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MAGAZINE

Picking Priorities for Tough Times





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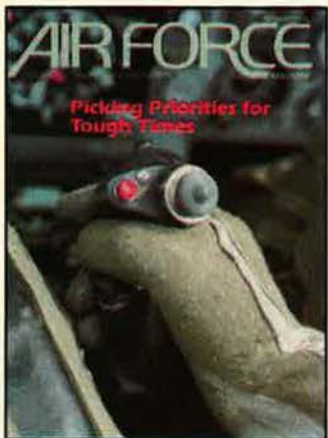
GARRETT



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AN EDITORIAL

What the Public Doesn't Know

By David L. Gray, PUBLISHER

THE public believes waste and fraud to be rampant in the defense budget. That is the primary conclusion of an opinion survey conducted earlier this year for the Packard Commission on defense management. Closer analysis of the survey report, however, yields two other conclusions that should be of particular interest to the readers of this magazine.

The first is that the American people are seriously misinformed about how their tax dollars are spent and managed. The second is that despite these negative misconceptions, there is still strong latent support for the armed forces and national defense.

Here's part of what the average American believes, according to the survey: that forty-six percent of the federal budget goes to defense; that almost half of the defense budget is lost to waste and fraud; that fraud—or other illegal activity—drains away as much of the defense budget as waste does; and that the Defense Department cannot or will not take effective action to reduce waste and fraud.

There is good news for these average Americans. Defense consumes only twenty-six percent of the federal budget, not forty-six percent. Since 1981, there have been 74,000 vigorous audits of defense procurements. They turned up findings that represent, in Pentagonese, "potential savings of \$9 billion." That level of "savings" works out to six-tenths of one percent of total DoD budget authority from FY '81 through FY '86. When an audit finds anything wrong at all, it tends to be inefficiency, not fraud. As for spare parts—the aspect of defense procurement that has most enraged the public—the data consistently confirms that overpricing is confined to a fraction of one percent of the defense budget and that fraud is even rarer.

Far and away, most of the procurement abuses that have come to light were discovered by—and corrected by—the Defense Department and the services themselves. Most knowledgeable analysts agree that defense management is better than the average found in large-scale enterprises in either the private or public sectors.

No amount of waste or fraud is acceptable. The public will not tolerate it, and every dollar squandered is one fewer that can be applied to the crying needs of national defense. On the other hand, anyone who believes that the Pentagon hogs forty-six percent of the federal budget and loses nearly half of that to waste and fraud simply is not in possession of the facts.

The amazing thing is that the public, believing these preposterous things to be true, still is supportive of the armed forces! Sixty-nine percent of those surveyed expressed positive or very positive general attitudes toward the military. Sixty-seven percent felt the US

should take an active role in world affairs, and seventy-three percent said that strong, effective American forces are essential to the preservation of freedom.

Fifty-two percent of the public wanted to hold the defense budget where it was. (The survey was taken in January and February 1986, before Gramm-Rudman-Hollings bloodletting began in earnest.) Twenty-one percent were in favor of increasing the defense budget, and only twenty-five percent wanted to see it cut. These figures might have been even more supportive had the respondents realized they were overestimating the defense share of the federal budget by seventy-five percent and the extent of waste and fraud by several great leaps of the imagination.

Further, sixty-three percent of the public agrees with the statement that "military defense is one area of the budget that we must spend whatever is needed rather than only what we can afford." Some of that majority, however, falls away when it comes to perception of requirements. Forty-two percent of the respondents said the US already has a military capability that is much greater than it needs to protect its interests in the world. Fifty-four percent disagreed. The survey did not explore how much the respondents knew about actual force levels and operational taskings, but it's a safe guess that few of them were aware of how thinly the US military is stretched against its worldwide missions.

It is legitimate to wonder where the public—which is inclined basically to support a strong program of national defense—got the notion that the military budget is running wild. The answer reflects no credit on the popular press or self-seeking politicians. In fact, there is every reason to believe that the public, given a better understanding of the situation, might wish to see an even higher priority for national defense. Judging from their legislative and speechmaking behavior, this seems to have escaped the attention of some members of Congress.

It will be a better investment of our time, though, to think along other lines. Twice in recent months, editorials in this magazine have pointed to the fundamental purpose of the Air Force Association: to promote public understanding of airpower and national security issues. The findings of the Packard Commission survey are a compelling reminder of how urgent and vital that purpose is.

The greatest contribution that we in the Air Force Association—and others of like mind and sincere interest—can make is to be sure that we are well informed ourselves and then to share that information aggressively. In this case, what the public doesn't know can hurt us all. ■



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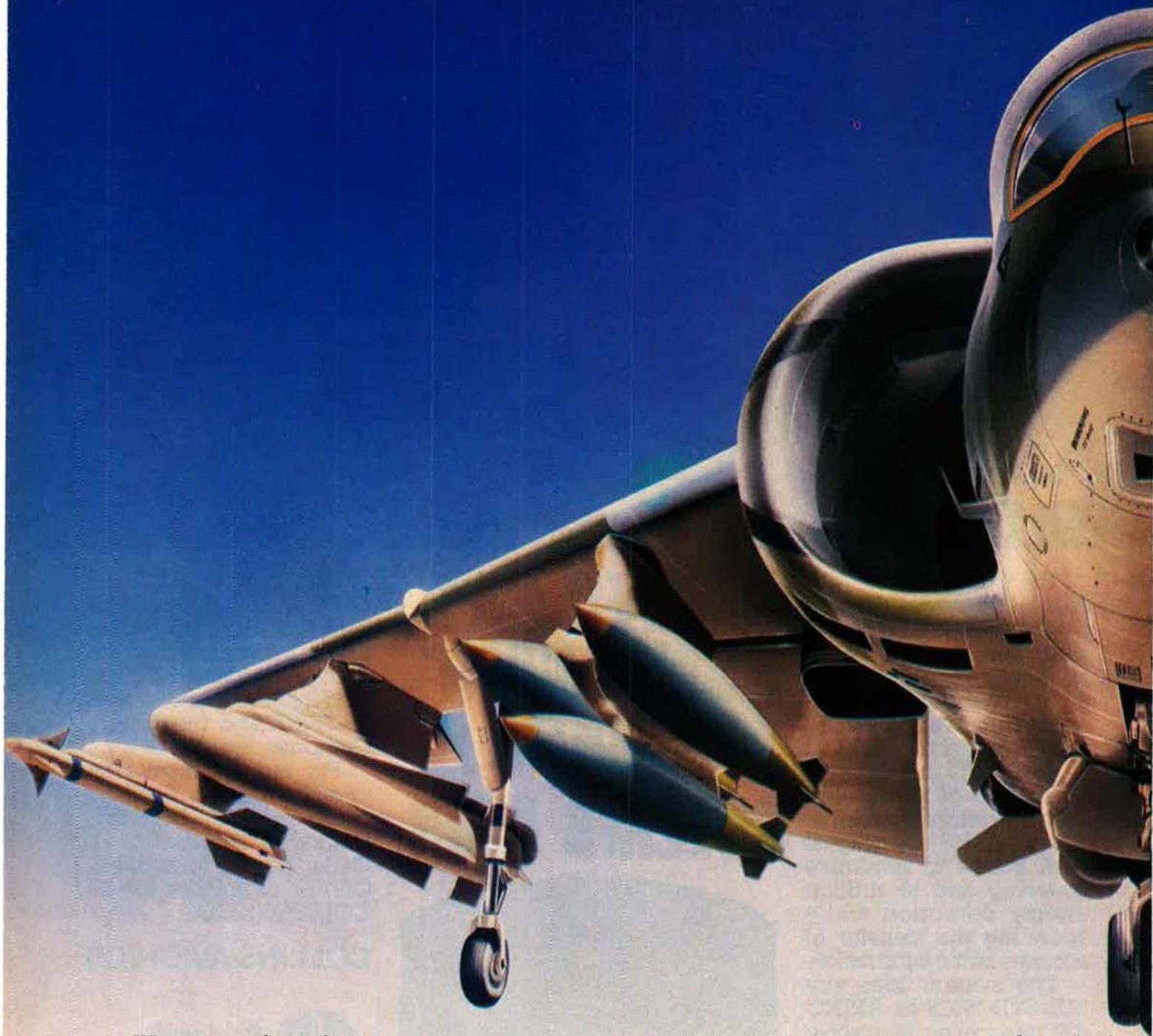


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Jointness and Reform

I have just read David L. Gray's editorial, "In the Name of Jointness," in the August 1986 issue of *AIR FORCE Magazine* (p. 8) and must say that I am both frightened and offended. The House Armed Services Committee has quite obviously overstepped the boundaries of common sense in its efforts to rid us of the Joint Chiefs as we know them.

To my mind, the creation of a "joint specialty" career field for officers is ludicrous, and a requirement for an officer to serve in that field in order to attain general officer rank is lunacy. Military people who spend their time in such duties invariably become "greased wheels," and to put a general who has spent a good portion of his career in joint assignments in charge of a major command is analogous to putting a brand-new O-1 in charge of a fighter wing.

I guess that the HASC doesn't understand that, in military organizations, you must have some form of central authority. Giving the CINCs of the ten commands full authority could lead to fights and backbiting and eventually the impairment of the military's readiness.

I must say that I am offended by Rep. Les Aspin's remark that the new proposal is a "slap at interservice parochialism." This comes at a time when there is new and unprecedented cooperation among the services. If Representative Aspin is so worried about parochialism, he should turn his attention to his own Democratic Party, which would totally undermine the foundations of this country in order to discredit the Republican Party and the present Administration.

SSgt. Dennis H. Berger, USAF
Altus AFB, Okla.

I am glad the CINC made me join the Air Force Association. David L. Gray's editorial "In the Name of Jointness" in the August 1986 issue was worth the annual dues. Mr. Gray is too kind to our lawmakers, however.

The Senate bill on military "reform" differs from the House bill only

in degree, not in kind. It also is stupid and irresponsible and raises troublesome questions about the judgment or motives of those who seek to perpetrate such mischief.

It remains for our Commander in Chief to save us from our failures, which have opened the door for the "deformers," and our hope lies in him siding with the professionals, tarnished as we are, rather than the politicians. After he vetoes the monstrosity, one can only hope that he will similarly discipline the services that have embarrassed him and will hold the professionals strictly accountable for their performance.

Col. G. D. Batcheller, USMC
Scott AFB, Ill.

Who's the Second?

I've been reading through my copy of the August 1986 issue of *AIR FORCE Magazine*. On page 40 of that issue in "Aerospace World," you say that, on May 17, the 149th Tactical Fighter Group at Kelly AFB, Tex., became the second Air National Guard unit to receive the F-16.

They may have got the F-16 on May 17; however, according to the March 31, 1986, issue of *Aviation Week and Space Technology*, the 169th Tactical Fighter Group at Tucson, Ariz., became the second Air National Guard unit to receive the F-16. What is the truth here, guys?

Hey, what about the 114th TFG at Sioux Falls, S. D.? It would be great to watch F-16s fly around Sioux Falls once in a while!

Besides reading the *Aviation Week* article, I know that Tucson has the

F-16s, because two of them were here in Sioux Falls to celebrate the fortieth anniversary of the South Dakota Air National Guard on August 9. The Thunderbirds were here, too, along with a lot of other great military aircraft.

I'd appreciate it if you fellows could let us readers (and especially us F-16 fans) know which story is right!

Gary K. Ruby
Sioux Falls, S. D.

● According to the *Air National Guard*, the 149th Tactical Fighter Group at Kelly AFB, Tex., was the second ANG unit to receive the F-16, as we reported. The 169th TFG, based at McEntire ANGB, S. C., was the first ANG unit to be equipped with the F-16. The 162d TFG at Tucson, Ariz., is slated to receive its F-16s in the last quarter of this year.—THE EDITORS

The Erosion of Quality

I applaud the letter from Capt. Steven D. Kahne on page 10 of the July 1986 issue of *AIR FORCE Magazine*. It was refreshing to hear from someone who's really "in the trenches."

I can understand his wonderment that there is no mention or apparent understanding of quality among those in positions of high influence. The service leaders jostle among themselves in pleading for money to buy their new weapons. Congressmen grudgingly dole it out. Industrialists boast of what they have to offer like salesmen on a car lot.

Out of this comes a contract, and everyone settles down complacently, awaiting the outcome. The only guy on the job is the Defense Contract Administration Services Representative (DCASR) on site. He must attempt to see that the government is getting its money's worth. Often the contract is vague and open to interpretation. If he catches a violation, he can refuse the product, cite the contractor for default, and withhold payment. The contractor must respond within an allotted period.

The contractor then corrects the deficiency or denies the defect. If it

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costs money, he invariably denies the defect and replies. The DCASR can now only endorse it with his rebuttal and forward it to the Program Office for resolution.

There, costs, schedules, and performance are weighed, usually in conversations with the contractor, bypassing the DCASR office. Usually, the issue is resolved in the contractor's favor. Occasionally, the Program Office backs the DCASR, and the citation is returned to the contractor. He then either swallows the bullet or, as is often the case, uses his other resources to appeal the issue up through the Defense Department's contract appeals system. All this takes time.

In the meantime, the DCASR must continue to accept and pay for the item under the now-modified contract. He can only hope that the government sticks to its guns and that the items are corrected by retrofit changes somewhere in the field that are paid for by the rightful party.

It is a frustrating, unsatisfying, thankless job. It is also not a career-enhancing assignment. I spent two years as an Engineering Officer at a Naval Plant Representative Office. . . .

As to quality itself, there does appear to be an almost complete lack of the old "pride of workmanship" in this country. This includes all levels—from engineers and administrators all the way to the assembly line. The time clock and paycheck have become paramount.

American carmakers, appliance manufacturers, camera producers, etc., have all seen their markets drifting overseas to quality producers. The DCAA is all that's kept our weapons producers from facing the same fate.

Lt. Cmdr. R. N. McDowell,
USN (Ret.)
Garden Grove, Calif.

Air Defense Fighter

For years now, the Air National Guard has been providing the bulk of this nation's air defense with 1950s and 1960s technology. It's time to quit paying lip service to the phrase "The Guard Belongs." This especially holds true for the Guard in the area of continental air defense, in which the F-106 was first and the F-4C/D is now

the primary interceptor aircraft.

An upgraded F-4D would surely be a quantum improvement over current resources, but only if the upgrade were complete. A fifteen-year-old (or more) F-4 with ten-year-old avionics is *not* the answer. To upgrade the F-4 effectively, avionics, airframe, and engines need to be updated to a late 1980s level. The Air Force can ill afford to put precious funds into a stop-gap aircraft, such as a partially updated old fighter. The realities of the current budget environment just won't allow this action. So what is the answer to the nation's air defense needs?

The other two aircraft that are under consideration—the F-16C and the F-20A—are state of the art, with lifetimes extending well into the twenty-first century. The F-20 Tigershark does, however, offer two items that are not part of the F-16 package. The first is that the Tigershark would be a "new" fighter. It would provide a third production line of fighters that would be invaluable in times of increased world tensions. The second advantage would fall in the area of tactics and training. The F-20 would improve our air-to-air forces overall by providing a superior air defense aircraft and a highly capable fighter to train against in peacetime. The F-20 would also further complicate a potential adversary's tactical planning.

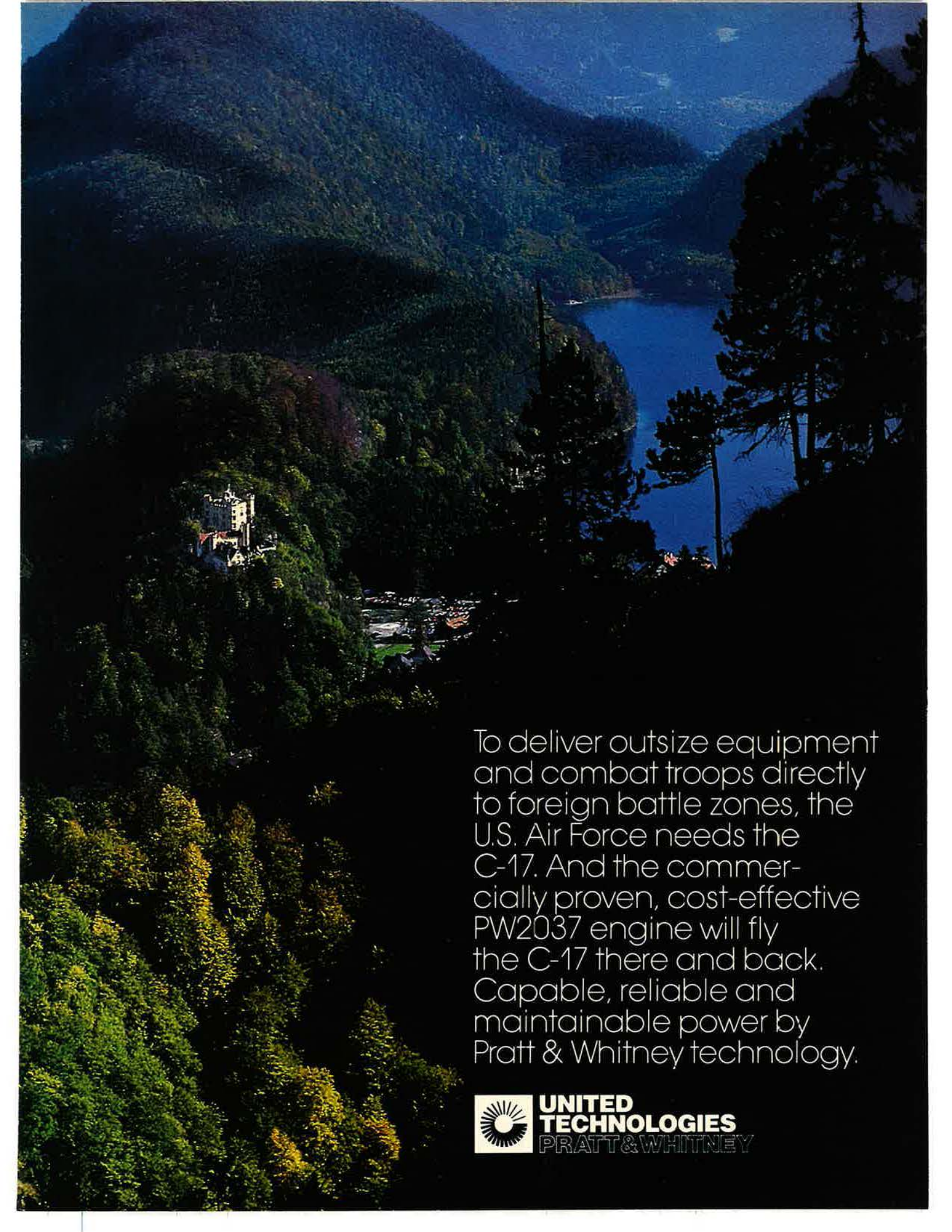
Whatever is finally done about the air defense fighter, I hope that one thing is kept in mind. The Air Guard does belong, with the rest of the tactical air forces, in the 1980s.

Capt. Larry R. Austin, OreANG
Vancouver, Wash.

The just-released General Accounting Office report questioning the suitability of either the F-20 or the F-16 as the new air defense fighter for USAF is right on the mark. The range, radar performance, and missile load of these aircraft are inadequate for the mission of stopping Soviet bombers from launching long-range cruise missiles against US targets. The F-14 or F-15 could perform the intended mission, but additional procurement of these expensive fighters is doubtful.

The pragmatic solution is to equip F-4s with new radars and conformal fuel tanks. For this mission, F-4s would be more capable than either the F-16 or F-20. Furthermore, an entire squadron could be upgraded for the cost of two F-15s.

Contrary to some claims, the "competition" between the F-16 and F-20 will not enhance competition in the aerospace industry or save tax-



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payer dollars. Selection of the F-20 would send a signal to the industry that if they spend enough money and lobby hard enough, they can sell the Defense Department an aircraft that it really doesn't want or need. The lower price of the F-16 entry only demonstrates that if you strip off enough capability from a fighter, you can offer it for less.

It will be interesting to see if Congress is more interested in satisfying the powerful aerospace lobby or in providing a cost-effective defense for the US.

Jeffrey G. Canclini
Edwards AFB, Calif.

COLA Cap

The Air Force Association, an alleged advocate of airpower and the people who provide it, has shown a strange lack of aggression in campaigning against the gross injustice perpetrated on federal retirees when their cost-of-living allowance (COLA) was denied by the Gramm-Rudman-Hollings act. Apparently, the Association feels that all is fair in love and war and Gramm-Rudman-Hollings!

While no one denies that federal spending must be controlled, rational people should demand that it be done equitably and not with favoritism to certain, perhaps more vocal groups that feel that they are somehow "more equal" in this land that was founded on liberty and justice for all! . . .

Everyone, especially retirees, should immediately contact their legislators and solicit support for legislation restoring the COLA. The initiative to start the ball rolling has already been taken in Congress. Now all it needs is some support. There is no shame in seeking equality in this nation, despite some of the Supreme Court's recent decisions to the contrary! Get out those pens and paper, and let's hear it for our right to be at least as equal as those who did not have to sacrifice their COLAs to Gramm-Rudman-Hollings!

MSgt. David E. Aldrich,
USAF (Ret.)
Richmond, Va.

● *AFA's policy statement on "Defense Manpower Issues" printed in the November 1985 issue of this magazine states that the Association believes that "the single most important institutional benefit and career incentive the Air Force offers is the military retirement system." Furthermore, in that policy statement, AFA supports "sustaining the present military and civilian retirement systems" and opposes "any proposal permanently modifying the Cost of Living Adjust-*

AIRMAIL

ment (COLA) mechanism or any other proposal that would further erode the real purchasing power of retiree pay, including caps and freezes." This Association has consistently and vigorously supported a strong retirement system in the pages of this magazine, on Capitol Hill, in its educational activities, and in other forums.—THE EDITORS

C-46F Curtiss Commando

The Southern California Wing of the Confederate Air Force is currently restoring a C-46F Curtiss Commando aircraft.

This airplane, Curtiss construction number 22486, USAAF serial number 44-78663, and civilian registration N53594, was built by Curtiss-Wright in Buffalo, N. Y., and was accepted by the Army Air Forces in July 1945.

During its Air Force career (1945-50), the plane was based at Memphis, Tenn., Salinas, Calif., Albuquerque, N. M., Mobile, Ala., Bergstrom AFB, Tex., Brookley Field, Ala., Sedalia, Mo., and Greenville AFB, S. C. On April 11, 1947, the plane was transferred to the War Assets Administration and was based at Pyote, Tex. It finally was based at Teterboro, N. J., where it was sold.

As a civilian ship (1950-78), the plane flew for Meteor Air Transport, Riddle, Zantop, Universal, Aviation Associates of Georgia, Associated Airmotive Inc., Ortner Air Services Inc., Quanama West Indies Co., Plymouth Leasing Co., and Rosenbaum Aviation. It was donated to the Confederate Air Force in 1978. During its civilian career, it was used as a passenger plane, freight carrier, and insecticide sprayer.

We would like to contact anyone who flew, maintained, or has any information, photos, or stories about the plane or the organizations she belonged to. All material will be handled with extreme care and returned.

This information will be used to help us restore the ship to its original configuration, to construct a display tracing the history of this particular C-46, and possibly to write a booklet about our plane.

Ron Fleishman
Confederate Air Force
Southern California Wing
P. O. Box 6709
Woodland Hills, Calif. 91365

Memphis Belle Restoration

The city of Memphis and the *Memphis Belle* Memorial Association are in great need of corporate and individual sponsors for the restoration and placement of the B-17 *Memphis Belle* into a permanent museum for all World War II crews. Our \$500,000 goal must be reached by October 31 in order to prevent losing the *Belle* forever.

The Memorial Association has received a limited-edition lithograph of the *Belle* that was produced by the Scottish artist, Dugal Cameron. These full-color, signed and numbered, framed prints will be shipped to the first 850 corporate or individual sponsors of the restoration who make a donation of at least \$300. All donations are fully tax-deductible, with the proceeds going to the *Memphis Belle* Memorial Association.

All former B-17 crew members should be interested in this project, as the *Belle* is probably one of the last remaining and most famous symbols of the airpower that won the war. Help is urgently needed in order to complete the restoration and secure the *Belle* permanently.

The Memorial Association asks that donations be sent to the address below.

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A-36 Dive Bomber

I am collecting and collating all relevant data on the origin, design, and testing of the A-36 aircraft that I can get copies of—indeed, any data available that I can gain access to. I am also trying to trace test pilots and combat pilots who flew the A-36 in Sicily, Italy, and Burma. Any photographs of the airplane, with dive brakes out and bombs or in dive attack position, would be welcome grist for my mill.

Please contact me at the address below.

Peter C. Smith
Foxden
12 Brooklands Rd., Riseley
Bedford MK44 1EE
United Kingdom

Aircraft Support Vehicles

I have a collection of data and photographs on US military vehicles, and two years ago I published *US Military Wheeled Vehicles*, which documents wheeled-vehicle usage by the US armed forces since 1899.

However, the area of aircraft ground-support equipment was not well represented in this volume, and

In pioneering work with applications for space-based defense systems and the next generation of missile seekers, Hughes Aircraft Company has demonstrated an advanced infrared sensor. The device is believed to be the world's first high-density, staring, long-wavelength infrared focal plane array (FPA). The hybrid chip, smaller than a fingernail, is integrated with optics and electronics to create TV-like images of a scene, even in total darkness. Unlike conventional infrared sensors, which mechanically scan a scene by means of oscillating or rotating mirrors, the FPA stares at a scene in its view at one time. It promises significant performance, size, weight, and cost benefits over ordinary sensors. The device was developed for the Defense Advanced Research Projects Agency as part of Strategic Defense Initiative efforts.

Vast improvements to NATO's air defense network are being made to handle modern-day threats more quickly and efficiently than ever. The NATO Air Defense Ground Environment (NADGE), which sweeps a protective radar umbrella from the north capes of Norway to eastern Turkey, is the largest automated air defense system in the world. It was completed in the early 1970s by an international consortium headed by Hughes. Now, Hughes and its European partners are blending new radars and data-processing capability into the network. Among the systems that update the NATO network are GEADGE for West Germany, UKADGE for the United Kingdom, and AEGIS (Airborne Early Warning/Ground Environment Integration Segment), which uses jam-resistant communications to correlate information from early-warning aircraft with that of ground radars.

With more than 300,000 deployed with the armed forces of over 30 nations, the TOW anti-tank missile has become a worldwide standard weapon for defense against armor. Hughes TOW offers considerable flexibility because it can be launched from a tripod on the ground, armored or unarmored vehicles, and helicopters. The wire-guided weapon is capable of destroying such targets as tanks, armored personnel carriers, bunkers, and small boats. Many of the original TOW missiles are being retrofitted with an improved warhead that includes an extendible probe for standoff detonation.

A U.S. Army laser device has proven to be extremely reliable in tests. The Ground/Vehicular Laser Locator Designator (G/VLLD), which determines distances to targets and illuminates targets for laser-homing weapons, achieved its goal of operating a mean time of 100 hours between failures. G/VLLD systems have operated for the equivalent of more than 108,000 designation missions and more than 45,000 ranging and location missions for a period exceeding 600 hours. The Hughes device can be mounted on armored vehicles or used with a ground tripod.

Malaysia is among the first nations in the world to use advanced displays in an air defense system. The new automated Malaysian Air Defense Ground Environment incorporates HPD-4000 large-screen displays. The display projectors, built around a patented device called a liquid-crystal light valve, provide commanders with easy-to-read maps, charts, and text in formats up to 15 feet square. MADGE, built by Hughes, allows Malaysia to detect and identify all civilian and military aircraft approaching its airspace. It also uses advanced data processing equipment, new communications, and a modern three-dimensional long-range radar.

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

there is not much to be found in the various historical archives covering these important but seldom-photographed vehicles.

If anyone has photographs of tow tractors, auxiliary power units, bomb handlers, lift trucks, refueling vehicles, passenger ramps, unusual crash/rescue equipment, or other specialized airfield support equipment that is self-propelled, especially from the years prior to 1970, I would appreciate the opportunity to borrow these photographs long enough to copy them. I have my own photo facilities, so I can have loaned prints on the way back to the loaner by return mail.

All letters will be answered, and I will certainly appreciate any assistance that is offered.

Maj. Fred W. Crismon,
USA (Ret.)
7th ATC Support Co.
Box 838
APO New York 09112

Fog Dispersal in Alaska

I'm sure readers include many World War II types who are loaded with facts and fancies of that period. Perhaps someone can answer a question I have about fog dispersal in the 1940s.

The history of Shemya AAF Base, 1943-45, carries this statement:

"A fog-dispersal unit was laid concurrently with the paving construction, and it ensured maximum use of the runway and safety of the crews and their aircraft during fog. It was placed on the east end of the main runway for a distance of 5,000 feet. When operating, it burned 50,000 gallons of white gasoline per hour."

That installation was put on the 10,000-foot runway in the summer of 1944. At that time, paving was replacing the original pierced-steel-planking (PSP) runway.

I'd appreciate hearing from anyone who can describe what the dispersal gear looked like, how it worked, and how effective it might have been in fighting the fantastic fogs of the Aleutians.

Lt. Col. Lyman L. Woodman,
USAF (Ret.)
3001 Widgeon Lane, Unit 8
Anchorage, Alaska 99508

"Eagles" Videotape

Did any readers out there attend the "Gathering of Eagles" air display at Indian Springs, Nev., on Tuesday, April 29, 1986, with a video camera in hand and get any good footage of the Confederate Air Force portion? Or know anyone who did?

I was "flight leader" of the eight AAF fighters in a borrowed P-51 Mus-

AIRMAIL

tang and had two hopes for a tape. One forgot his camera, and I haven't heard from the other. . . .

The Mustang owner, Lewis Shaw of Dallas, who so generously loaned that shiny airplane, probably wonders if I even took it to Las Vegas.

I also have videotapes of other air shows to trade.

Lt. Col. Robb R. Satterfield,
USAF (Ret.)
2906 McDonald St.
Midland, Tex. 79707

MassANG Rainbows

I am trying to locate any information, either text or photos, about the former Massachusetts Air National Guard Flight Demonstration Team, the Rainbows. This unit operated from 1950 to 1955 and was the first official Air Force flight demonstration team.

Any and all assistance will be greatly appreciated, and all materials will be returned on demand. I will also pay all postage.

Please contact me at the address below.

Frederick Howley
35 Oakland St.
Aurora, Colo. 80012

Phone: (303) 360-7340

Roll Call

We are trying to locate a World War II flying buddy, Sgt. Gregory J. Schmitz. "Snuffy" was a B-24 waist gunner on Tom Herdman's crew in the 855th Squadron, 491st Bomb Group, stationed at North Pickenham in England. His home address was Los Angeles, Calif.

Herdman's crew gets together once or twice a year, and we want very much to locate Snuffy Schmitz. Anyone having any information about Snuffy should contact me at the address below.

Orville L. Heldenbrand
10231 Black Oaks Dr.
Oklahoma City, Okla. 73165
Phone: (405) 794-7936

I would like to hear from members of the first class of bombardiers (42-12) at Williams Field, Ariz.

Please contact me at the address below.

William H. Oldenburg
5016 Bel Air
Boise, Idaho 83705

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Nuclear Test Delusions

By Edgar Ulsamer, SENIOR EDITOR (POLICY & TECHNOLOGY)

The Soviets are trying to sell the US a pig in a poke, and Congress, in its rush to buy it, may do real harm to chances for meaningful arms control.

Washington, D. C., Sept. 2



Recent preelection antics by members of Congress that could lead to a unilateral moratorium on US nuclear testing and the hoopla stirred up by the Natural Resources

Defense Council (NRDC, a private American group) over Soviet willingness to accept "in-country" monitoring stations—combined with broad media attention to renewed Soviet calls for a comprehensive test ban (CTB)—are impeding US efforts to reduce nuclear weapons and control their testing.

DoD's Deputy Assistant Secretary for Nuclear Forces and Arms Control Policy Frank J. Gaffney, Jr., summed up somewhat acerbically the Administration's reaction to the "agreement" between the NRDC and the Soviet Academy of Sciences to install seismometers in the vicinity of Soviet and American nuclear weapon test sites: "We are under no illusions as to the mischievous and counterproductive purpose that Soviet authorities hope it will serve: to confuse further the domestic debate about the need for American nuclear testing and the reasons why we oppose the effort of the Soviets and others to promote an inequitable, undesirable, and unverifiable ban on nuclear testing."

The most that the US can hope for from the NRDC's arrangement, he said, "is to obtain better data about the geology of certain areas of the Soviet Union at some distance from one Soviet nuclear test site. The arrangement does not address the very real possibility of clandestine testing at that or other known test sites, much

less at other locations in or outside the Soviet Union."

Ironically, the private organization's foray into nuclear diplomacy was hailed by some House members as "historic." Warning that well-meaning efforts toward "quick fixes" could derail the Administration's search for agreements with the Soviet Union on nuclear test limitations that could strengthen security for all nations, Mr. Gaffney cited as a case in point the "recent House vote to cut off funding for all US testing with a yield greater than one kiloton. If enacted into law, this measure would impose restrictions on the US virtually equivalent to those of a CTB without the means to verify effectively Soviet compliance with the same restrictions. It would preclude the very testing needed to maintain the safety and credibility of our deterrent."

Concomitantly, he added, the US "would be forced, for example, to halt the introduction of modern safety and security devices into the majority of our stockpile. Critical stockpile testing also would be impossible. We could not ensure the survivability of modernized systems already approved by Congress, such as the Trident II [SLBMs]. And the development of safe and reliable warheads for future systems would be dashed." In the Pentagon's view, he stressed, "we cannot let the House action or the NRDC arrangement undermine our sound policy on testing or distract us from our priority goal of deep, equitable, and effectively verifiable reductions in Soviet and American nuclear weapons."

Over the past three years, the US has sought to engage the Soviets in discussions on ways to make essential verification improvements to the 1974 Threshold Test Ban Treaty. The Soviets have reportedly violated the Treaty's 150-kiloton limit on several occasions. In 1984, the Administration proposed that Soviet and American government experts make direct, on-site yield measurements at each other's nuclear test sites. And earlier this year, the US provided the Soviets with a technical description of a

method known as CORRTX that can measure accurately the yield of a nuclear explosion. At the same time, the Administration proposed, without preconditions, that Soviet experts visit the Nevada test in April to discuss verification methods, examine the CORRTX system in operation, and monitor a planned US nuclear weapon test. The USSR did not respond.

Recent congressional testimony by the Chairman of the Joint Chiefs of Staff corroborated the basic Administration position that so long as the US and its allies must rely on nuclear weapons to deter aggression, nuclear testing must continue. A carefully structured nuclear testing program is imperative to demonstrate that US nuclear weapons are safe, effective, reliable, and survivable.

DARPA's Expanding Technological Horizons

In its final report, the President's Blue Ribbon Commission on Defense Management, popularly known as the Packard Commission, recommended "expanding the role of the Defense Advanced Research Projects Agency (DARPA)," especially in terms of prototyping. In addition to conducting research and exploratory development, "DARPA should have the additional mission of stimulating greater emphasis on prototyping in defense systems." In this context, the Commission stressed that DARPA should carry out prototype projects that embody technology that might be incorporated in joint programs or in selected service programs. Overall, the Commission felt that prototype programs "should allow us to fly—and know how much it will cost—before we buy."

For the time being, recently released congressional testimony makes clear, however, that DARPA will continue to emphasize technology-base projects that involve high-risk technologies of potential long-term multiservice utility. About seventy percent of DARPA's FY '87 budget request of \$838 million is earmarked for research and exploratory development.

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

IN FOCUS...

The two largest thrusts in the coming year are in computing technology, which absorbs about one-third, and in aeronautical research, which accounts for almost a quarter of the Agency's total budget. The *pièce de résistance* of DARPA's work on computers is its Strategic Computing Program, which was identified by Dr. Robert C. Duncan, the head of the Agency, as "our highest priority program that is advancing the state of the art in machine intelligence, machine architectures, and microelectronics." In the case of machine intelligence, DARPA is working on "computer vision, speech, natural language, and expert systems," he told Congress.

Recent progress, he explained, has been encouraging: A new-generation computer vision system demonstrated "outdoor dynamic image processing 400 times faster than any previous system." In another phase of the Strategic Computing Program, DARPA demonstrated a continuous speech recognition system with a 200-word vocabulary, while the Agency's initial version of a natural language understanding system, IRUS, "understands 2,000 words and 700 Naval-related concepts."

Another major computing advance scored by the DARPA program is the 64,000-processor "Connection Machine," which has demonstrated the ability to perform complex calculations at a speed better by a factor of four than the best existing computer and at one-sixth the cost. In the area of imaging processing, the Connection Machine performs at a level equivalent to the capabilities of between 1,000 and 10,000 current computers. By the end of this year, DARPA expects that its work on supercomputer architectures will lead to a thousandfold improvement in performance.

The dramatic laboratory advances of the Strategic Computing Program are being translated into hardware realities in such DARPA demonstration programs as the Autonomous Land Vehicle (ALV), the Fleet Command Battle Management Project (FCBMP), AirLand Battle Management (ALBM), the Pilot's Associate Project, and a system for radar/optical imagery analysis.

ALV, Dr. Duncan told Congress, recently "demonstrated speeds up to twenty kilometers per hour over a road containing fixed obstacles." This year, the vehicle is to "demonstrate autonomous, cross-country navigation over rough terrain with speeds up to ten kilometers per hour." He added that the breakthroughs of the ALV culminate in a

fundamental lesson: "How to integrate, in real time, dynamic vision, expert reasoning, and numerical calculations—[the fundamental precondition] for 'brilliant' weapon systems."

The AirLand Battle Management project has acquitted itself with similar aplomb, according to the DARPA Director. In "force-on-force" large-scale combat simulations, ALBM produced results "show[ing] that a factor of twenty to fifty improvement in execution time is possible, permitting ten hours of combat to be simulated in four to twelve minutes. Further research on ALBM," he said, "will demonstrate cooperative maneuver planning between corps and division headquarters."

In the case of the Pilot Associate Project, four demonstration expert systems have been developed that "will be substantially expanded and linked together" in FY '87 and beyond.

In the aeronautical arena, one of DARPA's major efforts is the X-Wing/RSRA, for Rotor System Research Aircraft. This technology demonstration involves a vertical takeoff and landing aircraft that, by stopping the rotor in flight, combines the vertical-lift efficiency of a helicopter with the speed, range, and altitude performance of a transonic fixed-wing aircraft. Design analysis indicates that "an operational X-Wing vehicle could have approximately three times the speed, range, and altitude performance of a conventional helicopter with equivalent payload capability," according to Dr. Duncan. This project is being carried out in concert with NASA. He told Congress that a large, fifty-six-foot rotor, fabricated of graphite composites, has been installed on the research aircraft and is about to enter flight test.

