slow for his landing. The engine quit, and he crashed short of the field. Beck was knocked out for a time, but otherwise not injured.

The machine was repaired in a few days, and on May 10, 1911, Kelly took it up. The least experienced of the Curtiss flyers, Kelly came in too high on his first attempt to land, pushed the nose down, and hit hard. The plane bounced up, and Kelly gave it power to go around again. On his second try, the same thing happened, but this time, Kelly didn't have enough power to go around again. Seeing that his machine was headed for a line of tents, he made a steep bank to the left, stalled, and crashed. Kelly was thrown from his seat, landed on his head, and died a few hours later.

Foulois, who had watched the repairs made after Beck's crash, blamed the accident on flaws in the Curtiss machine and on Beck's failure to test-fly it after it had been repaired. An investigation board reached another conclusion. It charged the accident to pilot error and to the damage done in Kelly's first landing attempt.

More Airmen Coming

Whatever the cause, the crash ended flying at Fort Sam. The Provisional Aero Company was disbanded. Beck and his planes were sent to College Park. Foulois, in trouble again for questioning a superior, was ordered to a desk job in Washington.

The Army's air arm was again down to one active flyer, but more were coming. In April 1911, Lts. Henry H. Arnold and Thomas DeWitt Milling had been ordered to Dayton for training at the Wright school. Arnold had been graduated from West Point in 1907 and had served four years in the infantry. Milling, graduated two years later, was in the cavalry.

The two found a boarding house in Dayton and began their training at the Wright factory with a detailed study of the machines under construction. The Wrights had also set up an older machine on sawhorses so students could get some feel of the controls.

On May 3, Arnold and Milling took the Dayton trolley to Simms Station to begin flight training. Arthur L. Welsh was assigned as Arnold's instructor, and J. Clifford Turpin served as Milling's.

Like other Wright students, Arnold rode as a passenger on his first few flights and was not allowed to touch any controls. His third time up, Welch let him follow through on the elevator control, and on the fourth ride, he was allowed to work it. On his ninth flight, he was allowed to work the warping levers part of the time, and by his eleventh, he was working the controls most of the time. On his twelfth flight, he began to learn to land. By his nineteenth, he was landing without assistance. After less than four hours of air time, he was allowed to solo.

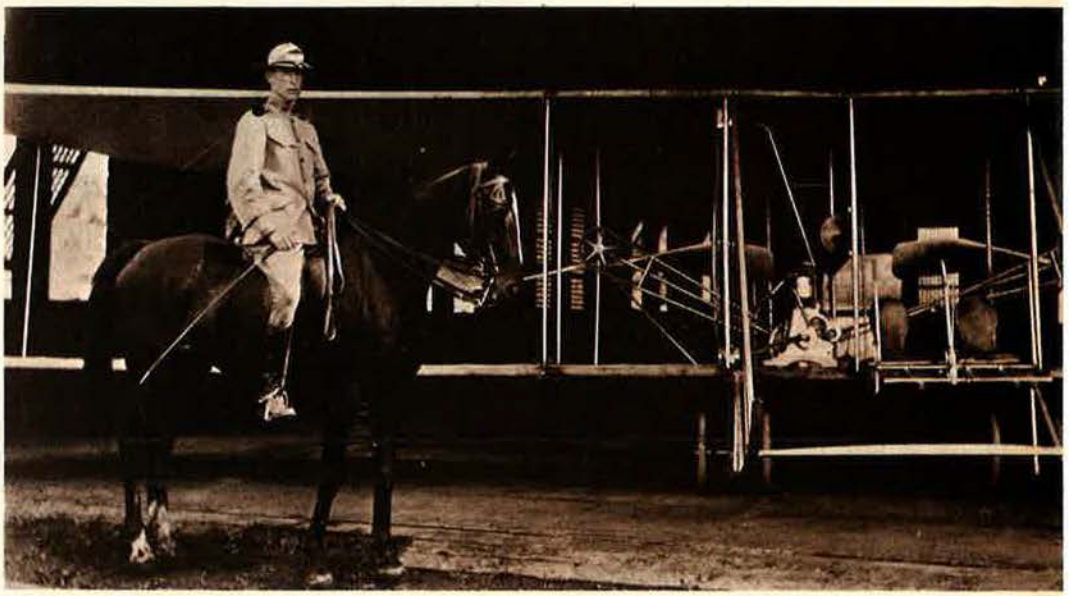
Milling progressed faster, being allowed to solo after only five days of training and a total of one hour and fifty-five minutes in the air. Orville had taken an interest in Milling and flew with him a number of times, but never with Arnold.

The Wrights did not permit flying on Sunday, but often invited some of their students to dinner that day with the family. Arnold and Milling were guests on at least one such occasion. Later, Arnold would describe lively discussions between Wilbur and Orville over the dinner table and in the hangar at Simms Station. The "memory" apparently was fanciful, since Wilbur was in Europe testifying at patent hearings during the entire time Arnold was training.

Arnold and Milling reported to College Park on June 14. By then, the Army had set up a permanent flying school there with Capt. Charles de Forest Chandler as commander and Lt. Roy C. Kirtland as adjutant. Chandler had qualified to pilot balloons and dirigibles, but was not trained in heavier-than-air machines. Arnold became his instructor, and Milling trained Kirtland. Later that summer, Chandler went to Dayton for further instruction and made more than twenty-five flights with Orville. Lahm had been there earlier for similar "postgraduate" lessons.

Experiments and Shows

That summer of 1911, Paul Beck



Lt. Frank P. Lahm was sent to the Philippines in 1912 to establish a flight school, at which the first enlisted man to qualify as a pilot, Cpl. Vernon L. Burge, was trained. This picture shows Lieutenant Lahm, originally a cavalryman, on horseback in front of the Wright biplane he would later crash in Manila. Lieutenant Lahm survived; the plane didn't.

reported to College Park with what was left of the Provisional Aero Company from Fort Sam. More machines were on order, and soon more officers would arrive for training. That fall, the Army opened a second school in Augusta, Ga., for use when the weather in Maryland was too severe.

Army flying soon became part training, part experimentation, and part public relations. By then, the Wrights and Glenn Curtiss had rival exhibition teams. US and foreign pilots, women as well as men, were competing in air shows and races. Speed and altitude records were being set and broken regularly. The Army pilots soon became part of that carnival world.

Arnold set an altitude record and flew as a stunt man in a movie titled "The Military Air Scout." Milling won a trophy for an endurance flight and became the first Army pilot to fly at night. With Chandler, Arnold made an ambitious cross-country flight. Milling experimented with a bomb-aiming device. Arnold flew while another officer fired a rifle from his plane to win a marksmanship competition.

In early 1912, Lt. Frank Lahm opened a flying school in the Philippines, where his students included Cpl. Vernon L. Burge, the first enlisted man to qualify as a pilot.

In the spring of 1913, most training was shifted to San Diego. By now, Army aviation was five years old, but still had only a handful of qualified pilots and few planes. Arnold and Chandler had been returned to troop duty. Milling was assigned to France. Six new Wright planes had been destroyed, including one that Lahm had crashed in Manila. Several students had been killed in training, and others had asked to be let out of the program. Congress approved flight pay to attract young officers to aviation, but flying was getting a deservedly bad reputation.

The death toll was particularly heavy in 1913, claiming Lts. Rex Chandler, C. Perry Rich, Moss L. Love, Joseph D. Park, Eric L. Ellington, Loren H. Call, and Hugh M. Kelly. In early 1914, when Lt. Henry B. Post plunged into San Diego Bay, two other flyers asked to be relieved of flying. The casualties were becoming too heavy. Following an investigation, the Army condemned all Wright and Curtiss "pusher" planes. The rear-mounted engines had pulled loose in too many crashes, crushing pilots or passengers.

Postscripts on the People

Henry H. "Hap" Arnold was in charge of the Army's aviation schools in World War I. He suffered a career setback for his support of Billy Mitchell, but became chief of the Army Air Forces in World War II and the only five-star aviation officer. He retired on June 30, 1946, and died in January 1950.

Charles de Forest Chandler served as chief of the Balloon Section in France during World War I and later in the Philippines and Mexico. He retired as a colonel in 1920 and died in 1939.