Other pacing technology projects carried out under the DARPA aegis involve unmanned air vehicles (UAVs). Among them is the Teal Cameo project, a largely classified undertaking. Teal Cameo, the DARPA Director reported to Congress, includes "a tri-service long-endurance successor to Aquila [a US Army-developed RPV to be used for target designation] as well as a high-altitude theater UAV aimed at providing alternatives for an unmanned successor to the TR-1 and

Joint STARS platform." Teal Cameo also might serve as a substitute for the recently canceled precision location strike system (PLSS).

Another DARPA UAV project highlighted by Dr. Duncan's testimony is "Amber," which he defined as an "unmanned, low-cost, aerial-vehicle technology development to demonstrate long-endurance capabilities." This test vehicle, he said, "is approximately 600 pounds' gross weight and achieves its long endurance through [use of] advanced composite structures, an advanced, lightweight, low-fuel-flow engine, and 'sailplane-like' aerodynamics. Existing service payloads will be integrated into Amber along with data links and ground stations." DARPA will hand over the program to the Army and Navy next year.

Another highly promising but largely classified DARPA program reported on by Dr. Duncan is LORAINÉ, for Long-Range Interceptor Experiment. While he was guarded in terms of describing some of the specifics of LORAINÉ, he identified the project as a "nonnuclear, long-range, highly maneuverable vehicle that could be of great significance in the air-delivered cruise-missile environment of the future." Dr. Duncan added that this precision-guided high-velocity weapon is "intended for naval battle group and CONUS air defense applications."

Elsewhere in his testimony, Dr. Duncan asserted that LORAINÉ's active sensor, the Swerve advanced radar, "could detect and track hostile targets and . . . guide the maneuvering warhead to the target. By virtue of its speed, the LORAINÉ could attack distant aircraft in a matter of minutes. By having a large search area, the LORAINÉ minimizes the need for accurate pretargeting information and could operate with or without in-flight updates." DARPA's new long-range intercept weapon, he said, is "ideally suited to complement long-range surveillance systems, such as [over-the-horizon radars and space-based IR that among other things] can be used to provide outer airspace defense for naval battle groups, [because LORAINÉ] is sized to fit in shipboard vertical launch tubes."

LORAINÉ and its phased-array Swerve radar demonstrated excellent performance and system survivability during flight testing, according to recently released congressional testimony. LORAINÉ can be launched by aircraft, from the ground, from ships, or from "other platforms" and, according to the congressional report, is part of DARPA's "work in strategic-bomber and cruise-missile defense."

The continuing standdown of NASA's Space Shuttle is delaying flight testing of DARPA's critically important Teal Ruby project. Dr. Duncan reported that unmanned launch vehicles, for the time being, don't seem to be able to accommodate the Teal Ruby and associated payloads. This space-based experiment, he explained, will be the first large-scale implementation of a two-dimensional, staring mosaic detector array and lightweight telescope optics. DARPA sees Teal Ruby as the technological trailblazer "for future space-based infrared surveillance systems capable of detecting aircraft and other low-threshold targets against the earth's clutter background." Teal Ruby is another key element of DARPA's strategic air and cruise-missile defense (SACM) program.

Another SACM project that DARPA is working on involves a bistatic radar that places the sending and receiving radar components on different platforms. Meant to support the North American air defense mission in the future, the bistatic radar's "illumination is provided [from] a spacecraft, and the uplink comes to an aircraft," according to the DARPA Director.

DARPA reported that significant progress is being made in charged-particle-beam technologies, especially by means of the Advanced Test Accelerator (ATA) at the Lawrence Livermore National Laboratory. "Remarkable results," Dr. Duncan told Congress, have been achieved by DARPA in an area that in the past was seen as a major stumbling block to particle-beam weapons, *i.e.*, propagation of the beam in dense air. DARPA's goal for this year is "to obtain firm evidence for the feasibility of multiple-pulse schemes to maximize the range and efficiency of the beam propagation." He added that "the Advanced Test Accelerator and the entire particle-beam technology base developed by DARPA will form the core of the new Free Electron Laser Program initiated by" the Strategic Defense Initiative ("Star Wars") program.

In light of congressional moves that seek to constrain further—or halt—US nuclear weapons tests on the presumption of reciprocity by the USSR, DARPA's Nuclear Monitoring Research Program takes on added importance. The Agency recently installed an advanced seismic array in Norway that "takes advantage of seismic signals propagating along low-loss paths from the Soviet Union." The payoff from the device will be "an order of magnitude improvement" in the detection of signals originating in

IN FOCUS...

the western part of the Soviet Union, according to Dr. Duncan.

Arms Control and the Public

The influential Washington-based "Committee on the Present Danger," in a recently released analysis of the state of arms control, finds "no grounds for expecting that current arms-control negotiations in Geneva will reverse the dangerous and destabilizing trends in the military balance that are the legacy of SALT I and SALT II."

Contending that the West cannot afford another bad arms-control agreement, the group argues that, at a minimum, the US should treat "significant throw-weight reductions to equal levels" as its nonnegotiable going-in position at the current talks in Geneva. Many of the founding members of the Committee serve in senior Administration posts, including in the field of arms control.

The Committee questioned the widely held Western view that the dismal state of the Soviet economy might drive the Kremlin to slow its arms buildup and to make concessions at the Geneva negotiations. This Western theory, the Committee claims, proved illusory when it was framed in the 1920s and has been out of step with actual Soviet behavior ever since.

Taking a more hardline stance than the Administration, "The Present Danger" analysis suggested that the new Soviet proposals merely paper over the USSR's intransigence with the facade of "progress." In the case of strategic defense issues, for instance, the new Soviet position represents "more of a change in tactics than in substance."

Overall, the Committee claims that Soviet arms-control proposals "would clearly leave the US with a more vulnerable nuclear deterrent and [would] seriously compromise the security of the US and its allies." The group also objects to the US proposal to ban all mobile ICBMs on grounds that it would create a condition of double jeopardy: The US would halt work on mobile ICBM deployment schemes altogether, while the Soviets would simply shift from open to clandestine development and deployment of mobile ICBMs.

The Committee on the Present Dan-

ger, meanwhile, has also released the results of two national polls on US public attitudes toward arms control and defense spending.

In the first instance, the findings showed strong dissatisfaction with past US-Soviet arms-control agreements and little optimism with regard to future accords. Seventy percent of those polled supported the Administration's recent decision to discontinue observance of the SALT II agreement. The majority of the respondents—sixty-nine percent—believes that the Soviet Union is violating existing arms-control accords. Further, a majority of those polled thought the prospect for success in arms control was poor, premised on their belief that the Soviet Union would never accept an arms-control agreement that was fair to the US. In case such an agreement were to be entered into by the superpowers, sixty-eight percent believe that the Soviet Union could not be trusted to comply with its terms.

The second poll commissioned by the Committee on the Present Danger—also conducted among a scientific sampling representing a cross section of public opinion—showed approval of current or greater levels of US defense spending, a strong belief that the Soviet Union is involved in promoting world terrorism, and overwhelming support for the Strategic Defense Initiative.

Overall, the findings of the Committee's poll suggest that three out of every four Americans oppose cutting the defense budget. Ninety-two percent believe that the importance of a strong military has either remained the same or increased in the past year, with less than ten percent of those polled expressing decreased confidence in the US defense effort.

Among the poll's other findings were:

- Seventy-two percent believe that the Soviet Union is trying to expand rather than simply defend its territory.

- Eighty percent believe that the Soviet Union is involved in promoting world terrorism.

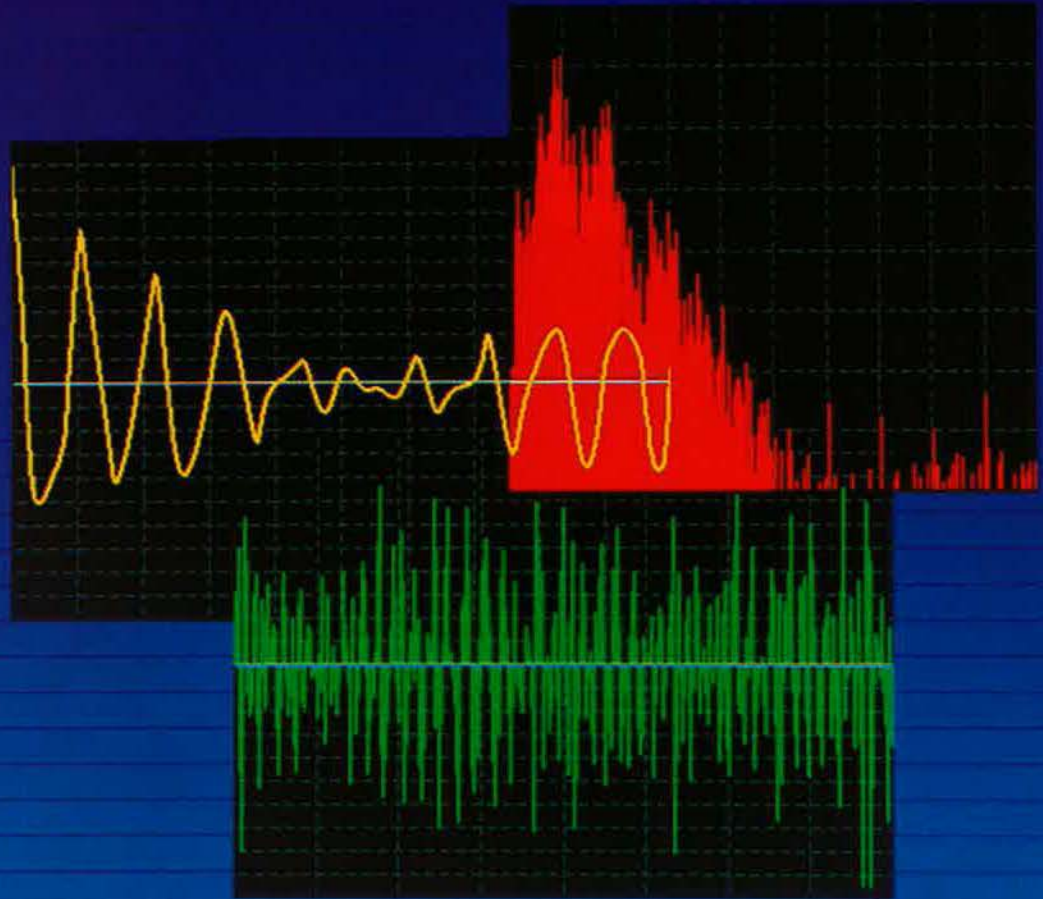
- Of those who favor increasing the defense budget, thirty-one percent believe that it should be achieved through cuts in nondefense spending, and eighteen percent feel that it should come from a tax increase.

- While a plurality (forty-eight percent) believes that the US has a stronger military than the Soviet Union, only forty-four percent feel that the US has a stronger nuclear force.

- Eighty-eight percent have the same confidence they had a year ago in the US defense effort. ■

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By Brian Green, AFA DIRECTOR OF LEGISLATIVE RESEARCH

Washington, D. C., Aug. 27

Authorization Bills Approved

The Senate passed its defense authorization bill by a vote of 86-3, approving \$295 billion in overall defense (DoD and Department of Energy weapons programs) budget authority (BA) and \$286 billion in outlays. The Reagan Administration had requested \$320 billion in BA and \$297 billion in outlays. The Senate made few changes in program-funding levels recommended by its Armed Services Committee (SASC), but two key votes were very close:

- By a margin of 50-49, it rejected a measure to reduce funding for the Strategic Defense Initiative (SDI) from the SASC-approved \$3.95 billion (of the \$5.3 billion requested) to \$3.4 billion, a real increase over FY '86 funding of three percent;

- By a 51-50 vote (Vice President Bush casting the tie breaker), the Senate defeated an amendment that would have prohibited production of the Bigeye binary chemical munition.

The Senate approved an amendment providing \$556 million in Air Force funds to reimburse NASA for use of the Space Shuttle. The measure was supported by the Air Force as necessary for stability during the recovery period of the Shuttle program.

The House approved a bill that mounts a much more serious challenge to the Administration's defense priorities. It reduced the \$292 billion in budget authority approved by the House Armed Services Committee (HASC) to \$286 billion and outlays from \$285 billion to \$279 billion. In program actions, the House:

- Reduced SDI funding from \$3.6 billion approved by the HASC to \$3.17 billion—an inflation-adjusted freeze.

- By a 210-209 vote, deleted funding for production of binary chemical weapons, including the Bigeye, and prohibited the US from withdrawing its existing chemical weapons in Europe unless they are replaced with binary weapons.

- Approved only twenty-four of the forty-eight F-15s requested and 150 of the 210 F-16s requested. The House

authorized thirty additional F-16s if funding could be found. Tactical aircraft R&D was cut by a third.

- Required the Air Force to fund either the Advanced Cruise Missile or the Short-Range Attack Missile II (SRAM II), but not both.

Differences between the House and Senate bills must be reconciled in conference.

SOF Reform Approved

The Senate approved an amendment to its authorization bill sponsored by Sens. Sam Nunn (D-Ga.) and William Cohen (R-Me.) that creates a unified command for special operations forces (SOF). The measure was opposed by the Joint Chiefs of Staff and the Administration.

The measure would establish:

- A board on the National Security Council that would coordinate low-intensity conflict policy; and

- An Assistant Secretary of Defense for Special Operations and Low-Intensity Conflict, who would supervise special operations and low-intensity conflict affairs for DoD.

The reforms are intended to provide better interservice coordination, improve the ability of the SOFs to compete for budget resources, and promote the development of SOF tactics, doctrine, and strategy. The House passed legislation with similar intent last month.

Arms Control Popular in Congress

The House approved several arms-control amendments to its authorization bill that, in combination, would radically alter established Administration arms-control policy. The Senate approved less definitive measures. The amendments include:

- By the House, a one-year moratorium on all nuclear tests larger than one kiloton at designated test sites, contingent on placement of on-site monitoring devices and on reciprocal Soviet restraint. Critics argued that the Soviets could test undetected outside designated areas and that the measure interfered with Administration negotiating pre-

rogatives. The Senate approved a "sense of the Congress" resolution calling for submission of the never-ratified 1974 Threshold Test Ban Treaty (that limits underground nuclear tests to 150 kilotons) to the Senate for its approval and immediate resumption of negotiations with the Soviet Union on a comprehensive test ban.

- A continuation of the ban on testing the Air Force F-15-launched anti-satellite weapon against an object in space if the Soviets do not resume such tests of their own ASAT system. Though approved in the House, the ban was repealed in the Senate.

- A denial of funding for any nuclear weapons program that would exceed the SALT II Treaty numerical limits. This action was approved by the House by a vote of 225-186. The Senate approved two "sense of the Senate" resolutions, one stating that it is in the US interest to continue complying with the numerical limits of the SALT II Treaty and the other that it is not in the interest of the US to continue complying with agreements "clearly violated" by the Soviets.

- A Senate declaration that congressionally approved SDI funding does not imply a US intent to "develop, test, or deploy" defenses that would violate the Antiballistic Missile Treaty.

HAC Approves Appropriations Markup

The House Appropriations Committee (HAC) finished its markup of the defense appropriations bill. The HAC generally approved the same funding levels as those in the authorization bill, with some notable exceptions. The HAC:

- Denied funding for the \$200 million B-1 contingency fund approved by the HASC that was intended to keep the B-1 production line open as a hedge against problems with the Advanced Technology Bomber (ATB).

- Increased funding for the Advanced Medium-Range Air-to-Air Missile (AMRAAM) from the HASC-approved level (\$426.5 million for 135 missiles) to \$582 million for 180 AMRAAMs. ■

**Ten years ago,
this couldn't have been built.**





The 1970's vs. The 1980's. The Progress of Technology: Performance.

The F-20 Tigershark is the first fighter aircraft designed and built, from the beginning, on the technology of the 1980's. It has the fastest scramble time of any fighter in the world; the F-20 gets off the ground, from a cold start, in 60 seconds with full systems accuracy.

The F-20 is equipped with the newest radar flying; radar that tracks 10 targets simultaneously, prioritizes 8, and operates with a mean time between failure of 200 hours.

Guaranteed and warranted.

The Progress of Technology: R & M.

The F-20 Tigershark is the first fighter aircraft designed and built, from the beginning, on today's technology, so its reliability is 6 mean flight hours between failure; better than twice that of its closest competitor. And each F-20 delivers over one and a half times the number of sorties per day, per aircraft. Built-in-Test (BIT) equipment, onboard monitoring, and the high reliability of its advanced systems mean it needs only 5.6 maintenance man-hours per flight hour.

A squadron of F-20's requires fewer than 200 maintenance and support personnel, less than half that of other current fighters.

And the F-20 is the first fighter to meet the USAF goals set forth in the R&M 2000 plan.
Guaranteed and warranted.




The 1970's vs. The 1980's. The Progress of Technology: Operations.

The F-20 Tigershark is the first fighter aircraft designed and built, from the beginning, on the reliable technology of the 1980's. So its operating and support costs are less than one half of any U.S. Air Force fighter flying today: \$4,050 per flying hour.

And the F-20 comes with a fixed price per flying hour for all materials and spare parts for the projected life of the aircraft.

Guaranteed and warranted.





F-20 Tigershark

The Progress of Technology: Reducing the Price of Defense.

The F-20 Tigershark is the first fighter designed and built, from the beginning, with the technology of the 1980's. It was developed by Northrop with its own funds. And in the last five years alone, over half a billion more in company funds have been invested in new fighter aircraft plant and equipment. Part of a continuing commitment to a record of pursuing high-quality, high-productivity fighter aircraft manufacturing.

A commitment to the U.S. Air Force backed by three facts: The F-20 Tigershark will meet a firm delivery schedule at a fixed flyaway price, a fixed price for initial support items and training equipment, and a fixed price per flying hour for all materials and spare parts for twenty years.

Guaranteed and warranted.

A close-up, low-angle shot of the nose of a dark-colored F-20 fighter jet. The aircraft's nose cone is the central focus, with an American flag decal on the left side. The number 'F-20' is painted in large, white, bold letters on the nose. The background is a clear, deep blue sky. The overall composition is dynamic and emphasizes the sleek, aerodynamic design of the aircraft.

F-20 Tigershark

**The Progress of Technology.
Guaranteed and Warranted.**

NORTHROP

Making advanced technology — and competition —
work for the United States Air Force.

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AEROSPACE WORLD

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

By Jeffrey P. Rhodes, DEFENSE EDITOR

Washington, D. C., Aug. 27

★ The nation's beleaguered space program took the first steps toward recovery in mid-August when President Reagan approved the congressional recommendation to build a new Space Shuttle Orbiter to replace the destroyed *Challenger* and NASA announced that a preliminary redesign of the solid-rocket booster (SRB) field joints had been selected.

In somewhat of a surprise move, the President also announced that NASA would be getting out of the business of launching commercial satellites. This action paves the way for private companies to begin their own space-launch operations.

The cost of the new Orbiter and spare parts will be roughly \$2.8 billion, but for FY '87, the President authorized only \$272 million to begin acquiring long-lead items for the new Orbiter and such other items as main engines and spacesuits. The larger outlays of funds for the as-yet-unnamed Orbiter should come in 1988 and 1989. Rockwell International, which built the original Orbiters, will also build the new ship. First flight of the replacement Shuttle is set for 1991.

The SRB field joint was the cause of the January 28 accident. The preliminary redesign involves the use of existing hardware, but with the addition

of a third O-ring seal inside the joint. Other changes include increased insulation and a "capture latch" that will ensure a tighter seal and prevent the SRB casings from rotating. The O-rings will be made of a new material, and small heaters will be added to keep the rings from freezing. Over the next sixteen months, the new joints will undergo component and sub-scale tests before proceeding to full-scale testing.

NASA has also asked the British firm of Martin-Baker Aircraft Co., Ltd., to put forward ideas for Shuttle crew ejection seats. In its current form, the Shuttle crew sits on two levels. Providing an ejection system would be difficult without modification to the Orbiter. The company has proposed moving all of the crew seats to one level.

Space Shuttle operations are scheduled to begin again in early 1988.

★ In related space news, on August 8, Air Force Systems Command's Space Division awarded four contracts worth \$5 million each to McDonnell Douglas Astronautics Co., Martin Marietta Denver Aerospace, General Dynamics Corp.'s Space Systems Division, and Hughes Aircraft Co. for Phase I research and development work on the new Medium Launch Vehicle (MLV).

The MLV's initial purpose will be to launch Navstar Global Positioning System (GPS) satellites. Because of the three accidents to US launch vehicles earlier this year, the operational schedule of the eighteen-satellite worldwide navigation system has slid backward more than four years.

The Martin Marietta proposal is for a variant of its Titan launcher, the General Dynamics design is based on its Atlas vehicle, and the McDonnell Douglas entry will be a slightly modified version of its Delta rocket. Hughes, which is teamed with Boeing Aerospace Co. on this project, is the only one of the contractors to propose a new launch vehicle.

The Jarvis MLV, named for Hughes engineer Gregory B. Jarvis, a payload



The Air Force recently let contracts to four manufacturers for initial work on the new Medium Launch Vehicle (MLV) program. The Jarvis MLV, which is shown here in artist's concept, will use existing technology from both the Apollo and Space Shuttle efforts and combine them as a new rocket. The 210-foot-tall launch vehicle was named for Gregory B. Jarvis, a Hughes engineer killed in the Challenger accident.

specialist killed in the *Challenger* accident, is not new in the traditional sense. The 210-foot tall, twenty-eight-foot diameter, three-stage launch vehicle uses F-1 and J-2 liquid-fuel engines from the Apollo-Saturn V rocket and structures and electronic systems derived from the Space Shuttle.

The fairing covering the transfer vehicle at the top of the rocket can accommodate payloads up to twenty-six feet in diameter. The Jarvis MLV is designed to carry up to six GPS satellites or a combination of GPS and other payloads into either low-earth or geosynchronous orbit.

The Jarvis can be launched from the Kennedy Space Center, Vandenberg AFB, Calif., or a proposed launch site on Johnston Island, about 800 miles southwest of Hawaii. Hughes estimates the MLV should be ready for launch thirty-eight to forty-two months after go-ahead from the Air Force.

★ Some fast thinking and good directions on the part of Jeff McCoy, a thirty-eight-year-old air traffic control supervisor at Chicago's O'Hare International Airport, saved a brand-new F-16C on a training flight from crashing into Lake Michigan on August 16.

The pilot of the F-16, Air Force Capt. Vince Amato, was roughly forty miles outside of Chicago and getting ready to start an air refueling when he radioed that he was losing oil pressure. Almost immediately after that, Captain Amato radioed that he had lost power in his engine.

McCoy, a sixteen-year FAA veteran, took over from another controller and was watching the crippled F-16 slice erratically through the air when Captain Amato radioed that his compass and gyroscope had also gone out. McCoy calmly told the F-16 pilot when and how long to hold his turns, and twenty seconds later, the F-16 broke out of the clouds at 1,000 feet with the runway of NAS Glenview, Ill., directly ahead.

Captain Amato, who told McCoy that he was only "a couple of seconds from ejecting," brought the airplane down at more than 200 miles per hour, flared out at nearly a forty-five-degree angle, caught the barrier, and made a perfect deadstick landing. From the time of failure to when the aircraft touched down, a total of four minutes elapsed.

McCoy, who was not sure if Captain Amato had crashed when the F-16 went off his radarscope, knew everything was all right a few minutes later when the pilot called on the phone with an offer of a free case of beer.

Captain Amato, who is assigned to

AEROSPACE WORLD



Israel's controversial new fighter aircraft, the Lavi, was rolled out at Israel Aircraft Industries' plant at Ben-Gurion International Airport near Tel Aviv on July 21. Twelve US firms are major subcontractors on the Lavi.

the Air Force Contract Management Division at Carswell AFB, Tex., was unhurt. McCoy later received congratulatory calls from FAA Administrator Donald Engen and Secretary of Transportation Elizabeth H. Dole.

★ On July 21, Israel Aircraft Industries (IAI) rolled out the prototype of Israel's next-generation fighter aircraft, the Lavi. An indigenous Israeli design, the Lavi is roughly the same size as and bears a resemblance to the General Dynamics F-16. The two planes have the same multirole mission and are in roughly the same performance class.

The Lavi (which means "lion" in Hebrew) has been a controversial project almost from the beginning. Developed with some \$1.2 billion in US aid since 1980, there has been recent pressure on the Israeli government to look at other alternatives to building the Lavi, such as building F-16s or F-20s in Israel. Israeli officials say that the plane's cost will be about \$15.5 million each, while DoD monitors say the flyaway cost will be roughly \$7 million more than the Israeli estimate.

Twelve US firms are involved as major subcontractors on the Lavi. Grumman, which makes the aeroelastically tailored composite wings, Pratt & Whitney, which developed the PW1120 engine for the Lavi from the F100 engine, and Garrett, which is providing environmental control and emergency and secondary power sys-

tems, are the top three subcontractors in terms of dollar value.

The Lavi has a fuel-carrying delta wing and movable canards for improved maneuverability. The plane also features low-drag weapons carriage.

Inside, the Lavi has a center stick

controller, a wide field-of-view head-up display, color multifunction displays, and, unlike the F-16, a Martin-Baker ejection seat with almost no tilt to it. The Israelis feel that the improved visibility afforded by the upright seat was worth the tradeoff of increased G-protection provided by the reclining seat.

The PW1120 engine recently completed 100 hours of testing at the Arnold Engineering Development Center at Arnold AFS, Tenn., and first flight of the Lavi is set for September. Production deliveries are scheduled to begin in 1990, and initial operational capability should be reached in 1992.

★ One of the disadvantages of fixed-wing aircraft is the need for runways to take off and land. One of the disadvantages of helicopters is that they can't reach high speeds.

However, a revolutionary X-shaped wing system that has been developed by Sikorsky Aircraft will combine the advantages of both types of aircraft—namely, vertical takeoff and landing and high speeds—into one aircraft.

By design, the X-Wing System takes off by the use of a helicopter-like rotor. Once in the air and moving at 180 to 200 knots, the four-bladed rotor is stopped and locked down to become two swept-forward and two swept-back fixed wings. Speeds of Mach 0.8 are expected to be reached in future vehicles.

On August 19, Sikorsky rolled out

the prototype X-Wing mounted on a modified Army/NASA Rotor Systems Research Aircraft (RSRA) that was delivered to NASA in 1978 to be a flying test-bed for advanced rotor concepts. The RSRA features four General Electric engines (two for the rotor system and two for forward flight) as well as a forty-five-foot wing that can support the weight of the aircraft. Data from the RSRA wing and the X-Wing can be monitored separately.

Each X-Wing blade is a symmetrical composite-material sleeve over a supporting graphite I-beam that, in turn, is attached to a lightweight, bearingless titanium hub. One of the most important features in the X-Wing concept was the development of a pneumodynamic, or air circulation, system that will provide lift and control during the conversion between rotary and fixed-wing flight. Variable blowing will substitute for flaps and ailerons during fixed-wing operations.

Flight tests of the joint DARPA/NASA system are to begin this month. Although there will be no attempt to take off vertically, the X-Wing will be stopped and started in flight to collect the needed data. A fully functional X-Wing aircraft will likely be built in the early 1990s.

★ The AIM-120 AMRAAM (Advanced Medium-Range Air-to-Air Missile) passed another important milestone on July 29 when the missile was fired successfully while the carrier aircraft, an F-16C, had its radar in a track-while-scan (TWS) mode. In TWS, the launch aircraft's radar can launch and direct multiple missiles against multiple targets simultaneously. The only current missile that can be launched

in this mode is the AIM-54 Phoenix used on Navy F-14 Tomcats.

The unarmed AIM-120 missile was launched from mid range in a thirty-degree near-tail-aspect shot while the F-16 was flying at Mach 1.3 at an altitude of 15,000 feet. The target, a QF-100 drone, was flying at Mach 0.75 at the same altitude as the shooter. After launch, the drone performed a four-G, thirty-five-degree turn, but the missile continued toward the target and scored a direct hit on the QF-100's vertical stabilizer. Although damaged, the drone was recovered.

This launch occurred just one week after the Air Force determined that the AMRAAM program is ready to proceed into advanced buy and long-lead procurement of initial production items. Once the implementing documentation is signed off by the Office of the Defense Secretary, procurement of those items can begin.

The 335-pound missile, which is nearly twelve feet long, will be carried on Air Force F-15s and F-16s and on Navy F-14s and F/A-18s. Great Britain and West Germany are also scheduled to buy the missiles.

★ Air Force Systems Command's Aerospace Medical Division (AMD) at Brooks AFB, Tex., recently completed a series of tests to see if flight crews could perform their assigned tasks while under the influence of a chemical defense protective drug called pyridostigmine bromide.

The tests were conducted in a modified two-cockpit C-131H called TIFS (Total In-Flight Simulator) that is owned by Aeronautical Systems Division's Flight Dynamics Laboratory. The aircraft's original nose was re-

placed with a pod-like second cockpit.

In this set of experiments, the plane was manned by test crews in the pod and a "safety" crew in the regular cockpit. Measuring equipment was located in the fuselage. The safety crew was responsible for takeoff and would have resumed control if any problems developed. The test crew took over after takeoff, flew the simulated C-130 mission profile, and landed the plane.

Operational C-130 crews from Dyess AFB, Tex., Little Rock AFB, Ark., McChord AFB, Wash., and Pope AFB, N. C., volunteered for the tests. Tactical airlift was chosen for the Air Force part of the triservice program because of its association with ground forces.

The crews' tolerance to the pyridostigmine was evaluated when they arrived in Texas. Before each mission, the pilots and copilots were hooked up to the equipment in the aircraft to measure heart rate and eye movement and blink rates. Each crew flew four missions, and on each flight, the crew members were given either the drug or a placebo.

Each of the missions lasted about an hour and a half, and in addition to flying the plane, the crews had to cope with simulated flight emergencies that were programmed into the computer-operated simulation. The crews' ability to perform was then graded.

An interim report of the findings of this program will be ready in early 1987.

In related news, Aerospace Medical Division will be celebrating its twenty-fifth anniversary in early October. AMD is responsible for maintaining man as a key element in Air Force operations. It operates a clinical medical center and provides specialized medical training and consultation. AMD also maintains the Air Force Drug Testing, Human Resources, and Occupational and Environmental Health Laboratories.

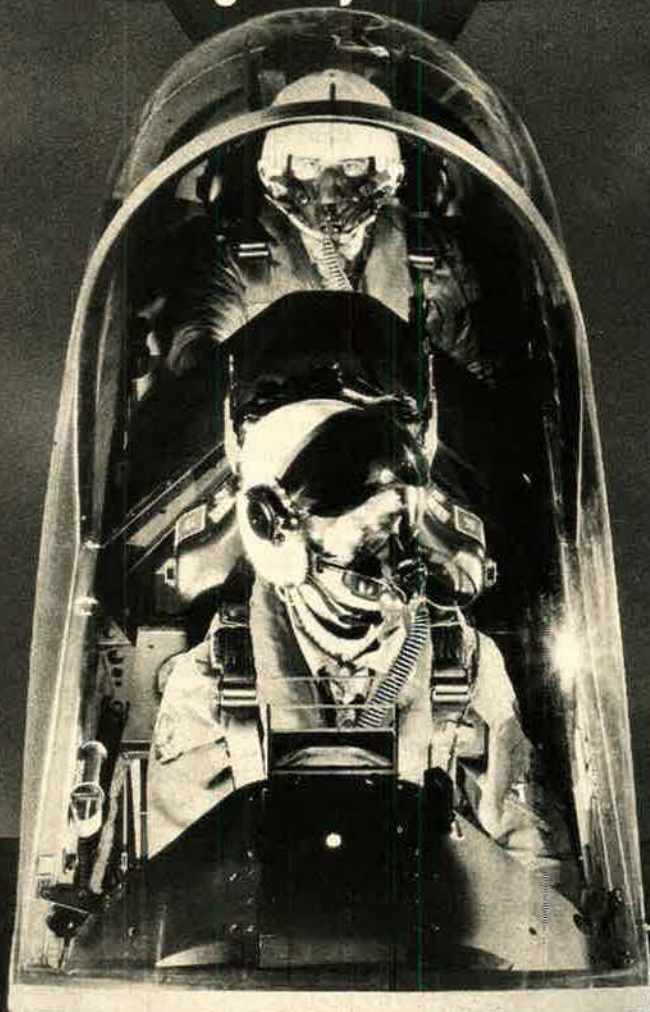
★ From Buck Rogers and Flash Gordon to Capt. James T. Kirk and the *Enterprise* of "Star Trek" fame, the laser weapon has always been portrayed as a figment of science fiction. That notion began to change in late July when scientists in the Advanced Chemical Laser and Quantum Optics Branches of the Air Force Weapons Laboratory at Kirtland AFB, N. M., successfully synchronized the beams of two iodine lasers.

Parts of the beams from the two lasers were injected into each other, causing the photons of one to align



The X-Wing concept combines the advantages of helicopters and fixed-wing aircraft into one airframe. While this is just a model of the X-Wing attached to the Army/NASA Rotor Systems Research Aircraft (RSRA), the real X-Wing was rolled out on August 19 and should be flying in October.

Which major features distinguish the
PC9
from a good jet trainer?



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

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

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

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

PILATUS

AEROSPACE WORLD

with the photons of the other. When individual beams are phased, the intensity of the output of the two "guns" at the target is squared. This means that the output of the two phase-coupled lasers equals the brightness of four unphased lasers. Thus, very powerful lasers can be built by using lasers and mirrors that are small and economical.

Because the iodine laser produces radiation from a chemical reaction, the energy can be stored for extended periods of time as compact liquid fuel. The iodine laser has a shorter wavelength than other chemical lasers and can be focused to a smaller and more intense spot on a target.

Lt. Col. Thomas Walker, Chief of the Quantum Optics Branch, said that "this demonstration is a real breakthrough. . . . We can phase-couple iodine lasers to obtain the high powers necessary for several Air Force and Strategic Defense Initiative applications."

★ After suffering major structural damage from a lightning strike in 1985, a C-5A from the 436th Military Airlift Wing at Dover AFB, Del., was repaired and took to the skies once more this past July 26.

The lightning bolt that struck the C-5 a year ago in September caused fumes from a drained fuel cell to explode, shattering thirty-six feet of the outer wing.

Instead of calling in the manufacturer, Lockheed-Georgia Co., it was decided to replace the wing in-house, and the repair job was given to the 2954th Combat Logistics Support Squadron, Kelly AFB, Tex. Since a repair of this type had never been done before, much of the 2954th's equipment had to be modified.

An outer wing box was "borrowed" from Lockheed, which had another C-5 in its Marietta, Ga., plant for repairs. After installation in the Dover C-5, the maintenance crews of the 436th MAW installed the flaps, aileron, slats, panels, and the hydraulic and fuel cell plumbing in the new wing. The C-5 at the Lockheed plant was fitted with a new wing box.

Military Airlift Command logistics officials said that after evaluating all of the factors involved in the repair, more than \$3 million was saved by doing the work at Dover.

While on the subject of C-5s with new wings, the San Antonio Air Logistics Center reports that the C-5A rewing program is ahead of schedule and \$100 million under budget.

Of the seventy-six aircraft to be refitted under the four-phase, \$1.4 billion program, sixty-nine aircraft have

entered the system, and sixty have already been completed. The work is being done at the Lockheed plant in Georgia.

The work involves replacing the center, inner, and outer wing boxes with boxes made of a corrosion-resistant aluminum alloy that is stronger than that of the original equipment. The new wings will extend the service life of the C-5As by 30,000 hours without load restrictions.

★ Few, if any, programs today can boast of turning down money, but the AGM-86B air-launched cruise missile (ALCM) program has done just that.

Aeronautical Systems Division (ASD) officials said production costs for the ALCM have been slashed so dramatically that a savings of more than \$90 million has been turned back to Air Force Systems Command.

"The missile was developed and produced on schedule within the original cost estimate and has met or exceeded every performance param-

posals for the FY '83 ALCM buy and conducted an in-depth review of Boeing's manufacturing processes and procedures. As a result, Boeing built a new factory that incorporates numerical control machines and robots. Boeing also encouraged ALCM workers to suggest ways to speed up missile production. Man-hours were cut eighty-nine percent as a result of worker suggestions.

The AGM-86B is now on alert with five SAC units and is in the process of being deployed at two more bases. Boeing is delivering roughly twenty missiles per month under the current production contract, which calls for 1,715 missiles. Production of the ALCM was scheduled to be completed in September.

★ To someone walking by the huge camouflaged building at Misawa AB, Japan, the noise coming from the inside may sound like a car running its engine. The noise, however, is not being made by a V-8, but by an F-16's F100 engine being tested at Misawa's new "hush house."

The state-of-the-art quiet chamber was designed by Mitsubishi and was constructed during 1984-85. Although specifically designed for the single-engine F-16, the hush house



These energy-efficient lawnmowers, powered by alternative fuels, have been used to trim the grass at Bitburg AB, West Germany, for the past twenty-nine years. Johann Wirtz, a shepherd for the past forty-four years, here tends his flock in the munitions area of the 36th Equipment Maintenance Squadron. (USAF photo by A1C Gene Scatena)

eter that was predicted at the beginning of the program," announced Col. Herbert Bevelhimer, the Director for the Air-Launched Strategic Missile System Program Office at ASD.

ASD officials said the savings were made possible through the efforts of both the ALCM program office and Boeing Aerospace Co. of Seattle, Wash., which manufactures the missile. The Air Force established a team that evaluated Boeing's cost pro-

can also test twin-engine F-15s or can be rigged in thirty minutes to test uninstalled engines.

The test cell has floor restraints capable of holding up to 60,000 pounds and features a forty-yard tunnel with a set of primary and secondary baffles to deflect the noise up and out. The forty-foot vertical secondary baffles are located on each side of the tunnel, and they keep winds inside to a manageable fifteen miles per hour and

greatly reduce temperatures. Everything in the hush house is spot welded, thus reducing the chance of rivets vibrating loose and causing foreign object damage to the engine.

Because the facility is so quiet, engines can be tested twenty-four hours a day, unlike at other facilities, where open-air testing is prohibited from 10:30 p.m. to 6:30 a.m. by Air Force regulation.

★ Almost forty-one years after their last official performance, twenty-six members of Glenn Miller's Army Air Forces Band received Air Force Commendation Medals on August 16 in ceremonies at the Air Force Museum at Wright-Patterson AFB, Ohio.

The medals were presented to the band members in attendance by Maj. Gen. Charles D. Metcalf, Comptroller of Air Force Logistics Command, for the band's morale-building efforts during World War II. The medal will be mailed to the band members who could not attend the ceremonies.

After the presentation, Ray McKinley, Major Miller's drummer, and Michael "Peanuts" Hucko, a featured clarinetist, performed with the "Airmen of Note," the Air Force Band's swing-era ensemble. Former Sergeant McKinley led the band after Major Miller's disappearance over the English Channel in 1944.

Major Miller was flying to France in a UC-64 Norseman in December 1944 to make advance preparations for the band when he disappeared and was presumed dead. No wreckage was ever found. Many theories, such as ice forming on the wings or engine failure, have been suggested as the cause of the crash. Earlier this year, though, a new theory emerged.

A British Lancaster bomber returning from an aborted mission had just jettisoned its 4,000-pound bomb into the English Channel when several crew members noticed a low-flying UC-64 several hundred feet below them. The pilot of the plane, Victor Gregory, reports that his tail gunner, Harry Fellows, said during the mission that the concussion and water-sput from the bomb had swamped a Norseman. Whether or not it was Major Miller's aircraft is unconfirmed, but the incident occurred at the time the UC-64 was thought to have crashed.

The true circumstances of Major Miller's disappearance may never be known.

★ Eight pilots and forty-one aircraft maintenance personnel representing three Air National Guard A-7 units will begin training in October in the use of

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the Low-Altitude Night Attack (LANA) system. Both classroom and hands-on training will be conducted by LTV Corp. in its Dallas facility.

The LANA system gives Corsair II pilots the same attack capabilities at night as they have in daylight. LANA is an automatic system that performs target detection and low-altitude navigation.

Air Force contract awards to LTV's Vought Aero Products Division total

nearly \$100 million. Actual modifications to the forty-eight single-seat A-7Ds and four two-place A-7Ks involved in the program will cost \$80 million, with \$15 million more allocated for spare parts. A separate \$2.7 million contract was awarded for two additional A-7K LANA systems, and a \$231,102 contract was awarded for LANA training.

LTV, which is currently modifying four aircraft, expects to complete the first twenty-four conversions by May 1987. The Air Force will modify the remaining aircraft at the Oklahoma City Air Logistics Center at Tinker AFB, Okla.

★ Although not many service stations will routinely check the oil in

SENIOR STAFF CHANGES

PROMOTIONS: To be Lieutenant General: Edward J. Heinz; Thomas J. Hickey; Bradley C. Hosmer.

RETIREMENTS: B/G Philippe O. Bouchard; L/G Edgar A. Chavarrie; B/G James L. Crouch; Gen. Andrew P. Iosue; M/G Gerald L. Prather; B/G Billy L. Rhoten; B/G David H. Roe; B/G Paul N. Scheidel; M/G Jack L. Watkins; AFRES B/G C. Thomas Yarrington.

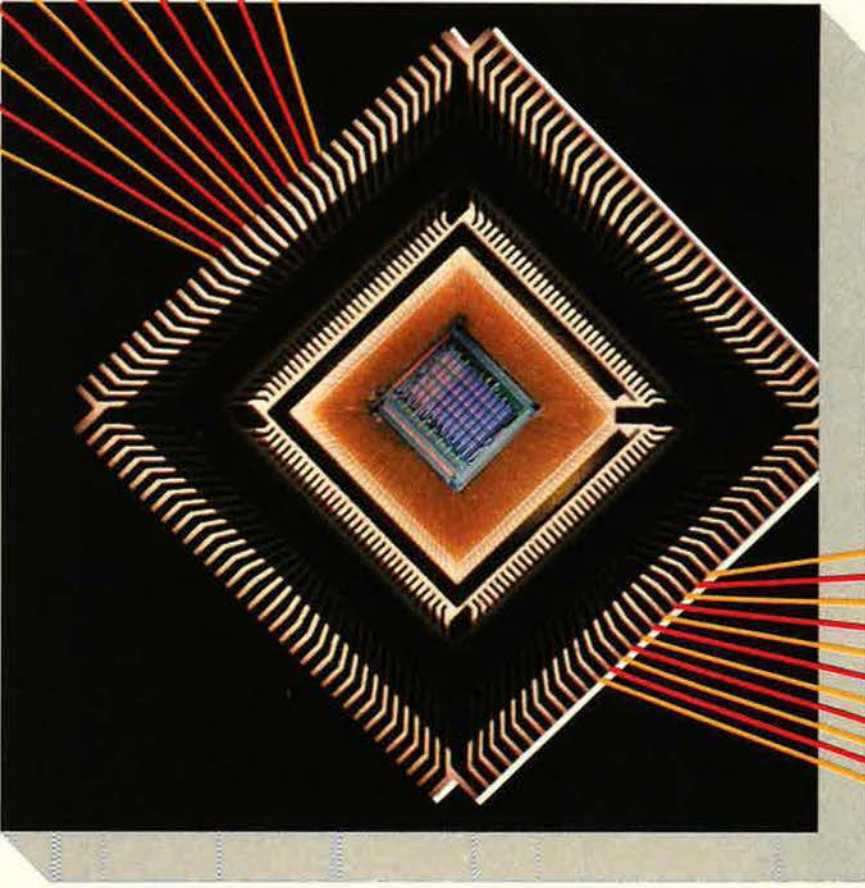
CHANGES: AFRES B/G Ronald C. Allen, Jr., from Mobilization Ass't to Ass't DCS/RD&A, Hq. USAF, Washington, D. C., to Mobilization Ass't to DCS/RD&A, Hq. USAF, Washington, D. C., replacing AFRES M/G William A. Anders . . . AFRES M/G William A. Anders, from Mobilization Ass't to DCS/RD&A, Hq. USAF, Washington, D. C., to Mobilization Ass't to Secretary of the Air Force, Hq. USAF, Washington, D. C., replacing AFRES M/G Donald Jenkins . . . B/G Joseph W. Ashy, from Spec. Ass't to Cmdr., Hq. TAC, Langley AFB, Va., to IG, Hq. TAC, Langley AFB, Va., replacing B/G John E. Jaquish . . . B/G Keith B. Connolly, from IG, Hq. PACAF, Hickam AFB, Hawaii, to Cmdr., 313th AD, PACAF, Kadena AB, Japan, replacing B/G Donald Snyder . . . B/G Richard E. Hawley, from Spec. Ass't to Cmdr., 313th AD, PACAF, Kadena AB, Japan, to Spec. Ass't to CINC, PACAF, Osan AB, South Korea, replacing M/G Gordon E. Williams.

B/G Richard G. Head, from Dep. Dir. for Ops., NMCC, & Dir. of Ops., OJCS, Washington, D. C., to Spec. Ass't to DCS/P&O, Hq. USAF, Washington, D. C., replacing M/G Eugene H. Fischer . . . M/G (L/G selectee) Edward J. Heinz, from Dir. of Intelligence (J-2), Hq. USEUCOM, Vaihingen, Germany, to Dir., Intelligence Community Staff, CIA, Langley, Va. . . . M/G (L/G selectee) Thomas J. Hickey, from Cmdr., Keesler TTC, ATC, Keesler AFB, Miss., to DCS/Personnel, Hq. USAF, Washington, D. C., replacing L/G John A. Shaud . . . B/G Frank B. Horton III, from Dep. Dir., Nat'l Strategic Target List Div., JSTPS, Hq. SAC, Offutt AFB, Neb., to Dir., Nat'l Intelligence Council, CIA, Langley, Va. . . . M/G (L/G selectee) Bradley C. Hosmer, from Ass't DCS/P&R, Hq. USAF, Washington, D. C., to President, Nat'l Def. Univ., Washington, D. C.

B/G John E. Jaquish, from IG, Hq. TAC, Langley AFB, Va., to C/S, Hq. TAC, Langley AFB, Va., replacing M/G James G. Jones . . . M/G James G. Jones, from C/S, Hq. TAC, Langley AFB, Va., to Cmdr., Keesler TTC, ATC, Keesler AFB, Miss., replacing M/G (L/G selectee) Thomas J. Hickey . . . B/G Robert H. Ludwig, from Cmdr., Strategic Information Systems Div. (AFCC), & DCS/Info. Systems (SAC), Hq. SAC, Offutt AFB, Neb., to Ass't C/S for Systems for C³ and Computers, Hq. USAF, Washington, D. C., replacing M/G John T. Stihl . . . L/G Forrest S. McCartney, from Cmdr., SD, AFSC, Los Angeles AFS, Calif., to Dir., John F. Kennedy Space Ctr., NASA, Cape Canaveral, Fla. . . . Col. (B/G selectee) Richard J. O'Lear, from Cmdr., Hq. AFTAC, Patrick AFB, Fla., to Dir. of Intelligence (J-2), Hq. USSPACECOM, Peterson AFB, Colo., replacing retiring B/G Billy J. Rhoten.

L/G John A. Shaud, from DCS/Personnel, Hq. USAF, Washington, D. C., to Cmdr., Hq. ATC, Randolph AFB, Tex., replacing retired Gen. Andrew P. Iosue . . . B/G Donald Snyder, from Cmdr., 313th AD, PACAF, Kadena AB, Japan, to Spec. Ass't to Cmdr., 12th AF, TAC, Bergstrom AFB, Tex. . . . M/G John T. Stihl, from Ass't C/S for Systems for C³ and Computers, Hq. USAF, Washington, D. C., to Cmdr., Hq. AFCC, Scott AFB, Ill., replacing retired M/G Gerald L. Prather.

SENIOR ENLISTED ADVISOR CHANGE: CMSgt. Richard E. Russell, to SEA, Hq. AFRES, Robins AFB, Ga., replacing CMSgt. Henry J. Scott. ■



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ITT DEFENSE

your car anymore, Air Force maintenance crews must regularly check an aircraft's engine oil to determine wear on the parts. By analyzing the oil, technicians can find out which metals, and how much of each, are present in the sample. Consequently, the analysis indicates which parts are wearing.

Until now, remote-site analysis was costly and difficult and also required the support of a stationary laboratory. However, Aeronautical Systems Division's Aero Propulsion Lab, along with Perkin-Elmer Co., has developed a portable analyzer that can perform all of the necessary tests inexpensively in the field.

Six prototypes of the analyzers have been built and tested successfully at such diverse locations as Elmendorf AFB, Alaska, and NAS Pensacola, Fla. The Portable Wear Metal Analyzer system is a joint Air Force-Navy program funded at \$2.2 million.

The analyzer system consists of two suitcase-size cases. A miniature graphite furnace that is electrically operated, along with special optics and a dispersing device called a polychromator, occupies one case. The other case contains the required electronics and a tank of nonflammable argon gas that prevents carbon in the ten-microliter sample from oxidizing. When the two cases are connected, the analyzer becomes a functional spectrometer system that can identify nine specific elements used in the engine's various components. The test takes four minutes.

Program responsibility will soon be transferred to the San Antonio Air Logistics Center, which has plans to eventually buy 129 of the analyzers.

★ The parachute has changed very little since 1911, when Joseph Pino developed the collapsible backpack design with a drogue, or pilot, chute attached. However, with the increased performance of modern aircraft, a parachute that could be deployed at high speeds had to be developed, and Air Force Systems Command's Aeronautical Systems Division has done just that.

The Automatic Inflation Modulation (AIM) parachute looks similar to the standard Air Force C-9 canopy, but makes several changes in materials and features to make a much better parachute. Whereas the C-9 has a maximum opening speed of 250 knots in conjunction with the ACES II ejection seat, the AIM canopy can be opened at speeds greater than 320 knots when used with the ACES II.

Instead of being all nylon, the AIM parachute's upper third is made of

AEROSPACE WORLD

Spandex, a stretch fabric that adjusts to airspeed. At high speeds, the material is highly porous, but as the chute slows, the weave closes to allow less air to escape, resulting in gradual, rather than rapid, slowing before full inflation of the canopy.

The main addition to the AIM design is an auxiliary Webb chute suspended under the mouth of the main canopy. This smaller parachute provides uniform inflation of the main canopy. At low speeds, the Webb chute inflates rapidly and stays suspended farther away from the main canopy. This action results in the main canopy inflating faster. At high speeds, the Webb chute draws into the mouth of the main canopy and slows inflation.

The AIM parachute also features marquisette panels, a kind of cheesecloth that increases the turn rate of the canopy, and very strong but lightweight Kevlar suspension lines.

Testing of the AIM parachute, which is being conducted at Edwards AFB, Calif., and Holloman AFB, N. M., will continue into 1988. Cost of the backpack version of the improved parachute is roughly \$539 each, or only about a third more than the C-9. The AIM parachute is made by Irwin Industries, Inc., of Fort Erie, Ontario, Canada.

★ The Air Force plans to recall to active duty eighteen Vietnam-era Teledyne Ryan Aeronautical Co. MQM-34M Remotely Piloted Vehicles (RPVs) that have been in storage since 1979. The RPVs will be used for Over-the-Horizon Backscatter (OTH-B) radar tests next year.

The RPVs were selected for the tests because of their resemblance, from both a size and speed standpoint, to cruise missiles. The RPVs

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will test the capability of the OTH-B radar to detect small targets over flight paths in excess of 1,000 miles.

The MQM-34Ms will be launched from DC-130 aircraft at distances up to 1,300 miles from the radar sites. At the conclusion of the mission, the

AEROSPACE WORLD



The first roof arch for the new \$10.6 million addition to the USAF Museum at Wright-Patterson AFB, Ohio, was recently put into place. When completed next year, the addition will double the size of the Museum. (USAF Museum photo by Harry Elliott)

RPVs will deploy a parachute and be recovered by an HH-53 helicopter using a Mid-Air Retrieval System (MARS). The RPVs will then be re-used.

The 6514th Test Squadron at Hill AFB, Utah, will reactivate the RPVs for flight status. The 6514th will also train personnel for operation and support of the vehicles.

The MQM-34 is part of a family of Ryan RPVs that completed more than 3,000 reconnaissance and other types of missions over Vietnam.

★ **DELIVERIES**—In early July, the Air Force took delivery of its 1,000th F-16 at the General Dynamics Corp.'s plant in Fort Worth, Tex. It joins 1,571 of its sister ships that have been built for ten air forces worldwide since 1978. Of that total, 1,178 have been built in Fort Worth, an additional 216 were built at the Fokker plant in the Netherlands, and the other 178 aircraft were made by SABCA in Belgium. The milestone aircraft can't claim any one country of origin, though, because the forward fuselage was made at Fort Worth, the center fuselage in the Netherlands, and the left wing in Brussels. Another Belgian company, SONACA, manufactured the aft fuse-

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lage, and Israel Aircraft Industries built the right wing. USAF F-16 #1,000 has been assigned to the 86th TFW at Ramstein AB, West Germany.

Also in July, the **first four McDonnell Douglas EF-18s arrived in Spain** after making a 4,032-nautical-mile nonstop flight from St. Louis, Mo., to Zaragoza AB in northeast Spain. The two-seat EF-18s, the Spanish version of the US Navy's F/A-18 Hornet, were flown to their new home by joint US/Spanish crews and were refueled en route by KC-10 tankers. Spain plans to acquire seventy-two EF-18s, with an option for twelve more.

Bell Helicopter Textron delivered the **second and third production AH-1W Super Cobras to the US Marine Corps in July**. Bell is currently under contract to produce forty-four of the attack helicopters, which, in addition to their chin-mounted 20-mm gun turret, can carry eight TOW or Hellfire missiles and are capable of firing AIM-9 Sidewinder air-to-air missiles. Additionally, thirty-seven AH-1Ts will be upgraded to W model standards, and thirty-four new AH-1Ws will likely be built in FY '88 and FY '89.

★ **NEWS NOTES**—Secretary of the Air Force Edward C. Aldridge, Jr., has directed that **Sunnyvale AFS, Calif., be renamed Onizuka AFS** in honor of Lt. Col. Ellison S. Onizuka, USAF, a mission specialist who was killed in the January 28 explosion of the Space Shuttle *Challenger*. Onizuka AFS is

home to the Air Force Satellite Control Facility, a unit of Air Force Systems Command's Space Division. The facility serves as a command and control facility for spacecraft and supports Shuttle flights through its worldwide network of satellite tracking and command stations.

Lt. Gen. Forrest S. McCartney, currently head of Space Division at Los Angeles AFS, Calif., was named on August 20 to be the **new head of NASA's Kennedy Space Center at Cape Canaveral, Fla.** Pending approval by the Senate Armed Services Committee, General McCartney is expected to assume command on October 1. He is the fourth active-duty military officer to receive a high management position at NASA since the *Challenger* accident. General McCartney, fifty-five, is a native of Fort Payne, Ala. He received his bachelor's degree in electrical engineering in 1952 and his master's degree in nuclear engineering from the Air Force Institute of Technology in 1955. In addition to commanding Space Division, he served also as director of the Peacekeeper ICBM program from 1980 to 1982. General McCartney and his wife, Ruth, have two children.

On August 22, the **Air Force completed the fourth successful test of its air-launched antisatellite (ASAT) weapon**. The weapon was released from an F-15 at high altitude and used the energy source of a distant star close to the horizon as its target. After the two-stage, roughly seventeen-

foot-long missile destroyed an aging satellite in low orbit last September, Congress banned all future ASAT launches in FY '86 against an actual target unless the President certified that the Soviets had conducted live tests of their ASAT weapon. Whether the congressional ban would be extended to FY '87 was being debated as this issue went to press. This latest test was the second in which the energy emitted by a star was used as the target. In the first test firing in 1984, the ASAT was launched to a predetermined point in space.

★ **DIED**—**Lt. Gen. Roscoe C. "Bim" Wilson, USAF (Ret.)**, who was involved in the development of the atomic bomb and who later served as the Commandant of the Air War College at Maxwell AFB, Ala., died August 22 in a nursing home in Louisville, Ky. He was eighty-one. During World War II, he was assigned to the Manhattan Engineering District, a cover name for the atomic bomb development project, as the Army Air Forces' project officer. At the end of the war, he served as chief of developmental engineering for USAAF. After a three-year tour at the AWC, he commanded Third Air Force in England. Upon retirement in 1961, he worked as the military director for the Rand Corp. and also for the Lincoln Laboratory of the Massachusetts Institute of Technology. The National Geographic Society named a glacier in Antarctica for General Wilson. ■

Staff Changes at Air Force Magazine

There have been some personnel changes at Air Force Magazine over the summer. Two new staffers have been added, and two more have been promoted to other positions.

Capt. Ronald A. Lovas, USAF, is a new Contributing Editor. He has been assigned to the magazine for the next ten months as part of USAF's Education With Industry (EWI) program.

A journalism major, Captain Lovas was commissioned through the AFROTC program at the College of St. Thomas in St. Paul, Minn., in 1981. His previous assignments include stints with the public affairs offices at the 1st Tactical Fighter Wing at Langley AFB, Va., and the USAF Tactical Fighter Weapons Center at Nellis AFB, Nev. Most recently, he served as the public affairs officer for the Thunderbirds, the Air Force's Air Demonstration Squadron. Before being commissioned, he had ten years of enlisted service.

He replaces Maj. Randal E. Morger, USAF, who was reassigned to the Pentagon.

Colleen A. Bollard was promoted to Staff Editor in June. As such, she is responsible for a wide variety of tasks in both the editorial and production areas of the magazine.

Miss Bollard joined the Air Force Association staff in January 1985. After working as an Administrative Assistant in the Industry Relations Department, she joined the Magazine Department in November 1985 as an Editorial Assistant. She did her undergraduate work in English at Virginia Tech.

She replaces Jeffrey P. Rhodes, who was promoted to Defense Editor.

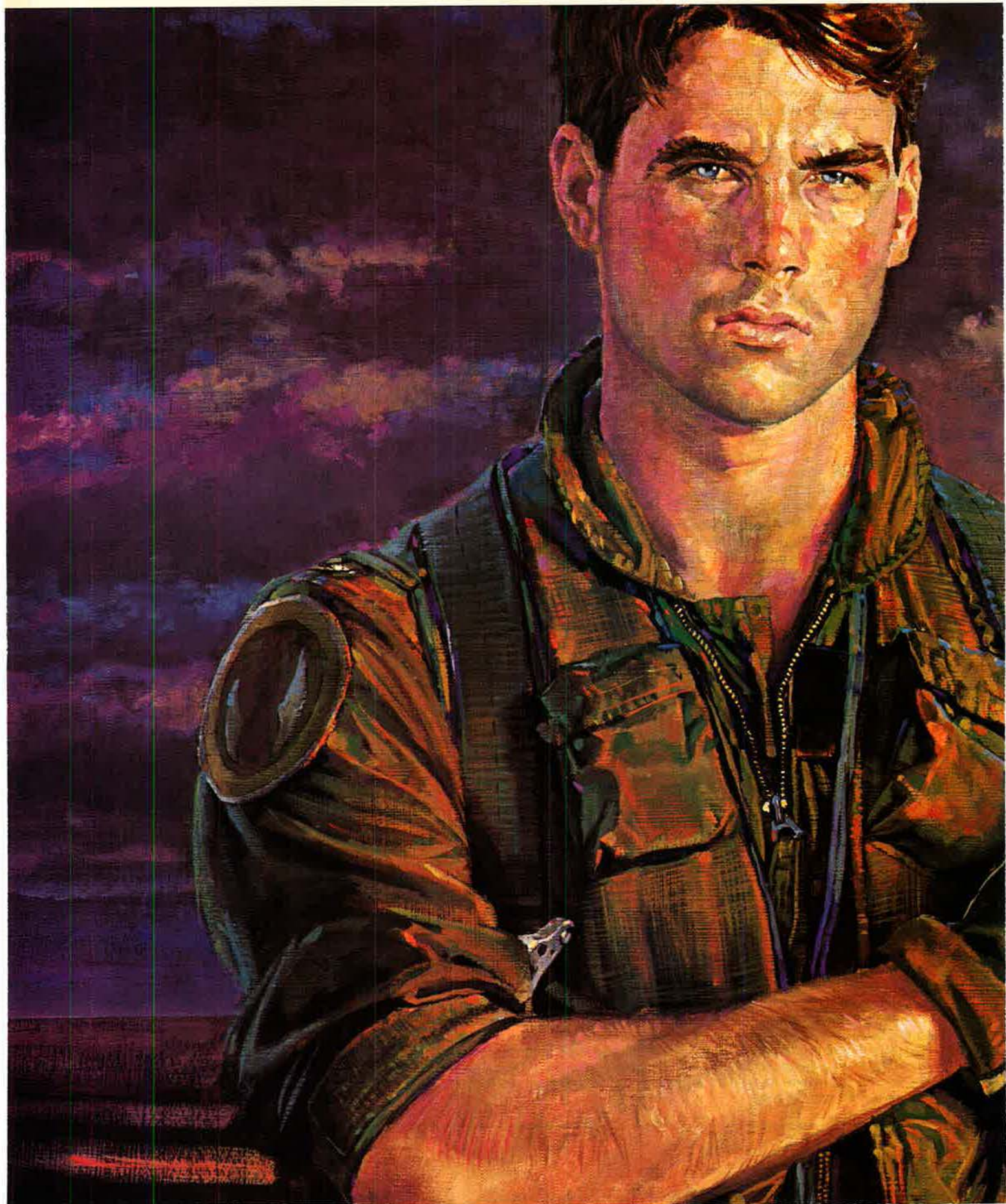
Daniel M. Sheehan has joined the staff as Editorial Assistant. His main responsibilities will be in the production areas of the magazine.

A native of New Brunswick, N. J., Mr. Sheehan graduated from Georgetown University in 1981 with a degree in German and history. He comes to the magazine directly from Capitol Hill, where he worked for the House of Representatives for four years.

He joined the staff in June.



Capt. Ronald A. Lovas (seated), Daniel M. Sheehan, and Colleen A. Bollard all have new duties at Air Force Magazine.



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There should be no question whether America will have it.

BOEING

The Air Force has thought out its requirements and knows what its priorities are. The problem is how to fund them.

The Issues

BY JAMES W. CANAN
SENIOR EDITOR

THE Air Force is in good shape. Its leaders are convinced that it is more capable—better manned, trained, and equipped—than at any time in its history, bar none.

They are not complacent, however. On the contrary, they are deeply concerned that the Air Force is in immediate danger of losing its hard-won momentum and of backsliding into the troubles of its not-so-distant past.

At the beginning of this decade, the Air Force was ailing. Its bombers and ICBMs were outdated, too many of its fighters were holdovers or hangar queens, its airlifter and tanker fleets were woefully short of capacity and versatility, its training suffered from severe constraints on flying time, and it had to struggle to recruit and retain good people.

The Air Force has come a long way toward complete recovery on all those counts and more in the years since then. This was made possible by ample funding in national defense budgets.

The funding was not the whole story, however. Just as important was the methodical way in which the Air Force went about putting it to use.

It did so by establishing priorities, by defining and delineating the issues that it needed to resolve in order to meet those priorities, and by allocating its money in support of its resulting game plan.

Now this system, which worked well when there was enough money to go around, could come unstuck.

Air Force funding, as part of the beleaguered defense budget, is faltering. At the same time, Air Force priorities and issues are becoming more complex, more numerous, and—in the name of a well-rounded warfighting force made up

of a host of indispensable elements and capable of addressing any threat, almost anywhere, to US national security—increasingly inseparable, one from the others.

Given all this, the Air Force can be expected to have rougher going in coping with all its issues and, thus, in promulgating and protecting all its priorities.

The stakes are high, maybe life-or-death. Unless the Air Force succeeds, it will have a hard time in just staying even with its gains of recent years and may well have to relinquish all too many of them.

This could be disastrous, for even as USAF has grown stronger, its task has become tougher. Its missions are more numerous and more exacting. The threats that it faces are more manifold and more menacing.

Meeting its priorities is a tall order for USAF, even with bountiful funding.

Five Top Priorities

The priorities fall into five main categories—modernizing strategic offensive and defensive forces, improving the readiness and sustainability of general-purpose forces, increasing airlift capability, modernizing and expanding tactical forces, and assuring access to space (see box, p. 49).

These enfold a multitude of programs, all of which pivot on a host of issues that USAF is currently addressing.

The issues themselves are grouped under the three broad headings of national security, resources and their management, and forces and capabilities.

The national security issues cover what the Air Force believes it needs to do “to preserve the peace,

freedom, and territorial integrity of the nation and to safeguard the fundamental values of our democratic system.”

They also cover the threats by potential adversaries, most notably the Soviet Union.

Resources issues have mainly to do with USAF's people and with managing acquisition programs, improving the reliability and maintainability of systems, and building and maintaining bases.

Forces-and-capabilities issues range the widest. They embrace strategic forces, theater forces, projection of forces (including those now earmarked for low-intensity conflicts and for special operations), and space.

Space cuts across nearly all cate-

While it is technology that is driving the Air Force into the twenty-first century, it must never be forgotten that it is people—be they pilots, engineers, policymakers, or mechanics—who must maintain the guiding hand on that technology. As important as is the technology of tomorrow, the Air Force must also have the men and equipment to do the job today. (AIR FORCE Magazine photo by Eddie McCrossan)

gories of Air Force issues and priorities. The reason is that today's satellites of highly varied purpose are increasingly expensive force

That Count



multipliers. Thus, they are pertinent to how USAF manages its resources and its forces, and they must be defended against possible attack.

In this connection, word has circulated outside the Air Force that USAF is ready to give up on its antisatellite program involving ASAT missiles launched from F-15 fighters.

In its presentation of priorities and issues, the Air Force indicates no such thing. It highlights, under space defense systems, its need for the ASAT weapons, for renewed permission to test them to their utmost, and for the public to understand that the Soviets have such weapons of their own and can readily deploy them.

People—The Essential Element

In the Air Force's schematic, people issues pervade all others even more extensively than do space issues. USAF regards its people as the foundation of its warfighting capability. It underlines its need for high-quality people to make its high-tech weapons work and describes them as "essential to all Air Force mission areas."

Pilot retention is a premier concern in this regard. There are many others as well, dealing with such topics as military pay comparability, the role of women in the military, medical and dental care, the tax-exempt status of military allowances, reimbursement for permanent changes of station, civilian-employment and civilian-compensation management, military retirement, the reenlistment bonus program, and, at the root of it all, "manpower and the federal budget dilemma."

Outside and inside the Air Force, there are skeptics who claim that USAF gives only lip service to its

people issues. When push comes to shove in the looming battles over the defense budget, the Air Force will be more willing to take hits on its people programs than on its hardware programs, such critics contend.

They also claim that, no matter what the Air Force says, some of its hardware programs are obviously more precious to it than others.

This is arguable, but the Air Force, for the record, concedes nothing. Its leaders insist that its accent on people as its main concern, as the foundation on which all its priorities stand, can indeed be taken at face value.

They also claim that it is impossible for them to designate one hardware program—for example, the Peacekeeper ICBM—as an untouchable, while specifying another one—for example, the C-17 airlifter—as something less.

Their reason for grouping priority programs as equals, they say, is that each must be viewed as inextricably linked with all others—something like molecules in a chain—in accordance with USAF's main goal of "balanced forces and capabilities that deter aggression across the spectrum of conflict."

For example, Peacekeeper's purpose in the first instance is to deter war and, in the second instance, to prevent a conventional war from escalating into a nuclear war. If conventional war breaks out in Europe, however, the C-17's ability to bring reinforcements from Stateside and to land them close to the front or to move them around from battle area to battle area would be vital to NATO's warfighting prowess.

The C-17 would also be a prime means of transporting US troops and gear into arenas of low-intensity conflict. It may even serve someday, provided it goes into production, as a handy aircraft for special operations forces to have around.

The whole thing goes together. USAF's need to be capable of deterring or waging nuclear war, high-intensity conventional war, and low-intensity conflicts and to perform special operations make Peacekeeper and the C-17 equal partners among priorities, at least in theory.

USAF does make a distinction, however, between strategic modernization and its other three top pri-

orities, including the improvement of airlift.

Strategic modernization, which embraces command control communications and intelligence (C³I), the B-1B bomber, the Advanced Technology Bomber (ATB), Peacekeeper, the Small ICBM (SICBM, or Midgetman), cruise missiles, the Short-Range Attack Missile (SRAM II), and strategic defense, is acknowledged by the Air Force to be first among equals.

The Air Force has its heart in this ranking. It notes, however, that strategic modernization was originally ranked foremost among national defense priorities by President Reagan, who later gave it additional leverage by infusing it with his SDI program.

Quite aside from USAF's legitimate purpose in presenting all its priorities as peers, there is an obvious tactical reason for its so doing.

If the Air Force concedes that some of its priorities and the programs organic to them are less important than others, it would thereby strengthen the hands of defense budget-cutters in going after those lesser programs, which would resemble crippled aircraft falling out of formation and becoming easy prey.

Shoring Up the Fighter Forces

High among USAF's premier goals are building up fighter forces and producing for them the Advanced Medium-Range Air-to-Air Missile (AMRAAM) and the Low-Altitude Navigation and Targeting Infrared for Night (LANTIRN) system.

USAF has an immutable requirement for a beyond-visual-range, autonomously radar-guided, air-to-air missile that will enable its fighters to engage multiple targets while simultaneously dashing out of harm's way.

In terms of keeping it alive and well, the AMRAAM program is a prime Air Force issue. Were it to fail for lack of congressional support, however, the requirement would remain. Given the threat, the Air Force would still need, as a high programmatic priority, a missile with the very same, or even better, characteristics.

The same goes for the LANTIRN

program in connection with USAF's overarching requirement for a high-priority system that will make its fighters capable of attacking ground targets at night and under the weather.

The Air Force puts a premium on modernizing and expanding its theater forces. There are many good reasons for this, a prime one being the Soviet Union's average production rate of 1,000 new fighters each year since 1980 and its latter-day progression to fighters that come perilously close to matching USAF's best.

USAF's theater forces are a composite of many capabilities: fighters and reconnaissance aircraft, electronic combat forces, special operations forces, intertheater and intratheater airlift, specialized command and control aircraft, and even strategic bombers operating in the conventional-combat mode.

Essential to all of these are adequate amounts of increasingly capable munitions.

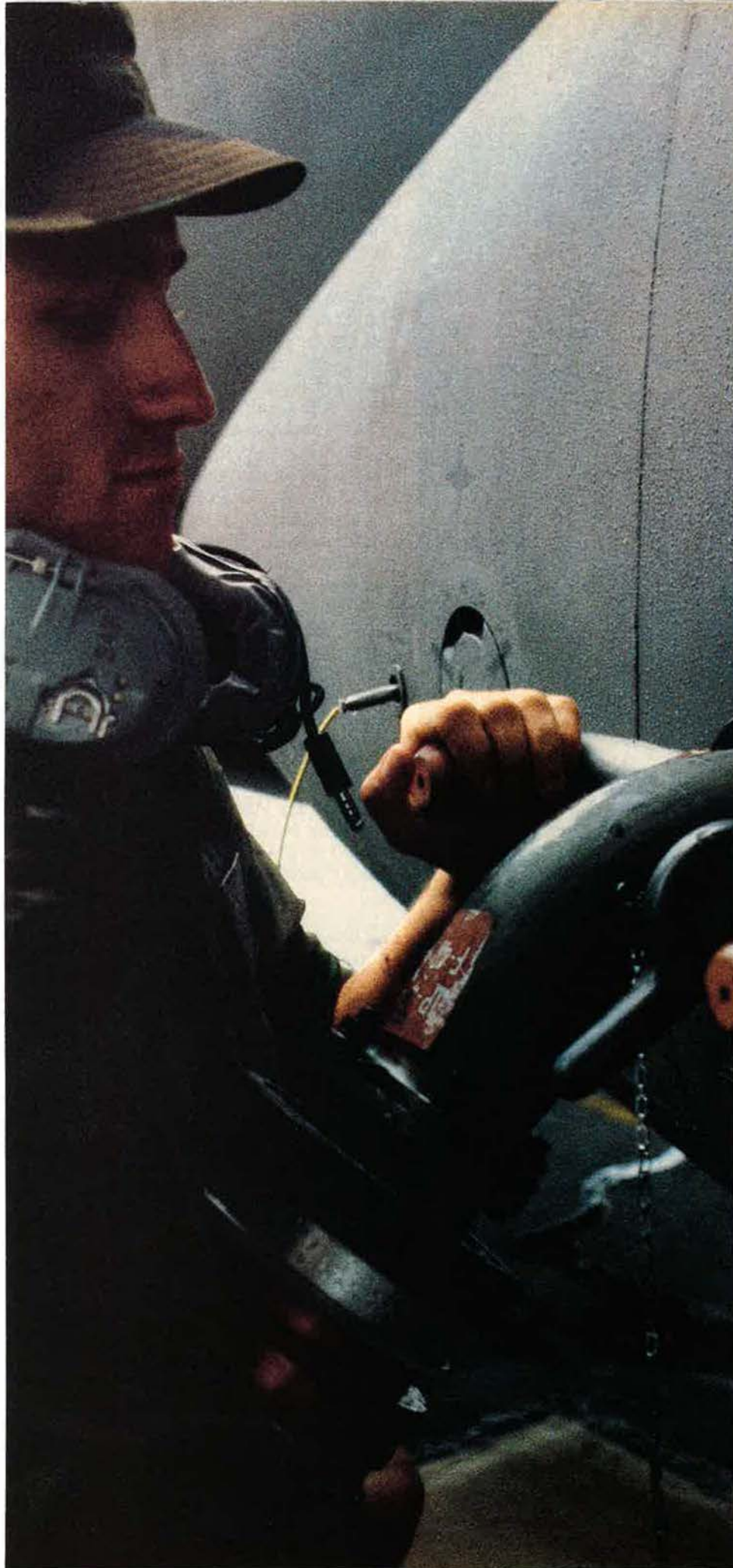
Withal, fighters are still the key to the capability of theater forces. Adhering to its Tactical Fighter Roadmap, the Air Force is fervently promoting a procurement strategy that would enable it to attain growth from the current force of approximately thirty-seven combat-coded tactical fighter wings to a force of forty such wings by 1991.

This means that the Air Force must procure 260 to 280 new fighters each year until then, meanwhile retiring older fighters at a pace and in proportions that would keep the average age of all fighters in the active force at approximately ten years.

Among new fighters, the F-15E dual-role fighter gets top billing, along with its need for LANTIRN to enable it to meet deep-interdiction requirements and to find and attack fixed and mobile targets at night and in adverse weather.

F-15E procurement is under way and is aimed at a total buy of 392 of the aircraft, with initial operational capability planned for 1989.

Yet another plum among USAF priorities is the Advanced Tactical Fighter, "an air-superiority fighter capable of performing operations in enemy airspace and of countering current and projected Soviet fighters."



As an example of how it has taken to integrating its aircraft priorities as well as the aircraft themselves, USAF groups its Joint Advanced Fighter Engine (JAFE) development program and its Critical Subsystems Development program, which includes avionics projects, in the ATF tent.

It also makes a point of Air Force/Navy cooperation in developing the ATF and the Navy's Advanced Tactical Aircraft (ATA) so as to avoid duplication and capitalize on opportunities for commonality of technologies, components, and subsystems.

USAF emphasizes, however, that the ATF and the ATA must be viewed as fundamentally different aircraft, each capable of performing missions that are unique to each service.

Master Plan for Electronic Combat

USAF's ability to perform all tactical missions depends heavily these days on its proficiency at electronic combat (EC), which includes electronic warfare, C³ countermeasures, and suppression of enemy air defenses.

In this regard, the Air Force is putting the finishing touches on its EC Master Plan and Roadmap, which will give its EC planners the

With the rise in worldwide terrorism, the Air Force has increasingly had to take the field of Special Operations into account. This crewman is refueling a C-141 that is used for low-level operations relating to the Special Operations mission. (AIR FORCE Magazine photo by William A. Ford)

same sort of long-range guidance that the Tactical Fighter Roadmap gives its fighter-force planners.

Such long-range plans, including the Airlift Master Plan, for exam-

ple, have come to serve as the basic instruments for USAF in laying out and linking up its priorities across the board.

The EC Master Plan and Roadmap is an urgently needed document. Nearly all aspects of modern warfare involve electronics. The interdependence among electronic systems is growing and will continue to grow as weapon systems—the ATF, for example—are more thoroughly integrated and automated.

This is why USAF also regards its Integrated Electronic Warfare System (INEWS), now being developed for the ATF, as a high-priority program.

USAF's technological advantage in electronic combat has been slipping. The Soviets have been coming on with a rush in their development and deployment of sophisticated electronic systems. Of special concern to USAF is the progress that the Soviets have made in their integrated air-defense system.

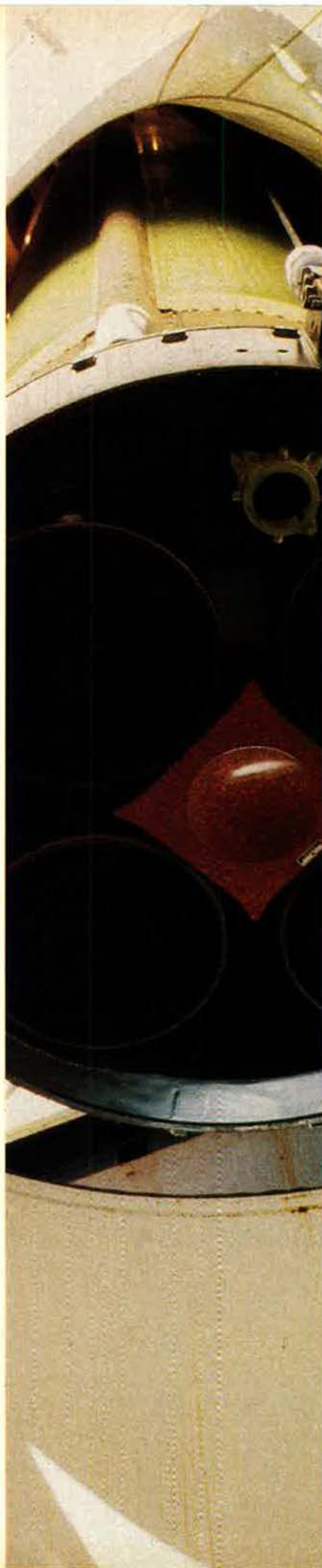
If the Soviets ever gain supremacy in electronic combat, USAF will be in deep tactical trouble, the aerodynamic attributes and other characteristics of its fighters notwithstanding.