Glenn Curtiss supplied trainers for the Army in World War I, and in 1919 he built the flying boat used in the first transatlantic flight. Later, he experimented with automobiles and became involved with real estate. He died in 1930. By then, the Curtiss Co. had merged with its former rival to become the Curtiss-Wright Co., which supplied fighters and transports to the Army Air Forces in World War II.

Benjamin Foulois, at one time the only active flyer in the Army, became chief of the Air Service of the AEF in World War I. Later he was made chief of the Army Air Corps and a major general. He continued his not-always-tactful defense of airpower and retired under fire in 1935. He died in 1967.

Frederic Humphreys, who resigned after being trained by Wilbur Wright, returned to fly in World War I. Later, he commanded an engineer regiment of the New York National Guard as a brigadier general.

Frank P. Lahm, the first US Army officer to fly, organized the lighter-than-air service for the American Expeditionary Force in Europe. Later, he organized the Air Corps Training Center at what is now Randolph AFB, Tex., served as air attaché to France, Spain, and Belgium, and was commander of Randolph Field. He retired as a major general in 1941 and died in 1963.

Wilbur Wright died of typhoid fever in 1912. **Orville Wright** continued to experiment with aircraft improvements, including an automatic stabilizer. He made his last flight as a pilot in 1918 and died in 1948.

New Designs

The Army's new "tractor" planes, with the engines in front, also were suspect. The Army grounded one Curtiss model and four Burgess machines built under Wright patents. All were rebuilt by Grover C. Loening, a former Wright employee.

The Burgess planes were changed most dramatically. Loening replaced the Wright wing-warping system with ailerons and Curtiss-type wheel-and-yoke controls. He removed the skids and installed new wheels, shortened the wings, and replaced the twin tails with a large, single rudder and fixed vertical fin.

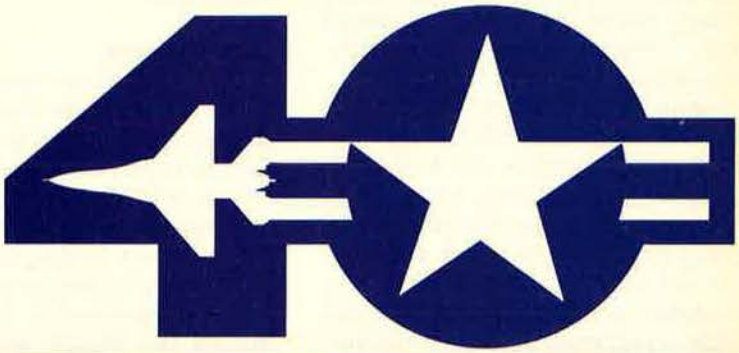
The box-kite look of the early machines was gone. Both Burgess and Curtiss machines had enclosed cockpits and upfront propellers. By mid-1914, at Loening's recommendation, the Army bought its first planes from Glenn L. Martin. The same year, it tested a new J model Curtiss plane that was to be the forerunner of the "Jenny" trainers of World War I.

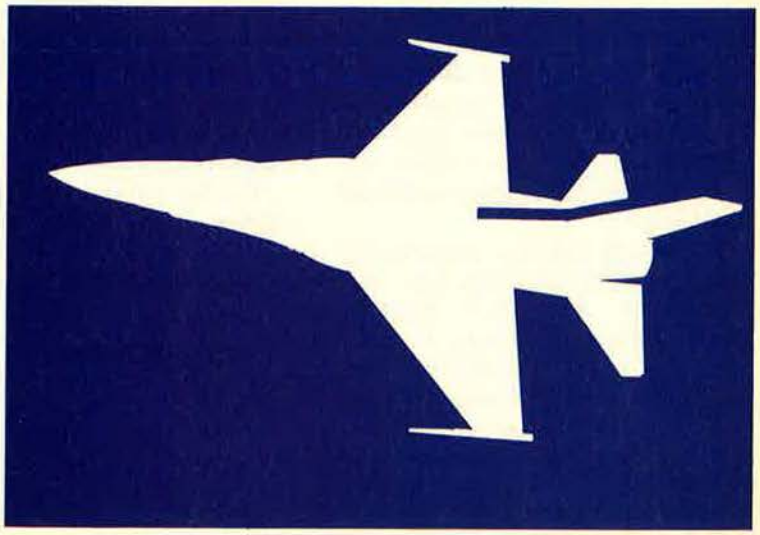
It would be another year before the Army would adopt the now-familiar standardized controls with a single column for elevator and ailerons and foot controls for the rudder. By then, Europe would be at war, and the United States would be engaged in a belated effort to build its newly created Aviation Section into an effective force.

The effort would be too late. American pilots would fly in France. But for a combination of reasons—the early reluctance of the Wrights to share their invention, the Army's slowness in realizing its potential, and the failure of Congress to provide funds when that potential was realized—the country where aviation was born would put no planes of its own into combat. ■

A Fifteenth Air Force B-24 bombardier during World War II, Bruce D. Callander was recalled to active duty as an information officer during the Korean War. Between tours of active duty, he earned a B.A. degree in journalism at the University of Michigan. In 1952, he joined the staff of Air Force Times, *becoming Editor in 1972. Now a free-lance writer, Mr. Callander's recent articles for us have included "It's Basic" in the June '87 issue and "The Uncertain Art of Career Management" in April.*

In September . . .
AIR FORCE Magazine salutes the United States Air Force on its anniversary.





Closing for advertising is July 24, copy by August 5.

AIR FORCE MAGAZINE
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The Film of War

A1C Darryl Winters was one of the first and most heroic Air Force combat photographers in Vietnam.

BY JOHN L. FRISBEE
CONTRIBUTING EDITOR

IT WAS inevitable that the airplane and the camera would be teamed to reach that long-elusive goal of military commanders—rapid, detailed information on distant enemy forces. Even before USAF's earliest progenitor, the Aeronautical Division of the US Signal Corps, was created in 1907, a young Signal Corps officer, Capt. Billy Mitchell, was experimenting with kite-borne cameras.

As aeronautical and photographic technology advanced, the uses of aerial photography expanded beyond reconnaissance to include documentation of combat operations for tactical evaluation and training purposes. That function became the mission of Military Airlift Command's Aerospace Audiovisual Service (AAVS). Early in the Vietnam War, AAVS "backseat" motion picture photographers were sent to Southeast Asia to cover air operations. Before the war ended, twelve AAVS combat photographers had lost their lives in line of duty.

One of the early backseaters was A1C Darryl G. Winters, who was assigned to the 600th Photographic Squadron at Tan Son Nhut AB in January 1965. For the next eighteen months, Winters served with the squadron's detachment at Bien Hoa. At that time, there were fewer than a dozen Air Force combat photographers in Vietnam.

Darryl Winters flew his first combat mission four days after he reported for duty. According to his detachment commander, 1st Lt. Douglas Burrows, Winters was "a top-notch motion picture man" who "would rather fly than eat." At the end of his twelve-month tour of duty, Winters had flown through enough enemy ground fire and seen enough aircraft shot down to have a firm understanding of the hazards of tactical operations. Nevertheless, he asked to extend for an additional twelve months.

As his eighteenth month in Vietnam approached, Winters had flown more than 300 missions—nine over North Vietnam—most of them in F-100Fs, Winters's favorite aircraft. He had earned a reputation as a superb photographer and as a man who would volunteer for any dangerous mission.

Winters also covered air strikes from the ground, accompanying Army units on search-and-destroy forays. And in May 1965, when a series of explosions on the ramp at Bien Hoa destroyed thirteen aircraft and killed thirty Americans, Winters was one of three AAVS cameramen who went into the blazing area to film the disaster. For that action, he was awarded the Bronze Star. Here was a young man with a sense of mission and a belief in the importance of his work.

Darryl Winters was the first AAVS combat photographer to lose his life in Vietnam.

By July 19, 1966, Airman Winters had earned eleven Oak Leaf clusters to his Air Medal and had taken 30,000 feet of combat film that was used for tactical and intelligence evaluation of air strikes. Because of the quality of his photography, much of the footage was cleared for use by the news media. On that day, the twenty-seven-year-old Winters volunteered to film a strafing attack on a Viet Cong position in a well-defended area a few miles west of Saigon. It was his 217th mission in the backseat of an F-100.