In the context of helping those fighters, USAF also sets great store by its programs for tactical reconnaissance and engagement and for tactical C³I.

The Joint Surveillance Target and Attack Radar System (Joint STARS) is a big one here. It is an Air Force/Army program to field a common airborne radar system for spotting and tracking enemy rear-echelon ground forces and for directing air-launched and ground-launched weapons against them.

The Air Force and the Army agreed that Joint STARS should be mounted aboard a C-18 aircraft. There is pressure in some circles to give the C-18 a slip and go beyond it in developing a follow-on aircraft for Joint STARS, meanwhile delaying its deployment.

This is a major issue for USAF, which is fighting for deployment of Joint STARS on C-18s as quickly as possible. It is convinced that delaying the program until a follow-on aircraft is developed would jeopardize its capability to perform an extremely urgent and immediate war-



time mission. In this, it has the Army and the Office of the Secretary of Defense squarely on its side.

Ensuring a Complementary Mix

As important as Joint STARS clearly is, the Air Force believes that it needs a complementary mix of tactical reconnaissance systems. One sensor, platform, or method of employment, such as standoff, orbital, or penetrating, cannot fulfill all tac recon requirements.

Consequently, USAF is also pushing hard in behalf of its Tactical Air Reconnaissance System (TARS), composed of an electro-optical sensor suite for RF-4C aircraft and a reconnaissance pod for another fighter yet to be designated. The program also calls for ground stations with worldwide capability for receiving, processing, and exploiting the reconnaissance data.

TARS is scheduled to go into full-scale development next year. It is seen as one element of the proposed Advanced Tactical Air Reconnaissance System (ATARS) now being devised.

The other element of ATARS involves a touchy subject—Remotely Piloted Vehicles (RPVs). Called the Unmanned Air Reconnaissance System (UARS), that element would involve RPVs collecting data under conditions that are not con-

The President's plan for the modernization of the nation's strategic forces is well under way. B-1B production is beginning to hit its stride, and this was the scene earlier this year at F. E. Warren AFB, Wyo., as the first Minuteman III missile was removed from its silo to make room for the Peacekeeper ICBM.

ducive to the survival or the cost-effectiveness of manned aircraft.

USAF has been accused of ignoring the potential of RPVs in its alleged preoccupation with manned

platforms. It claims, however, that it is indeed interested in using RPVs on a number of missions, including reconnaissance.

USAF's consideration of the UARS program among its major issues tends to give credence to its claim. Its role in that program is to design its TARS sensors and associated equipment to be compatible with the RPVs that the Navy, USAF's partner in the UARS program, alone will develop and build, beginning later this year.

Among many other theater-warfare issues, the need for chemical-warfare retaliatory capability to deter a Soviet chemical attack ranks high with USAF. So do the needs to sustain the Ground-Launched Cruise Missile (GLCM) deployment in Europe and to fend off any further congressionally imposed lowering of the ceiling on US troop strength there.

Air-to-surface weapons get big play among Air Force theater-warfare priorities.

For use in Europe, USAF needs standoff weapons, direct-attack weapons, and weapons capable of multiple kills per pass to attack the airfields, armor, and air defense systems that are the keys to the potency of Warsaw Pact forces.

For the Pacific, the needs are different—improved, nonnuclear bombs and missiles capable of destroying the large numbers of hardened targets in that theater.

Overall, USAF's goal is the deployment of adequate quantities and varieties of air-to-ground weapons to meet all mission demands, from the toughest to the slightest, in all theaters.

Strategic Modernization

When it comes to the capabilities of the total force, there are no issues and no priorities more important to the Air Force than those in the strategic arena.

Congressional limitations on Peacekeeper missile deployment—down to fifty missiles from the 100 that USAF and the Administration had planned—and uncertainties surrounding the SICBM program imply an erosion of USAF's land-based missile leg of the US strategic triad.

Consequently, the Air Force comes down hard with its long-

standing argument that unless that land-based leg is kept alive and kicking through modernization via Peacekeeper and SICBM, US strategic forces—reduced to a dyad of missile-launching submarines and bombers with and without cruise missiles—will not be up to their missions of deterrence and, if necessary, of retaliation.

USAF makes the case, moreover, that the Soviets, in steadily deploying successive generations of land-based ICBMs, clearly show that they think the same way as USAF.

The Air Force also notes that the powerful, ten-warhead Peacekeeper and the presumably mobile, single-warhead SICBM would serve as instruments in behalf of arms control as evidence of US strategic power and national resolve that would influence Moscow to make a deal.

Issues surrounding the Peacekeeper and SICBM programs have to do with the numbers of both in the offing, their capability and survivability, and, in the case of SICBM, its weight limit, which USAF believes should be 37,000 pounds instead of the congressionally mandated 33,000 pounds.

The bottom line for USAF where both are concerned is this: "We will continue to seek greater deterrence stability through deployment of Peacekeeper, development of the Small ICBM, and vigorous pursuit of mutually verifiable arms-reduction agreements."

The Air Force appears to address its two-bomber program less defensively than it does its ICBM programs.

Both the B-1B and the ATB are major parts of its top-priority strategic modernization program, and both are coming along just fine. Under cost and on schedule, the B-1B is entering the inventory. The ATB seems solidly on track in the latter stages of its development, heading for first delivery in the early 1990s.

Year by year, USAF seems increasingly willing to express confidence that the ATB will indeed live up to its promise as a penetrator of Soviet defenses well into the next century.

By the same token, USAF re-emphasizes ever more firmly that it has no plans whatever to expand its B-1B buy beyond the 100 originally scheduled aircraft.

Bombers are making quite a comeback from the time, not all that long ago, when they were being dismissed by some defense planners as out of style in the age of unmanned strategic weapons.

As USAF notes: "Because of the increased Soviet emphasis on mobile ICBM delivery systems and command centers, the manned bomber's real-time potential for locating and destroying relocatable systems is vital to the maintenance of a viable triad."

As always, moreover, the Air

USAF Priorities

- Modernizing strategic forces.
- Improving readiness and sustainability.
- Increasing airlift capabilities.
- Modernizing and expanding tactical forces.
- Assuring access to space.

In these categories, the programs considered to be the most vital to improving USAF's combat capability are:

Strategic Modernization

Peacekeeper
SICBM
Advanced Technology Bomber
B-1B
C³
Advanced basing technologies

Readiness and Sustainability

Spares
Training
Flying hours
Exercises
Quantities of munitions

Airlift

C-17
Special Operations Forces

Tactical Forces

F-15E
AMRAAM
LANTIRN
Modern munitions
Advanced Tactical Fighter
C³
Electronic warfare systems

Space

Manned/unmanned launchers
Redundant capability
National Aerospace Plane

Force makes a big point of the bomber's ability to carry a large number and variety of weapons, to attack widely separated targets, and to change course to alternate targets or to come back home, unlike ICBMs, if war does not materialize as threatened.

The Air Force is not overlooking the B-52, either. Among its major programs are those to enhance the B-52's potential for meeting projected worldwide threats by employing standoff weapons against targets on land or at sea.

"Once again," says USAF, "the B-52's inherent characteristics of rapid response, long range, and extended loiter time, coupled with other unique mission capabilities, make it an ideal platform to support maritime operations."

In the strategic arena, the Air Force makes it clear that its need for air defense interceptor aircraft of modern vintage is now an urgent one, given Soviet advances in long-range, bomber-carried cruise missiles. Hand in hand with this requirement is the need to improve USAF's atmospheric threat-warning systems.

To meet this need, USAF has embarked on its Air Defense Initiative (ADI) program, which it sees as complementary to the Strategic Defense Initiative program for defense against ballistic missiles.

Ensuring Adequate C³I

Without adequate strategic C³I, the entire strategic deterrence force would mean little or nothing. The credibility of that force, the Air Force notes, depends on systems that provide positive control and communications for the effective employment of the triad.

"In the past," says USAF, "we have not modernized our C³ systems fast enough to counter the threat. The President's Strategic Modernization Program, however, makes upgrading C³ systems one of our highest priorities."

Here again, some critics charge that the Air Force puts more rhetoric than resources into modernizing strategic C³. They warn that this alleged tendency will show up even more starkly, and be even more dangerous, in the coming defense budget crunch.

The Air Force insists that it does

not and will not slight strategic C³ and that its accusers ignore its need to keep strategic C³ funding in balance with funding for other strategic elements.

Increased Emphasis on Special Operations Forces

As part of its force-projection priorities, "Special Operations Forces are receiving increased emphasis," the Air Force says, adding:

"Our programs to purchase more MC-130H Combat Talon IIs and AC-130 gunships, along with the conversion of additional CH/HH-53s to Pave Low III (MH-53) configuration, are giant steps toward the Air Force goal to provide effective airlift and selective firepower support for Army Special Forces, Army Rangers, and Naval Special Warfare Units."

USAF regards the fixed-wing, tilt-rotor CV-22A aircraft as its chief long-range contribution to improving the effectiveness of the SOF, one that "will greatly enhance and expand Air Force SOF ability to respond to a crisis."

The SOFs are regarded as important for engaging in Low-Intensity Conflict (LIC). This does not mean, however, that special operations and low-intensity conflicts are synonymous. As USAF notes, LIC can involve forces much different from SOF and may even exclude SOF.

USAF defines Low-Intensity Conflict as "generally confined to a geographic area and . . . often characterized by constraints on weaponry and tactics."

The growing importance that the Air Force and the Army give to their capabilities for waging such combat is exemplified by their recent establishment of a joint center at Langley AFB, Va., for upgrading such capabilities.

That center merits much attention in USAF's depiction of its major issues, as do a number of other interservice programs that illustrate the increasing accent on jointness in the US military operations.

R&M 2000

Undergirding all USAF issues and priorities are those having to do with Air Force resources and their management and with the reliability and maintainability of systems.

Nowadays, USAF gives its R&M

priorities, programs, and issues at least their fair share of attention. As the cornerstone of its R&M 2000 Action Plan, it is demanding—no ifs, ands, or buts—improved R&M for its weapons in the field, in development, and on the drawing boards. Its contractors are rewarded if they heed this and are penalized if they do not.

R&M initiatives, now the ultimate responsibility of the Air Force Special Assistant for R&M at the Pentagon, "are taking hold," the Air Force declares.

They had better continue to do so. The readiness and sustainability of Air Force systems depend on it, and so does USAF's future ability to keep its costs in bounds as its main means of managing its tightening budgets.

Well-run acquisition programs are also crucial to USAF's good management of resources. So it is no surprise that USAF continues to accentuate its acquisition strategies.

There is a bit of constructive irony in this. As USAF notes, public awareness of shortcomings in the acquisition system was heightened while defense spending was on the rise. The reforms that USAF instituted to correct such shortcomings will serve it well in their contribution to more efficient management, especially if defense spending, as expected, goes into decline.

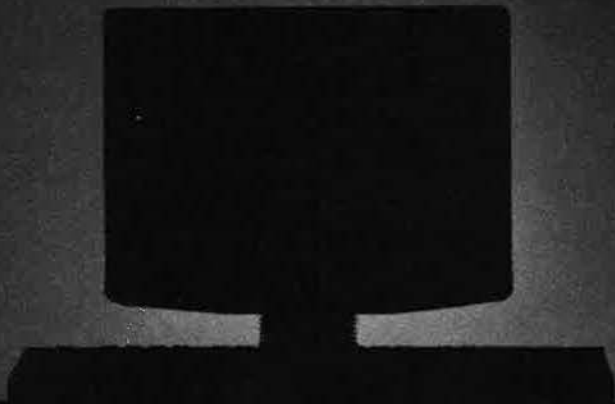
Noting that "our acquisition process is pressed by heavy demands," the Air Force nevertheless claims "significant progress with management reforms instituted since 1981."

"The professionalism of the acquisition management community is an issue of major importance to the Air Force, to Congress, and to the American public," the Air Force declares.

As part of the Defense Acquisition Improvement Program, USAF has instituted improvements to control costs, improve R&M, and enhance competition at the prime-contract and subcontract levels.

The payoffs from such endeavors may well spell the difference as the Air Force, in the years immediately ahead, battles to keep its priorities straight and to implement them coherently with programs caught in severe budgetary binds. ■

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USAF's new Chief of Staff talks about forces, priorities, and requirements.

Tomorrow's Readiness Counts, Too

BY EDGAR ULSAMER
SENIOR EDITOR (POLICY & TECHNOLOGY)

THE management philosophy of Gen. Larry D. Welch, the Air Force's new Chief of Staff, stresses decentralization of authority and responsibility by placing "one supervisor" in full control of "one piece" of the Air Force mission. Full control, he explained, extends from authority and resources to accountability. A layered management structure that obscures rather than pinpoints responsibility is inimical to this approach, General Welch emphasized. While the shift toward decentralized management is a top priority, he plans to pursue this goal in an evolutionary manner.

The new Chief's emphasis on "evolution" came across also in his analysis of the Air Force's basic priorities. Those priorities, he said, "were right [when first formulated] and remain so." The challenge that confronts the Air Force now, he emphasized in an interview with AIR FORCE Magazine, is to keep these priorities intact and in balance even though funding levels might decline sharply in the future. The result might be some "tough choices, because we do have to balance things." These balances, he explained, must be maintained among various major mission areas as well as in terms of "readiness today and readiness tomorrow." In the first instance, "that means spare parts and ammunition—and those are important—while readiness tomorrow is modernization."

The Top Priorities

The central priority—long-standing and uncontested—is "providing a productive environment and



As he begins his tenure as USAF's twelfth Chief of Staff, Gen. Larry D. Welch sees as his biggest challenge keeping the service's basic priorities intact in the face of budget cuts.

motivating our Air Force people." Whatever progress the Air Force makes in combat readiness and combat capability is derived "from the fact that we have high-quality people." Quality is a function of several factors. Key among them is the imperative that "we give our people the wherewithal to do their daily jobs, which means spare parts, tools, support equipment, and whatever other things they need to do their job. It also means professional facilities for professional people to work in."

Ranking right below the people issue is strategic force modernization, USAF's top programmatic challenge. The pivotal factor driving this priority, General Welch pointed out, is that the US has only about half of the prompt hard-target kill capability needed to maintain effective deterrence while the USSR's capability is at twice the required level.

As a result, "our number-one priority today is the Peacekeeper missile." MX, he said, "is by far the most available, most affordable solution to this shortfall." The Peacekeeper ICBM "is here, it works, it's a technical success story by anybody's standard, and we simply need to get on with the deployment [of the full complement] of 100 missiles."

The Air Force—in line with a congressional mandate to deploy the second fifty Peacekeepers survivably and in a mode other than modified Minuteman silos—is investigating eight different basing schemes. Of these eight deployment modes, four are specifically tailored for survivability, General Welch said, adding that, under

current plans, the Air Force late this year will select the one "that we think makes the most sense." Survivability, he pointed out, "clearly is desirable; what we will have to weigh when the time comes is affordability vs. the degree of survivability."

The Air Force's position on ICBM survivability remains unchanged and unambiguous: "Survivability is important, but even more important is the deterrent capability [that] resides in MX." The fact that the Soviets can never be certain of succeeding "in a surprise attack makes these missiles a powerful deterrent, however survivable their deployment mode."

No Substitute for the ICBM

The new military head of the Air Force—until recently the Commander in Chief of Strategic Air Command—dismissed contentions making the rounds in Congress and the executive branch of government that the age of the ICBM is past and that the strategic triad should devolve to a dyad of sea-based and air-breathing strategic offensive weapons: "Serious strategic thinkers understand the importance of the ICBM leg of the triad. In the first place, the Soviets have the greatest respect for ICBMs. The clear and incontestable evidence of that is the reliance that the Soviets place on the ICBM leg in their triad."

There are good reasons for that, according to General Welch: "The ICBMs give you peacetime alert forces with the highest capability at the lowest cost. There is no other way to provide that much deterrence for that price; that alone makes the ICBM leg a vital part of the deterrence capability." Additionally, only ICBMs currently provide prompt hard-target kill capability. Even with all planned improvements of the other legs of the triad, the ICBM component will remain "the most effective part of [the US prompt] hard-target kill capability. There are no substitutes for the ICBM," in General Welch's view.

USAF's Chief of Staff sees merit in the US plan to seek the elimination of all mobile ICBMs—whether MIRVed or single-warhead weapons—in the current round of strategic arms-reduction talks. Explaining that the US proposal to outlaw mobile-based ICBMs must be viewed within the context of such parallel conditions as cutting existing nuclear warhead inventories in half, General Welch said the "very straightforward motivation [behind the US proposal is that] mobile ICBMs are very hard to verify. Even more important, the Soviets are fielding mobile missiles today, and we [will be fielding] our mobile missile in the early 1990s, if all goes well." As a consequence, it is advantageous for "us to suggest at this time that [both sides] dispense with mobile ICBMs—assuming that the Soviets negotiate in good faith," General Welch pointed out.

SICBM and the Two-Bomber Program

So far as this country's plans for the Small ICBM (SICBM) are concerned, General Welch said the Air Force is working on answers to two basic questions: "First, what is the cost differential between a single-warhead mobile [design] and one [carrying] two or three RVs? Second, what is the impact on mobility [of greater size and weight that might result from MIRVing] and, hence, on survivability?" Major cost savings obviously can be realized if a survivable SICBM carries more than

one warhead. But a MIRVed design "makes sense" only if it retains adequate mobility while lowering costs, and "we don't know the answer to that yet." In this context, General Welch expressed irritation over premature claims that MIRVed SICBMs with adequate mobility are within the state of the art, asserting that he was "very much opposed to Pentagon engineering. If we need to make technical decisions, we ought to get our technical people to get us that technical information."

General Welch is strongly opposed to efforts to force the Air Force to buy more than 100 B-1Bs: "Our two-bomber program is well conceived and well executed." He pointed out that the Air Force launched the B-1B program because of the need for an "interim bomber to ensure that we would have the time to develop ATB [the Advanced Technology, or Stealth, Bomber] in an orderly fashion and with an acceptable degree of risk."

The B-1B, he emphasized, "provided us exactly that." He added that the B-1B is a "superb" weapon system that "will be an effective penetrating bomber for a number of years and, beyond that, will be an effective cruise-missile carrier for decades." Although the B-1B was the right program at the right time, "100 remains the right number. In this budget environment, the only way we can afford more than 100 [B-1Bs] is to delay ATB." But there is no valid reason for holding up the ATB program, which is "on the right schedule because we bought time with the B-1B."

The popular notion that ATB is not suitable for force projection and other conventional warfare roles is "exactly wrong," according to General Welch. While the Air Force has not yet decided on a follow-on aircraft to the B-52G to serve in the role of a long-range conventional bomber, two facts are abundantly clear, according to General Welch: "The B-1B will have a good conventional capability, but the ATB is far and away the most promising conventional vehicle that we can imagine." The Stealth bomber, he disclosed, "will have a very, very respectable bomb-carrying capability [over] very respectable ranges. When you add the stealth aspect to all those normal capabilities that are important in conventional operations, [the end result is a] new dimension in conventional support that we never had before."

The B-1B as well as ATB will rely heavily on SRAM II, a follow-on to and replacement for SRAM-A, which is "rapidly becoming overage and [whose] engines are getting unreliable," USAF's Chief of Staff emphasized. The Air Force examined carefully the possibility of re-engining SRAM-A—as suggested on Capitol Hill—but found that SRAM II is "clearly the best solution" in terms of performance and cost-effectiveness.

He also pointed out that—contrary to the notion of some congressional experts—the B-1B and eventually the ATB will need both "ACM [the advanced cruise missile, a stealthy, longer-range replacement of the ALCM-B air-launched cruise missile] and SRAM II." The ACM, now in flight test, "is the right cruise missile for the B-1B and beyond." It has greater range as well as advanced performance compared to ALCM-B and, therefore, can cope with the increasing forward capabilities of Soviet defenses more effectively, according to General Welch. From the Air Force's point of view, SRAM II and ACM are not "either/or" issues, but represent essential strategic weapon systems, he added.

The Challenges of Low-Intensity Conflict

Over the past few years, the Air Force has increased its emphasis on "the very low end of the conflict spectrum—that is, Low-Intensity Conflict [LIC] and the Special Operations Forces [SOF]"—with the result that this form of warfare now receives adequate, balanced attention, according to General Welch.

The challenges associated with Low-Intensity Conflict, he suggested, are keenly affected by semantics: "LIC is such a broad term that I am not exactly sure how useful it is." There is a tendency to use the term in an all-encompassing manner, "from antidrug operations up to major conflict that doesn't involve superpower confrontation." By that definition, "the Air Force spectrum of capabilities for Low-Intensity Conflict is everything up to nuclear confrontation." The resultant problem then is "how to balance all the different demands across that broad [mission] spectrum."

Beclouding the issue further are vague and overlapping definitions affixed to the SOF mission: "There is the tendency, especially in Washington, to regard Special Operations Forces as [within] the purview of antiterrorism or perhaps, at the most, antiguerrilla warfare. The fact is that the SOFs play a major role in much larger conflicts." These loose definitions overlook the central fact that "the Special Operations Forces, in most cases, have to be very closely integrated with the so-called conventional forces."

These ambiguous definitions scatter considerable confusion—including the notion of perceived shortcomings—in their wake, according to General Welch. "We have," he pointed out, "aircraft that are committed to the SOFs with crews that are specially trained to support special operations missions."

A broad range of forces is in fact in being and has application to ambiguous warfare operations, General Welch stressed. "The Commandant of the US Marine Corps might argue that he has the whole Corps assigned to the SOF mission," even though under the narrow definition of the term that fact is usually overlooked, General Welch maintained.

Misunderstandings in Congress and elsewhere notwithstanding, "We clearly have increased greatly our emphasis at the low end of the [LIC] spectrum. We plan to double the MC-130 fleet—and that is already submitted to Congress—and we are doubling the force of Pave Low helicopters. [Moreover,] that is just the beginning of what we have planned" in terms of bolstering the Air Force's LIC capabilities.

Tactical Forces and Standoff

The Air Force's long-standing goal of building the TAFs (tactical air forces) to a force level equivalent to forty combat-coded wings is slipping, General Welch acknowledged ruefully: "I am afraid we are on a course parallel to, rather than on a course toward it." The current budget environment, especially in light of the just-completed cutbacks in the acquisition area for FY '88, means that "we simply won't get up to forty wings." He added that this forecast is valid for at least "the next two or three years, and I seriously doubt that anybody can see beyond that."

The frequently aired contention that the Air Force is at best tepid about the use of remotely piloted vehicles

(RPVs) and other automated standoff weapons is incorrect and unwarranted, in the view of General Welch, who has extensive background in the tactical arena. The Air Force, he emphasized, "is very interested in stand-off weapons," mainly because the increased sophistication of tactical defenses mandates "the use of standoff weapons against a good many targets." RPVs especially are a very "desirable solution to a number of missions or, at the very least, as supplements to various missions."

By the same token, the Air Force's enthusiasm for RPVs in the past has been dampened because "we haven't had tremendously encouraging experience with past RPV programs. Either they didn't work, or the costs escalated to three, four, or five times the estimate we started out with."

But there is reason for optimism with regard to unmanned vehicles of this type: "At the present time, we have several RPV programs under way, plus there are a couple of others [run] by other services that we are interested in. I believe the time has come where we know how to [design and build] RPVs, where we know how to make them work, and where we know how to keep them reasonably close to our cost estimates."

But however configured, standoff weapons that are to play an essential role in the tactical air warfare arena must be "robust. We need systems with great autonomous capabilities that are independent of fragile networks. I am all for standoff," USAF's new Chief of Staff cautioned, "but very suspicious of complex networks."

Multiservice Systems

Another topical issue in the tactical air warfare arena that General Welch viewed with cautious optimism centers on weapon systems commonality. There are many past success stories that teach categoric "dos" and "don'ts" in terms of commonality, he pointed out. The fundamental lesson is "that success stories in the past came from successful programs launched by one service and adopted by another service." He cited the F-4 in this context, which served as the backbone of the Air Force's tactical forces for more than a decade, even though the Navy had developed the aircraft. "The A-7 and the Sparrow missile are other examples—and there are lots of them—where a system developed by one service was found to be extremely useful by another with just minor modifications."

But the commonality principle must not be carried too far. "Where we get into trouble is in cases that involve the [forced coalescence] of very complex sets of multi-service requirements, [with the result that] we wind up building a 'camel.'"

Two major tactical aircraft programs are under consideration for multiservice roles at present. In the case of the Air Force's Advanced Tactical Fighter (ATF) program, the Navy "has been directed to consider it as [that service's] follow-on air-superiority fighter [by modifying the aircraft] for carrier operations," General Welch said. Conversely, the Navy is developing an air-to-ground combat aircraft, the Advanced Tactical Aircraft, or ATA, that the Air Force will be looking at "in terms of [adapting it to serve as] our next air-to-ground fighter." He emphasized that he saw "no reason why this won't work so long as we don't wreck the ATA by separate sets of requirements or do the same thing to ATF."

Jointness and Reform Issues

Among the Air Force's top priorities that General Welch helped formulate in such previous assignments as USAF's Vice Chief of Staff and Deputy Chief of Staff for Programs and Resources, there is one that he is especially committed to: "There is absolutely no question that we will continue the 'joint initiatives' with other services. The emphasis on joint programs and cooperation will expand more and more. This is very natural for the Air Force, because we support the other services. With the exception of offensive strategic forces—and even here we do the job in cooperation with the Navy—our missions are flown in support of other services. So I find it very natural to pursue joint initiatives, especially since they have been very successful. They have saved both the Air Force and the Army a lot of money."

Several parallel efforts under way in the Administration as well as in Congress to reorganize the way the armed forces plan, buy, and fight include positive elements and others that are "not helpful," in General Welch's view. "I think all of us could agree that it [would be good] for us and the country" if some of the management layers burdening the acquisition process were eliminated.

General Welch added, "I applaud the Packard Commission's findings. We in the Air Force are moving on with implementing [the Commission's recommended changes] because we think that the effects will be very positive." There are many features of the Defense Department's reorganization plan "that I agree are very beneficial."

But he warned that in all reorganization schemes there is the acute danger that proposals will be added that "are not helpful." The core proposals of the various reorganization bills and plans are "generally positive. It's the fringe that contains a lot of things that are dangerous," General Welch suggested.

The new Chief of Staff, who launched his military career in the enlisted ranks of the Kansas National Guard's 16th Armored Field Artillery a quarter of a century ago, reacted with a broad grin to concerns within the service that its top leadership was "TAC-dominated." For one, he pointed out, "I come to this job as the CINCSAC. If anyone doubts what that means, let me assure them that the SAC imperatives capture you in about one hour. But on the broader question about the background of the senior people of the Air Force, [we need to remember that] there are three tacair commanders in the Air Force, but only one CINCSAC and one CINCMAC, with the result that more 'tactical generals' are likely [to occupy top command slots]. We should point out also that the reason we call them generals is that they are generalists."

General Welch added that he lets the record speak for itself in terms of the Air Force leadership's "tremendous and effective support of strategic modernization and airlift programs." The fact that very high on "my priority list are Peacekeeper, ATB, and the C-17 should not escape anybody's attention. As a matter of fact, they may be higher on my list than any tactical program. I think," he concluded, "that the balance is taken good care of."

Apparently, so too is the Air Force under General Welch's leadership. ■

He rates the current enlisted force "the best we've ever had" and has some definite ideas for keeping the standard up.

Advocate of the Force

BY JOHN T. CORRELL, EDITOR IN CHIEF



As he begins his tour of duty as the top enlisted man in the Air Force, CMSAF James C. Binnicker feels his top priority is to keep the enlisted force heading in the right direction.

AIR FORCE Magazine photos by Guy Aceto, Art Director

CMSAF James C. Binnicker began his tour as the ninth Chief Master Sergeant of the Air Force last July with one big advantage that some of his predecessors didn't have. The enlisted force that he represents is in excellent shape.

It hasn't always been that way. Chief Binnicker says that he often returned from his travels as a command senior enlisted advisor in the 1970s "depressed beyond belief" by the discontent and poor conditions in the field. Military compensation had taken repeated beatings in the budget, so airmen and NCOs were leaving the service in great numbers, taking their years of accumulated experience with them. There was serious talk of labor unions within the armed forces.

The troops were still getting the job done, but many of them were too preoccupied with concerns about their personal welfare—what Chief Binnicker calls the "Me-I Syndrome."

That cycle was finally broken by the restoration of pay and benefits in the federal budget. Chief Binnicker served for six months as the Air Force's enlisted representative to the Presidential Commission on Military Compensation that helped bring it about.

Today's enlisted force is top notch—well-motivated, less self-centered, and more mission-oriented than the force of ten years ago. The experience levels have been rebuilt. Chief Binnicker rates the current force as "the best we've ever had" and says his lead priority is to keep it headed in the right direction.

Chief Binnicker has superb credentials for understanding what makes the enlisted force tick. In his twenty-nine years of Air Force service, he has experienced about all there is to experience. He has worked on the flight line, in the shops, and in office assignments. He has had four overseas tours. He has served in a combat zone, at the Manpower and Personnel Center (which in January 1986 was redesignated the Military Personnel Center), and as chairman of AFA's Enlisted Council. He has been senior enlisted advisor at a wing, a numbered air force, and two major commands.

Like other leaders taking a force-wide view, Chief Binnicker is concerned that budget cuts may threaten the quality that the Air Force has painstakingly rebuilt

since the 1970s. Military compensation, for example, already trails wages in the civilian sector by 8.3 percent. At the same time, he believes that there is much the Air Force can do internally to prevent problems and to reinforce quality. The critical element, he says, is how well senior NCOs and first-line supervisors live up to their responsibilities.

Leadership and Retention

He says that an unmistakable pattern in retention illustrates his point. He has spent thousands of hours talking with airmen and NCOs, and he saw data evidence by the basketful when he was Chief of the USAF Enlisted Retention Branch.

"We track reenlistment rates by AFSC, by squadron," he says. "In some squadrons at some bases, the retention rate is significantly lower than at another base, same kind of squadron, same AFSC."

With few exceptions, he says there are only two possible explanations for the difference in retention rates. The reason may be that the base is one of those unpopular locations where people do not want to be stationed. If not, the problem is almost certainly leadership.

"It's the example that is set by the supervisor in his attitude toward the Air Force and toward life," he says. "We like to work for and be around the kind of people who just ooze integrity and credibility. People, I'm convinced, usually leave the Air Force not because of the pay or the living conditions—certainly those are factors, important factors—but because they're disgruntled with their supervisors and their working conditions, the kinds of things that we can fix. If, instead of giving reenlistment talks, the supervisor sets the right example, that will influence the right decision about reenlisting."

The "M" in PME

Among the conclusions that Chief Binnicker has reached on his way to the top is that the NCO's essential job is to lead, to take "ultimate responsibility" for the subordinates in his charge. Naturally enough, one of the Chief's first projects is to ensure that NCOs are prepared adequately for that role.

"We are reviewing Professional Military Education [PME] from top to bottom," he says. "At present, a great deal of the content is about force deployments and geopolitics and Maslow's Hierarchy of Needs. Some folks have said, 'Enough! We're not focusing our attention in the right direction.' We're not going to restructure PME, but we're looking to refocus it. We want to put the 'M'—for 'Military'—back in PME. We need to provide the NCO the tools to deal with contemporary problems, not to become a political scientist." He says that grand theory and geopolitics have a place in PME, but that it's probably a smaller place than they now occupy.

A task force of major command representatives has begun meetings as part of a year-long study of PME content. From what he has learned in discussions so far, Chief Binnicker foresees that the refocused curriculum will emphasize leadership and management and that material will be added on such subjects as how to help airmen deal with family and financial problems.

Airmen begin PME with NCO Prep School at the local bases, just before their promotion to buck sergeant. As staff sergeants, they go to NCO Leadership School, still at their local bases. Each major command operates one or more NCO Academies, where the students are tech sergeants. Finally, 1,250 new senior master sergeants are selected each year to attend the USAF Senior NCO Academy at Gunter AFS, Ala.

Chief Binnicker pushes PME especially hard because he sees it as a cornerstone of NCO professionalism—and because he almost missed out on it himself.

"You're looking at a guy who didn't get to go," he says. "Back in the early days, I worked for supervisors who felt they couldn't spare me long enough to attend PME. They saw that I got promoted regularly and fast, and I'm appreciative of that, but there's a void in my life that I wish I could fill. I missed nearly all of that [PME]—either because I couldn't go at the time or because I was beyond eligibility when I could. I finally did get to go to the Senior NCO Academy. I was in the third class."

Advice from the Chief

The Chief Master Sergeant of the Air Force is not in the chain of command. When the position was created in 1967, it was set up that way so that the Chief would not become bogged down in day-to-day programmatic matters. Instead, he was to be free to travel, talk, listen, advise the Chief of Staff and the Secretary, and represent the enlisted viewpoint across the board. In congressional hearings in 1967, Rep. L. Mendel Rivers (D-S. C.), Chairman of the House Armed Services Committee, told Air Force Secretary Harold Brown to make sure everybody understood that the new Chief was not some minor functionary. "He is a special bird," said Representative Rivers.

Inevitably, that "special bird" becomes a role model for many of the half million airmen and NCOs he represents. He is frequently asked for advice in planning a successful Air Force career. Some want to know what they should do in order to have a chance someday to wear the special stripes of the Chief Master Sergeant of the Air Force.

"You can't design your career that way," Chief Binnicker says. "There's no roadmap that I could lay out. My advice would be to do the best job you can at what you're doing right now and not to worry about the next job. So many people, when they get into a new job, immediately start planning their next job. The current job becomes secondary, and they lose sight of what they're doing."

"When you are doing a good job, those influential people who can make a difference in your career recognize the professionalism, the commitment, and the dedication. They recognize that here's an individual we need to take care of, and they do."

Chief Binnicker imposes a special responsibility here on senior NCOs. It is their duty, he says, to become unofficial "sponsors" for airmen with promise, guiding their careers and coaching them along. It does not particularly matter if these airmen are under their direct supervision or not.

"The man that I credit with most of my success early on was in a totally different shop and AFSC," Chief Binnicker says. "He was a maintenance guy."

The Chief believes that senior NCOs should be living examples of Air Force standards and that it is up to them to see that the troops meet standards, too. He says further that younger airmen no longer regard "standards" as a code word for "Mickey Mouse"—a perception that used to be widespread in the junior force.

"In those days," Chief Binnicker says, "the standards applied only to the people. They didn't apply to the facilities. Today, they go to every corner of the base so that people benefit from high standards in a better working area, a better living area, and more pleasant surroundings."

The example he knows best—having been senior enlisted advisor to the Tactical Air Command commander until a few months ago—is the "TAC Standard" that has almost become a prototype for what can be done with a little money and a lot of determination. In 1978, TAC launched the "Look" programs, in which the command



Paul W. Airey (right) who served as the first Chief Master Sergeant of the Air Force from 1967 to 1969, gives some pointers to his eighth successor, Chief Binnicker.

opened self-help centers and reallocated funds from its budget to renovate run-down facilities. It began in the maintenance areas and spread from there.

"People raise their own standards when they live and work in areas like that," Chief Binnicker says.

Budgetary Storm Clouds

But senior NCOs and other Air Force leaders, working all the internal improvements in the world, cannot ensure alone that the force will stay at today's quality levels. Congress has to help by voting reasonable pay

and benefits. As Chief Binnicker's predecessor, Chief Master Sergeant of the Air Force Sam E. Parish, said, "Patriotism is a great thing—you can live it and believe it, but you can't eat it."

Chief Binnicker is concerned by the "budgetary storm clouds" he sees on the horizon. Comparability of military and civilian pay was achieved in October 1981, but a gap has now developed, and it's widening. The Chief says that small gaps are not a significant factor in recruiting and retention but that, as the experience of the 1970s demonstrated, large ones are devastating.

No threat to benefits is so disturbing to the force—including first-termers, the Chief says—as devaluation of the military retirement system. A change that went into effect August 1 reduced by twenty-five percent the retirement benefits of those entering service after that date while "grandfathering" the benefits of those who had come in earlier. A reduction of that scope to the benefits of the current force would almost certainly have triggered an instant retention crisis. The approach decided upon, however, may have planted the seeds for a different retention problem—the proportions of which are not known—in the future.

"We now have two systems, and that's not healthy," Chief Binnicker says. "It creates an 'us-and-them' situation. I think it's really going to hurt us in four or five years when those folks who came in after August 1, 1986, come up on their career decision—especially if the pay raises between now and then aren't what they need to be. The decision not to stay in the Air Force will become easier."

A short budget will affect more than pay and benefits, though. It will also bring changes in force management. Chief Binnicker says it's probable that the Air Force will have to lengthen the standard overseas tour to four years—from the present three—because of reductions in Permanent Change of Station (PCS) money.

"If we have to go for the four-year tour, the overseas volunteer rate will go down," Chief Binnicker says. "Once people get overseas, they find out they like it, and they extend. But it's a different matter if you're in the United States and you're told the assignment will be four years. Three years, for some reason, sounds better to people." He expects that a number of senior NCOs who are eligible to retire will do so rather than accept a four-year tour overseas.

Budgetary storm clouds notwithstanding, Chief Binnicker has no doubt that the US Air Force of 1986 is a great place to be, and he takes obvious pride in the fine enlisted force he represents. His schedule is heavy—but not too heavy to keep him from finding time for any airman or NCO who calls him.

"The first question I'm going to ask is if he has talked to his supervisor," Chief Binnicker says. "Then I'll listen to his whole story. Most problems can be solved by the supervisor, and given an opportunity, the supervisor will solve them. Sometimes the problem is the supervisor—but the neat part about the Air Force is that everybody's got a boss, including the supervisor."