A few days earlier, he had commented that he had more missions in the Super Sabre than most of the pilots he flew with. "I'm so accustomed to the cockpit of the plane," he said, "that I sometimes feel I could take over the controls and fly it myself."

He never had a chance to find out. The F-100 was hit by ground fire and crashed in the jungle. Winters was the first AAVS combat photographer killed in action in Vietnam.

Darryl Winters was awarded the Distinguished Flying Cross posthumously for his extraordinary achievements in an assignment that combined the high risks of tactical air operations and the perils of jungle warfare. By the nature of their duties, combat photographers and their peacetime counterparts in AAVS have to be where the action is, though their acts of heroism are sometimes obscured by the more spectacular work of the aircrews whose operations they record on film. That should not be.

In 1968, AAVS established the Darryl G. Winters Award, which is presented annually to an AAVS member in recognition of outstanding achievement. Winters's unique combat career remains an inspiration, particularly to those in his field, and still another demonstration that valor and dedication to duty know no bounds of age, rank, or professional duties. ■

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Listed below are the Industrial Associates of the Air Force Association. Through this affiliation, these companies support the objectives of AFA as they relate to the responsible use of aerospace technology for the betterment of society and the maintenance of adequate aerospace power as a requisite of national security and international amity.

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By Robin Whittle, AFA DIRECTOR OF COMMUNICATIONS

Senator Flies in the B-1B

AFA National Director Jan Laitos says behind-the-scenes action by area AFA, Air Force, and community leaders and other Air Force supporters convinced Sen. Tom Daschle (D-S. D.) to take a ride in the B-1B to see for himself how it does in aerial maneuvers.

Strapped aboard Ellsworth AFB's twelfth B-1B for a three-hour, eighteen-minute flight, Senator Daschle said that he was surprised at the "tremendous maneuverability" of the 390,000-pound bomber. During the flight, which originated at Rockwell International's Palmdale, Calif., production plant on April 13, the Senator got an opportunity to fly the B-1B for forty minutes through maneuvers.

A licensed single-engine pilot since 1981 and a former Air Force intelligence officer, Senator Daschle took the B-1B through sixty-degree banks left and right and a steep climb over Colorado. "I was impressed at how skilled a pilot he was," said B-1B pilot Lt. Col. Paul Shorock. The admiration was mutual. Senator Daschle said later of the four-man B-1B crew, "They've got to be the best in the world."

Another highlight of the flight for the Senator was the refueling over the Grand Canyon. "It was even more impressive than flying the airplane," he said. The crew, which also included Lt. Col. Terry Bott, aircraft commander, and Majs. James LaSalvia, offensive systems officer, and Daniel Ford, defensive systems officer, said they enjoyed showing off their aircraft. The crew flew two instrument approaches and two visual approaches to the Ellsworth AFB runway that the Senator described as "fantastic."

At a reception at Ellsworth AFB that evening, Senator Daschle discussed his flight and said the bomber suffers from "minor deficiencies" that are being corrected. "There are problems, and they are addressing them. I think the B-1 is going to be around at least as long as I will." After having breakfast and briefings with Air Force and Rockwell officials that morning, Senator Daschle said he was satisfied the planes could be delivered for $20.5 billion, the amount Congress authorized in 1981 for 100 bombers. Ellsworth AFB will eventually have thirty-five.

An exuberant Sen. Tom Daschle (D-S. D.) waves to waiting reporters as he deplanes after his three-hour, eighteen-minute flight aboard a B-1B aircraft based at Ellsworth AFB, S. D. During the flight, Senator Daschle took over the controls of the bomber for forty minutes and executed several maneuvers.

AFA leaders involved in the reception, in addition to National Director Laitos, were South Dakota AFA President Jim England and Rushmore Chapter President R. G. McCracken. "More B-1Bs will be coming to Ellsworth AFB until the base has its full complement of thirty-five in September," Mr. Laitos said.

Blytheville Chapter Honors USAF's Chief Nurse

Brig. Gen. Carmelita Schimmenti, Chief of the Air Force Nursing Corps, was the guest of honor at the Blytheville Chapter's special reception on March 14 during which Chapter officials presented their first annual $1,000 donation to the Mississippi County Community College School of Nursing.

During the afternoon event, which was held at the Blytheville NCO Club, Chapter President Bill Jeffries set the

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stage for the presentation of the check by screening AFA's new documentary, "Off We Go," for the 187 military, civic, and AFA leaders in attendance. Citing AFA's national goals, Mr. Jeffries explained the Association's commitment to quality education in key career fields and invited Dr. John Sullins, President of the Mississippi County Community College, Dr. Gary Taylor, Dean of Academic Affairs, and General Schimmenti to join him at the podium. In accepting the donation in behalf of the College, Dr. Sullins said the school's nursing students were among the school's most dedicated and most energetic and, in many cases, had the greatest need for financial assistance.

A highlight of the Blytheville Chapter's reception honoring Brig. Gen. Carmelita Schimmenti, Chief of the Air Force Nursing Corps, was the Chapter's presentation of a $1,000 check to the nursing program at the Mississippi County Community College. Shown during the presentation of the check are, from left, MCCC President Dr. John P. Sullins, General Schimmenti, and Blytheville Chapter President Bill Jeffries.

State Sen. Mike Bearden then took the microphone in behalf of Gov. Bill Clinton to welcome the Air Force's top nurse to Arkansas. In her remarks, General Schimmenti commended the Blytheville AFA Chapter for being at the forefront in establishing a scholarship for nurses. "I think it's worthy, and I'm so proud to be a part of this event this afternoon," she said.

At the close of the reception, Mr. Jeffries presented General Schimmenti with an AFA cap in appreciation of her presence at the event. Among the distinguished guests, in addition to Senator Bearden and his wife, were State Rep. Wayne Wagner and Mrs. Wagner; County Judge Joe Gurley; Col. Bruce Smith, 97th Bombardment Wing Commander, and Mrs. Smith; 97th Combat Support Group Commander Col. Bob Fray and Mrs. Fray; USAF Hospital Commander Col. Jim Hays and Mrs. Hays; Liz Heintz, President of the Blytheville Community Council; Arkansas AFA President Tom Williams; Arkansas AFA Vice President Bud Walters; and Arkansas AFA Secretary/Treasurer Jack Kraras. Blytheville Chapter leaders, in addition to Mr. Jeffries, included Vice President Tommy Sylvester, Secretary Dick Bratton, and Treasurer Wayne Lewis.

On display throughout the reception were the Chapter's numerous state AFA awards, national Storz membership award, membership achievement plaques, and several Medals of Merit earned by Chapter members. The honors were housed in two lighted display cases so all could see and appreciate the Chapter's numerous achievements.

Midnight Sun Chapter Cosponsors Fund-Raiser

AFA's Fairbanks Midnight Sun Chapter and the Interior and Arctic Alaska Aeronautical Foundation (IAAAF) joined forces to cosponsor, for the first time, a fund-raising banquet to benefit the Alaskaland Pioneer Air Museum, reports Chapter member Everett A. Long. IAAAF works to preserve Alaska's rich pioneer aviation heritage. According to

Former astronaut Donald "Deke" Slayton, right, offers his congratulations to David Childs after presenting Mr. Childs with a plaque that honors his successful attempt to break the record for the number of consecutive inside loops. Mr. Childs broke the old record in August 1986 after flying a dizzying 2,368 loops. Mr. Slayton was guest speaker for a fund-raising banquet sponsored jointly by the Fairbanks Midnight Sun Chapter and the Interior and Arctic Alaska Aeronautical Foundation. Proceeds from the fund-raiser benefit the Alaskaland Air Museum.

Mr. Long, IAAAF has for many years "treated the Fairbanks community to a top speaker during a fund-raising dinner to benefit the local air museum."

Chapter officials were looking for a way to support the museum and needed a good midwinter program for the quarterly banquet. Since IAAAF and AFA support similar objectives in aerospace education and share members as well, "it just made sense to share the work load."

IAAAF had lined up Donald "Deke" Slayton, one of the original Mercury 7 astronauts and a crew member of the successful Apollo-Soyuz joint spaceflight in July 1975, to address the February 27 banquet. He presented a slide show and discussion on "The Past, Present, and Future of NASA Spaceflight."

Mr. Slayton was active in NASA's Space Shuttle program as manager of the approach and landing phase, including the piggyback 747 flights, that occurred as part of the evaluation and study phase of atmospheric flight for the Shuttle. Although no longer active in military flying, Mr. Slayton keeps a hand in high-performance flying. He is President of the National Air Racing Group's International Formula One division, and he races an IF1 aircraft. These are small 500-pound airplanes powered by a 100-horsepower engine that can average up to 270 mph over a tight three-mile course. Mr. Slayton races at the Reno Air Races each September.

"It's a lot of fun," he told the audience. "The IF1 gives a reasonably high performance for a little airplane,

AFA's Fort Worth Chapter earlier this year honored Mary Sue Keith, wife of AFA National President Sam E. Keith, Jr., by sponsoring her as an AFA Life Member. Flanking Mrs. Keith as she takes the microphone to thank Chapter members are AFA President Keith, left, and former AFA National President and former Board Chairman Joe L. Shosid.

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and it's an airplane you can afford to fly."

A highlight of the banquet was Mr. Slayton's presentation of a plaque to David Childs of North Pole, Alaska, for setting a new US national record for consecutive inside loops. On August 9, 1986, Mr. Childs broke the existing record with 2,368 consecutive inside loops in 14.97 hours. The previous record was 2,315⅝ loops by Steve Powell in 1980. In accepting the plaque, Mr. Childs said he took advantage of Alaska's long summer daylight hours and noted that "if someone wants to beat my record, they'll have to come to Alaska to do it."

The evening was a success for the air museum, and both organizations were pleased with the results. In fact, both are planning for a repeat performance next year.

"We look forward to this cooperative joint venture again," said Steve Thomas, Fairbanks Midnight Sun Chapter President. "We did this to support the air museum, not for our own gain, and they made a good profit. Next year, we are going to do more planning, extend more invitations, and double-check RSVP confirmations to ensure an even greater community-wide event," the AFA leader concluded.

Doolittle Chapter Hosts Raider Reunion

Of the forty-six surviving members of Gen. Jimmy Doolittle's courageous Raiders, twenty-six met for their forty-fifth reunion on April 16–18. Last year, they rendezvoused at AFA's "Gathering of Eagles" in Las Vegas. This year, they met at the Los Angeles Airport Hyatt House Hotel for a three-day reunion that included a banquet in the Hyatt Ballroom hosted by AFA's Doolittle/Los Angeles Area Chapter. Chapter officials also escorted the Raiders to see the *Queen Mary* and *Spruce Goose* the day before the banquet.

More than 200 banquet attendees turned out on the anniversary of the raid to pay tribute to the eighty original Raiders. On April 18, 1942, after launching secretly from the American carrier *Hornet*, they flew a daring bombing mission against Japan that resulted in a much-needed boost for American morale.

Hal Strack, California AFA Vice President and immediate past Doolittle Chapter President, was master of ceremonies for the evening. Doolittle Raider Bob Hite led the invocation. In addition, former USAF Chief of Staff Gen. Lew Allen, USAF (Ret.), current Director of the Jet Propulsion Laboratory, read a message from Air Force Chief of Staff Gen. Larry D. Welch,

Some of the participants in the forty-fifth reunion of the Doolittle Raiders gather for a "family portrait" in front of a B-25 Mitchell bomber. AFA's Doolittle/Los Angeles Area Chapter sponsored a banquet at the Hyatt House Hotel Ballroom for the Raiders and earlier escorted them on tours of the Queen Mary and the Spruce Goose. California AFA Vice President Hal Strack, front row left, served as master of ceremonies for the banquet. (Photo by Ken Caprio)

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 place of AFA's activities within the state, may be obtained from the appropriate contact.

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This program is not open to the general public, and there is no admission charge. If you are a member of the military, Department of Defense, an aerospace industry executive, or an AFA member, you are cordially invited to attend. You may register at the exhibits on September 15, 16, and 17, showing proper credentials, or write for further details to:

Charles E. Cruze
Air Force Association
1501 Lee Highway
Arlington, VA 22209-1198 USA

and Honorary Raider Rear Adm. Henry Miller, USN (Ret.), the Naval aviator who instructed the Doolittle Raiders on carrier takeoff procedures, read a message from Chief of Naval Operations Adm. Carlisle A. H. Trost. The introduction of Doolittle Raiders present at the banquet was made by Raider Brig. Gen. Richard Knobloch, USAF (Ret.).

While General Doolittle was unable to attend the banquet, the boss was with them in spirit, General Knobloch told the crowd. General Doolittle had attended the Raiders' private meeting held earlier. Banquet attendee and Chapter member Ed Gordon recalled that the good-natured repartee among the Raiders as they were being introduced reflected "the spirit General Doolittle fostered in his men."

Another highlight of the evening was the annual presentation of two $1,500 scholarships by the Raiders to two outstanding students selected by the sponsoring organization in the area in which the Raiders hold their reunion. Cadet Dorian Buitrago, a student at Northrop University and a member of the University of Southern California AFROTC detachment, and Cadet Christopher Stewart, a junior at California Polytechnic State University at San Luis Obispo and a member of the Loyola Marymount University AFROTC detachment, were this year's recipients.

Before the colors were retired by the University of Southern California's AFROTC Color Guard, Doolittle historian Col. C. V. Glines, USAF (Ret.), recounted the dramatic Doolittle raid, and a brief film was also shown.

AFA's Doolittle Chapter expended a great deal of time and effort in planning its sponsorship of the forty-fifth anniversary. But it was time well spent, for all felt they had been touched by the experience. The Doolittle Program Committee included Hal Strack, Ted Bishop, Howard Christensen, Phil Copeland, Connie Eckard, and Robert Lawson in addition to Chapter President Larry Molnar, Vice President Bud Chamberlain, and Treasurer Harold Boston. ■

UNIT REUNIONS

2d Emergency Rescue Squadron
Members of the 2d Emergency Rescue Squadron will hold a reunion on September 10–12, 1987, at the Patterson Inn in Fairborn, Ohio. **Contact:** John W. Crawford, 10 Filbert Ave., Stratford, N. J. 08084. Phone: (609) 784-6363.

4th Emergency Rescue Squadron
Members of the 4th Emergency Rescue Squadron who served in the Pacific during World War II will hold a reunion on September 22–25, 1987, in Colorado Springs, Colo. **Contact:** William "Mac" McGregor, P. O. Box 98, St. Germain, Wis. 54558. Phone: (715) 479-8801.

6th Photo Squadron Veterans Ass'n
The 6th Photo Squadron, which was stationed at Peterson Field, Colo., and St. Louis, Mo., will hold a reunion on October 16–18, 1987, at the Holiday Inn in Orlando, Fla. **Contact:** Frank Schaufler, 1162 S. W. Willow Lane, Palm City, Fla. 33490. Phone: (305) 283-0076.

8th Air Force Historical Society
The 8th Air Force Historical Society will hold its thirteenth annual reunion on October 14–18, 1987, in Pittsburgh, Pa. **Con-**

tact: 8th Air Force Historical Society, P. O. Box 3556, Hollywood, Fla. 33083.

9th Bomb Group
Members of the 9th Bomb Group who served on Tinian Island in 1945 will hold a reunion on October 22–25, 1987, in Tucson, Ariz. **Contact:** Leonard W. Carpi, 523 E. Oakey Blvd., Las Vegas, Nev. 89104. Phone: (702) 384-5353. Herbert W. Hobler, 295 Mercer Rd., Princeton, N. J. 08540. Phone: (609) 924-4389.

14th Air Force Ass'n
The Fourteenth Air Force "Flying Tigers" will hold a reunion on September 10–12, 1987, in Orlando, Fla. **Contact:** William K. Bonneaux, 889 Vance Circle N. E., Palm Bay, Fla. 32905. Phone: (305) 727-3560. Donald M. Howland, P. O. Box 561, North Windham, Me. 04062. Phone: (207) 892-5160 or (207) 761-0921.

21st Air Depot Group
The 21st Air Depot Group will hold a reunion on September 5, 1987, at the Holiday Inn in Englewood, Ohio. **Contact:** James Campbell, 20 Chelsea St., Staten Island, N. Y. 10307.