"I have instructed my office staff, and they understand my policy. I will talk to anybody who calls if they're patient and will wait until I can talk to them. The staff does not put anybody off because they determine it might not be important to the Chief. I determine that." ■



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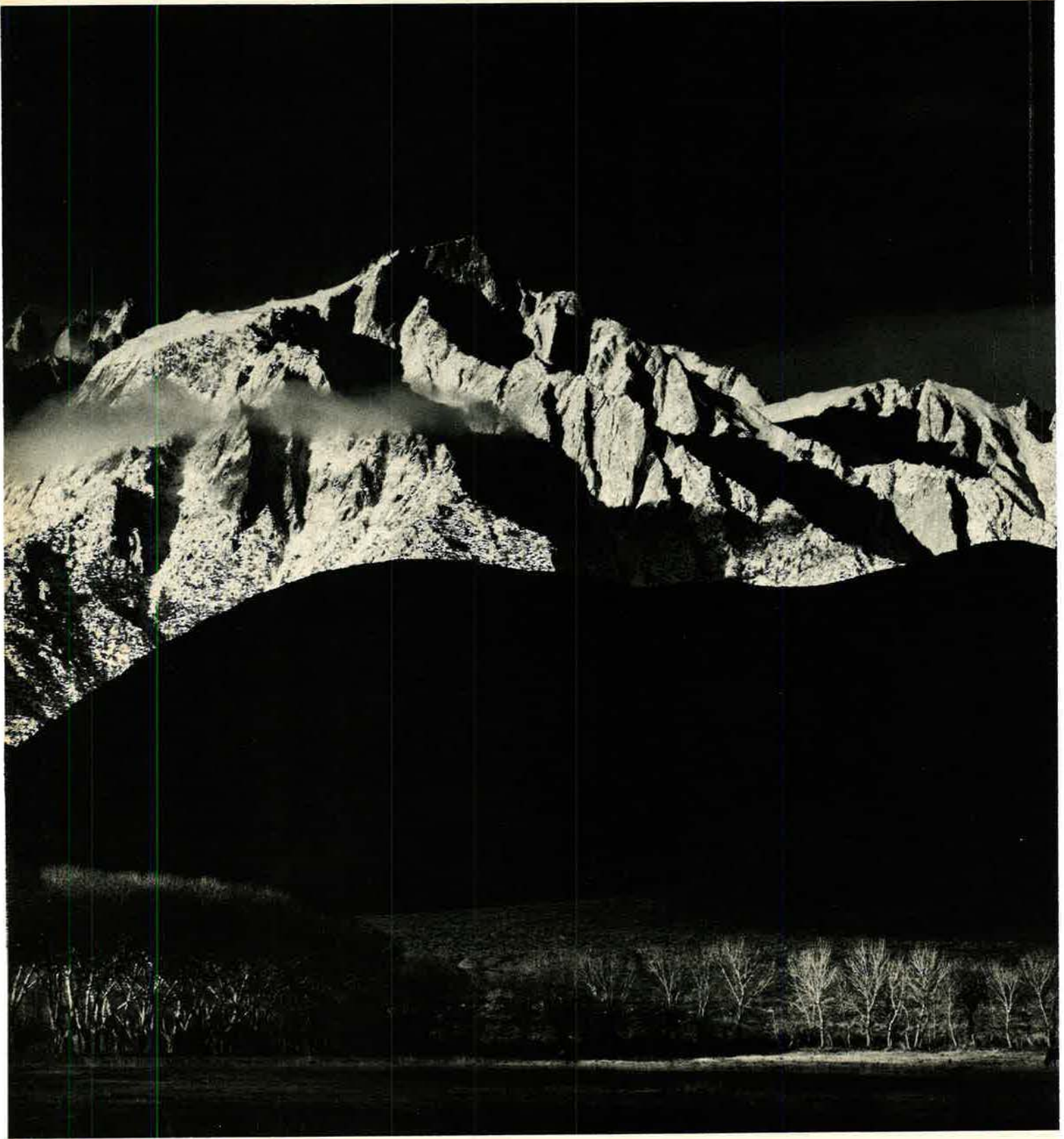
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L T V : L O O K I N G A H E A D





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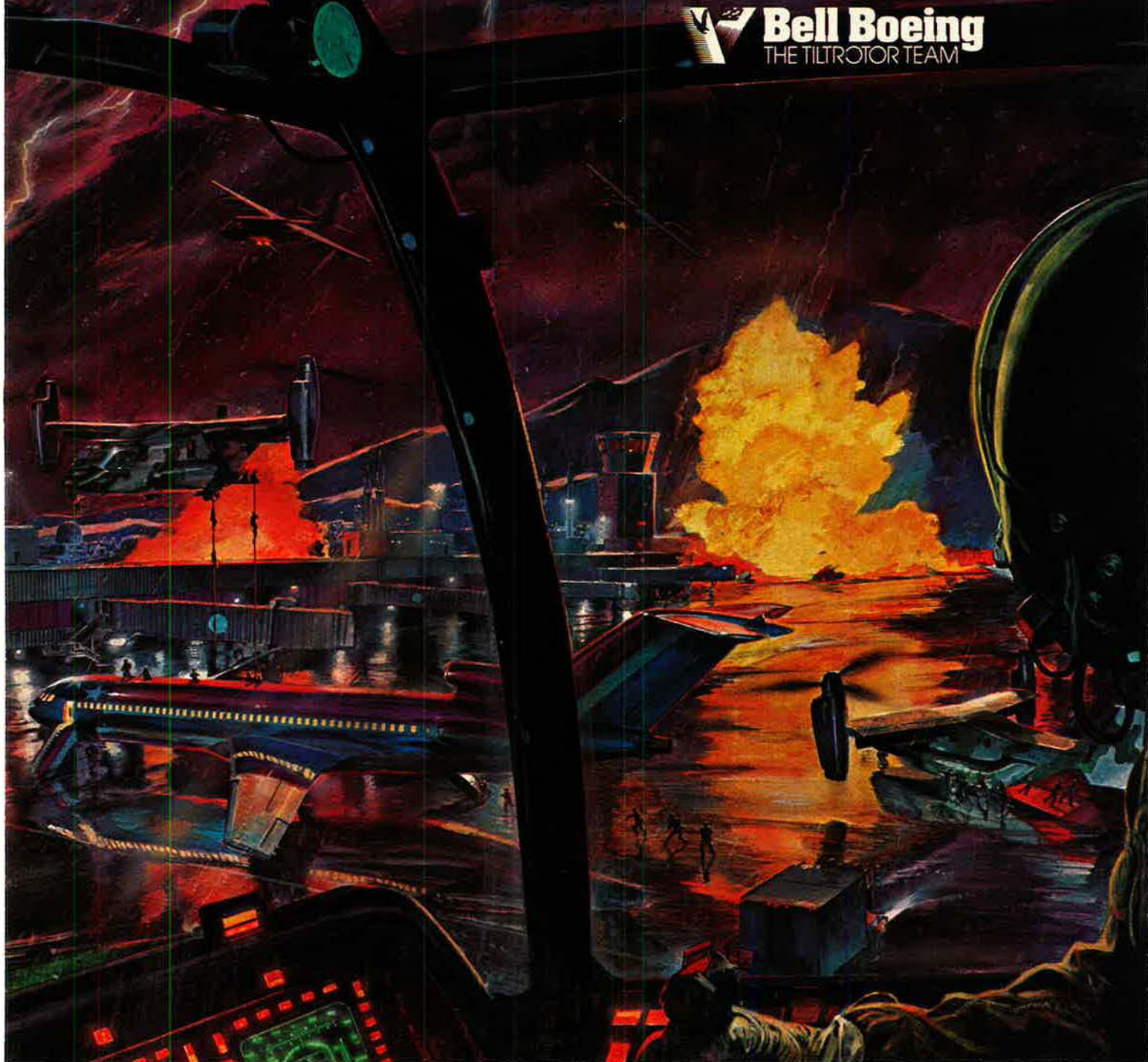
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On Capitol Hill, an incredible number of committees and staffers manipulate the defense budget, line by line.

Oversight IS Overdone

**BY GEN. ROBERT T. MARSH, USAF (RET.)
CHAIRMAN, AFA SCIENCE & TECHNOLOGY COMMITTEE**

THE President's Blue Ribbon Commission on Defense Management—the Packard Commission—recently issued its final recommendations, and the Department of Defense is in the process of implementing nearly all of those that are within its authority to handle. Unfortunately, internal DoD reforms alone will go only partway toward the improvements in defense management envisioned by the Commission. The Packard report also called for major reform of congressional oversight and defense budgeting practices. There has been a notable lack of attention to these recommendations.

Congressional oversight, the Commission said, should be refocused and limited, concentrating legislative attention on the broader aspects of national security, promoting stable funding for individual

acquisition programs, and freeing senior Defense managers to manage more effectively.

Oversight of the Defense Department is an important and essential congressional responsibility. However, over the past several decades it has become so intense and detailed as to usurp DoD decision-making functions, paralyze the budgeting process, and harmfully divert senior DoD personnel from their primary leadership and management responsibilities to interminable interfacing with numerous congressional committees, subcommittees, and staffs.

This ever-increasing degree of oversight directly parallels the explosive growth of the congressional staff in the past several decades. The number of personal and committee staffers on Capitol Hill more than tripled in the 1960s and 1970s

and is still increasing. Particularly noticeable is the growth of committee staff personnel—from approximately 1,000 in 1970 to 3,500 by 1981. This growth was not the result of corresponding growth in the Executive Branch. DoD personnel, for example, decreased in number by more than a million from 1970 to 1980.

Troublesome Trend

This trend has been particularly troublesome for Defense. As the size of committee staffs grew, the number of committees and subcommittees overseeing defense grew even more—from only a handful two decades ago to forty-five today! In one area—Research and Development—at least eleven separate committees claim oversight responsibility. More than 1,100 committee staff members support the Senators and Representatives of these eleven committees. This is in addition to the members' office staffs. In 1970, the total staff for these same committees numbered 427.

This unbridled growth in congressional staffs and consequent expansion of oversight has created an increasingly oppressive burden. The Defense Department now generates about 20,000 pages of program justification annually and sends some 1,500 witnesses to 400 hearings that ramble on for thousands of hours. Sometimes these top-level professionals end up testifying before staffers alone, the various members of Congress being otherwise occupied.

Further burdening DoD is the number of reports and action items required by Congress. So far in 1986, for example, DoD has received more than 700 action items, many of which require reports back to Congress. Some of these directed reports and studies are incredibly complicated, requiring much effort and costing a great deal to generate. Others are duplicative, and still others are contradictory.

For example, the Senate's FY '87 Authorization Bill requires a report on the religious preferences of service personnel; a certification that the Air Force and Navy "will accommodate essential requirements necessary for cross-service utilization" in designing advanced tactical aircraft; and a report by the Secre-

tary of Defense on "ICBM Modernization to be submitted in conjunction with the annual report to Congress on the ICBM Modernization Program."

Not surprisingly, congressionally mandated report requirements have grown along with the size of the congressional staff. Defense Secretary Caspar Weinberger says that there has been an 1,167 percent increase in the number of reports and studies (from thirty-six to 456) requested by Congress between 1970 and 1985 and a 1,022 percent increase in other actions directed by Congress. Additionally, there was a 233 per-

cent increase in general provisions in the law directing specific DoD activities. When the Secretary asked for relief, the result was a requirement for three more reports to substantiate his request.

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The overage of cooks is doing strange things to the soup.

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Impact on the Budget

The most troublesome aspect of this micromanagement involves the review and approval of the DoD budget. In my view, most of the important recommendations of the Packard Commission are aimed at promoting program stability, which, in turn, shortens the acquisition cy-

dramatic, beneficial effect of several years of stable program funding. In 1984 and 1985, the annual cost growth rates of DoD's major programs dropped to less than one percent from a high of fourteen percent in 1981. In fact, in its last quarterly report to Congress, DoD announced that major program cost growth had given way to cost reduction.

I am afraid that was a passing phenomenon—not the result of a deliberate recognition by Congress of the merits of funding stability but rather the indirect result of a few years of strong funding support for the entire modernization program. That support has now all but vanished. And as budgets decline, the adverse effects of oversight will be felt acutely.

The overage of cooks is doing strange things to the soup. At least four different committees review

and mark up every line item of the complex DoD budget. Naturally, there is a wide divergence of views about individual projects and programs based on the biases and levels of expertise of various members and staffers, on parochial interests, on constituent pressures, and on other factors. As these divergent positions are resolved by compromise, the outcome will seldom be the optimum program originally proposed by DoD.

In recent years, a new problem has emerged: the authorizing and appropriating committees have such widely differing views that DoD ends up with many programs authorized but unfunded and many others that are funded but unauthorized. The effort to untangle this mess is time-consuming.

Nearly Unmanageable Process

Annual delays in approving a defense budget make it apparent that the process is nearly unmanageable. DoD increasingly relies on Continuing Resolutions, a somewhat recent invention that permits the government to function in a new fiscal year even though Congress has not passed the budget. The uncertainty resulting from these budget delays does not contribute to stability.

In the absence of disciplined, responsive committee action, congressional budget decisions tend more and more to respond to individual members' parochial views, resulting in very detailed and illogical adjustments to budget line items. With this and the ever-increasing staff size, it should be no surprise that last year Congress actually adjusted more than 3,000 individual budget line items during the authorization and appropriation process. That represents a 630 percent increase in line item adjustments from 1970. And the budget "tweaking" doesn't end in committees. Another 130 amendments were proposed to the FY '87 Authorization Bill on the floor of the House.

The FY '87 House and Senate Authorization Bills portend a great surge of program instability by virtue of their bottom lines alone. Few programs escaped the scalpel, but practically none was canceled. Hence, reduced production rates

and schedule stretchouts will be the only resort. Outcries about "cost overruns" are likely to be heard again soon, and history suggests that public blame will fall on the Pentagon.

It now appears that cuts in Air Force fighter production programs will be less severe than the original House Armed Services Committee markup would have made them. Had the original mark held, procurement of F-15s would have been cut from forty-eight to twenty-four and procurement of F-16s from 216 to 150. That would have added \$348 million and \$409 million, respec-

\$200 million for "hedging" unrequested follow-on B-1s. These are inserted at the expense of many higher-priority needs.

Finally, this line item manipulation gives rise to inconsistencies between forces and weapon systems. The ground-launched cruise missile (GLCM), for example, was deployed without the concurrent supporting infrastructure of bases and housing. Force-ceiling headroom in Europe for such systems as the EF-111 and the TR-1 is not available without withdrawing other forces. I anticipate that the manpower-intensive Small ICBM weapon system

number of committees and subcommittees exercising oversight of defense from forty-five to seventeen.

The Packard Commission recommended replacing the line item budget review with high-level review of policy and strategy. The hope was held out that this could lead to mission-area budgeting, a practical and sound idea. Under that approach, Congress would set funding levels for broad mission areas (such as strategic offensive forces) and allow defense professionals to allocate resources among the competing programs. It would ensure a better match between the budget and defense plans and strategy, provide flexibility to adjust to unplanned program or threat developments, and permit DoD to maintain program stability and to pursue such economies as multiyear procurements.

Another important element of reform is two-year budgeting. Much has been written about how this could reduce the congressional work load, permit a broader review, and allow a return to timely budget approvals. This is probably true, but a more compelling argument is the contribution of biennial budgeting to program stability. Biennial budgeting combined with authorization of entire phases (*e.g.*, full-scale engineering development) of major programs at major milestones would represent substantial improvement.

Finally, congressional committee and personal staffs should be reduced. Limiting oversight to fewer committees would reduce the requirement for defense expertise on so many congressional committee staffs. With these reductions and the lower work load generated, DoD and the services could reduce their staffs accordingly.

Congressional reform will not cure all that ails defense acquisition management. There are serious issues for the Defense Department to address, too. It would be so much easier, though, if Congress would carry its share of the reform load. ■

Line item manipulation gives rise to inconsistencies between forces and weapon systems.

tively, to the cost of these programs, since the aircraft would have to be bought eventually but at a higher price.

And then there is the Peacekeeper missile. The House cut procurement to twelve, down from the twenty-one requested by the President. Apart from the negative impact on our strategic posture, this action will probably increase the unit cost from \$70.2 million to \$97.8 million. (Had Congress supported the Air Force's original plan, the unit cost would have been about \$52.2 million this year.) Ironically, in the process of cutting hundreds of program line items and introducing much instability—with resultant cost increases—this line item manipulation produces aberrations. Examples are the inclusion of twelve unrequested T-46 trainer aircraft at a cost of \$151 million and

will encounter similar inconsistency of congressional support as it moves forward.

Congressional manipulation of the defense budget is detailed and illogical. That is precisely why the Packard Commission and others have called for Congress to end its line item budget reviews and micro-management of the defense program.

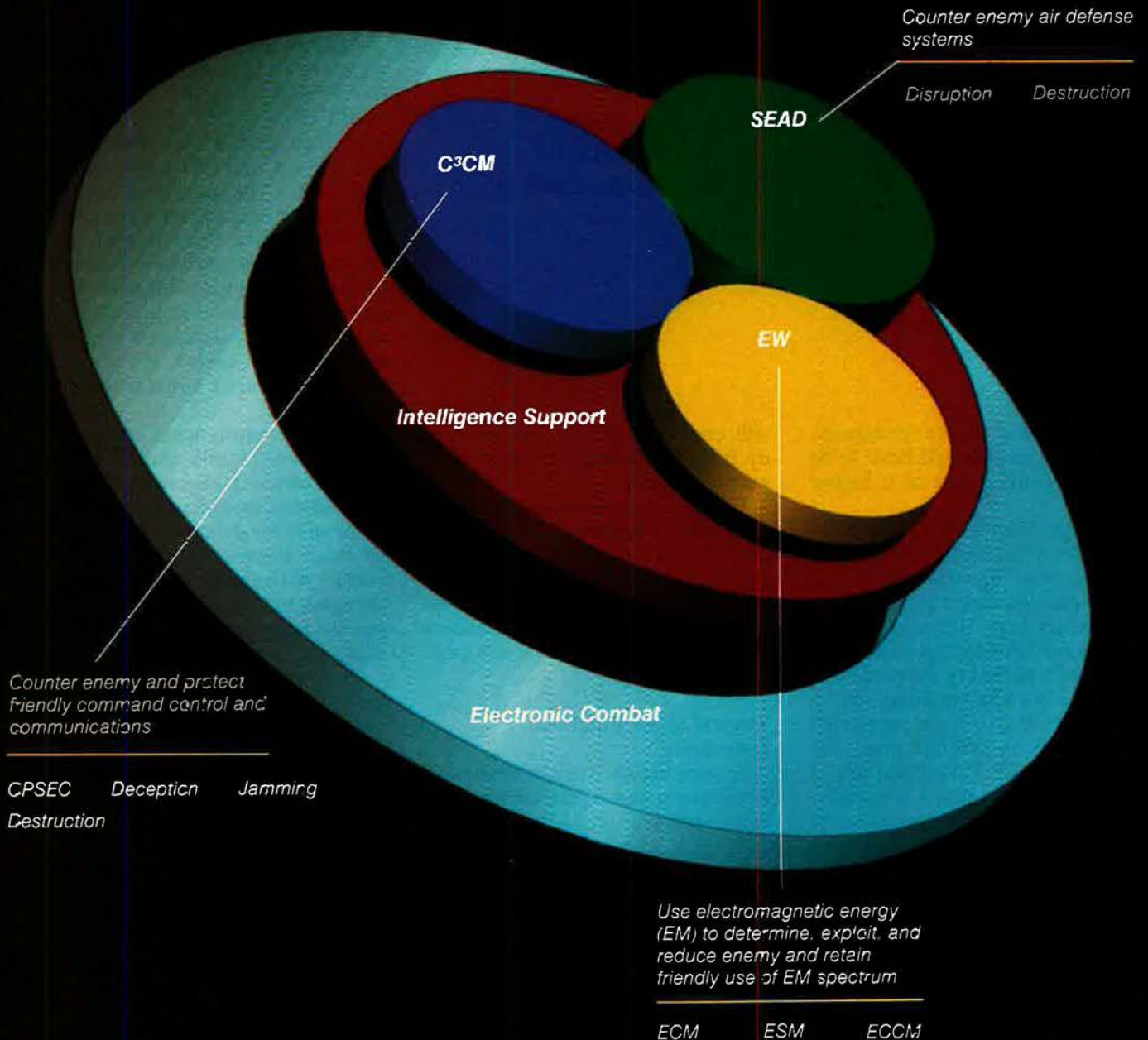
Toward More Efficient Oversight

Among the alternatives deserving strong support is a proposal by Rep. Jim Courter (R-N. J.) to reduce the

Gen. Robert T. Marsh, USAF (Ret.), is former Commander of Air Force Systems Command. He served twenty-four years in various capacities with AFSC and a total of forty-one years in the Air Force before his 1984 retirement. He is currently an aerospace consultant and chairman of AFA's Science and Technology Committee. His by-line appeared most recently in our July '86 issue with the article "Our Tech Base Needs Attention."

The Soviets invented "radio-electronic combat" and would employ it relentlessly in aerial combat.

BATTLE OF THE



BEAMS

BY EDGAR ULSAMER
SENIOR EDITOR (POLICY & TECHNOLOGY)

THE USSR's predilection for electronic warfare, which the Soviets call radio-electronic combat (REC), may well stem from the fact that it is a Russian invention. In 1904, during the Russo-Japanese War, a Russian radio operator figured out that the wily Japanese were using radios on board small patrol vessels to direct the bombardment of Port Arthur. He ingeniously "jammed" the hostile radios with his spark transmitter, and the Japanese gunners promptly went wide of the mark.

With this legacy, the Soviet A-med Forces have never wavered in their determination to win the "war on the airwaves," said Maj. Gen. Thomas S. Swalm, Commander of TAC's Tactical Air Warfare Center (TAWC), at AFA's symposium on C³I and Electronic Warfare held June 26, 1986, in Boston, Mass. The modern Soviet definition of REC, General Swalm explained, "is to limit, delay, or nullify the enemy's use of his command and control systems while protecting Soviet systems through electronic counter-countermeasures [ECCM]. When applied against us, their goal is to destroy or disrupt at least fifty percent of our command and control and weapon systems communications."

Four Pillars of Soviet REC

Soviet REC doctrine hinges on four specific components. First, in a chronological sense, is electronic reconnaissance and acquisition, meaning simply obtaining and analyzing information on US and allied military operations. This leads next to "electronic attack," such as active jamming, and then, whenever possible, to physical destruction. The last set of measures, according to General Swalm, is "deception and electronic protection," meaning the self-preservation of the Soviet C³ system. Successful application of this doctrine, Soviet strategists lecture unceasingly, depends on synchronization of these four elements of REC.

The latest and most formidable addition to the already impressive array of Soviet airborne electronic intelligence (ELINT) platforms is the MiG-25R Foxbat. This aircraft "significantly" shrinks the time between target detection and engagement by dint of its high-speed,

side-looking radar, advanced airborne cameras, and other sensors tailored for post-mission analysis, according to the TAWC Commander.

The basic precept of Soviet REC is premised on incontrovertible logic, according to General Swalm: "The most effective jamming technique is a 500-pound bomb right down the radar feedhorn. Soviet REC is built around and integrated with firepower units ranging from the smallest operations force to tactical aviation." Among the more dramatic Soviet REC weapons is the air-to-surface Kelt missile, which homes on hostile radars to destroy them with its 2,200-pound warhead.

The twin concepts of "ROK" and "RUK" (these acronyms are from Russian phrases that do not translate readily) evidence an even more advanced stage in Soviet REC. These schemes revolve around the orchestrated use of fire-and-forget munitions against air defense weapons, control posts, communications centers, and other electronic combat assets. " 'ROK' destroys the target through conventional artillery and rocket fire, while 'RUK' [does so by means of] air-to-surface and surface-to-surface missiles."

The fact that fire-and-forget munitions require integration of reconnaissance, command and control, and destruction in a matter of seconds or minutes rather than in a matter of hours or days spawned the "ROK/RUK" additions to Soviet REC doctrine, according to General Swalm.

The Russian penchant for deception has given rise to elaborate devices and ploys in radio-electronic combat that range from physical camouflage of weapons to such sophisticated ECCM techniques as "false radar target bridges" created by floating reflectors. Visual deception often takes the form of such simple but potentially effective tricks as dummy tanks made of mud that can give the enemy false information on unit strength.

On a higher technological plane, the Soviets reportedly employ a frequency-hopping monopulse radar on the SA-8 surface-to-air missile (SAM) that might make the weapon "jam-resistant to our ordinary noise and angle deception jamming," the TAWC Commander told the AFA symposium.

General Swalm took issue with the Western notion that the "Soviets are seriously lagging the US in technology. While it is true that some of their equipment uses vacuum-tube technology, much of [it] is modern and transistorized. Plus, they have equipment in large numbers with redundancy, extensive netting, and alternate communications channels, [thus] creating an awesome combat arena."

USAF's Electronic Combat Concept

In response to this grave and mounting threat, the Air Force has come up with a unique "electronic combat" concept that "includes the traditional EW role as viewed by the US Army and Navy, plus the added elements of



SWALM: No letup in sight

command control and communications countermeasures [C³CM] and suppression of enemy air defenses, or SEAD." This Air Force electronic combat concept is divided into "electronic support measures, electronic countermeasures, and electronic counter-countermeasures [that] are not ends in themselves" but that coalesce into combat support operations and increase both offensive and defensive capabilities.

The current mainstay of USAF's electronic support measures (ESM), he said, are the twenty-four RF-4C TEREK (tactical electronic reconnaissance) aircraft assigned to the CONUS, Europe, and the Pacific. These systems detect, identify, and pinpoint radar emitters in near real time and data-link relevant information to ground stations or other aircraft. The Air Force is grafting significant software changes onto these systems to increase their efficiency, General Swalm told the AFA symposium.

For the longer term, the Air Force is working on ATARS, the advanced tactical air reconnaissance system, which phases advanced electro-optical and infrared capabilities into the operational forces through a four-stage modernization program. ATARS's first stage

is under way and centers on demonstrations of an electro-optical/infrared pod with associated digital sensor packages and data-link capabilities on an F-16. Stages two, three, and four, he added, "will upgrade the RF-4C, place the package in an unmanned recce vehicle or drone, and perhaps incorporate the system in a follow-on fighter."

The EF-111 Raven remains the mainstay of USAF's electronic countermeasure capabilities, but is handicapped by numbers. Only forty-two aircraft were produced. While the EF-111 is highly effective at blinding hostile early warning and ground control intercept (GCI) radars, the Air Force recognizes that penetration and attack aircraft require their own self-protection equipment for use against terminal threat systems. Backing up the current crop of ALQ-119 and -131 ECM pods is an internal jammer development known as the Advanced Self-Protection Jammer (ASPJ), which can "jam selected slices of the spectrum with appropriate, measured power," according to the TAWC Commander. This jammer is scheduled to begin deployment on F-16s and F/A-18s in about five years.

In the ECCM field, the antijam circuitry of the Have Quick radios enables USAF crews to use UHF voice communications in a jammed environment, while the follow-on Joint Tactical Information Distribution System (JTIDS), which entered operational testing last summer, uses a time-division architecture and spread-spectrum techniques to ensure high reliability in a hostile electromagnetic environment, General Swalm reported.

ECCM is not confined to aircraft. The advanced medium-range air-to-air missile, AMRAAM, he explained, has "software and hardware features [that provide protection] against such jamming as barrage, spot, or blinking noise and [against] deception jamming techniques employed by Soviet fighters."

Upgrading USAF's EW Capabilities

In order to take the war on the airwaves to the enemy, the Air Force is out to negate the enemy's C³ capabilities by means of the Compass Call C³CM aircraft. General Swalm added that "working in concert with Compass Call, the Army is fielding the Quick Fix helicopter to augment the very limited Compass Call fleet, which presently numbers only ten aircraft [but is expected to grow] to a total of sixteen by 1987." The purpose of these two systems, he explained, is to degrade the enemy's combat effectiveness and "force him into decentralized targeting—calling the plays at the line of scrimmage."

The recent bombing raid against terrorist command and control facilities in Libya, he said, "illustrates the effectiveness of synchronized C³CM. The integration of EF-111 and EA-6B airborne jammers against surveillance radars with strict operation security discipline and deception techniques enabled the F-111 strike packages to achieve tactical surprise despite open speculation for weeks that US military action against Libyan-sponsored terrorists was imminent."

SEAD, an array of activities that neutralize, destroy, or temporarily degrade enemy air defenses, is another high-priority component of USAF's electronic combat master plan. Currently in the works are sequential upgrades of the F-4G Wild Weasel defense suppression

system. The APR-38 receiver of the F-4G that spots and locates enemy emitters has limitations in processing and frequency coverage. The aircraft, therefore, will soon be retrofitted with a state-of-the-art computer "with seven times the speed and eight times the memory capacity of the current system." Further, General Swalm told the AFA symposium, "in the early 1990s, the system will be upgraded with the new APR-47, which will include a new receiver with increased detection capabilities. The APR-47-equipped F-4G, together with our high-speed antiradiation missile, the HARM, will extend the F-4G's life into the 1990s."

Because it takes from seven to nine years to field an entirely new defense suppression system, General Swalm suggested that now is the time to start looking at follow-on platforms to the F-4G. At present, there are 102 Wild Weasels in USAF's inventory, with an additional eighteen slated to be acquired in 1988.

Soviet Advances

The urgency of upgrading USAF's EW assets is underscored by across-the-board advances on the Soviet side, the TAWC Commander suggested. By way of a benchmark, he cited the Su-27 Flanker, whose look-down/shoot-down radar capability enables this aircraft to operate against both bombers and cruise missiles: "Its antenna is fifty percent larger than [that of the] F-15, giving it a detection range greater than a hundred nautical miles." Also, the Flanker uses advanced Doppler processing, probably along with "electro-optical and infrared search and track [IRST] systems [that make possible] long-range silent intercepts, with no emission until just before missile launch."

There is no letup in sight, he suggested. "In the future, [the Soviets] will add more satellites for better C³, laser weapons, standoff jammers, updates [to] SAMs and guns, drones, and a new generation of . . . jammers." The battlefield in the year 2000, consequently, "will have more beeps and squeaks and be more complex and correspondingly more lethal."

The answer, in part, is to maintain the pace of USAF's integrated electronic combat program, General Swalm suggested. Several hundred F-16C aircraft, for instance, "were to get the ASPJ, but [for a range of reasons] now will have to rely on pods." Meeting the emerging "monopulse threat" is another electronic combat priority, according to the TAWC Commander.

Further, "we have to freeze designs and deploy ECM and ECCM systems with what works today. We should not concentrate on the emerging technologies so much that we don't field systems to meet today's capability of protection." Another key need is to buy and field "operable and reliable" support equipment and not to delay funds for support equipment until "the system approaches test." As a how-not-to example, he cited the F-15 self-protection suite fielded in 1976, which still requires a limited amount of contractor support. Also, the lack of adequate support equipment for USAF's newest fighter self-protection pod, the Block II ALQ-131, means that "we will have to rely on contractor support for at least two years" after the equipment enters the operational inventory.

Other urgently needed improvements, General Swalm said, include supportable software that can be

reprogrammed in the field: "The idea of returning to depot or factory for reprogramming is not a viable wartime plan." Lastly, "We must practice, train with, and fully understand our systems' capabilities, limitations, and employment tactics." Stressing that electronic combat is "too important to be left to the electronics wizards," General Swalm suggested that, from TAC's perspective, it remains "our most challenging warfighting task."

The Air Force's FCC

The then-Commander of Air Force Communications Command, Maj. Gen. Gerald L. Prather, told the AFA symposium that one of AFCC's key functions is to serve as the Air Force's "Federal Communications Commission. We are working toward a package [of frequency management] that should prevent communications fratricide . . . on the electronic battlefield." AFCC, he added, is testing this package in the Pacific, where it is "working well." Eventually, this advanced and comprehensive approach to frequency management will also encompass the Army and the Navy.

Although not in the development business, AFCC is an acquisition command that buys off-the-shelf automated electronics systems and develops the associated software, General Prather reported. By way of an example, he cited the fact that "we have built a widespread-spectrum, secure-communications network from scratch in the Pacific over the past two years." The divestiture of AT&T and the resultant diversification and decentralization of the commercial-communications sector have "changed the nature of our business,



PRATHER: Preventing communications fratricide.

[resulting, among other things, in the requirement] to increase the number of contracting officers," he pointed out.

Valid concerns about commonality of military electronic equipment can be carried too far, in the AFCC Commander's view. "The key point is whether or not we

can communicate with each other, meaning both voice and data, and the answer does not depend on common equipment." Rather, he emphasized, the need is for common standards and interoperability. Congress, he suggested, should "quit driving us to buy one piece of gear for everybody when you can buy equally capable radio systems that [cost less, yet] meet common standards."

In the case of TRI-TAC, the joint tactical communications program, for instance, "the Army needs a radio that is highly mobile and survivable on the battlefield." The Air Force needs these qualities in its digital radios only in isolated instances and is mainly interested in "a small, transportable unit that can be set up wherever we are basing our aircraft. We need something that is rugged, but it won't have to withstand the rigors of ground combat." Equipment that meets the Air Force's need is available "off-the-shelf" from industry "without [USAF's] having to pay the heavy price associated with the Army requirements," he said.

The Logistics Challenge

Software management is far and away the most critical challenge facing the Air Force Logistics Command, said AFLC's Vice Commander, Lt. Gen. Marc C. Reynolds, at the AFA symposium. He explained that the cost of developing the software for a new type of fighter comes on average to about \$450 million, while the subsequent software maintenance costs over the life of the system generally exceed \$1 billion. He added that, by the end of the decade, software costs are likely to double. Self-diagnostic and automated systems, on the other hand, promise to ease the Air Force's logistics task in the years ahead.

In anticipation of future requirements, AFLC has initiated an effort known as TAPM, or Technology Application Program Management, according to General Reynolds. This effort examines the potential impact of emerging technologies on logistics. So far, twenty-two individual technologies with long-term potential have been designated as TAPM candidates and arranged in four major areas. He identified these areas as advanced computational resources and electronics, including artificial intelligence and fiber optics; advanced materials, including composites and corrosion-resistant, "high-tech" materials; weapon-systems airworthiness and force management; and product support technologies, such as hardness and diagnostics.

Electronics vs. RF Weapons

Some of today's high-performance fighters and probably almost all future systems of this type use or will use control configured vehicle (CCV) technologies. These aircraft designs are aerodynamically unstable, a fact that is compensated for by fly-by-wire and similar electronic controls. In a nuclear or high-power microwave (HPM) environment, these electronic controls are likely to go out of commission, and aircraft of this type will crash unless provided with special protection. Key here are shielding and fiber optics, several symposium speakers pointed out.

The Defense Nuclear Agency (DNA) is responsible for the study and simulation of nuclear as well as high-power microwave environments. Maj. David H. Stone, a



REYNOLDS: Automated systems ease the task.

DNA program manager specializing in high-power microwave effects on electronic systems, told the AFA meeting that interest in radio-frequency (RF) weapons is increasing because modern electronics are extremely vulnerable to HPM, which is a key element of RF technology.

In the not too distant future, he predicted, HPM weapons will make their entrance on the battlefield, "perhaps on tracked vehicles near the FEBA [forward edge of the battle area], or on the perimeter of an air base, or on an aircraft, or maybe on a ship." HPM weapons, used in "conjunction with air defense guns, missiles, and conventional [electronic warfare systems], may produce synergisms that make the difference in a battle." That difference, he suggested, might well come into play "on the third day of the battle rather than on the first. After a multitude of sorties, troop movements, field maintenance, and general rattling of hardware, EM [electromagnetic] hardening techniques are likely to degrade considerably—perhaps by orders of magnitude."







"The Navy is developing its electronic warfare capability with emphasis on eliminating any efforts that are redundant with [those of] the US Army or Air Force," Dr. E. Ann Berman, Deputy Assistant Secretary of the Navy for C³I Systems, told the AFA meeting. To this end, "we are examining all our EW programs and requirements while conferring with the other services to structure a total EW program that is nonduplicative, affordable, and interoperable."

She explained that, in cooperation with the Air Force, "we are concluding the full-scale development of the ASPJ system and are beginning development of the Integrated Electronic Warfare System [INEWS] for the next-generation advanced technology aircraft." Further, in the area of radar-warning receivers (RWR) for tactical aircraft, "we are providing Navy inputs to the Air Force RWR programs in order to achieve commonality in future upgrade programs." ■



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PRODUCIBILITY

BY JAMES W. CANAN
SENIOR EDITOR

THE factories of the aerospace industry, including those of its subcontractors and vendors, hold the key to the success of the Air Force's ambitious systems acquisition programs in the years ahead.

Too many of those factories are overly labor-intensive, short on automation, plagued with excessive paperwork, wasteful of materials, sloppily coordinated and controlled, and saddled with obsolescent equipment and fabrication practices.

Unless they are brought up to snuff, they will be incapable of producing systems of the increasing sophistication that the Air Force simply must have and at prices that the Air Force, in a time of tightening budgets, will be able to afford.

The systems won't do much good if they're never built. This is why the Air Force now devotes as much attention to developing and implementing new manufacturing technologies as it does to developing, incorporating, and integrating the new technologies—those of avi-



A Rohr Industries robot handles airframe components in the company's new flexible assembly subsystems (FAS) facility. Rohr is a leader among the growing number of subcontractors participating in USAF manufacturing modernization programs.

onics, propulsion, and materials, for example—of the systems themselves.

ManTech and TechMod

In this vein, Air Force Systems Command's Manufacturing Technology (ManTech) and Technology Modernization (TechMod) programs, both aimed at sprucing up a plethora of plants that produce Air Force hardware, are taking on greater significance and attracting greater numbers of participating contractors all the time.

The contractors have big stakes in these programs. Companies sporting the best manufacturing technologies are the most likely to win USAF contracts that are now pegged squarely to assurances of maximum productivity and minimum costs.

The whole idea is to make USAF's systems, subsystems, and components "producible." This means that they pass smoothly from design and development into production, are built and assembled at top efficiency and productivity, then perform as superbly as they are supposed to in accordance with their designs, wear well and are easily maintained, yet do not break the bank in their purchase prices.

It is a tall order. Just prior to retiring from the Air Force as Aeronautical Systems Division Commander last July, Lt. Gen. Thomas H. McMullen summed its significance up as follows:

"There is nothing we can do that is more important than to manufacture things more effectively. Our acquisition of new, high-performance systems places heavy emphasis on producibility.

"We now weigh producibility and the things that go with it—reliability and maintainability—equally with technical, cost, and scheduling factors in ensuring that each aircraft we buy meets its mission requirement.

"Our goal has to be to make effective manufacturing an integral part of our acquisition process from day one."

A great deal of USAF's drive toward ensuring the producibility of its systems is derived from its plans for its Advanced Tactical Fighter (ATF) just now heading into the demonstration/validation phase of its development.

The ATF simply must be affordable. If it is not, it will never fly, despite the promise of brilliant performance. This is why USAF felt compelled to establish a stringent unit price ceiling for the ATF—a production flyaway cost not to exceed \$35 million in Fiscal Year 1985 dollars—even while endowing the fighter's design with the latest and best technologies to give it superlative performance.

How will it be possible for USAF to get such a great fighter at such a relatively low cost?

"In the end, the key to that will be the ATF's producibility," General McMullen declared.

The same may be said for most or all Air Force major systems, and the Advanced Technology Bomber (ATB) may be another prime example.