25th Fighter Squadron
Members of the 25th Fighter Squadron "Assam Draggin" will hold a reunion on September 9–12, 1987, at the Palace Hotel in Lake Buena Vista, Fla. **Contact:** Stanley A. Strout, 4717 Montgomery Dr., Santa Rosa, Calif. 95405. Phone: (707) 539-0357.

UNIT REUNIONS

Reunion Notices

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.

27th Air Depot Group
The 27th Air Depot Group will hold a reunion on September 4–6, 1987, in St. Paul, Minn. **Contact:** Sidney A. Ronnigen, Box 119, Goodhue, Minn. 55027. Phone: (612) 923-4686.

41st Aerospace Rescue and Recovery Squadron
The 41st Aerospace Rescue and Recovery Squadron at McClellan AFB, Calif., is scheduled to be deactivated in September and will hold a reunion on September 26–27, 1987, at McClellan AFB, Calif., to coincide with the deactivation. All former squadron members are invited. **Contact:** Lt. Col. Allan W. Rowe, USAF, 41st ARRS/CCF, McClellan AFB, Calif. 95652-6004. Phone: (916) 643-4164.

B-57 Canberra Ass'n
Crew members of the B-57 Canberra will hold a reunion on September 4–6, 1987, in Ogden, Utah. **Contact:** B-57 Canberra Association, P. O. Box 2703, Ogden, Utah 84404. Phone: (801) 782-4902 (Jimmie L. Smith) or (801) 544-5438 (George Cap).

62d/37th Troop Carrier Squadrons
Members of the 62d and 37th Troop Carrier Squadrons based at Ashiya AB, Japan, in 1952–57 will hold a reunion on October 29–November 1, 1987, in Houston, Tex. **Contact:** Earl Ehrenberg, 3012 Denver St., San Diego, Calif. 92117. Phone: (619) 275-3822.

63d AAF/FTD
The 63d Army Air Forces Field Training Detachment based at Douglas, Ga., in 1941–44 will hold a reunion on October 18–24, 1987, on Jekyll Island, Ga. **Contact:** Paul D. Schlundt, 3149 N. Winfield Ave., Indianapolis, Ind. 46222-1953. Phone: (317) 924-1825.

75th Fighter Squadron
The 75th Fighter Squadron will hold a reunion on September 4–6, 1987, in Dayton, Ohio. **Contact:** A. J. "Jack" Gadberry, 1116 Charlston Ct., Fairborn, Ohio 45324. Myron D. Levy, 11933 Claychester Dr., Des Peres, Mo. 63131.

79th Fighter Group Ass'n
Members of the 79th Fighter Group (which includes the 85th, 86th, and 87th Fighter Squadrons) will hold a reunion on July 26–30, 1987, at the Tropicana Hotel and Country Club in Las Vegas, Nev. **Contact:** Edwin Newbould, 1206 S. E. 27th Terrace, Cape Coral, Fla. 33904. Phone: (813) 574-7098.

82d Bomb Squadron
The 82d Bomb Squadron, 12th Bomb Group, will hold a reunion on September 3–6, 1987, in Great Falls, Mont. **Contact:** Pat Goodover, 803 Forest, Great Falls, Mont. 59404.

93d Troop Carrier Squadron
The 93d Troop Carrier Squadron, 439th Troop Carrier Group, will hold a reunion on October 30–November 2, 1987, at the Fort Magruder Inn in Williamsburg, Va. **Contact:** Lt. Col. Tom Morris, USAF (Ret.), 456 St. George's Ct., Satellite Beach, Fla. 32937. Phone: (305) 773-6960.

161st Tactical Reconnaissance Squadron
World War II veterans of the 161st Tactical Reconnaissance Squadron are planning to hold a reunion on October 16–18, 1987, in Louisville, Ky. **Contact:** Don Hilliker, 6701 Falls Creek Rd., Louisville, Ky. 40222. Phone: (502) 425-2760.

312th Bomb Group
The 312th Bomb Group "The Roarin' 20s" will hold a reunion on August 7–9, 1987, at the Ramada Inn in Nashville, Tenn. **Contact:** Robert and Betty Beard, Rte. 1, Box 367, Burns, Tenn. 37029. Phone: (615) 670-5703.

319th Bomb Group
Veterans of the 319th Bomb Group will hold a reunion on August 16–20, 1987, at Grand Forks AFB, N. D. **Contact:** Capt. Tracey E. McFadden, USAF, 319th BMW/DOV, Grand Forks AFB, N. D. 58205. Phone: (701) 594-6466.

341st Fighter Squadron Ass'n
Members of the 341st Fighter Squadron, Fifth Air Force, from World War II will hold a reunion on September 24–27, 1987, at the Clarion Hotel in St. Louis, Mo. **Contact:** Tony Gibbons, 18 Burgandy Dr., Lake St. Louis, Mo. 63367. Phone: (314) 625-3016.

376th Heavy Bomb Group Ass'n
The 376th Bomb Group will hold a reunion on September 27–October 1, 1987, at the Holiday Inn Waterside in Norfolk, Va. **Contact:** Norman Appold, 126 Woodlake Dr., N. W., Gainesville, Ga. 30506. Phone: (404) 535-7210.

385th Bomb Group
The 385th Bomb Group will hold a reunion on July 24–26, 1987, in Dayton, Ohio. **Contact:** R. G. Weikert, 6306 Green Leaves Rd., Indianapolis, Ind. 46220. Phone: (317) 257-3969.

455th Strategic Missile Wing
Members of the 455th Strategic Missile Wing, which includes the 740th, 741st, and 742d Strategic Missile Squadrons, will hold a reunion on August 26–28, 1987, in Minot, N. D. **Contact:** Tom O. Olofson, 4525 Banff St., Annandale, Va. 22003. Raymond T. Cwikowski, 700 Banbury Rd., Dayton, Ohio 45459.

459th Fighter Squadron
The 459th Fighter Squadron "Twin Dragon" will hold a reunion on September 10–12, 1987, in Bozeman, Mont. **Contact:** Roger Dent, Box 191, Hulett, Wyo. 82720.

485th Fighter Squadron
The 485th Fighter Squadron will hold a reunion on September 17–19, 1987, in Dayton, Ohio. **Contact:** William A. Swart, 202 Norwegian Dr., Eaton, Ohio 45320. Phone: (513) 456-2259.

500th Bomb Squadron Ass'n
Members of the 500th Bomb Squadron, 345th Bomb Group, from World War II will hold a reunion on October 7–11, 1987, at the Marriott Hotel in Orlando, Fla. **Contact:** Ed Madeo, 2321 Southern Lite Ave., Lutz, Fla. 33549. Phone: (813) 949-8058. Tom Seery, 11 Vista Palm Lane, Vero Beach, Fla. 32960. Phone: (305) 562-2419.

530th Fighter Squadron
The 530th Fighter Squadron "Yellow Scorpions" will hold a reunion on September 24–26, 1987, at the Chamberlin Resort in Hampton, Va. **Contact:** A. X. Hiltgen, P. O. Box 708, Floral City, Fla. 32636. Phone: (904) 726-8625.

Coming Events

July 17–18, **Wisconsin State Convention,** Milwaukee . . . July 17–19, **Mississippi State Convention,** Biloxi . . . July 17–19, **Pennsylvania State Convention,** Harrisburg . . . July 17–19, **Texas State Convention,** Dallas . . . July 18, **Nevada State Convention,** Tonopah . . . July 24–25, **Oregon State Convention,** Portland . . . July 31–August 1, **Colorado State Convention,** Lowry AFB . . . July 31–August 2, **Florida State Convention,** MacDill AFB . . . July 31–August 1, **Missouri State Convention,** Kansas City . . . August 7–9, **Arkansas State Convention,** Fayetteville . . . August 19, **Delaware State Convention,** Dover AFB . . . August 20–23, **California State Convention,** Vandenberg AFB . . . August 21–23, **Utah State Convention,** Salt Lake City . . . August 28–30, **Arizona State Convention,** Sedona . . . August 29, **Illinois State Convention,** Glenview NAS, Chicago . . . August 29, **Indiana State Convention,** Fort Wayne . . . September 14–17, **AFA National Convention and Aerospace Development Briefings and Displays,** Washington, D. C. . . . September 25–26, **North Dakota State Convention,** Minot.

MOVING?

Let us know your new address six weeks in advance so that you don't miss any copies of AIR FORCE.

Clip this form and attach your mailing label (from the plastic bag that contained this copy of your magazine), and send to:

Air Force Association
Attn: Change of Address
1501 Lee Highway
Arlington, VA
22209-1198

Please fasten your mailing label here

Please print your NEW address here:

NAME

ADDRESS

CITY, STATE, ZIP CODE

AFA CHAMPLUS® .... Strong Protection

When a Single Accident or Illness Could Cost *You* Thousands of Dollars, You Need AFA CHAMPLUS®. . . for *Strong* Protection against Costs CHAMPUS Doesn't Cover!

For military retirees and their dependents . . . and dependents of active-duty personnel . . . more and more medical care is being provided through the government CHAMPUS program.

And, of course CHAMPUS pays 75% of allowable charges.

But today's soaring hospital costs—nearly $550 a day in some major metropolitan medical centers—can run up a $20,000 bill for even a moderately serious accident or illness.

Your 25% of $20,000 is no joke!

AFA CHAMPLUS® protects you against that kind of financial catastrophe *and* covers most of your share of routine medical expenses as well.

HOW AFA CHAMPLUS® WORKS FOR YOU!

WHO IS ELIGIBLE?

1) All AFA members under 65 years of age who are currently receiving military retired pay and are eligible for benefits under Public Law 89-614 (CHAMPUS), their spouses under age 65 and their unmarried dependent children under age 21, or age 23 if in college. (There are some exceptions for older age children. See "Exceptions and Limitations".)
2) All eligible dependents of AFA members on active duty. Eligible dependents are spouses under age 65 and unmarried dependent children under age 21, or age 23 if in college. (There are some exceptions for older age children. See "Exceptions and Limitations".)

EXCEPTIONAL BENEFIT PLAN

(See chart at right)

FOUR YEAR BASIC BENEFIT. Benefits for most injuries or illnesses may be paid for up to a four-year period.

PLUS THESE SPECIAL BENEFITS . . .

1) Up to 45 consecutive days of in-hospital care for mental, nervous, or emotional disorders. Outpatient care may include up to 20 visits of a physician or $500 per insured person each year.
2) Up to 30 days care per insured per year in a Skilled Nursing Facility.
3) Up to 30 days care per insured per year and up to 60 days lifetime in a CHAMPUS-approved Residential Treatment Center.
4) Up to 30 days care per insured per year and up to 60 days lifetime in a CHAMPUS-approved Special Treatment Facility.
5) Up to 5 visits per insured per year to Marriage and Family Counselors under conditions defined by CHAMPUS.

YOUR INSURANCE IS NON-CANCELLABLE

As long as you are a member of the Air Force Association, pay your premiums on time, and the master contract remains in force, your insurance cannot be cancelled.

ADMINISTERED BY YOUR ASSOCIATION . . . UNDERWRITTEN BY MUTUAL OF OMAHA

AFA CHAMPLUS® insurance is administered by trained insurance professionals on your Association staff. You get prompt, reliable, courteous service from people who know your needs and know every detail of your coverage. Your insurance is underwritten by Mutual of Omaha, the largest individual and family health insurance company in the world.

AFA OFFERS YOU HOSPITAL BENEFITS AFTER AGE 65

Once you reach Age 65 and are covered under Medicare, AFA offers you protection against hospital expenses not covered by Medicare through the *Senior Age Benefit Plan* of AFA Hospital Indemnity Insurance. Members enrolled in AFA CHAMPLUS® will automatically receive full information about AFA's Medicare supplement program upon attainment of Age 65 so there will be no lapse in coverage.

AFA CHAMPLUS® BENEFIT SCHEDULE

Care	*CHAMPUS Pays*	*AFA CHAMPLUS® Pays*
	For Military Retirees Under Age 65 and Their Dependents	
Inpatient civilian hospital care	CHAMPUS pays 75% of allowable charges.	CHAMPLUS® pays the 25% of allowable charges not covered by CHAMPUS.
Inpatient military hospital care	The only charge normally made is a $7.30 per day subsistence fee, not covered by CHAMPUS.	CHAMPLUS® pays the $7.30 per day subsistence fee.
Outpatient care	CHAMPUS COVERS 75% of outpatient care fees after an annual deductible of $50 per person ($100 maximum per family) is satisfied.	CHAMPLUS® pays the 25% of allowable charges not covered by CHAMPUS after the deductible has been satisfied.
	For Dependents of Active-Duty Military Personnel	
Inpatient civilian hospital care	CHAMPUS pays all covered services and supplies furnished by a hospital, less $25 or $7.30 per day, whichever is greater.	CHAMPLUS® pays the greater of $7.30 per day or $25 of the reasonable hospital charges not covered by CHAMPUS.
Inpatient military hospital care	The only charge normally made is a $7.30 per day subsistence fee, not covered by CHAMPUS.	CHAMPLUS® pays the $7.30 per day subsistence fee.
Outpatient care	CHAMPUS covers 80% of outpatient care fees after an annual deductible of $50 per person ($100 maximum per family) is satisfied.	CHAMPLUS® pays the 20% of allowable charges not covered by CHAMPUS after the deductible has been satisfied.

NOTE: Outpatient benefits cover emergency room treatment, doctor bills, pharmaceuticals, and other professional services.

There are some reasonable limitations and exclusions for both inpatient and outpatient coverage. Please note these elsewhere in the plan description.

Against Costs CHAMPUS Doesn't Cover

APPLY TODAY!
JUST FOLLOW THESE STEPS

Choose either AFA CHAMPLUS® Inpatient coverage or combined Inpatient and Outpatient coverage for yourself. Determine the coverage you want for dependent members of your family. Complete the enclosed application form in full. Total the premium for the coverage you select from the premium tables on this page. Mail the application with your check or money order for your initial premium payment, payable to AFA.

AFA's CHAMPLUS®

EXCEPTIONS & LIMITATIONS

Coverage will not be provided for conditions for which treatment has been received during the 12-month period prior to the effective date of insurance until the expiration of 12 consecutive months of insurance coverage without further treatment. *After coverage has been in force for 24 consecutive months, pre-existing* conditions will be covered regardless of prior treatment. Children over age 21 (age 23 if in college) will continue to be eligible if they have been declared incapacitated and if they were insured under CHAMPLUS® on the date so declared. Coverage for these older age children will be provided at slightly higher rates upon notification to AFA.

EXCLUSIONS

This plan does not cover and no payment shall be made for:

a) routine physical examinations or immunizations

b) domiciliary or custodial care

c) dental care (except as required as a necessary adjunct to medical or surgical treatment)

d) routine care of the newborn or well-baby care

e) injuries or sickness resulting from declared or undeclared war or any act thereof

f) injuries or sickness due to acts of intentional self-destruction or attempted suicide, while sane or insane

g) treatment for prevention or cure of alcoholism or drug addiction

h) eye refraction examinations

i) Prosthetic devices (other than artificial limbs and artificial eyes), hearing aids, orthopedic footwear, eyeglasses and contact lenses

j) expenses for which benefits are or may be payable under Public Law 89-614 (CHAMPUS)

PREMIUM SCHEDULE

Plan 1—For military retirees and dependents (Quarterly Premiums)

Inpatient Benefits

Member's Attained Age	Member	Spouse	Each Child
Under 50	$21.88	$27.35	$14.85
50–54	$32.70	$40.88	$14.85
55–59	$39.78	$49.73	$14.85
60–64	$45.80	$57.25	$14.85

Inpatient and Outpatient Benefits

Under 50	$30.82	$36.98	$37.13
50–54	$42.35	$50.82	$37.13
55–59	$56.01	$67.21	$37.13
60–64	$64.48	$77.38	$37.13

Plan 2—For dependents of active-duty personnel (Annual Premiums)

Inpatient Only	None	$ 9.68	$ 5.94
Inpatient and Outpatient	None	$38.72	$29.70

APPLICATION FOR AFA CHAMPLUS®

Group Policy GMG-FC70
Mutual of Omaha Insurance Company
Home Office: Omaha, Nebraska

Full name of Member _____
Rank Last First Middle

Address _____
Number and Street City State ZIP Code

Date of Birth _____ Current Age ____ Height ____ Weight ____ Soc. Sec. No. _____
Month/Day/Year

This insurance coverage may only be issued to AFA members. Please check the appropriate box below:

☐ I am currently an AFA Member.