Northrop Corp., Boeing Co., General Electric Co., and Vought Aero Products Division of LTV Corp., the major ATB contractors, are all partners with USAF in programs for upgrading their manufacturing equipment and technologies.

Some Early Starts

In order to make better products and greater profits under contracts in hand and to get into advantageous position to compete for future ones, many companies began investing heavily in new facilities even before becoming involved in Air Force plant-modernization programs.

Northrop is a good example. Its unique Production Development Center (PDC), completed five years ago at a cost of \$24 million, has been a boon to its production of F-5 fighters, its coproduction of the Navy's F/A-18 fighters, and its production of the first three F-20s, which it is pushing the Air Force and foreign nations to buy.

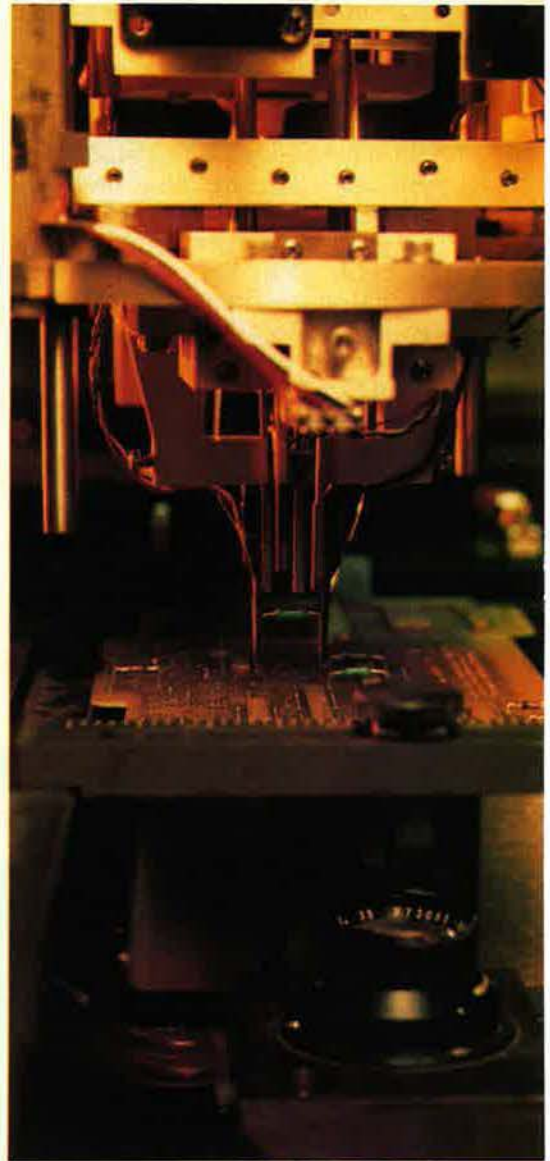
Northrop claims that it would be able to deliver the first operational F-20 within two years of receiving its first order for the aircraft. It will be able to do so, it claims, as a result of the modern manufacturing procedures that it developed and refined in its PDC.

Those procedures enabled it to cut major assembly costs almost in half from the first to the third F-20 that it built and to reduce man-hours by one-third from the second to the third F-20, the company claims.

Northrop Chairman Thomas V. Jones has noted that the company's PDC is "aimed squarely at solving problems that hurt productivity and have an adverse impact on costs."

Despite other such examples of companies taking the lead, Air Force seed money is credited throughout the industry with having been the major stimulus for companies' investments in manufacturing technology modernization and implementation.

In its ManTech program, AFSC has come a long way over the past several years in spurring its contractors to modernize—with much



Automation and robotics work together to turn out fully tested and assembled circuit boards at Westinghouse's Electronic Assembly Plant (EAP).

emphasis on the incorporation of Computer Integrated Manufacturing (CIM)—to give them a leg up on what it calls “the factory of the future.”

Putting the technology to work on factory floors is the work of the TechMod program. It was the forerunner, and is now an integral part, of the triservice Industrial Modernization Incentives Program (IMIP) that the Defense Department instituted in 1982.

ManTech, which is run by ASD out of its Materials Laboratory, was begun nearly twenty years ago. TechMod, which now involves all AFSC product divisions, got its start in 1975.

Getting on Board

ASD and Electronic Systems Division at Hanscom AFB, Mass., are the most active in TechMod/IMIP programs, but the other divisions are picking up steam as well.

For example, Armament Division at Eglin AFB, Fla., runs several TechMod programs with Hughes, Raytheon, Rockwell, and other contractors to upgrade their manufacturing of missiles, including the Hughes Advanced Medium-Range Air-to-Air Missile (AMRAAM).

The key to the success of the sometimes-troubled AMRAAM program may well turn out to be the missile's producibility. Earlier this year, Hughes awarded Northrop a TechMod subcontract to develop advanced manufacturing technology for AMRAAM subsystem production. Northrop will use lasers, computers, and robots in the manufacture of gyroscopes for the missile.

AFSC's Ballistic Missile Office at Norton AFB, Calif., runs manufacturing-modernization programs with Rockwell and Honeywell that are pegged to production of various parts of ICBMs.

Space Division at Los Angeles has several programs under way with General Electric to improve productivity and to lower costs in the manufacture of Navstar Global Positioning System (GPS) navigation satellites.

Growing numbers of major electronics system manufacturers are involved in programs overseen by ESD. Its “Get Price” program, an amalgam of TechMod and IMIP,

now embraces up to a dozen contractors and is expected to embrace a half-dozen more in coming months.

ASD is where most of the action is centered, however. Contractor investment in ASD TechMod programs is projected at \$1.6 billion through Fiscal Year 1987 as a result of Air Force seed-money stimulus. These contractors are the giants of the aircraft and engine industries and even of the electronics industry.

Among the latter, Westinghouse, for example, is heavily into ASD programs as well as ESD programs and is regarded at both AFSC divisions as a major investor in, and force for, industrial modernization.

Prime contractors participating in ASD TechMod programs include airframe manufacturers Boeing Military Aircraft Co. (KC-135R), General Dynamics (F-16), Douglas Aircraft Co. of McDonnell Douglas Corp. (C-17), Lockheed-Georgia Co. (C-5), Fairchild Republic Co. (T-46A), and Rockwell International Corp. (B-1B). Also involved are engine producers Pratt & Whitney, General Electric, Williams International, Teledyne CAE, and Garrett.

Martin Marietta, producer of the Low-Altitude Navigation and Targeting Infrared for Night (LAN-TIRN) system, Eaton Corp.'s AIL Division, maker of defensive avionics for the B-1B, and ITT, a wide-scale producer of aircraft avionics, are among others participating.

Both the ManTech and TechMod programs picked up momentum at the beginning of this decade after it had become alarmingly apparent that the US defense industrial base had withered, was pervasively obsolescent, and had almost no capability for wartime surge production of vital weapon systems.

The erosion of the industrial base was especially evident at the subcontractor and vendor levels in such industries as forgings and castings. Many second-tier and third-tier companies had left the defense business. Those remaining had too many orders for their technologically backward plants to handle in expeditious fashion.

Bad bottlenecks in production and big backlogs of hardware needed for Air Force systems, notably engines and airframes, were all too common.

Helping the Subcontractors

Consequently, USAF began harking to the shortcomings and the needs of the subcontractors and vendors and, in a departure from its customary practice of letting its prime contractors deal with them exclusively, began taking a hand in their factory modernization.

Now, TechMod programs at ASD, for example, deal extensively and aggressively with subcontractors and vendors. Twenty-seven of them are involved in the ASD-General Dynamics program for the F-16. Subcontractor participation is also on the rise in ASD programs with Rockwell, General Electric, and Pratt & Whitney.

ASD's TechMod arrangements with subcontractors go beyond programs that are pegged to such specific weapon systems as the F-16 and the B-1B, however. ASD recently established its Industrial Base Division to involve them in programs on an industry-wide basis.

Among such programs are those with Teledyne Microelectronics Co. and Varian Associates to upgrade the manufacturing of traveling wave tubes (TWTs) that are so vital to electronic countermeasures systems; with Cleveland Pneumatic Co. to the benefit of the landing-gear manufacturing industry; and with Ladish Co. and Ontario Forge Corp., among others, in the forging industry.

“We place heavy emphasis on programs with subcontractors,” says David Dilley, chief of the ASD Industrial Base Division's Plans Branch. “Their products account for as much as sixty percent of the costs of weapon systems.

“Manufacturing technology has not been filtering down to them,” Mr. Dilley says. “Their state-of-the-art technology is not as good as that of the prime contractors. It has to be improved in order to ensure a quality, high-tech defense industrial base for all critical components, because without them we won't be able to fly.”

The aluminum precision forgings industry got a big boost from ASD's B-1B TechMod program. Manufacturing innovations resulting from it enabled the industry to double the size of the parts it can produce—from 200 square inches up to 400

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square inches. This has helped to keep the B-1B production program from exceeding projected costs and to stay on schedule.

ASD believes that by correcting manufacturing deficiencies in the forgings industry—mainly through the introduction of computer-aided design and manufacture—it will be able to cut the lead times for forgings deliveries—which is a big problem—by as much as seventy-five percent.

Modernization of forgings and castings manufacturing is given considerable attention in the "Propulsion TechMod" program that got going in 1982 and that has become the largest of all such programs at ASD.

"At least half of the cost of our engine contracts is for the subcontractor and vendor base," explains Carl A. Lombard, deputy director of manufacturing and quality assurance under ASD's Deputy for Propulsion. "We've found that when we save a dollar of costs at the subcontractor-vendor level, it translates into a saving of \$5 or \$6 at the system manufacturing level."

Propulsion TechMod programs are being carried out under \$132.2 million worth of USAF contracts with GE, P&W, Williams International, Teledyne, and Garrett. Involving many subcontractors, those programs are expected to save \$750 million for the Air Force and the contractors (in lower prices for the Air Force and in higher profits for the contractors) over the next five years.

GE has already paid back to the Air Force \$4.8 million in cold cash as TechMod "fallout savings" from its production of the F101 engines for the B-1B bombers.

This represents only the first installment of more such paybacks to come. GE estimates that its TechMod innovations will enable it to cut the cost of the 124 F101 engines scheduled for production in Fiscal Year 1987 by \$39,000 apiece.

Savings Are Real

All this indicates that TechMod savings are for real—direct reductions of the originally fixed price of a multiyear engine production contract.

Altogether, GE's Aircraft Engine Business Group is implementing

TechMod programs that it expects will save \$400 million in the long run.

"This proves," says ASD's Mr. Lombard, "that the Air Force and its contractors can work together to save the taxpayer a lot of money."

At this writing, Air Force funding in GE TechMod programs totals \$53 million. GE and its participating contractors are expected to make capital investments of \$300 million over the next five years.

The first Propulsion TechMod contract—for \$3.5 million—went to P&W in 1982. Under it, P&W and three subcontractors analyzed their

manufacture of engines and engine parts and came up with many ways to improve it through modern equipment and techniques and through an emphasis on automation.

Additional contracts since then have raised the Air Force investment in P&W TechMod to more than \$12 million. They helped P&W to develop computer-aided manufacturing technologies and others in the production of vital turbine and compressor disks.

The number of P&W subcontractors taking part in TechMod has more than doubled in four years. There are now seven—Precision



Forged engine disks emerge from a furnace in the heat-treating work cell at Pratt & Whitney's new plant in Georgia. USAF TechMod seed money helped to stimulate P&W's construction of the up-to-date facility.

Castparts Corp., CYTEMP Division of CYCLOPS Corp., Ex-Cell-O Corp.'s Aerospace Division, Shultz Steel Co., Duradyne Technologies, Howmet Corp., and Fansteel/Precision Sheet Metal Division.

Their products, the indispensable stuff of aircraft engines, include titanium, nickel, and cobalt alloys, precision castings, compressor blades and vanes, fan blades, forgings, extrusions, seamless rings, airfoil castings, and nonrotating turbine components.

Some of those same subcontractors are also taking part in the TechMod program for upgrading the manufacturing of air-, sea-, and ground-launched cruise missiles. It is being carried out under a \$23 million contract with Williams International, the prime contractor, and also includes Teledyne CAE, a major supplier of parts and the second-source producer as well.

Among the facets of the upgrading are projects for joining and coating metals, for advanced machining and forming, and for working with powdered metals.

All such work has high spinoff value for the civilian and non-USAF propulsion industries.

Williams International has already refunded the Air Force \$2.5 million in savings realized through TechMod program manufacturing innovations on cruise-missile engine contracts.

Over the past eight years, ASD has spent nearly \$350 million on TechMod programs. As a result, it projects more than \$3 billion in cost savings and in cost avoidance over the next ten years.

At this writing, ASD TechMod programs involve eighty-one manufacturers—fifteen prime contractors and sixty-six subcontractors. ASD expects to be working with more than one hundred primes and subs by mid-1987.

Proliferating Payoffs

TechMod payoffs are proliferating as the programs evolve in number and scope.

The F-16 program with General Dynamics was the TechMod pioneer. Begun almost exactly eight years ago, it involved Air Force and GD investments of \$25 million and \$100 million, respectively.

The twenty-seven subcontractors

in the F-16 program are committed to more than one hundred projects with a total capital investment of nearly \$400 million and an anticipated savings of about \$1 billion.

The Air Force anticipates savings of more than \$350 million. The other services and the civilian sector will benefit too, however, because GD's subcontractors turn out hardware for them as well with the new tools and streamlined processes accrued in the TechMod program (now called the F-16 Industrial Technology Modernization [ITM] program).

The program's goal is ninety subcontractor programs by 1993 and a total DoD savings of more than \$2 billion.

Examples of projects already put to work in factories are an automated trim cell, photogrammetric inspection, automated material handling, automated wing drilling, integrated, standardized manufacturing planning, laser cutting, robotic drilling of canopy structures, and electrical-harness data systems.

The F-16 TechMod program was not the first to bring major subcontractors aboard, however. That distinction fell to the ASD program with Lockheed-Georgia on its C-5A wing modernization program, which was joined by Avco Aerostructures early on.

Avco developed a sealant application system and an electromagnetic clamp drill. Lockheed's innovations included brush deburring, a voice data-entry system, and a direct numerical control/computer numerical control (DNC/CNC) setup for the manufacturing process.

Lockheed's C-130 production program and C-130 modification program also benefited from the C-5A rewinging TechMod program, and now the benefits are also showing up in the company's manufacture of C-5Bs.

Avco applied the knowledge and the hardware that it gained on the Lockheed TechMod program to its manufacture of wings for B-1B bombers, as did several other B-1B subcontractors involved in the F-16 TechMod program.

Avco is a major player in ASD's B-1B TechMod program too, along with Rockwell, Vought, Boeing, Eaton Corp's AIL Division, and all other contractors prominent in the B-1B production program.

"Every large contractor in our program is working on a factory of the future," declares Col. Paul L. Beggs, director of manufacturing and quality assurance in ASD's B-1B program office.

It is an imposing array of contractors—Rockwell on airframe fabrication and integration, Vought on the aft intermediate fuselage and aft fuselage, Avco on wing fabrication, General Electric on the engines, TRW on airfoil castings, Precision Castparts (PCC) on structural castings, AIL on defensive avionics, SEDCO Systems on defensive-avionics components, and Cleveland Pneumatic on landing gear.

These companies' manufacturing innovations have had a great deal to do with keeping B-1B production on schedule and unriden with cost overruns. This is especially noteworthy in the case of Avco.

Avco's new autoclave process for continuous contour-forming of B-1B wings in unprecedentedly large sections has been a godsend to B-1B production. Without it, Avco would probably not have been able to keep pace with the planned production rate of four B-1Bs a month, and the resulting slowdown would have caused major problems of cost and efficiency.

Keeping B-1B production on track is also heavily dependent on the precise, expeditious machining of its structural parts. This has been happening, much thanks to the up-to-date machine shop—the largest in the free world—that Rockwell runs at Columbus, Ohio, courtesy, in part, of Air Force manufacturing-modernization funding.

Get Price

At El Paso, Tex., Rockwell Collins operates an electronics assembly plant that Air Force officials refer to as an outstanding example of what Computer Integrated Manufacturing can accomplish in excellence of products and productivity. Rockwell Collins is a major player in ESD factory-modernization programs.

Westinghouse's three-year-old Electronic Assembly Plant (EAP) at College Station, Tex., also regarded as classy, is also a protégé of the Get Price program.

ESD has spent nearly \$30 million on a dozen or so Get Price programs

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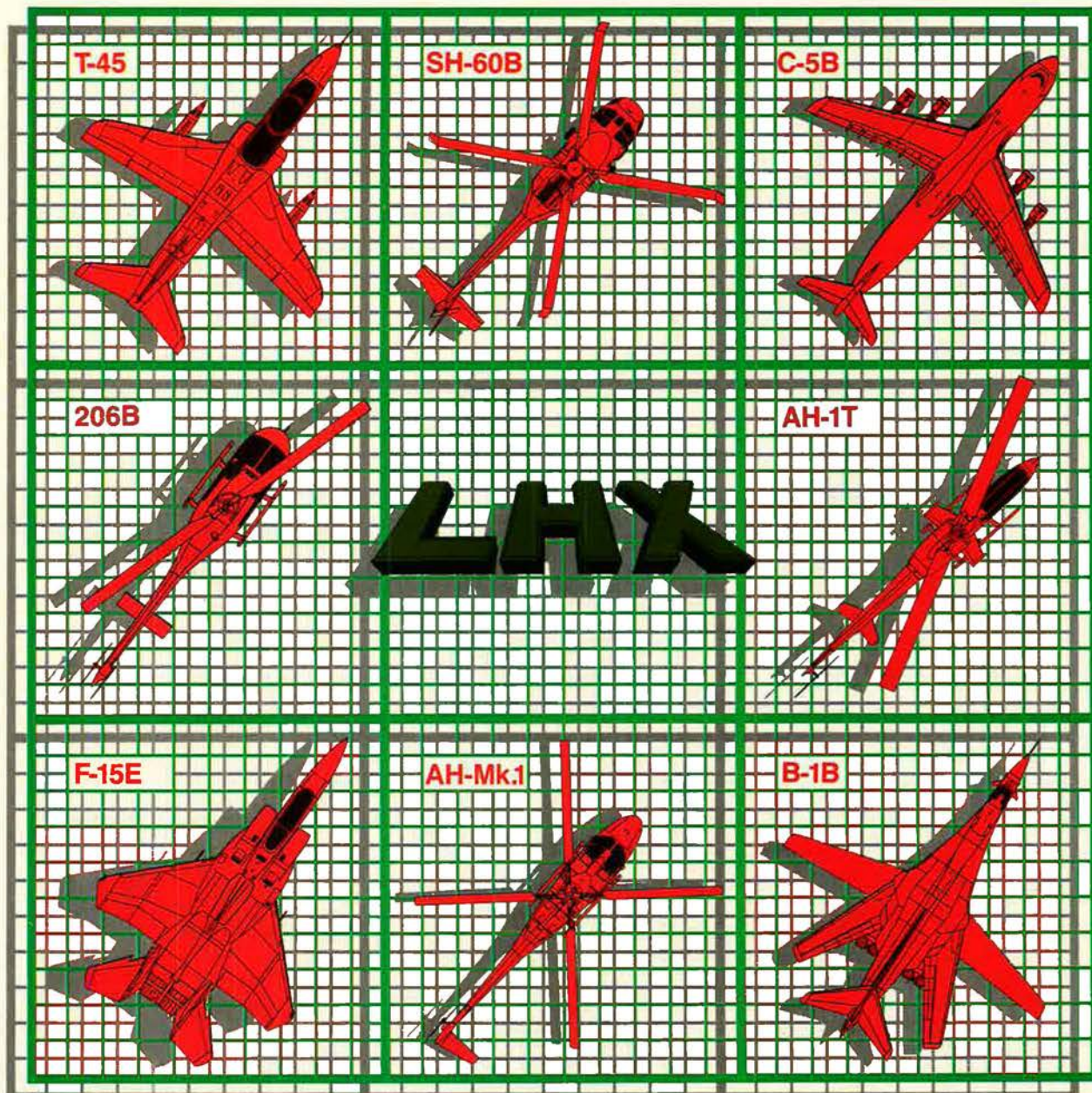
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with such companies as Boeing, GTE, Magnavox, Westinghouse, Rockwell Collins, Bell Aerospace, Singer-Kearfott, Hazeltine, GE, and Raytheon. It anticipates savings of more than \$1 billion in production costs of its participating contractors as a result.

"We don't reward the companies for good intentions," emphasizes Gerald E. Zahn, ESD's director of technology modernization and industrial management. "They have to invest in new equipment and put it on the factory floors."

Prior to taking advantage of ESD seed funding, Westinghouse had begun developing plans for capital investment to improve the quality and the productivity of its Defense Electronics Center (DEC) in Baltimore, Md. The company realized that it had better modernize the DEC—particularly through such techniques as computer-assisted design, robotics, and automated handling of materials—if it were to remain competitive over the long run in the defense electronics business.

It had come to realize that its DEC facilities were not up to the intensely demanding job of manufacturing, testing, and inspecting electronic devices that USAF required to be increasingly sophisticated yet more densely packaged in smaller spaces.

For example, the Westinghouse radars in the B-1B and in newer models of the F-16 were called on to do twice as much in half the space compared to the capabilities of previous Westinghouse radars.

So Westinghouse was ripe for a Get Price contract to help it to analyze what it needed to do, then to develop the enabling technologies, and finally to put them to work in its plants.

Westinghouse officials acknowledge that the Get Price program accelerated and emboldened its plans for modernizing the DEC.

The program made possible the company's implementation of new, factory-wide facilities to produce weapon sensor systems and command and control sensor systems for the Army and the Navy as well as for the Air Force. USAF is the main beneficiary, however, because it buys almost three-fourths of the DEC's output.

Focusing on its Electronic As-

sembly Plant in Texas, Westinghouse took advantage of Get Price funding, plus much more of its own, to develop and begin implementing new technologies for the manufacture, test, and inspection of printed wiring assemblies—devices crucial to the functioning and packaging of radars that must be big in performance yet small in size.

The company says that it has combined sophisticated sensor, laser, robotic, and artificial intelligence capabilities to develop work stations capable of producing fully tested and assembled circuit boards. It anticipates that its use of

such stations will increase its productivity in the circuit-board assembly process by 800 percent, double its initial yield from such boards, and drastically reduce its manufacturing cycle time.

Major systems benefiting from Westinghouse's various manufacturing-modernization projects with USAF represent, in the aggregate, a multibillion-dollar Air Force investment. Along with the radars for the F-16 and the B-1B, they include E-3A Airborne Warning and Control System (AWACS) radars and electronic countermeasure pods for fighter aircraft.



Vought Aero Products Division's highly automated flexible machining cell (FMC) is said to be the most sophisticated computer-controlled facility of its kind in the world. It machines 541 parts for the B-1B bomber.

The ManTech Program

Undergirding all TechMod programs is Air Force Systems Command's ManTech program managed by ASD's Materials Laboratory. With about \$70 million worth of contracts, ManTech is responsible for the development of materials and technologies of high promise for the aerospace industry at large.

It aims chiefly at advancing the state of the art in manufacturing and repair technologies and processes. Technologies and processes implemented via TechMod programs in particular factories may have been advanced in whole or in part by ManTech programs and may indeed have resulted from both working in concert.

The major thrusts of Materials Laboratory's ManTech Division are in the categories of machining, production and integration of composites, powder metallurgy technology, quality assurance technology, electronics packaging, digital and microwave electronic devices, automated batch manufacturing, and the conservation of critical materials.

Computer Integrated Manufacturing is the key to, and is pervasive in, all such endeavors. Software projects now account for one-fourth of the ManTech work on CIM, whereas all such work was exclusively hardware-oriented as recently as the beginning of this decade.

"Factories are driven off of their data bases—technical and business, involving scheduling, costs, and deliveries," explains Dr. Gary L. Denman, director of the Materials Laboratory. "The integration of all that data is complicated, with massive amounts of data and heterogeneous computer environments. We're trying to accelerate and reduce the risk of such integration."

A major goal of all CIM projects is the reduction of labor and its cost, a disproportionately high one, in aerospace manufacturing.

In this, says Dr. Denman, "We're not talking about production-line labor. Maybe some. But we're focusing on white-collar labor in support jobs that CIM should make superfluous."

Among major ManTech programs are those in sheet metal and advanced machining technologies.

For example, the Advanced Machining System (AMS) is scheduled to go on line next year at GD's Fort Worth, Tex., facility. Being built to provide automated, flexible machining of aircraft components much more productively and at much lower cost than is now the standard, the system will be incorporated with other GD plant processes and is a major part of the company's move toward a paperless, electronically managed plant.

As part of this program, GD will also build a flexible machining system (FMS) for up to one hundred of the more than 2,000 machined parts on its F-16 aircraft. FMS will operate completely unattended by humans, utilizing wire-guided vehicles and robots.

The GD facility is scheduled to go on line next January. Its shop-floor control system will be implemented on the production line at General Electric's Wilmington, N. C., plant six months later—an example of the multicompany spinoff that ManTech officials shoot for in their programs.

ManTech's advanced-machining initiatives are also in motion at Dravo Automation Sciences, Pittsburgh, Pa., and at Rohr Industries, Chula Vista, Calif. These two firms exemplify the second-tier and third-tier subcontractors that produce nearly two-thirds of all machined parts for Air Force weapon systems.

Vought Aero Products Division was in the forefront of machining industry innovators. Its Flexible Machining Cell (FMC) at Dallas, Tex.—reputedly the largest and most sophisticated computer-controlled machining facility in the world—went into operation two years ago.

The FMC machines 541 parts for the B-1B, or about one-fourth of the 2,000 machined parts that Vought builds into each bomber's aft and aft intermediate fuselages. It makes extensive use of robots.

The Ball Is Rolling

There are many more examples of companies moving to implement their versions of the factory of the future to which the ManTech program aspires on all industrial fronts.

Among them, TRW's Electronic Systems Group and Martin Mariet-

ta Orlando Aerospace announced major developments within the past several months.

TRW will invest \$50 million over the next three years to build and begin operating its Advanced Avionics Manufacturing Facility in San Diego, a highly automated production plant using a CIM system.

TRW sees that plant as its main means of establishing itself as a major manufacturer of advanced avionics systems, most notably the Integrated Communication, Navigation, and Identification Avionics (ICNIA) system and the Integrated Electronic Warfare System, or INEWS, that TRW is already helping USAF to develop.

Under a ManTech contract, Martin Marietta, which runs a successful LANTIRN TechMod program, was chosen to head an industry team that will select processes and equipment to improve the manufacturing yield and reliability of advanced military electronics.

The work is focusing on the Very-High-Speed Integrated Circuits (VHSIC) and the printed wiring boards on which they are soldered.

These three programs—ICNIA, INEWS, and VHSIC—are all extremely pertinent to the successful development and production of USAF's Advanced Tactical Fighter. The allure of prospective ATF contracts is prime motivation for the manufacturing-modernization programs and plans of many companies.

The Air Force has said that the ATF's airframe will run heavily to composite materials. Now, new and better ways of producing and integrating composites are being fostered in the ManTech program.

Last October, ASD's Materials Laboratory and McDonnell Douglas teamed up, under an \$8.9 million cost-sharing contract to the company, to establish the Integrated Composites Center (ICC) at the company's St. Louis, Mo., facility.

McDonnell Douglas will use the extensively automated ICC to produce composite parts for its Air Force F-15 and its Navy F/A-18 and AV-8B aircraft. The Center will not come fully on line until late in this decade, however, in the nick of time for the ATF production in which McDonnell Douglas hopes at least to share. ■

Personal Affairs CHECKLIST

INSTRUCTIONS: Read the checklist below carefully and be sure you have taken care of these important matters.

- Store important papers and records in one centralized safe place with easy access. Don't risk moving them every time you PCS.
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- Make sure your family has aid in claiming insurance proceeds and government benefits in the event of death or disability.
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It would be imprudent for North Korea to attack the US-ROK powerhouse to the south. The North, however, is not always prudent.

Partners on the Peninsula

BY MAJ. RANDAL E. MORGER, USAF



This entourage of USAF and ROKAF fighters demonstrates US and Korean joint operations. Pictured from the rear, a USAF F-15 from Kadena AB, Okinawa, Japan; an ROKAF F-4E; an ROKAF F-5; a USAF F-4E from Osan AB, Korea; and a USAF F-16 from Kunsan AB, Korea. (USAF photo by MSgt. Ken Hammond)

HERE'S one commonly discussed scenario for renewed war on the Korean peninsula. The North Korean leader, Kim Il Sung, concludes that conditions are ripe and orders his People's Army to attack. He sends hundreds of thousands of his troops across the demilitarized zone (DMZ) in the first wave, funneling them through the Musnon, Dongduchon, and Cholwon corridors toward Seoul. Since Kim Il Sung is acting without the support of the Soviet Union, his aim is to move south as rapidly as possible and to surround and capture the ROK capital. Then, with the South's government and economy effectively beheaded and with the fifth largest city in the world as his hostage, Kim Il Sung sues for a renewed armistice.

At AFA's Gathering of Eagles last April, Gen. Kim In Ki, Chief of Staff of the Republic of Korea Air Force (ROKAF), said that "the likelihood of the North coming south in the next few years is very high" and that the North's plan would be to take Seoul within five to seven days.

Most defense experts feel Kim Il Sung would be making a big mistake if he attacked the South unilaterally. Casualties would be high on both sides, but the North would be beaten back quickly to its side of the DMZ. "In my view, it would be an extremely irrational act for North Korea to attack the ROK unilaterally," said Gen. Robert W. Bazley, Commander in Chief of Pacific Air Forces.

Even so, a unilateral attack cannot be dismissed. Kim Il Sung, who is seventy-four, has held power in the North since 1948. He has often stated his desire to see the peninsula reunified before his death. He is unpredictable and volatile. ROK defense officials tie Korean stability to regional and world peace, as do Western observers, and their first concern is Kim Il Sung's intentions. Said General Kim in his Gathering of Eagles presentation, "Should North Korea perceive a weakness in our resolve, they will no doubt launch a military assault."

The Korean peninsula has taken on new geostrategic importance since the Soviets made a decision ten years ago to expand their military influence in the Pacific. US defense officials have watched the

massive buildup of Soviet forces in eastern Asia along with the evidence of closer ties between Pyongyang and Moscow. At the US Pacific Command, spokesmen say that the USSR now has the ability to sustain a second front in the Pacific in wartime. The ongoing delivery of MiG-23s to North Korea is part of an apparent *quid pro quo* for Soviet port-call rights and military overflights on the northern part of the peninsula.

How the North Stacks Up

By all signs, the Communists across the DMZ are surely up to something. North Korean Army strength is now estimated at 750,000 ground troops, which outmans the combined forces of the ROK Army and US 2d Division stationed in Korea by about forty percent. The North fields quality tanks, nearly three times as many of them as the South does. It has a better than two-to-one advantage in artillery pieces and armored personnel carriers. Possibly a half million men are now deployed forward in a fifty-mile-wide sector along the DMZ.

On paper, North Korea's military holds most of the numerical and some of the qualitative advantages. But it also has a major weakness. The North's economy is on the ropes, so Kim Il Sung has not been able to finance any kind of comprehensive modernization for his air force. It is a large force, with approximately 780 combat aircraft, but it consists largely of castoffs and hand-me-downs from China and the USSR. It's also poorly trained by ROK and US standards.

The qualitative edge of the ROKAF/USAF units means that the North had better keep its fighters bunkered in their mountain redoubts or risk losing them quickly in the air. Either way, the South establishes air superiority and can then direct withering firepower against the North's troops and supply routes. The consensus is that the South's superior airpower would be the decisive edge for ROK victory against a unilateral North Korean attack.

"To put it another way, if I were the leader of the North Korean Air Force and Kim Il Sung said, 'Hey, we're going to war tomorrow,' I think my response would be, 'Hey, I

don't think I really want to go,' " General Bazley commented.

Maj. Gen. James P. Smothermon was more specific. (In August, he completed his tour as Commander of the US Air Forces in Korea and also as Commander of the 314th Air Division at Osan AB, thirty-eight miles south of Seoul.) "If the North committed its air force on the first day of battle, I think we'd win the war pretty quickly," he said. How fast? "In a few days."

The ROK Air Force has come a long way since the Korean War. USAF units there are also far more capable than they were just six years ago. Perhaps more important, though, is the partnership between the two forces that officials say is closer now than it has ever been before. A variety of political, social, and military factors has contributed, but from a purely ROKAF/USAF angle, the tone is set by the way the leaders work together. Generals Bazley and Kim enjoy a rapport. The 314th Air Division Commander, now Maj. Gen. James T. Callaghan, and the Commander of the ROKAF's Combat Air Command, Lt. Gen. Suh Dang Yul, have collocated headquarters at Osan. Off duty, they are next-door neighbors.

Better Command Structure

The seven-year-old ROK-US Combined Forces Command (CFC), now the primary deterrence and warfighting command on the peninsula, provides a better structure for cooperation than did its predecessor. The older United Nations Command (UNC) had no mechanism to allow ROK military leaders to participate in key decisions affecting their country's defense. Under the CFC, a multiservice binational headquarters staff works together daily. The UNC continues to administer the terms of the 1953 armistice agreement. It's also the legal channel for reintroducing other United Nations combat forces if the armistice is broken.

The Commander of the CFC, US Army Gen. William Livsey, also commands the UNC, US Forces Korea, and the US's Eighth Army and holds three other titles as well. The CFC has operational control of most ROK forces; US combat forces would "chop" to the CFC as

hostilities increased. Officials say that the complex overall command structure, on the whole, works well.

At the air forces' operational level, the fact that they operate separately is more apparent on paper than in the field. The Hardened Tactical Air Control Center (HTACC) at Osan AB is the most visible evidence of ROKAF/USAF interaction. Unlike most TACCs, it's a permanent, heavily fortified, two-story bunker. Here, peacetime and wartime plans are made for flying units in Korea, ground inputs are coordinated, and hostile air traffic is tracked.

At the HTACC, ROKAF and USAF airmen and representatives from other services of both nations work side by side in almost every area of planning and operations. For rapid transition to war, said General Bazley, "we're all set. We have procedures down pat, the checklist, the frag orders . . . perhaps better than anything they enjoy in the Central Region [of Europe]."

300 aircraft, took part in the eleventh such exercise last February through April. Aerial tactics have evolved from small-scale combined operations in the 1970s to large mixed-force strike packages today. The allies also get practice with special-use aircraft assets that are not normally stationed in the Pacific.

The North Koreans are not pleased. The North tried to block the latest Team Spirit, breaking off North-South talks to protest the maneuvers. Canceling the exercise, General Bazley emphasized, "would be one of the worst things we could do, because one of the major payoffs from Team Spirit is deterrence. It lets [the North] know that we're able to deliver a formidable force to Korea."

The two air forces hold smaller-scale exercises too, such as the biannual Cope Jade for combined air defense practice. A new aspect to that week-long event occurred last June when F-4s from Korean and USAF units were integrated

responding to a surprise attack during which "we'd have to use everything we've got [in place in Korea] to our maximum capability. We think that's the way to go."

Binational ties are bound at the grass roots by the 11,000 US Air Force men and women stationed in the Republic of Korea. The 51st TFW at Osan and the 8th TFW at Kunsan AB are both host units sharing their facilities with ROKAF tenants. Elsewhere, such as at Taegu, Suwon, and Kwang Ju ABs, the ROKAF hosts American tenants. Aircraft cross-servicing is routine among the two air forces' maintenance personnel, and support officers say they enjoy excellent relations with their counterparts at each base. Close relations are particularly important, said General Smothermon, since most American personnel serve only one year in Korea.

"The ROKAF really is our continuity here," he said.

ROKAF/USAF Capabilities

The ROKAF, in the words of General Bazley, is a "marvelous professional organization" whose airmen are "alert, responsive . . . and know how to use their weapon systems." In a nation where conscription fills most of the military manpower requirements, the 33,000-man air force is made up entirely of volunteers. The Korean Air Force Academy is the primary source of officer commissions; its curriculum is similar to that of the US Air Force Academy. Pilots, especially fighter pilots, are held in high esteem by the society at large.

ROKAF officials are extremely tight-lipped about their force lineup. However, combat assets are known to include about 460 aircraft, mostly F-5 multirole fighters. A few F-4D/E Phantom squadrons also perform both air defense and air-to-ground roles. The first of a projected buy of thirty-six F-16C/D Fighting Falcons arrived in the country last spring. A limited number of F-86 Sabres is still in service. The ROKAF also fields a variety of training, forward air control, transport, and special-use aircraft.

US airmen who have practiced Dissimilar Air Combat Tactics with ROKAF aircrews on the joint-use Air Combat Maneuvering Instru-



A North Korean armed guard marks the armistice line that ended large-scale fighting on the peninsula in 1953. A Military Armistice Commission still conducts talks within the Joint Security Area at Panmunjom. Recent fire fights begun by the North's forces have kept tensions high along the border.

Team Spirit, touted as the free world's largest joint and combined field training exercise, involves approximately 200,000 ROK and US participants and "gets better every year," General Bazley said. About 17,000 USAF people, along with

into individual flights—two ROKAF Phantoms flying alongside two 51st Tactical Fighter Wing F-4s to conduct four-ship air defense missions. Such integrated operations, General Smothermon said, can be particularly important in re-

mentation Range over the Yellow Sea give them high marks and describe their tactics as "up to the task" of facing pilots from the North. General Kim said the ROKAF is now implementing exercises similar to Red Flag to provide a realistic training environment for crews. The initial ROKAF instructor cadre has received training at Nellis AFB, Nev., home of USAF's Red Flag. Just as the US Air Force has experienced, General Kim said, "we [find that the number of] accidents [goes] down as flying time and realism go up."

For USAF units in Korea, "realism" is the order of the day. The pilots train regularly over the same pieces of real estate they'd likely be defending in combat. Since private air traffic is minimal, aircrews have few flight restrictions. In the air and on the ground, morale and combat readiness are high. "We've got one of the best motivators in the world," said Col. Henry Cochran, 51st TFW Commander, gesturing in the direction of the DMZ—roughly six minutes' flying time by MiG fighter from Osan. At Kunsan, then-Commander of the 8th TFW Col. Nels Running said his unit operates with "the Wolf Pack spirit." Kunsan is a remote assignment and probably as close an approximation to a wartime environment as can be found in the US Air Force today.

"If the balloon goes up, our men and women are going to be fighting from the first sweep of the second hand," said General Bazley. Reminders of readiness are everywhere. One Saturday last spring, for example, the 25th Tactical Fighter Squadron at Suwon AB scored a record number of A-10 sorties for a single day, flying 160 sorties. Even as the "Determined Draggin'" exercise was taking place, however, the squadron commander pointed to stocks of prepositioned weapons inside the "flow-through" refueling and rearming shelters. "If the war started right now, we'd just drop off the dummy bombs and start uploading the real munitions," Lt. Col. Hank Haden explained. "We're by-God-ready to go."

As the 25th demonstrated, its Thunderbolt II attack jets could quickly deliver huge amounts of firepower to the battlefield, even in the event of a surprise attack. The

two squadrons of F-16 Fighting Falcons based at Kunsan share the close air support mission, but focus more on interdiction. The 51st TFW's two squadrons of F-4Es are the last two Phantom units on active

their number-one problem. The North has a ranger/commando force of some 80,000 to 100,000 men who would likely engage in sapper attacks against key rear-area positions during the opening round of



Gen. Kim In Ki (seated in cockpit), Chief of Staff of the Republic of Korea Air Force, inspects the first F-16 Fighting Falcon delivered to the ROKAF last April. The purchase of the fighters will help the Republic of Korea offset the two-to-one numerical advantage of the North Korean Air Force.

duty with a primary mission of air defense, but they too have an air-to-ground capability.

A handful of other USAF aircraft is also in-country. Several fighters rotate in for air defense and reconnaissance duties. Military Airlift Command keeps HH-3s on hand for search and rescue. The USAF frontline fighters immediately available are also backed by augmentation plans that PACAF officials say would bring other forces quickly to the peninsula.

Combat Concerns

USAF/ROKAF leaders agree that South Korea's defense capability is better today than it has ever been. Some glaring shortcomings still exist, though. For example, the command and control structure is good, said General Smothermon, but communications still need improvement. "We're working that problem very hard," he said.

On defense, Generals Kim and Bazley both cite survivability as

conflict. It also has a fleet of some 250 small An-2 Colt transports and eighty-five illegally obtained helicopters that are virtually indistinguishable from some of the choppers in the South's inventory.

General Kim said that improving low-level radar detection to meet the infiltration threat is "one of the Korean military's urgent needs if we are to be able to counter these very difficult targets." Even then, he added, "some of the aircraft may penetrate our defenses and deploy forces."

The vision of heavily armed commandos heaving satchel charges into aircraft shelters didn't appeal to General Smothermon. The commandos have "great potential to do severe damage," he acknowledged. He's counting on USAF security police units and ROKAF and ROK/US Army units to squelch "hit-and-run" threats. The risk to the air bases is lessened by a tight, overlapping ring of point air defenses. At Kunsan and Osan, those include the

shoulder-fired, heat-seeking Stinger missiles.

General Kim noted that North Korea is also producing and storing chemical weapons, and there's no doubt in his mind that the North "will employ chemical warfare" if they attack. Both the ROKAF and USAF are trained and equipped to operate in a chemical environment, but have no ability right now to respond in kind.

One final defensive concern on General Smothermon's mind was

on that plan," he said, but confided that "if the war goes like we believe it will, I don't think we'll have to evacuate even one dependent."

Winning the War

Against the unilateral attack, the ROKAF/USAF team is convinced it can quickly win the air war and shorten the ground war significantly. That feeling is bolstered by the opening this December of the Korean Combat Operations Intelligence Center. When it goes into op-



Pilots from the 80th Tactical Fighter Squadron taxi their F-16As for a late afternoon sortie from Kunsan AB. The 8th Tactical Fighter Wing's primary mission is daylight precision bombing, and pilots laud the F-16's performance in that area. Pilots also train for air-to-air and night engagements.

the 4,000 US dependents and other noncombatants who might need to be evacuated from his sector. The current plan calls for them to report, when the fighting starts, for evacuation processing to such air bases as Osan that are sure to be prime targets. The former 314th Air Division Commander said he would like to see the processing point shifted to an area farther south; the air division staff is working with the ROK government to secure facilities. Then, when transport aircraft were available and air cover assured, "I can systematically and safely bring those dependents" onto an air base for the flight out of the combat zone. "We're working hard

eration, reconnaissance and intelligence information from a wide variety of sensors and sources will funnel into this central point for rapid processing and analysis. The synthesized information will be fed to operations planners for force coordination.

The major problem with carrying the war to the enemy is an old one, namely the need for a better ability to fight at night. The North Koreans discovered that weakness thirty-five years ago, and it's a pretty good guess they'd rely again on nighttime troop movement and resupply.

"We have some ability to fight at night," General Smothermon said, "but it's much degraded" in compar-

ison to daylight, clear-weather bombing.

Limited in-country improvements are finally coming. The ROKAF begins acquiring Pave Tack for its F-4Es in 1987. In the long term, LANTIRN (the Low-Altitude Navigation and Targeting Infrared for Night) system "would be perfect" for Korea, General Kim noted. LANTIRN, however, is still years away from the kind of ready availability or supportability that would allow the pods to be deployed in large numbers.

Day or night, interdiction sorties deep into the North will be needed to stymie enemy troop or supply movements, box up any remaining MiGs, and destroy the North's stocks of war supplies. General Bazley said his "comfort index is very high" about the amount and type of munitions on hand in the ROK to support the ground war. General Kim described overall ROKAF sustainability as "pretty good." Both men expressed concern, though, about the lack of any readily available, long-range, strike aircraft in the theater to deliver weapons deep behind enemy lines.

Shorter-range delivery systems are getting better, however, at least for daytime precision bombing. With the stationing of F-16s in-country, General Bazley noted, "that large stockpile of dumb bombs suddenly became very smart."

North Korean air defenses are not nearly so formidable as those of the Warsaw Pact forces—a fact for which the A-10 pilots at Suwon are particularly grateful—but they still pose a lethal challenge to an aircraft straying into their range. In addition to about 8,000 antiaircraft guns, the North is now reported to be supplementing its aging SA-2 surface-to-air missile systems with SA-3s, a lookalike of the American HAWK. Ground troops are equipped with the shoulder-fired heat-seeking SA-7. General Kim is also concerned that the twenty-six Soviet-delivered MiG-23s, firing the AA-7 missile, present a beyond-visual-range threat to ROKAF pilots—a new capability for the North Koreans.

"Even without further modernization of the North Korean Air Force or air defenses, we should have electronic warfare [EW] sys-

tems in-theater" to counter air defense threats, General Bazley stressed. "If we could afford them, I think the Chief [of Staff, USAF,] would give them to us."

As with night operations, the ROKAF/USAF does have some EW capability now, primarily with systems already on their tactical fighters. The air forces fly against simulated EW threats on the Pil Sung (Victory) Korean Tactical Range. General Bazley also pointed out that the Navy's Pacific Fleet has good EW capability and that "about ninety percent of PACAF exercises annually involve the Navy and Marine Corps."

Future Improvements

With the ROKAF and US Air Force both feeling a budget squeeze, the pace of future modernization will probably be slow. From the USAF standpoint, said General Smothermon, "we may see a few additives," but he forecasts no substantial force buildup for Korea. "We are going to modernize, though," he added.

Base facilities are finally receiving a much-needed facelift. The Carter Administration's troop pullout idea eliminated most military construction funds for Korea, and only lately has the money worked back through the budget process to the peninsula. At Osan, for example, new munitions maintenance and storage facilities are being built, a hospital is nearing completion, and more survivable squadron operations buildings are in the works.

The Republic of Korea provides assistance for operationally oriented construction, such as the "hardening" projects that include new third-generation aircraft shelters. The United Nations Command figures that the ROK contribution saves US taxpayers a substantial amount under the Combined Defense Improvement Program.

The big US Air Force drive is to provide for more accompanied tours at Osan and Taegu and to open up Kunsan for command-sponsored families as well. Allowing more airmen to bring their families to Korea "makes good sense operationally and economically," General Smothermon said. If Congress approves, the Air Force will double

the number of on-base housing units at Osan from 210 to 420. US Air Forces Korea is shooting for a 1988 target date to introduce families at Kunsan.

US officials described the ROKAF as eager to acquire modern technologies and weapon systems. The F-16 buy has already taken a big chunk out of their defense budget, though, and the ROK is spending a lot of money to prepare for the 1988 summer Olympic Games.

"As the budget allows," General Kim said, a high priority is to update the radar and weapons delivery systems for the ROKAF F-4 fleet. Among F-5 improvements the Gen-

aimed at meeting the ROKAF's requirement for a multirole fighter with the range to cover the entire peninsula and the ability to deliver diverse armaments. The F-16, F-20, and F/A-18 all appear to meet the operational need, he said, so the question becomes one of economics—whether and to what extent offset programs and opportunity for technology transfer would be allowed, among other factors. In General Kim's opinion, neither the ongoing F-16 purchase nor the fact that Korea currently produces F-5s under license from Northrop will be a "decisive factor" in picking a future fighter.



Sgt. James Shepard of the 8th Security Police Squadron at Kunsan AB demonstrates how to aim a Stinger missile. Members of the air defense detachment say the Stinger is deadly when fired by trained personnel.

eral contemplates are more powerful radars for longer-range target detection, a better inertial navigation system, and updated weapons delivery systems.

General Kim said the ROK government has made no decision yet on a possible follow-on buy to the F-16. Future procurement, he stressed, would continue to be

As for a ROK-designed and -produced fighter, General Kim doesn't see that as a probability in the near future. Rather, he views the option of further coproduction or licensed production in a "risk-reducing, shared investment" approach between the ROK and aerospace industries as a more favorable path for now. ■

Maj. Randal E. Morger is a former Contributing Editor of AIR FORCE Magazine under the Air Force Institute of Technology's Education With Industry (EWI) program. He is currently assigned to the Office of the Assistant Secretary of Defense for Public Affairs.

Technologies of

How the U.S. Defense Community benefits solutions that meet multiple-mission needs.



▲ Eleven common modules enable TI to economically tailor FLIR "see-in-the-dark" systems to meet individual needs of the armed services. The 11 modules are (left to right) visual collimator, preamplifier, scanner assembly, bias regulator, scan interface, auxiliary control, detector Dewar, postamplifier, LED array, infrared imager, and cryogenic cooler.

Above you see three different Forward-Looking Infrared (FLIR) systems made by Texas Instruments. Each performs precisely to the mission requirement of the particular military service deploying it.

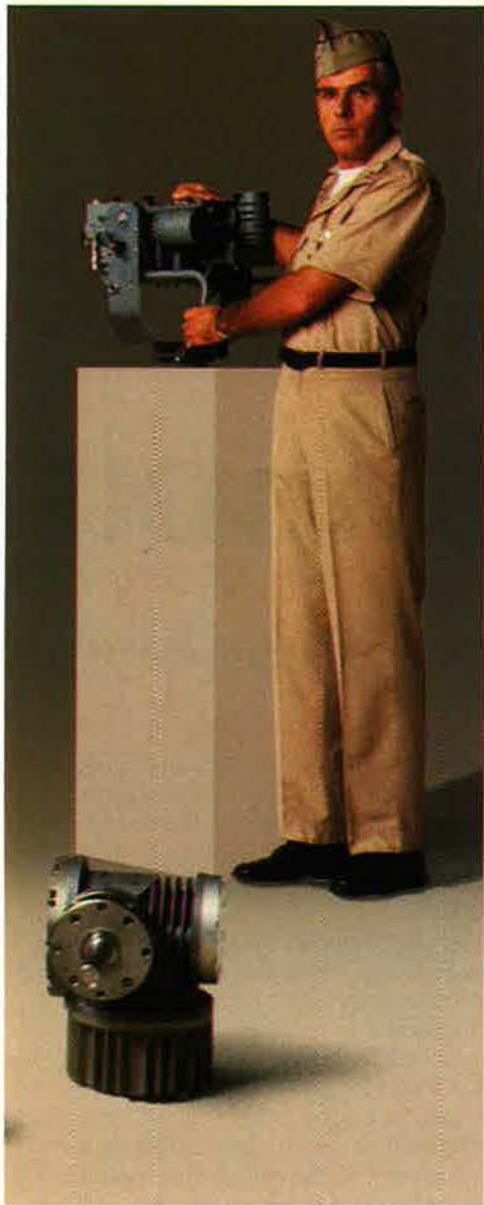
Yet each of these FLIR systems is not a costly custom design. They share the common functional

modules developed by TI that you see in the foreground. These modules have helped cut unit costs to the point where use of FLIR in a wide range of applications is practical.

To reduce these sophisticated electro-optics systems to the simplest possible components, TI marshaled vast technical resources. Naturally,

Simplicity:

from TI's drive for simple, even elegant,



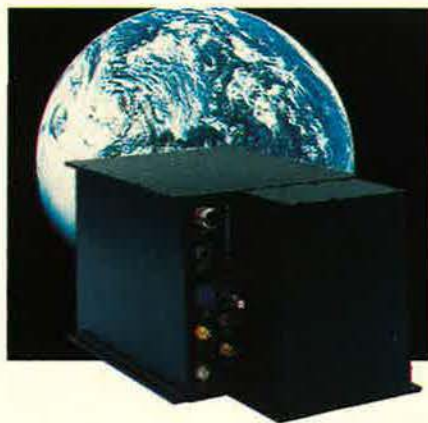
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Using satellite signals to fix positions, TI receivers, like this missile guidance unit, bring an outstanding degree of precision to the user. Common components allow TI to simplify the adaptation of the basic design to various receiver systems.

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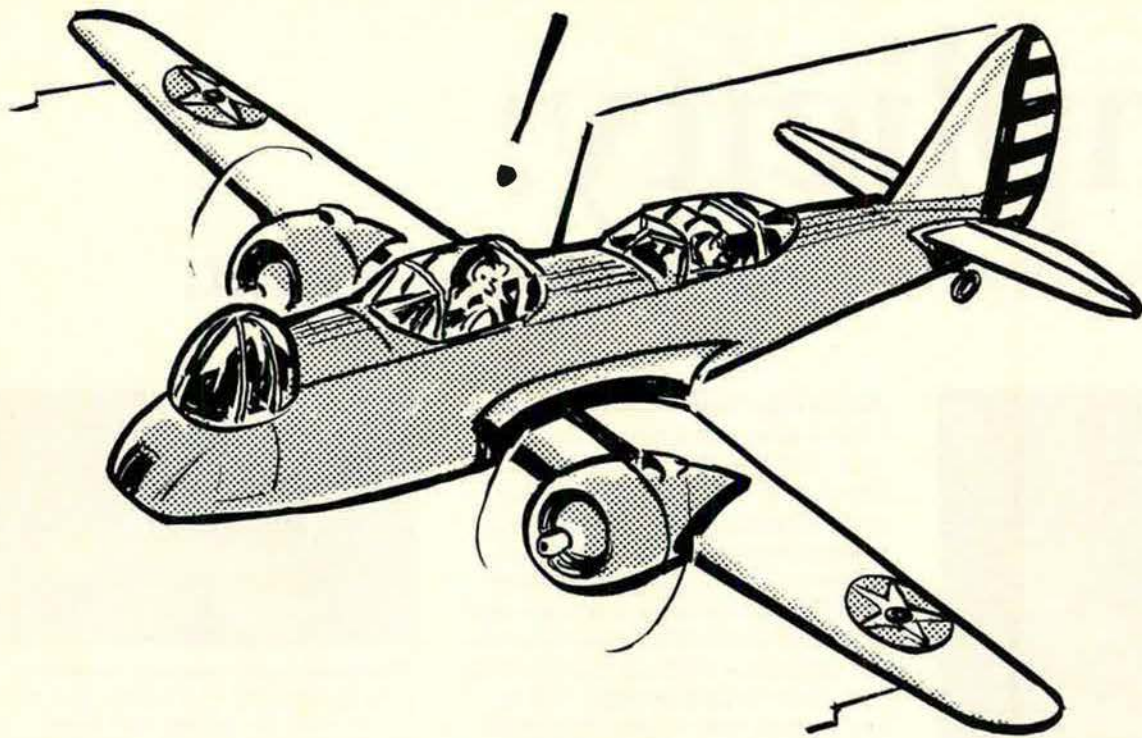
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experience with infrared and cryogenics played a large part. So too the design and manufacturing knowledge gained from producing state-of-the-art infrared detectors and semiconductor chips. Result: An elegant solution that serves three masters extremely well.


**TEXAS
INSTRUMENTS**



There are major legends and minor legends, and then there was Philpott.

Philpott

BY MAJ. GEN. DALE O. SMITH, USAF (RET.)

WHEN I thought of writing about 2d Lt. James A. Philpott, I tried to locate him, but his name didn't appear in official records. I thought he might be related to Lt. Gen. Jammie M. Philpott. After all, there can't be *that* many Philpotts in the world.

But, no, on phoning the General in Georgia, I learned they weren't related, nor had the General ever met James A. Philpott. But he *had* heard of him:

"Isn't he the one who flew through a hangar in Denver?"

"That's got to be the same one," I replied.

So, James, wherever you are, I hope you'll forgive me for this memoir, which may be somewhat distorted. But what legends aren't?

The Arrival of Philpott

When Philpott joined the 9th Bombardment Squadron at Hamilton Field, Calif., in the 1930s, things

began to happen. He left his mark on that staid old outfit. Philpott was the only Flying Cadet in the squadron. No doubt his commission had been delayed because of some escapade.

At that time, we were flying Martin B-10s and had just received the Norden bombsight from the Navy. The sight was a complicated device unsuited to Navy needs, and the Navy was happy to unload it on the Army Air Corps. Moreover, we were delighted to get it, even though it mystified us. Anything was better than the clockwork gadget we had been using to scatter practice bombs far and wide.

The Norden was gyro-stabilized and could correct for drift and ground speed. By sighting through a telescope and manipulating four knobs, you could center the crosshairs on the target and hold them there, provided the pilot zeroed a needle on an instrument in

Illustrations by Bob Stevens

the cockpit. (This may not enlighten you, I know, but take it on faith, as we did. The bombsight was later tied into the autopilot, which eliminated pilot error.)

Of course, airspeed had to remain constant. You just held a trigger, and the bomb would drop automatically at the right time to hit the target. No one knew exactly when the bomb would drop. So all the movies that show the bombardier mashing a button to drop his bombs are pure Hollywood.

We learned that when these many variables were manipulated just so under ideal conditions, the bombs *did* drop, as advertised, into a "pickle barrel." But a highly skilled bombardier with the cooperation of an equally skilled pilot was required to achieve acceptable accuracy. And this meant practice. Lots of practice.

Of course, his oddball request was denied. It had nothing to do with the bombing task at hand.

Philpott Gets His Jump

Well, in order to record our bombing accuracy at Mather, we had an officer sit on a spar just aft of the open bomb bay and mark the bomb strikes on a clipboard. One day, Philpott had this duty while I was flying. The bombardier in the nose and Sergeant Jakes in the rear gunner's position completed the crew.

As we made what seemed to be a successful bomb run, I called Philpott over the interphone to learn where the bomb had hit. No answer. I called again. Still silence. Finally, Sergeant Jakes, who could see into the bomb bay, answered in a frightened voice.

"Sir, Mr. Philpott is gone!"

"Gone? What do you mean 'gone'?"

"He isn't here!"

Well, he couldn't have stepped out for a cup of coffee. I gulped, banked sharply, and looked down. Sure enough, there floated a billowing white parachute. Flying Cadet Philpott had made his jump. And he came down still clutching the clipboard.

When he was subsequently called on the carpet, he reported, "I lost my balance while leaning over to watch the bomb drop, and I just fell out."

Our C.O. didn't pursue it further, but assigned Philpott the duty of range security and charged him with keeping all people, vehicles, dogs, and parachutists away from our bull's-eye target.

Another day, when I was the bombardier, a small airplane ap-

Has the Last Word

We spent hours on a makeshift simulator, a ten-foot-high tripod on wheels. We sat on top of this rig in a chair while manipulating the Norden and chasing a movable "bug" across the hangar floor. But this wasn't enough. We needed a bombing range.

Someone remembered Mather Field near Sacramento, which had been a large cantonment in World War I and was now barren and deserted. We established a camp there and marked out a large lime bull's-eye at one end of the old field. Our B-10s then began cratering the bull's-eye with 100-pound practice bombs that contained a black-powder marking charge.

Among our intrepid aviator/bombardiers was Flying Cadet Philpott. He kept pestering our C.O. for permission to make a parachute jump. (Let me remind you that parachute jumping in those days was largely confined to daredevils at carnivals.)



"Flying Cadet Philpott had made his jump. And he came down still clutching the clipboard."

peared in my telescope. It landed and bounced wildly through the bomb craters, coming to rest on the white spot. I let up on the trigger just in time to avoid dropping a bomb on it. That ended our practice for the day, so we landed.

I learned that Philpott, on seeing this same plane, had jumped into a half-ton truck and careened through the craters to the airplane. It was a Navy craft piloted by a mature lieutenant commander. He had become lost and on seeing those large white circles had assumed them to be the marker designating an airfield. Some small airfields were marked with a white circle in those days.

Red-faced, the Navy officer stood beside his plane as Philpott roared up in a cloud of dust. Highly indignant, the cadet accosted the lieutenant commander: "What are you doing on our target, sailor?"

The Return of Philpott

The world hadn't recovered from the Great Depression. Philpott was promoted to second lieutenant at \$125 a month plus fifty percent flying pay. Base pay for a buck private was \$21 a month, and sometimes squadron tools thought to be lost ended up in pawn shops.

I had demonstrated unusual perspicacity for a second john by etching tools with an electric pencil to stop the hemorrhage, and thus I alienated many enlisted men. Then I was ordered by Maj. Ken Walker, our C.O., to make up for a horrendous shortage of tools. But on scouring the regulations, there seemed to be no legitimate way of my doing this short of paying for them, and that prospect invited personal starvation.

An enterprising supply sergeant saved my backside. Each morning he'd come to work with a bucket full of old tools he'd found. We'd turn these in for credit, and before long the books balanced. This feat made me a supply expert.

I learned later that the sergeant knew where Base Supply had been dumping worn-out tools in San Pablo Bay, and each morning he took a swim there. Too bad all second johns aren't blessed with such a sergeant.

With this new reputation as a technical supply genius, I was assigned to the Hawaiian Air Depot as

Assistant Engineering Officer and Test Pilot. The latter duty had nothing to do with my flying ability. It simply went with the job. I had to see that overhauled aircraft would fly properly before they were turned over to the tactical squadrons. It gave me a lot of varied experience, and I came to fancy myself as a rather hot pilot.

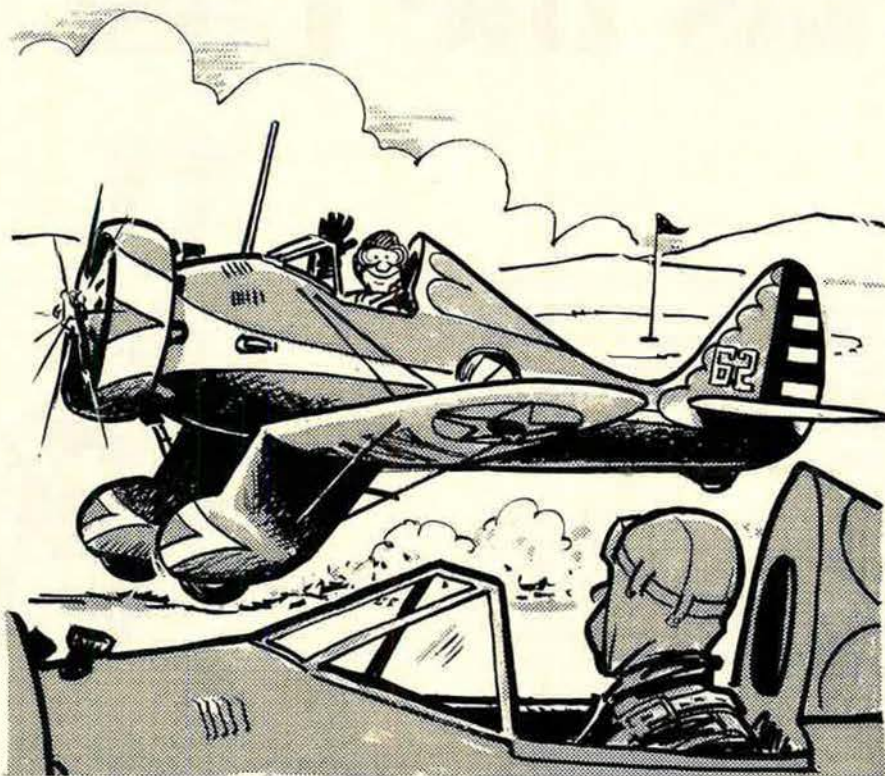
One day, I was testing the vicious little P-26 "Peashooter" high above the Pali when I glanced over my right shoulder to find another Peashooter there on my wing. From its markings, I knew it was flown by one of those cocky fighter pilots from Wheeler Field. He obviously wanted to play games, but I had work to do.

"I'll shake him," I said to myself and began a series of stalls, loops, Immelmans, chandelles, dives, and steep turns that had contrails

streaming from our wingtips. If you horsed that little monster in too tightly, it would snap into a wingtip stall and God knows what happened next! I expected the following Peashooter pilot to make that mistake, but he never did. He stuck to me like a postage stamp, doing whatever I did and doing it better.

In desperation, I then did something I now shudder to think about. I landed on a deserted golf course on windward Oahu. Now a Peashooter, with its stubby wings and fixed landing gear with pants on the wheels, was not made for strange field landings. It had a nasty habit of flipping over on its back and breaking the pilot's neck.

As I rolled to a bumpy stop, I looked over my shoulder, and there he was, grinning at me. I might have known. It was 2d Lt. James A. Philpott. ■



Maj. Gen. Dale O. Smith, USAF (Ret.), is a 1934 graduate of West Point. During World War II, he commanded the 384th Bomb Group in England. His Air Force career included command of two air divisions and a long stint of high-level assignments at the Pentagon. He retired in 1964 and began a second career as a writer. He has authored a number of books on defense-related matters. His offerings for this magazine include "The Target Was Marienburg" (September '82) and "But for the Captains" (March '85).

JANE'S

ALL THE WORLD'S AIRCRAFT SUPPLEMENT

OCTOBER 1986



Mikoyan MiG-29 (NATO Fulcrum) counter-air fighter of the Soviet Air Force landing at Kuopio-Rissala air base, Finland (Lentokuva H. Vallas)

MiG
ARTEM I. MIKOYAN DESIGN BUREAU, USSR

Reports of the capability of the MiG-29 counter-air fighter began to circulate when the US *Congressional Record* published small overhead pictures of the aircraft, together with the larger Sukhoi Su-27, some years ago. Those satellite shots were followed last December by the first photographs of an Su-27 prototype, and much improved three-views of both aircraft, in the 1985-86 edition of *Jane's All the World's Aircraft*.

On 1 July this year, six MiG-29s appeared outside the Warsaw Pact borders for the first time, when

they made a goodwill visit to Kuopio-Rissala air base in Finland. They confirmed the extent to which Soviet airframe designers have closed the technology gap on which the West has relied to offset the Warsaw Pact's 2½ to 1 numerical superiority over NATO air forces in Europe.

MIKOYAN MiG-29

NATO reporting name: Fulcrum

The first major surprise came when the MiGs landed. As the nosewheel of each aircraft made contact with the runway, doors were triggered to blank off the underslung engine air intakes. Later scrutiny of photographs revealed how the MiG de-

signers had overcome the problems caused by ingestion of snow, slush, ice, and foreign objects into the engine ducts during take-off and landing on the kind of runways used by Warsaw Pact frontline fighter forces, especially in winter. When the intake trunks are closed, engine air is taken in through a series of lateral louvres in the upper surface of the aircraft's deep wingroot leading-edge extensions.

In the original satellite photograph, these louvres had appeared as dark patches, leading to an early assumption that there was a gun in each wingroot. In fact there is only one gun, in the port wing, with a leading-edge blast panel in front of the muzzle orifice, followed immediately by a pair of small gas



MiG-29 display team of the Soviet Air Force flying above the solo aerobatic aircraft, which is landing with brake-chute deployed (*Lentokuva E. Vañas*)

vents. Farther back, on this one side only, is a row of additional gun gas vents, in front of the port set of auxiliary engine air intakes. The type of gun installed is open to conjecture at this stage. A twin-barrel 30 mm weapon of the kind fitted to the Su-25 Frogfoot and Mi-24 Hind-E might have been expected, but the orifice suggests a single barrel.

Main armament of Fulcrum for its air-superiority role is said by the US Department of Defense to comprise six air-to-air missiles. The engine ducts are so close to the ground that early assumptions of four missiles underwing and two under the ducts are no longer feasible. All six must be carried underwing, although no weapon pylons were fitted to the aircraft that visited Finland. They were, however, fully operational in other respects, unlike the MiG-23 Flogger-Gs from Kubinka that were stripped of their sensor pods and other equipment when they flew to Kuopio in 1978.

Prominent in front of the windscreen of each Fulcrum, offset to starboard, was an infra-red sensor under a large transparent dome. Here was a pertinent reminder of the warning by US Assistant Secretary of Defense Donald C. Latham that at least three of the latest Soviet fighters are fitted with these extremely useful combat aids, against none in the USAF, although the American F-106 pioneered the use of search and track IR many years ago.

Farther forward, in Fulcrum's large ogival nose, was another reminder of a US government statement claiming that covertly acquired documentation on the F/A-18's fire control radar served as the technical basis for new lookdown/shootdown engagement radars for the latest generation of Soviet fighters. Fulcrum has such a pulse-Doppler radar, and may take advantage of the acquired technology to counter NATO ECM and ECCM as much as to enhance the basic radar search/track capability.

There was nothing on the Fulcrums in Finland to suggest that the Soviet Union is yet equipping its fighters to refuel in flight. Also, although the MiG has a high-set cockpit, giving its pilot a reasonable forward view over the sloping nose, he certainly lacks the superb all-round field of view offered to the pilots of F-15s and F-16s through 360° low-sill canopies. Nor can the bulky head-up display, IR sensor, and large wing leading-edge extensions be helpful in this respect.

Comparison of the general configurations of the MiG-29 Fulcrum and Su-27 Flanker prompts the thought that some central authority, perhaps the famous TsAGI Central Aerodynamics and Hydrodynamics Institute, may be exerting a greater influence on design than was the case in the era of the late Artem Mikoyan and Pavel Sukhoi. The Sukhoi fighter maintains the tradition of being larger and seemingly more crude than the MiG, but the two designs are strikingly similar in most respects, even in such detail as current tail fin location and the manner in which the mainwheels retract into the wingroots.

Dimensionally, as expected, Fulcrum has proved to be very close to the F/A-18 Hornet, which has a wing span of 11.43 m (37 ft 6 in) and overall length of 17.07 m (56 ft 0 in). Its all-up weight is also likely to be similar to the Hornet's fighter mission take-off weight of 16,651 kg (36,710 lb). However, the MiG has more powerful turbofans, giving a thrust-to-weight ratio better than 1:1 and a much improved sustained turn rate compared with earlier Soviet fighters.

Although intended primarily as a single-seat counter-air fighter, it is likely to have a full dual-role air combat/attack capability, and a combat capable two-seater is also in production. Manufacture is centred at a factory in Moscow. Its status and scale are evident from the fact that the Indian government expects soon to begin acquiring MiG-29s (in flyaway form initially; for licence manufacture later) to meet its requirement for aircraft to match Pakistan's F-16s.

More than 150 MiG-29s are already operational with Soviet units stationed in East Germany, in the Soviet Union west of the Urals, and in the far eastern USSR. Other countries expecting early deliveries include Syria, with Jordan as a potential operator following its lack of success in seeking Western fighters.



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An A-10 aircraft launches a Raytheon-produced IR Maverick missile.



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Where quality starts with fundamentals

Thud Ridge: A Legacy and a Legend

"Jack Broughton expected a lot from every pilot in the gaggle, but no more than he gave."—Leo Thorsness

BY JOHN L. FRISBEE
CONTRIBUTING EDITOR

THEY don't come any more professional than Jack Broughton. After graduating from West Point in 1945, he spent twenty-three years in fighters. Following 114 combat missions in Korea, he earned world-class recognition in the stick-and-rudder league when he was selected to lead the Thunderbirds demonstration team. Then it was F-106s in air defense, a year at the National War College, and on to Southeast Asia as Deputy Commander of the 355th Tac Fighter Wing, equipped with F-105s, popularly known as Thuds.

Col. Jack Broughton believed in our defense of South Vietnam. He also believed that micromanagement of the war by inexperienced civilian theorists in Washington and by a headquarters thousands of miles away violated centuries of military experience. Remote direction of the war, down to minute tactical details, was costing irreplaceable planes and, more important, the lives or freedom of men he led. He cared deeply about those men—so deeply that he led far more than his share of the toughest missions to targets along Thud Ridge to the northwest of Hanoi, where the guns, the SAMs, and the MiGs were concentrated in the deadliest of air defenses.

As his mission tally climbed toward 100, Jack Broughton became one of the few men to be hit by a SAM and survive and one of the few to win the Air Force Cross. All of this—the heroic exploits of many 355th pilots, the massive rescue effort he led when Medal of Honor winner Leo Thorsness was shot down (see "Valor," April '85 issue),

and his own most memorable two days of combat—is described in hair-raising detail in *Thud Ridge*, Colonel Broughton's classic account of F-105 operations in the North, recently reprinted in paperback by Bantam Books.

Those two days began one afternoon in mid-1967 when Broughton led his wing against rail yards near Hanoi. He took the flak-suppression flight, determined to get the 85-mm and 100-mm guns that protected the yards. After a successful strike, he led an armed recce, discovering a valley that intelligence believed abandoned but that now was full of fat logistic targets. Leading the attack, Colonel Broughton was hit by 37-mm fire that knocked out his stability augmentation system. Normally that meant curtains for a Thud, but with superb airmanship he regained control of the 49,000-pound beast and made it back to Takhli.

While the maintenance people replaced the tail section of his aircraft, he requested permission to take the wing back to that same valley the next morning. Organizing the mission took most of the night. With two hours' sleep, Broughton led his pilots in a predawn takeoff and through a wall of violent thunderstorms in what was described by others as "the wildest aerial refueling episode in the history of fighter aviation." Colonel Broughton had to make eight hookups in that black turbulence before he got all the planes in his wing refueled. Re-



Col. Jack Broughton straps on his "Thud," with help from his crew chief, ready to head North again.

grouping the force under almost impossible conditions, he led the flak-suppression flight, silencing the guns that had almost ended his career the previous afternoon, while his pilots clobbered their targets.

As the strike force withdrew, Broughton went after an undamaged building with his guns. He was hit by flak but continued the attack, his aircraft on fire and two main hydraulic systems out. The remaining utility system fluctuated from zero to 3,000 pounds' pressure. If it went, his Thud would become "an unguided missile." Very gently, he pulled out of his dive at treetop level, nursed the wounded bird up to 23,000 feet, where he got the fire out, and made it to an emergency strip, where he had to penetrate a 700-foot ceiling, hydraulic pressure falling periodically to zero all the way.

Those two missions earned Jack Broughton a recommendation for his second Air Force Cross. But that was not to be. Two of his pilots who were fired on by a Russian ship in Haiphong harbor committed the unpardonable sin of returning fire. For his unorthodox defense of the pilots, Colonel Broughton was court-martialed and, for lack of hard evidence, was given no more than a slap on the wrist. Nevertheless, he knew that the door to command and to promotion had been slammed shut. He retired from the Air Force. Thus did we lose one of our great combat leaders who left for all airmen a legacy and a legend of valor.

In a recent letter, Col. Leo Thorsness wrote: "Jack Broughton was the finest combat leader at Takhli during my time there . . . a leader who led with brains and guts. All fighter pilots have some good traits: Jack had them all. But one of his greatest strengths—supporting his pilots—was his downfall."

If the day ever comes when this country goes head-to-head with the Communist first team, let's hope there will be a few Jack Broughtons around to lead the way. ■



INTERCOM

By Robin L. Whittle, AFA DIRECTOR OF COMMUNICATIONS

Cleveland Chapter Is Renamed

AFA's Cleveland Chapter will never again be quite the same. Not only does it now carry the name of an enormously energetic American industrialist and aviation pioneer, but it has come of age as an AFA chapter to watch. It was selected as the outstanding chapter in the nation in communications for 1986 and was so honored at last month's AFA convention.

At a dinner held on July 28, the Cleveland Chapter was officially renamed in honor of ninety-four-year-old Frederick C. Crawford, a brilliant and dynamic man. He rose from being a millwright's helper earning thirty cents an hour at the Steel Products Co. in 1916 to Chairman of the Executive Committee of TRW, Inc.—a company he helped shape into a giant in the aviation and automotive industries.

As Chapter Communications Director Anthony Mazzolini tells the story, Mr. Crawford's employer at the steel company, Charles E. Thompson, had reservations about hiring him. Mr. Crawford had graduated magna cum laude from Harvard and earned an engineering degree from Harvard's graduate school of applied sciences. Mr. Thompson wasn't sure about this "educated upstart." However, he quickly changed his mind, and Mr. Crawford was on the fast track to the top.

In 1926, the company name was changed to Thompson Products Inc., and by 1929, Mr. Crawford was vice president and general manager in Cleveland. He was elected a director in 1926, and by 1933, he was president of the company. When Thompson Products merged with Ramo-Wooldrige Corp. to become TRW, Inc. in 1953, he became Chairman of the Executive Committee. Although he retired in 1959, he remained Chairman of the Executive Committee and a director. He was later named Honorary Chairman of the Board, which he remains to this day.

Ohio AFA President and Cleveland Chapter founder John Boeman said that the audience was enchanted with the stories Mr. Crawford told at the



AFA's Cleveland Chapter was recently renamed in honor of industrialist Frederick C. Crawford. Among those participating in the renaming ceremonies were, from left, Chapter Communications Director Anthony Mazzolini, Chapter President Leo A. Johnson, then-AFA Board Chairman Ed Stearn, Mr. Crawford, Chapter Membership Chairman George Ludwig, and Ohio AFA President John Boeman.

dinner. Throughout his career, he was called perhaps the greatest face-to-face communicator American business has produced. In describing his powerful speaking style, the business press of the time used such phrases as the "Crawford magnetism," "super showman," with "a complete mastery of words that never loses itself in wordiness." He demonstrated these qualities to the delight of the crowd.

In fact, nearly 300 top business, civil, and military leaders attended the dinner. The event was sponsored by eleven leading local and national companies, including Cleveland's major newspaper, *The Plain Dealer*.

A highlight of the evening was when AFA Board Chairman Ed Stearn read a telegram that stated in part: "I am delighted to congratulate Frederick C. Crawford on the honor given him by the Cleveland Chapter. Frederick Crawford's career has spanned decades of change in industry, and he has not only adapted to such change but has spearheaded it. Because of his imagination, his enterprise, and his resolve, the arsenal of democracy is more formidably stocked than ever. Nancy joins me in wishing everyone at the ceremony a memorable evening. God bless you all." It was signed by

President Ronald Reagan, a charter member of AFA.

Another highlight was the presentation of a \$1,000 scholarship to a local high school student.

"Two years ago we didn't have two nickels to rub together. Now we're on the shoulders of giants, and it's up to us to keep the momentum going," Mr. Mazzolini said. Movers behind the event included Leo A. Johnson, President; James W. Taddeo and Patricia Stark, Vice Presidents; John Primeau, Treasurer; Louis Brothag, Secretary; George Ludwig, Membership Chairman; Don McGinley, Awards; James T. Larkins, Program; Alfred Urban, Finance; and Leo D'Arcy, Eloise Graves, Marc Graves, Grace Kudukis, and Tony Mazzolini.