☐ I enclose $18 for annual AFA membership dues (includes subscription ($14) to AIR FORCE Magazine).

PLAN & TYPE OF COVERAGE REQUESTED

Plan Requested (Check One)
☐ AFA CHAMPLUS® PLAN I (for military retirees & dependents)
☐ AFA CHAMPLUS® PLAN II (for dependents of active-duty personnel)

Coverage Requested (Check One)
☐ Inpatient Benefits Only
☐ Inpatient and Outpatient Benefits

Person(s) to be insured (Check One)
☐ Member Only
☐ Spouse Only
☐ Member & Spouse
☐ Member & Children
☐ Spouse & Children
☐ Member, Spouse & Children

PREMIUM CALCULATION

All premiums are based on the attained age of the AFA member applying for this coverage. Plan I premium payments are normally paid on a quarterly basis but, if desired, they may be made on either a semi-annual (multiply by 2), or annual (multiply by 4) basis.

Quarterly (annual) premium for member (age ____) $_____

Quarterly (annual) premium for spouse (based on member's age) $_____

Quarterly (annual) premium for ____ children @ $ $_____

Total premium enclosed $_____

If this application requests coverage for your spouse and/or eligible children, please complete the following information for each person for whom you are requesting coverage.

Names of Dependents to be Insured	Relationship to Member	Date of Birth (Month/Day/Year)

(To list additional dependents, please use a separate sheet.)

In applying for this coverage, I understand and agree that (a) coverage shall become effective on the last day of the calendar month during which my application together with the proper amount is mailed to AFA, (b) only hospital confinements (both inpatient and outpatient) or other CHAMPUS-approved services commencing after the effective date of insurance are covered and (c) any conditions for which I or my eligible dependents received medical treatment or advice or have taken prescribed drugs or medicine within 12 months prior to the effective date of this insurance coverage will not be covered until the expiration of 12 consecutive months of insurance coverage without medical treatment or advice or having taken prescribed drugs or medicine for such conditions. I also understand and agree that all such pre-existing conditions will be covered after this insurance has been in effect for 24 consecutive months.

Date _____, 19 ____ _____
Member's Signature

Form 6173GH App.

Application must be accompanied by a check or money order. Send remittance to: Air Force Association, Insurance Division, 1501 Lee Highway, Arlington, VA 22209-1198

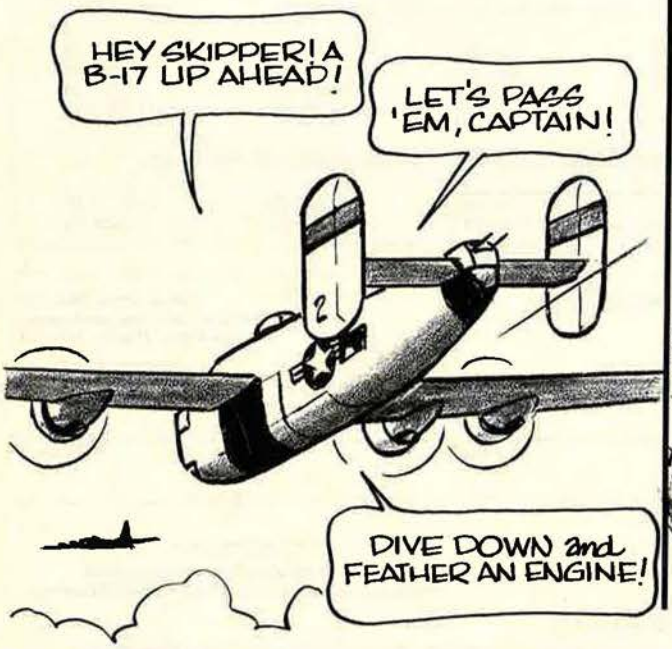
7/87

Bob Stevens'

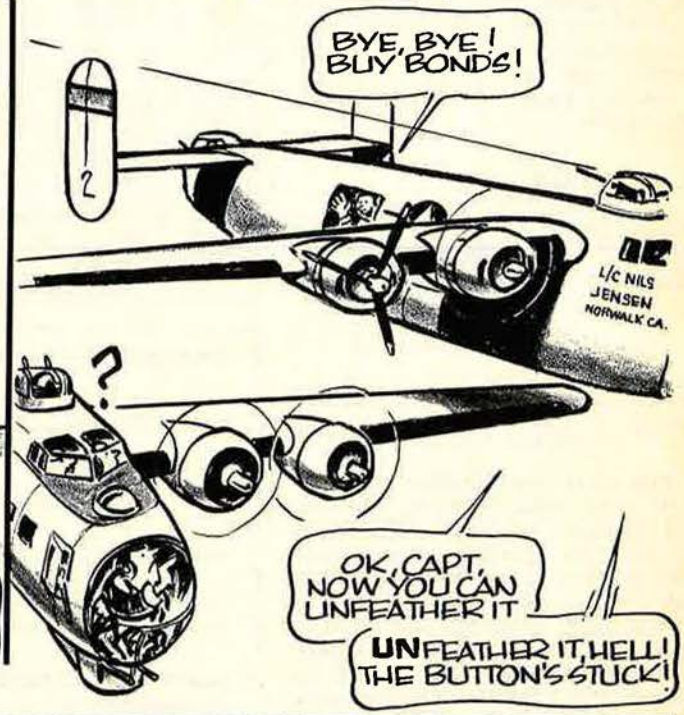
"There I was..."

WE GO BACK TO WW DEUCE FOR THESE TALES. THERE ARE MANY VARIANTS OF THE FIRST STORY. WE THINK THIS ONE - EMBELLISHED SOMEWHAT - HAS THE BEST END-ING.

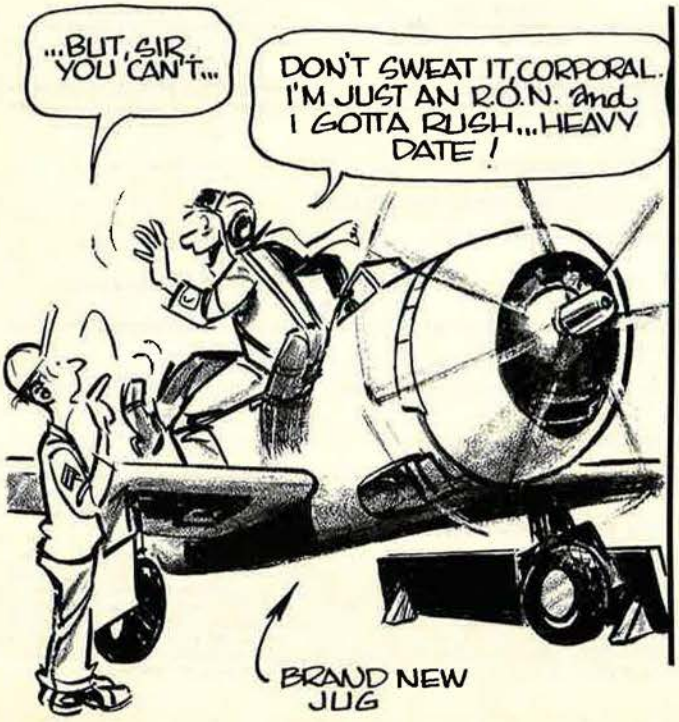
SCENE: NEW AIRCRAFT, NEW CREWS EN ROUTE TO EUROPE - AN HOUR OUT OF THE AZORES.



SO THE '24 CRUISES BY THE '17 ON THREE ENGINES!

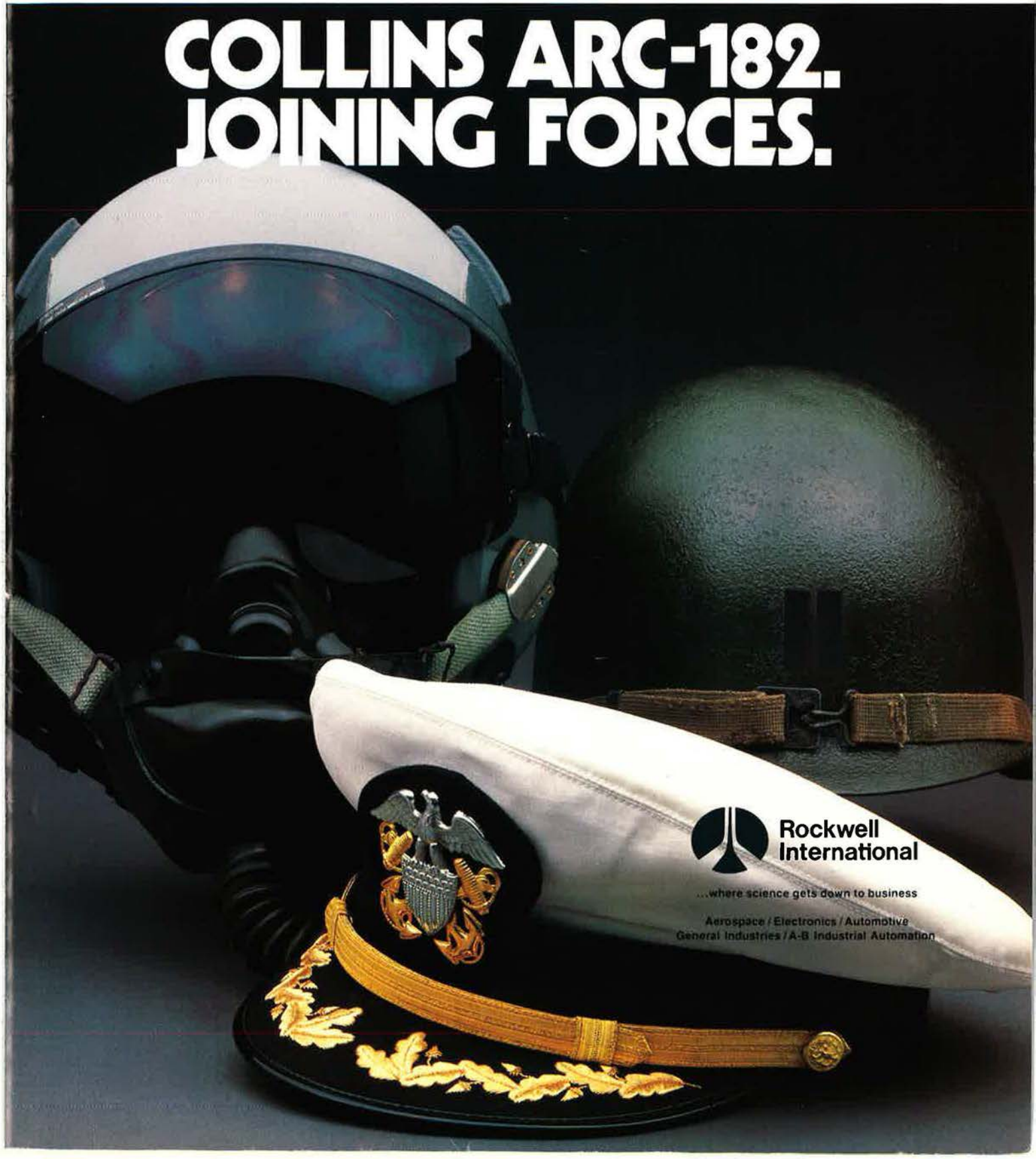


IN A TOTALLY UNRELATED STORY WE HAVE THE CASE - NEAR WAR'S END - OF A HOT PILOT PARKING HIS BIRD WHERE HE SHOULDN'T OUGHTA -



The multimode Collins ARC-182 replaces four separate radios to provide a single tri-service communications terminal. ■ Widely used in Navy aircraft, the ARC-182 delivers multiband coverage of VHF-FM/AM and UHF-FM/AM frequencies. Available options enable multi-channel scanning and/or voice Satcom. It has 11,960 channels in the 30 to 400 MHz AM/FM frequency range. ■ The compact Collins ARC-182 completely integrates communications with close air support, air traffic control, military and NATO forces and maritime operations. ■ The unit offers built-in or remote control operation. Optional configurations can be controlled from a MIL-STD-1553 multiplex data bus. It features built-in test to the module level for quick, easy maintenance. Dual installations provide redundant, full-band coverage. ■ For information contact: Collins Defense Communications, Rockwell International, 350 Collins Road N.E., MS 120-131, Cedar Rapids, Iowa 52498, U.S.A. (319) 395-1600, Telex 464-435. **Collins ACCD: The Electronic Combat Specialists.**

COLLINS ARC-182. JOINING FORCES.



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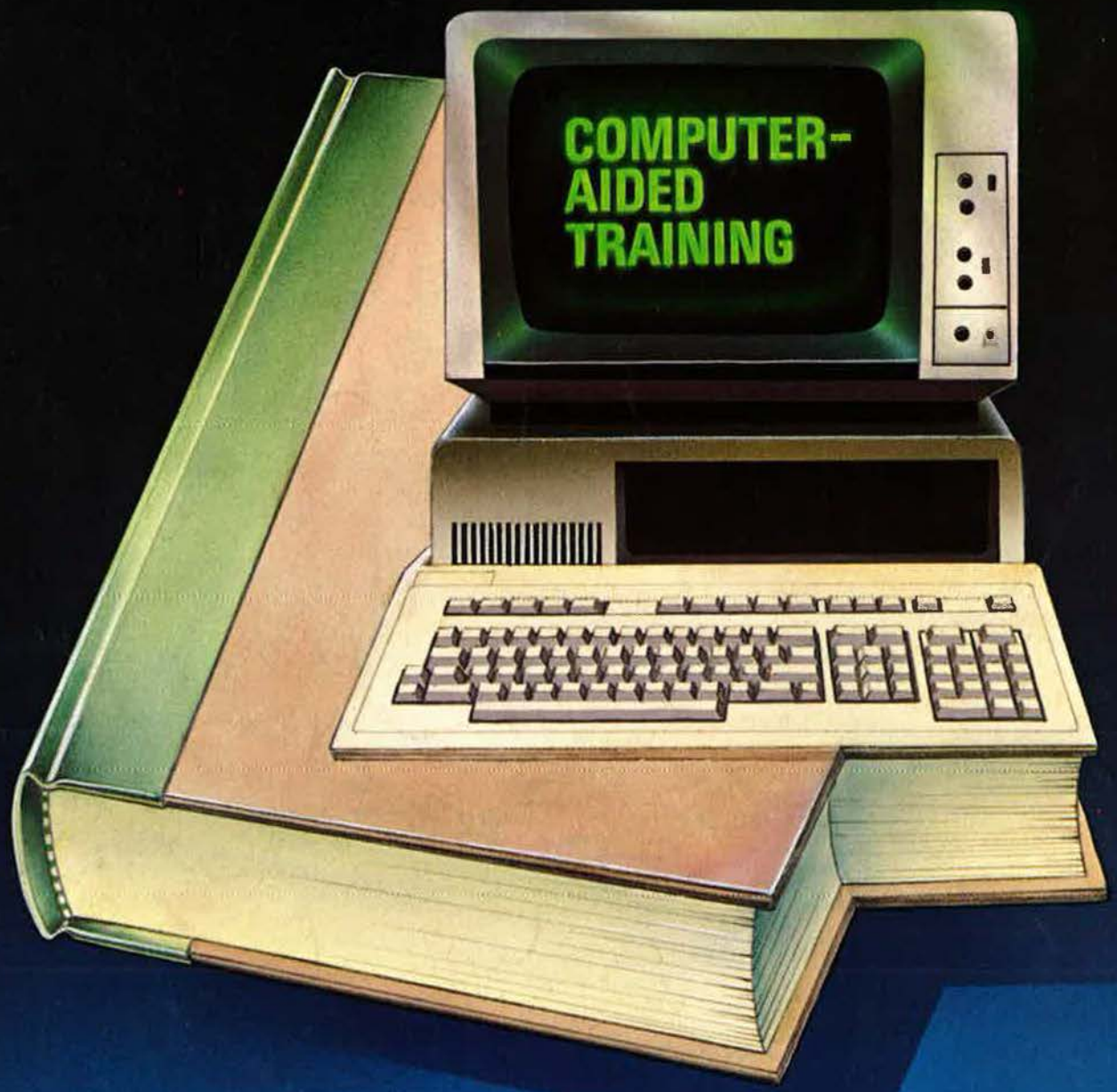

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