Pennsylvania AFA Honors Native Son

June 25 was a special day throughout the country as military, aviation, and civic groups recognized the centennial of Gen. H. H. "Hap" Arnold's birth. But nowhere was this so evident as in his home state of Pennsylvania, thanks to the work of Pennsylvania AFA and several of its chapters.

Gov. Dick Thornburgh issued a statement commending those who

were observing the centennial and called General Arnold "a distinguished American who made significant contributions to the building of the United States Air Force. Pennsylvania is indeed proud that General Arnold was a native son of the Keystone State." That sparked a spate of proclamations issued around the state by mayors and county commissioners at the request of local AFA chapters. AFA's Joe Walker-Mon Valley Chapter, led by Pennsylvania AFA Vice President Ron Chromulak, received proclamations issued by the Washington and Westmoreland County Commissioners and by Mayors Jim Sepesky of Monessen, Anthony Massafra of Donora, Joseph Tintori of North Belle Vernon, as well as from officials in Greensburg and North Huntingdon. In addition, Chapter officials worked with the local library to show historical films on General Arnold's career.

AFA's Altoona Chapter, led by Altoona Mayor Dave Jannetta who is now Pennsylvania AFA President, hosted a barbecue at Bland Park in Tipton, Pa., in honor of General Arnold. Brief remarks in honor of the Air Force's only five-star general were given by Wanda Clark, President of the Air Force Mothers Flight #41, Frances Chathams, Commander, Keystone Country Cadet CAP Squadron, Lt. Col. Gary Gerardine, Group Commander, Challenger Seven, Group 1500, CAP, and then-AFA State President Jack Flaig. The guest speaker was Col. David A. Allen, Commander of AFROTC at Penn State University. The ceremonies were covered by WTAJ-TV, with segments airing over two days.

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Luncheons were staged in Merion Station, in Ardmore, Pa., at Penn State University, and in Gladwyne, General Arnold's home town. The latter, sponsored by AFA's Metro Philadelphia Chapter, was perhaps the most significant because it was held not far from the house where General Arnold was born. The house still stands, but is now the rectory of St. John Vianney

Catholic Church. A plaque on the lawn is the only clue to its historical significance.

The luncheon was held at the General Wayne Inn, which dates back to 1704 and is said to be the oldest restaurant in continuous operation in North America. Organizers of the luncheon included President Gene Goldenberg, Vice Presidents John Gross and Billy Gould, Secretaries Ed Gibbons and John Davies, Program Director Jim McClasky, Regional Director Dick Hart, and past President Joe Lawrence.

The chairman of the luncheon, Billy Gould, served under General Arnold in Africa in World War II. Mr. Gould stated, "The General is one of our for-



Mayor James Sepesky, right, of Monessen, Pa., recently presented an official proclamation marking Gen. H. H. "Hap" Arnold Day to Pennsylvania AFA Vice President Ron Chromulak, left, and Joe Walker-Mon Valley Chapter Secretary Bob Sybolt.



One of AFA's limited-edition bronze sculptures, the "Gathering of Eagles," recently found a roost with the 463d Military Airlift Wing at Dover AFB, Del. AFA National Treasurer George Chabbott, left, and his wife Marilyn donated the sculpture, which was accepted by Wing Commander Col. Walter Kross, right.

gotten heroes. America would never have won World War II if it hadn't been for the foresight of Hap Arnold—the father of the modern Air Force. Yet, he's almost forgotten."

Pennsylvania AFA was also involved in plans for the Gen. H. H. Arnold postage stamp, announced in Gladwyne on June 25. The denomination and date of issue have yet to be determined (see photo in "Aerospace World," p. 39, September '86 issue).

One direct link AFA has to memories of General Arnold is through Henry Coffin III, an active Pennsylvania AFAer who served under General Arnold in the Army Signal Corps at Kelly Field in San Antonio, Tex., in World War I. In an interview with the Philadelphia *Inquirer*, Mr. Coffin told an amusing story. General Arnold, the son of a medical doctor who came from a long, proud line of Mennonite farmers, left for West Point in 1903. After graduating, he returned to mar-

ry Eleanor "Bee" Pool, a banker's daughter from Ardmore.

"Most people didn't think the wedding would ever come off after Bee's unpleasant visit to Hap at West Point," Mr. Coffin said in the interview. When Bee arrived, Hap was under house arrest. He had rolled a cannon down the steps of his dorm, and it had crashed through a brick wall into a dining room. He was confined to his room, and Bee could only wave to him.

"They didn't see each other again until the day they were married in Ardmore," Mr. Coffin said.

Honors for Los Angeles Ball

In July, AFA, its affiliate the Aerospace Education Foundation, and SCAMP (Scholarships for Children of American Military Personnel) honored individuals who through the years have helped put on the annual Los Angeles Ball. Singled out were the Honorary Chairmen (the first one, in 1972, was then-Gov. Ronald Reagan of California), the General Chairmen, the military hosts (traditionally the Commander, SAC's Fifteenth Air Force, alternating with the Commander of AFSC's Space Division), the principal business supporters, and AFA volunteers.

In the latter category were four AFAers who have worked with the Ball since its inception: Ron Gray of TRW Corp., Bob and Ruth Lawson, who have opened their home to SCAMP winners each year; and Ed Stearn, outgoing AFA Board Chairman and President of SCAMP.

Also honored was Lee Ostrow, widow of Marty Ostrow. Mr. Ostrow was SCAMP's founder and the first General Chairman of the Los Angeles Ball. Since its inception, the annual Ball has raised nearly \$1.25 million for charity, proceeds going to both SCAMP and the AEF. This year's Ball will be on October 31.

On the Scene

AFA's year-old **Paul Revere Chapter**—honored last month at AFA's national convention as the outstanding medium-size (151-400 members) chapter in the nation—scored another coup with a well-attended, well-organized dinner meeting with **Maj. Gen. Aloysius G. Casey**, Commander of the Ballistic Missile Office at Norton AFB, Calif. Chapter President **Bill Lewis**, honored with AFA's coveted Exceptional Service Award, reports that General Casey did a magnificent job of detailing the status of key strategic modernization programs and their positive effect on Soviet willingness to negotiate arms reductions seriously.



Among guests at the Charles A. Lindbergh Chapter's spring dinner were, from left, Connecticut Secretary of State Julia Tashjian, Gen. John L. Piotrowski, Connecticut AFA Vice President Alton G. Hudson, and Governor's Foot Guardsman Roger Merrill.

Paul Revere Chapter officials got the word out in the best tradition of their namesake. The result was an audience that included business and civic leaders, local reporters, officials from AFSC's Electronic Systems Division, and Revere Chapter members. Distinguished guests included then-AFA Board Chairman **Ed Stearn** and **Brig. Gen. James E. Freytag**, ESD Deputy Commander for Strategic Systems. "All in all, it was a great event," said Joe Luceri, Chapter Communications Director.

The number-one chapter in the nation for 1986 (as it had also been in 1983)—AFA's **Charles A. Lindbergh Chapter** in Connecticut—put on an-

other stellar event that featured Vice Chief of Staff **Gen. John L. Piotrowski** as the speaker. Chapter President **John Henry Griffin**, an AFA 1986 Exceptional Service Award winner, said that the spring dinner dance was well attended. Guests included the **Hon. Julia Tashjian**, Connecticut Secretary of State, and **Maj. Gen. John T. Gereski, USA**, Connecticut Adjutant General. A grand flourish was added with the parade of the colors by the 2d Company of the Connecticut Governor's Foot Guard, which dates back to the Revolutionary War and has escorted every Connecticut governor since that time. Connecticut AFA Vice President **Al Hudson** is a captain in



AFA's Paul Revere Chapter honored BMO Commander Maj. Gen. Aloysius G. Casey at a recent dinner meeting that included, from left, Brig. Gen. James E. Freytag, General Casey, Chapter President Bill Lewis, and then-AFA Board Chairman Ed Stearn.

the 2d Company. During the evening, President Griffin honored the Vice Chief with a Gen. Ira Eaker Fellowship in AFA's Aerospace Education Foundation.

"At last count, there were more than 4,500 retired military personnel in Delaware, and more than 2,900 are Air Force," stated Delaware AFA President **Horace Cook**, winner of an AFA Exceptional Service Award. This statement appeared on the front page of Delaware AFA's *News Bulletin*, a new statewide mini-newspaper that is sure to help the AFA leader achieve his goals for the coming year. "Delaware is known as the 'First State' throughout the United States; let's make it the first state for AFA activity," he concluded.

In other Delaware news, **Jim Flood**,

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then used successively in Denmark, Sweden, and France before returning to the United States," Mr. Flood said. The "Fort" is expected to fly next summer.

Dover was one of many stops along the eastern shore for British Rotarians **Martin Nutbeam**, a police sergeant stationed at a small town in Hampshire; **Keith Judson**, personnel recruitment manager for a retail company in Southampton; **Stephen Miller**, insurance agent; **Colin Skeen**, at-

over Germany, occupied France, and the Netherlands, dropping leaflets and materials—numbering 1.5 billion—to reach the people.

This was fascinating fare for **Patrick Carty**, who was born after the war and grew up in a town outside Cheddington. Mr. Carty stopped at Cheddington one day and decided that it ought to be remembered for the brave men and women who served there. He and six others formed the Cheddington Association and began publishing a newsletter called the Cheddington *Leaflets*.

Hungry for more information, Mr. Carty kept running across the same name—Marjorie Hunt. The commander had kept up with her troops and those who served in the unit, thus enabling several reunions to take place—both in the US and abroad. Finally, Mr. Carty caught up with her at the latest reunion held in Ohio in July. It was there that he presented her with a plaque of appreciation, expressing the profound gratitude Britishers feel for Marjorie Hunt and those who served with her at Cheddington. "I was floored," she said. "These were special people to us," Mr. Carty explained.

Gen. Jimmy Doolittle, USAF (Ret.), AFA's first National President, was given a tribute the likes of which he and his family won't soon forget, thanks to AFA's second National President, **Tom Lanphier, Jr.**, AFA's fourteenth National President **Joe Foss**, the **American Fighter Aces Association**, **San Diego AFA**—and most important—comedian and longtime military supporter **Bob Hope**, his entourage of stars, and AFA's first Vice President and beloved actor **Jimmy Stewart**.

Planning began two years ago for a celebration that would honor General Doolittle's ninetieth birthday and the twenty-fifth anniversary of the fighter aces group. Jimmy Doolittle turns ninety on December 14. The event was held in June at the Naval Air Station Miramar in San Diego where General Doolittle learned to fly, received his military commission, and married his wife Joe on December 24, 1917, at the Hotel del Coronado. Some 5,000 sailors, Marines, and their families roared at Hope's legendary one-liners.

Other stars included **Phyllis Diller**, who has appeared in more Hope shows than any other female (twenty-three), master of ceremonies and singer **Glen Campbell**, actor **Don Knotts**, **Audrey Landers**, who has appeared in "Dallas" and the stage play "A Chorus Line," and singer **Shirley Jones**.

The Delaware Galaxy Chapter contributed to strong transatlantic ties by helping to host a group of Rotarians from Britain during the group's recent visit to this country. The group visited Dover AFB and observed restoration work on the B-17 Shoo Shoo Baby. The visiting Rotarians included, from left, Barry Framp, Colin Skeen, Keith Judson, Stephen Miller, Charles Shakeshaft, and Martin Nutbeam.



President of AFA's **Delaware Galaxy Chapter**, also an AFA Exceptional Service Award winner, reports that all is well with Anglo-American relations if the recent visit by six members of the Rotary International exchange group is any guide. The Britishers visited Dover AFB, where team members viewed the restoration work on the B-17 *Shoo Shoo Baby*, one of the few B-17s left that actually flew in World War II.

"After being shot down on its twenty-third mission, it was repaired and

torney; **Charles Shakeshaft**, team leader; and **Barry Framp**, an optician.

England holds many memories for AFA's **Marjorie Hunt**, active Michigan AFA leader and the only woman to be named AFA Man of the Year (1968). A retired Air Force lieutenant colonel, she had been a captain in command of the Women's Army Auxiliary Corps at Cheddington Airfield during World War II. Cheddington, outside of London, was the site of a little known activity of the Eighth Air Force—psychological warfare. Its bombers flew

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"Those of us concerned with the Salute are unashamedly proud of the event and of Bob Hope," Tom Lanphier said. "With the help of many people—**George Ceuleers** who conceived the idea, **Tex McCrary**, **Duke Cunningham**, **Zeke Cormiter**, **Hal Vita**, **Pat Mix**, **Joe Foss**, and **Jack Purdy** as well as many people in San Diego—the job got done and done well."

Knoxville's McGhee Tyson Airport turned fifty gracefully with the help of the Army's Golden Knights parachute team and the Navy's Blue Angels. AFA's **Gen. Bruce K. Holloway Chapter** joined in the festivities with a welcoming reception for the Blue Angels. During the reception, Tennessee AFA President **Jack Westbrook** honored the team with gift memberships in the Chapter. The new Blue Angel AFAers are **Cmdr. Gil Rud**, **Lt. Cmdr. Curt Watson**, **Lt. Cmdr. Donnie Cochran**, **Lt. Cmdr. Wes Robinson**, **USMC Maj. Bill Campbell**, **USMC Capt. Mark Bircher**, **USMC Capt. Pete Donato**, **USMC Capt. Mike Mulally**, **Lt. David Anderson**, **Lt. Jim Anderson**, **Lt. Wayne Molnar**, and **Lt. Pat Walsh**.

Recent users of the Aerospace Education Foundation's popular Roundtable videotapes, which are available on loan to AFA chapters through AFA's Communications Department, are **Don Stone**, Donald W. Steele, Sr., Chapter, Roundtable on "Terrorism"; **Candice Gill**, San Bernardino Chapter, Roundtable on the "Integrity of the Defense Industry"; **Bill Olsen**, Cape Canaveral Chapter, Roundtables on "SDI," "Terrorism," and "Satisfying US Military/Civilian Space Requirements"; **John Kelly**, Baltimore Chapter, "SDI," "Terrorism," and "Educating for Leadership in Space"; **Lt. James Marr**, Scott Memorial Chapter, "Artificial Intelligence"; **MSgt. Laura Dumez**, Thomas B. Anthony Chapter, "What Is Past Is Prologue"; and **Maj. Reynold Rose**, "Artificial Intelligence."

There was an excellent turnout for the first annual membership dinner. Officials of the **Maj. Gen. Robert M. White Chapter** in Heidelberg, Germany, were justifiably exuberant. Distinguished guests included **Brig. Gen. and Mrs. Brian L. Smith**, Deputy Chief of Staff for Operations, 4th Allied Tactical Air Force; **Col. and Mrs. Daniel Nesbitt**, USAFE Liaison to the US Army Europe; **Maj. Gen. and Mrs. William M. Charles, Jr.**, Chief of Staff, 4th Allied Tactical Air Force; Chapter namesake retired **Maj. Gen. and Mrs. Robert M. White**; and the evening's speaker, **Gen. and Mrs. Richard L. Lawson**, Deputy Commander in Chief, US European Command. Chapter President **Lt. Col. Thomas L.**

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Burke, Jr., served as master of ceremonies.

Colonel Burke emphasized the Total Force character of AFA that welcomes all Air Force personnel—enlisted and officer. With that, he introduced the newest AFA member, his son, **SrA. and Mrs. Thomas Burke III**.

General Lawson gave an excellent address about becoming involved in AFA as Air Force members as well as the importance of NATO and its con-

Southern Arizona for new arrivals to the area.

AFA's newly renamed **Inland Empire Chapter** (formerly Spokane Chapter) in Spokane, Wash., has developed its own slide show to recruit Community Partners from throughout the inland empire, which includes northern Idaho, western Montana, and northeast Oregon in addition to the eastern part of the Evergreen State. Chapter President **Ernie Hicks** says the production is geared to the community and emphasizes the importance of Fairchild AFB to the area.

The program was prepared by **Capt. Mark Morgan**, 47th Air Division, Fairchild AFB, and **Tim Williams**, an executive with the local United Way. Mr. Hicks says that the program has been



The Tucson Chapter's Community Partner program continues to grow. Chapter President John E. Devlyn, right, recently presented a Community Partner plaque to Jackie Childs, Manager of the Arizona Bank at Davis-Monthan AFB.

tributions to peace in Europe over many years. "He stressed that we all need to convey the importance and meaning behind NATO to our children and grandchildren to help foster their understanding of how peace and freedom are achieved and maintained," Colonel Burke said.

The latest Community Partner to join AFA's **Tucson Chapter** is the Arizona Bank at Davis-Monthan AFB. Tucson Chapter President **John E. Devlyn** recently presented a Community Partner plaque to Arizona Bank Manager **Jackie Childs**. Chapter Vice President **Frank L. Smith** says that Jackie is chairman of the Orientation Committee of the Chamber of Commerce's Military Affairs Committee. The Committee presents weekly orientation sessions on Tucson and

used before the Spokane Kiwanis, local Reserve Officers Association, Spokane Rotary Club, and other groups. The program has been well-received and incorporates slides from the national AFA sound/slide production, which other chapters may use as the basis for a more local presentation as well.

AFA's outstanding state organization for 1986—Florida—held an equally impressive convention at Cocoa Beach in June. The featured speakers, **A. Scott Crossfield**, consultant to the House Committee on Science and Technology and noted test pilot; **Brig. Gen. Kenneth E. Staten**, program manager of the National Aerospace Plane program, AFSC, Wright-Patterson AFB, Ohio; and **Col. Francis S. Gabreski**, World

War II and Korean fighter ace, took the audience on a dramatic tour of the milestones of flight.

As project engineer and/or project pilot/participant in the X-1, X-2, X-3, X-4, X-5, XF-92, D558-II, and X-15, Mr. Crossfield set several speed records and was the first to fly Mach 2. Col. "Gabby" Gabreski, who downed thirty-four and a half enemy aircraft in two wars, recounted the aerial drama of World War II and Korea. A glimpse into the future was afforded by General Staten, who discussed the National Aerospace Plane, the program he manages.

Award winners honored at the convention were **Maj. Roy Taylor**, 3246th Test Wing, Eglin AFB, who received the Jerry Waterman Award, the highest honor Florida AFA bestows on an active-duty member, and **Don Giadrosich**, Chief Scientist, Tactical Air Warfare Center, who won the Gen. Lewis A. Brereton Award, the highest recognition Florida AFA bestows on a civilian. Chapter "Man of the Year" was **Norm Drake**, former Eglin Chapter President. Certificates of appreciation went to **Art Stevens**; **Jack Taylor**, current Eglin Chapter President; **Maj. Gen. Thomas Swalm**, TAWC Commander; and **Lee Terrell**, Florida Vice President/Northwest.

AFA's Florida Highlands Chapter was named the outstanding Chapter in the state, and President **Roy Whitton** was honored as "Florida Man of the Year." **Leo Gomez** was Chapter Man of the Year, and other Florida Highlands Chapter members were honored for performance in many areas. Distinguished guests included then-AFA President **Marty and Pat Harris** and National Vice President for the Southwest Region **H. Lake Hamrick** and his wife **Shirley**. Mrs. Hamrick served as convention parliamentarian. **Donald T. Beck** was re-elected Florida AFA President. Other state officers elected were **Roy P. Whitton**, Executive Vice President; **Charles J. Tanner**, Treasurer; and **Alice Tisthammer**, Secretary.

The Tennessee AFA convention and South Central Regional workshop were joined in a weekend event that was guaranteed a successful outcome, thanks to the planning and organizing of **Al Ritter**, President, and **Bill Kimzey**, convention chairman of AFA's Gen. H. H. Arnold Memorial Chapter, which hosted the event. The guest speakers were **Maj. Gen. Charles D. Metcalf**, Comptroller, AFLC, for the awards banquet and **Col. Phil Conran**, AEDC Commander, who officiated at the following day's windup luncheon.

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at the convention were Tennessee AFA President **Jack K. Westbrook**, Presidential Citation, and **Daniel F. Callahan III**, **Lewis W. Hall**, **William F. Kimzey**, **Lawrence D. Lambert**, **Arthur R. McFadden**, **Hugh D. Perry**, **Darell L. Pratt**, and **John Ruble**, Medals of Merit. Also honored were **TSgt. Earl D. Rigsby**, Outstanding Air National Guardsman; **SSgt. James W. Jordan**, Outstanding USAF Recruit; **Heritage High School** for its Out-

standing Junior ROTC unit; **University of Tennessee** for its Outstanding Angel Flight; **Memphis State University** for its Outstanding Air Force ROTC unit; and **Knoxville Composite Squadron No. III**, Outstanding CAP unit. Longtime local and national AFA leader **Tom Bigger** was honored with the first Tennessee AFA Volunteer Award for his consistent and dedicated service to AFA at all levels.

Gen. Charles L. Donnelly, Jr., Com-

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mander in Chief, USAFE, was the featured speaker at AFA's Fort Worth Chapter.

AFA National Director **Ed Monaghan** wrote to his Alaska congressional delegation in support of S.1223, which calls for funding a Korean War Memorial. "The 1988 Summer Olympics will be played in a land that was once a battlefield where 54,246 Americans died, 103,248 were wounded, 7,000 were taken prisoner, and 8,177 are still missing in action. It

is also the thirty-fifth anniversary of the cease-fire," Mr. Monaghan said. "I earnestly request your support in recognizing those who gave so much in America's 'forgotten war,'" he concluded.

"We simply cannot continue to be an association of World War II veterans," then-Pennsylvania AFA President **Jack Flaig** stated in a recent issue of the Pennsylvania *Flier*. "New blood is essential. We in Pennsylvania may be leading the way." Mr. Flaig was referring to the group of newly elected state officials. They include **David L. Jannetta**, Mayor of Altoona, Pa., Pennsylvania AFA President; **Ron Chromulak**, Vice President; **Ann Germano**, Secretary; and **Frank Juliano**, Treasurer. Several of these new officials are under forty. ■

UNIT REUNIONS

Class 40-D

Members of Class 40-D will hold their first reunion on October 24-26, 1986, at the Hilton Palacio Del Rio in San Antonio, Tex. **Contact:** Bruce Burgess, P. O. Box 34690, San Antonio, Tex. 78265-4690. Phone: (512) 655-4020.

Class 47-C

Members of Pilot Class 47-C "Guinea Pigs" will hold a reunion on November 6-9, 1986, at the Marriott's Grand Hotel in Point Clear, Ala. **Contact:** Bob Campion, P. O. Box 369, Rowlett, Tex. 75088.

345th Bomb Group

Members of the 345th Bomb Group will hold a reunion on November 12-16, 1986, at the La Mansion Del Norte Hotel in San Antonio, Tex. **Contact:** Sandy Cortesio, 906 Drake, Centerville, Iowa 52544. Phone: (515) 856-6565.

482d Bomb Group

The 482d Bomb Group will rendezvous with the 8th Air Force Historical Society on October 15-19, 1986, in Hollywood, Fla. **Contact:** Dennis R. Scanlan, Jr., One Scanlan Plaza, St. Paul, Minn. 51507.

7330th Flying Training Wing

The 7330th Flying Training Wing, stationed at Fürstenfeldbruck AB, Germany, will hold its thirty-third-year reunion on October 23-26, 1986, at the Marriott Hotel on the River Walk in San Antonio, Tex. **Contact:** John McRae, 2115 Oakwild, San Antonio, Tex. 78232.

Class 41-D

I would like to hear from members of Class 41-D who were in basic and advanced training at Barksdale, Randolph, and Selma Army Airfields. I am interested in holding a reunion.

Please contact the address below.

Col. Claude Sledd, USAF (Ret.)
 3901 Border
 Apt. 17
 Muskogee, Okla. 74401

Phone: (918) 682-5214

Defense Communications Planning Group

The Defense Communications Planning Group (DCPG), later renamed the Defense Special Projects Group (DSPG), will hold its twentieth-year reunion on October 25, 1986, in Arlington, Va., for all personnel who were assigned to this organization. **Contact:** David Israel, c/o MITRE Corp., Mail Stop W540, 1820 Dolley Madison Blvd., McLean, Va. 22102.

25th Bomb Group

Veterans of the 25th Bomb Group will hold a reunion with the 8th Air Force Historical Society on October 15-19, 1986, at the Diplomat Resort Hotel in Hollywood, Fla. **Contact:** Col. Warren Borges, USAF (Ret.), 162 Topsfield Rd., Ipswich, Mass. 01938. Phone: (617) 356-2881.

37th Fighter Squadron

The 37th Fighter Squadron will hold a reunion on October 10-12, 1986, in Baltimore, Md. **Contact:** Earvie T. Cloyd, 4236 N. 34th Pl., Phoenix, Ariz. 85018. Phone: (602) 956-3318.

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.

FOR THE COLLECTOR . . .



Our durable, custom-designed Library Case, in blue simulated leather with silver embossed spine, allows you to organize your valuable back issues of AIR FORCE chronologically while protecting them from dust and wear.

Mail to: Jesse Jones Industries
 499 E. Erie Ave., Dept. AF
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Please send me _____ Library Cases at \$7.95 each, 3 for \$21.95, 6 for \$39.95. (Postage and handling \$1.00 additional per case, \$2.50 outside U.S.A.)

My check (or money order) for \$ _____ is enclosed.

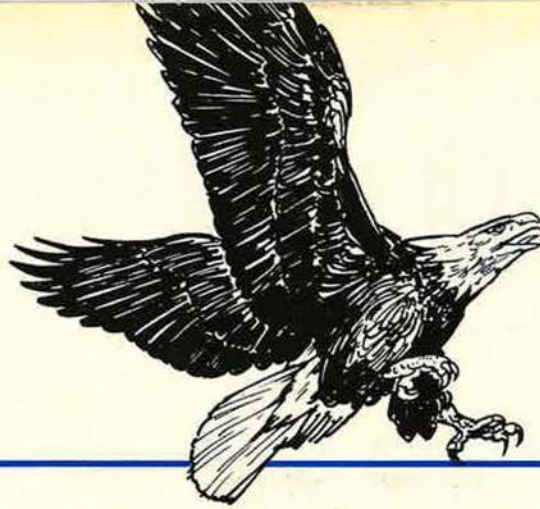
Charge card orders available—call toll-free 1-800-972-5858. (Minimum \$15 order.)

Name _____

Address _____

City _____

State _____ Zip _____



AFA's New Eagle Series Life Insurance Program

Membership Service at its Best!

As its newest service to members, the Air Force Association has made three far reaching changes to its group life insurance program . . . and all three are being provided with no change in the cost of coverage. Current program participants have been separately notified of these changes, but all AFA members should know about them because—for those who want or need more life insurance—they dramatically increase the value of AFA membership.

1. Primary Coverage

Significant increases in coverage have been made for all age categories between 20 and 60. These increases—ranging from 11% to 40%—provide dramatic reductions in the net cost of coverage . . . and make the program more attractive than ever before!

2. Flying Coverage

Until now AFA's program restricted coverage for flying personnel under age 35 to 50% of the

scheduled coverage if death was caused by a non-war related aviation accident. That restriction has now been totally removed and this means that coverage for flying personnel under age 35 has more than doubled . . . at no increase in cost!

3. War-Time Coverage

Coverage for deaths due to aviation accidents resulting from war, or act of war, has been increased so that a full 50% of the scheduled benefit amount is now provided. This change sharply increases the amount of coverage provided young flyers . . . and assures all participants of significant coverage in the event of war!

Details of the new Eagle Series program are shown on the following page . . .

AFA's NEW EAGLE SERIES Group Life Insurance

Up to \$350,000 Protection for Your Family!

CHOOSE FROM:

- **The High Option PLUS Plan**
now pays benefits up to **\$350,000.00**
- **The High Option Plan**
now pays benefits up to **\$262,500.00**
- **The Standard Plan**
now pays benefits up to **\$175,000.00**

Important Benefits and Features

Eligibility—All members of the Air Force Association under age 65 are eligible to apply for this coverage . . . and, once insured, to apply for higher levels of coverage.

Flying and Non-Flying Personnel—All insured members of the same age are provided the same amount of coverage regardless of whether or not they are on flying status and regardless of whether or not they are killed in an aviation accident! There is no age restriction for full benefits and there is no benefit or cost difference for those on flying status. AFA's new Eagle Series Life Insurance program eliminates all these differences and provides strong, reliable coverage for *all* members at the *same* cost.

Coverage to Age 75—Insurance provided under this group program may be retained at the same low group rate to age 75.

War Related Death Benefits—Unlike many programs that severely restrict coverage in the event of war or act of war, AFA's program provides full benefits for war related deaths except for aircraft crew members who are killed in aviation accidents. In such circumstances the death benefit is 50% of the scheduled benefit amount.

Guaranteed Conversion Provision—At age 75 (or if you wish, upon termination of AFA membership) your coverage is convertible, within 31 days of the date you become eli-

gible, to any permanent plan of insurance then being offered by United of Omaha, regardless of your health at that time. The maximum amount convertible is the amount of your group coverage at the time of conversion.

Under the Family Plan, the spouse's coverage is also convertible to permanent insurance in the event the member dies. The application for such coverage must be made within 31 days of the member's death. Children's coverage under the Family Plan, however is not convertible, but upon attaining age 21, each insured child is automatically eligible to apply for a \$10,000 Whole Life Insurance policy. This policy includes a guaranteed issue benefit which provides the insured the right to purchase additional coverage at standard rates on future dates specified in the policy.

Disability Waiver of Premium—If you become totally disabled at any time prior to age 60 for a period of at least nine months while your coverage remains in force, you may apply for the Disability Waiver of Premium Benefit. Upon approval, your Eagle Series insurance will remain in force without further payment of premiums for as long as you continue to be totally disabled.

Dividend Policy—AFA has continuously provided program improvements in addition to paying substantial year end dividends based on actual program experience.

Effective Date of Coverage—All certificates are dated and take effect on the last day of the month in which your application for coverage is approved and coverage runs concurrently with AFA membership.

Termination of Coverage—Your coverage can be terminated only if you are no longer an Air Force Association member in good standing, if you do not pay your premium, if the AFA Master Policy is discontinued,

or on the first renewal date following your 75th birthday.

Professionally Administered—AFA's Eagle Series Insurance program is administered by the Association's staff of professionally trained insurance personnel with extensive experience in group insurance programs and requirements.

Convenient Payment Plan—Premium payments may be made directly to AFA in quarterly, semi-annual, or annual installments, or by monthly government allotment. If you make payments directly to AFA, the Association will mail renewal statements approximately 30 days in advance of each premium due date. For active duty and retired personnel, however, AFA recommends that payments be made automatically by monthly government allotment (payable to the Air Force Association) so as to prevent any possible lapse in coverage.

Exceptions—Group Life Insurance: Benefits for suicide or death from injuries intentionally self-inflicted while sane or insane shall not be effective until coverage has been in force 12 months. Benefits for a war related aviation accident in which the Insured was serving as pilot or crew member of the aircraft involved are 50% of the scheduled amount of coverage.

The insurance coverage described in this plan is provided under a group insurance policy issued by United of Omaha Life Insurance Company to the First National Bank of Minneapolis as trustee of the Air Force Association Group Insurance Trust.

Schedule of Benefits

Choose the Plan that Fits Your Family's Needs for Security

Member's Attained Age	High Option PLUS Plan	High Option Plan	Standard Plan
	Premium \$20 a Month	Premium \$15 a Month	Premium \$10 a Month
	COVERAGE	COVERAGE	COVERAGE
20-24	\$350,000	\$262,500	\$175,000
25-29	300,000	225,000	150,000
30-34	220,000	165,000	110,000
35-39	160,000	120,000	80,000
40-44	100,000	75,000	50,000
45-49	60,000	45,000	30,000
50-54	40,000	30,000	20,000
55-59	28,000	21,000	14,000
60-64	18,000	13,500	9,000
65-69	8,000	6,000	4,000
70-75	5,000	3,750	2,500

The above schedule of benefits will be paid in the event of any death except that: one half (50%) of the benefits will be paid in the event of a war related aviation accident.

Optional Family Coverage

(May Be Added To Standard, High Option or High Option PLUS Plan)
Premium: \$2.50 Per Month

Member's Attained Age	Life Insurance Coverage for Spouse	Life Insurance Coverage for Each Child
20-39	\$20,000	\$4,000
40-44	15,000	4,000
45-49	10,000	4,000
50-54	7,000	4,000
55-59	5,000	4,000
60-64	3,000	4,000
65-69	2,000	4,000
70-74	1,000	4,000

Between the ages of six months and 21 years, each child is provided \$4,000 coverage. Children under 6 months are provided with \$250 coverage once they are 15 days old and discharged from the hospital.

Upon attaining age 21, children covered under this group insurance program may, provided satisfactory evidence of insurability is submitted, request coverage (in most states) under a \$10,000 permanent individual life insurance policy with guaranteed purchase options.

PLEASE RETAIN THIS MEDICAL INFORMATION BUREAU PRENOTIFICATION FOR YOUR RECORDS

Information regarding your insurability will be treated as confidential. United of Omaha Life Insurance Company may, however, make a brief report thereon to the Medical Information Bureau, a nonprofit membership organization of life insurance companies, which operates an information exchange on behalf of its members. If you

apply to another Bureau member company for life or health insurance coverage, or a claim for benefits is submitted to such a company, the Bureau, upon request, will supply such company with information in its file.

Upon receipt of a request from you, the Bureau will arrange disclosure of any information it may have in your file. (Medical information will be disclosed only to your attending physician.) If you question the accuracy of information in the Bureau's file, you may contact the Bureau and

seek a correction in accordance with the procedures set forth in the Federal Fair Credit Reporting Act. The address of the Bureau's information office is P.O. Box 105, Essex Station, Boston, Mass 02112, Phone (617) 426-3660.

United of Omaha Life Insurance Company may release information in its file to other life insurance companies to whom you may apply for life or health insurance, or to whom a claim for benefits may be submitted.

APPLICATION FOR AFA GROUP LIFE INSURANCE

Full name of member _____		Rank _____	Last _____	First _____	Middle _____
Address _____		Number and Street _____	City _____	State _____	ZIP Code _____
Date of Birth _____		Height _____	Weight _____	Social Security Number _____	Flying Status <input type="checkbox"/> Yes <input type="checkbox"/> No
Mo. _____ Day _____ Yr. _____					
This insurance is available only to AFA members <input type="checkbox"/> I enclose \$18 for annual AFA membership dues (includes subscription (\$14) to AIR FORCE Magazine).			<input type="checkbox"/> I am an AFA member.		
Name and relationship of primary beneficiary _____			Name and relationship of contingent beneficiary _____		
Name and relationship of contingent beneficiary _____			Name and relationship of contingent beneficiary _____		
Please indicate below the Mode of Payment and the Plan you elect:					
Mode of Payment		Plan of Insurance			
		Standard Plan		High Option Plan	
		Member Only	Member and Dependents	Member Only	Member and Dependents
		<input type="checkbox"/> \$ 10.00	<input type="checkbox"/> \$ 12.50	<input type="checkbox"/> \$ 15.00	<input type="checkbox"/> \$ 17.50
Monthly government allotment (only for military personnel). I enclose 2 months premium to cover the necessary period for my allotment (payable to Air Force Association) to be established.					
Quarterly. I enclose amount checked.		<input type="checkbox"/> \$ 30.00	<input type="checkbox"/> \$ 37.50	<input type="checkbox"/> \$ 45.00	<input type="checkbox"/> \$ 52.50
Semi-Annually. I enclose amount checked.		<input type="checkbox"/> \$ 60.00	<input type="checkbox"/> \$ 75.00	<input type="checkbox"/> \$ 90.00	<input type="checkbox"/> \$105.00
Annually. I enclose amount checked.		<input type="checkbox"/> \$120.00	<input type="checkbox"/> \$150.00	<input type="checkbox"/> \$180.00	<input type="checkbox"/> \$210.00
				<input type="checkbox"/> \$ 20.00	<input type="checkbox"/> \$ 22.50
				<input type="checkbox"/> \$ 60.00	<input type="checkbox"/> \$ 67.50
				<input type="checkbox"/> \$120.00	<input type="checkbox"/> \$135.00
				<input type="checkbox"/> \$240.00	<input type="checkbox"/> \$270.00
Names of Dependents To Be Insured		Relationship to Member		Dates of Birth Mo. Day Yr.	
				Height	
				Weight	
Have you or any dependents for whom you are requesting insurance ever had or received advice or treatment for: kidney disease, cancer, diabetes, respiratory disease, epilepsy, arteriosclerosis, high blood pressure, heart disease or disorder, stroke, venereal disease or tuberculosis? Yes <input type="checkbox"/> No <input type="checkbox"/>					
Have you or any dependents for whom you are requesting insurance been confined to any hospital, sanatorium, asylum or similar institution in the past 5 years? Yes <input type="checkbox"/> No <input type="checkbox"/>					
Have you or any dependents for whom you are requesting insurance received medical attention or surgical advice or treatment in the past 5 years or are now under treatment or using medications for any disease or disorder? Yes <input type="checkbox"/> No <input type="checkbox"/>					
If YOU ANSWERED "YES" TO ANY OF THE ABOVE QUESTIONS, EXPLAIN FULLY including date, name, degree of recovery and name and address of doctor. (Use additional sheet of paper if necessary.)					
I apply to United of Omaha Life Insurance Company for insurance under the group plan issued to the First National Bank of Minneapolis as Trustee of the Air Force Association Group Insurance Trust. Information in this application, a copy of which shall be attached to and made a part of my certificate when issued, is given to obtain the plan requested and is true and complete to the best of my knowledge and belief. I agree that no insurance will be effective until a certificate has been issued and the initial premium paid.					
I hereby authorize any licensed physician, medical practitioner, hospital, clinic or other medically related facility, insurance company, the Medical Information Bureau or other organization, institution or person, that has any records or knowledge of me or my health, to give to the United of Omaha Life Insurance Company any such information. A photographic copy of this authorization shall be as valid as the original. I hereby acknowledge that I have a copy of the Medical Information Bureau's prenotification information.					
Date _____, 19 _____		Member's Signature _____			
Application must be accompanied by a check or money order. Send remittance to: Insurance Division, AFA, 1501 Lee Highway, Arlington, Virginia 22209-1198.					



Group Policy GLG-2625
United of Omaha Life Insurance Company
Home Office Omaha Nebraska

Apply Today! If You Have Questions, Call TOLL FREE: 1-800-858-2003.

Bob Stevens'

"There I was..."

JUST BACK ACROSS THE FENCE

HELLO, ANYBODY - THIS IS CADILLAC LEAD ON GCI COMMON... I'M ALMOST OUTTA FUEL N' LOST! GOT ANY TANKERS AROUND? I'M 10 MIN. TO PUNCH OUT! GIMMEE A VECTOR, GIMMEE A BREAK, GIMMEE ANYTHING!



NINE and a HALF SWEATY MIN. LATER



WHEW!! WAS THAT CLOSE!



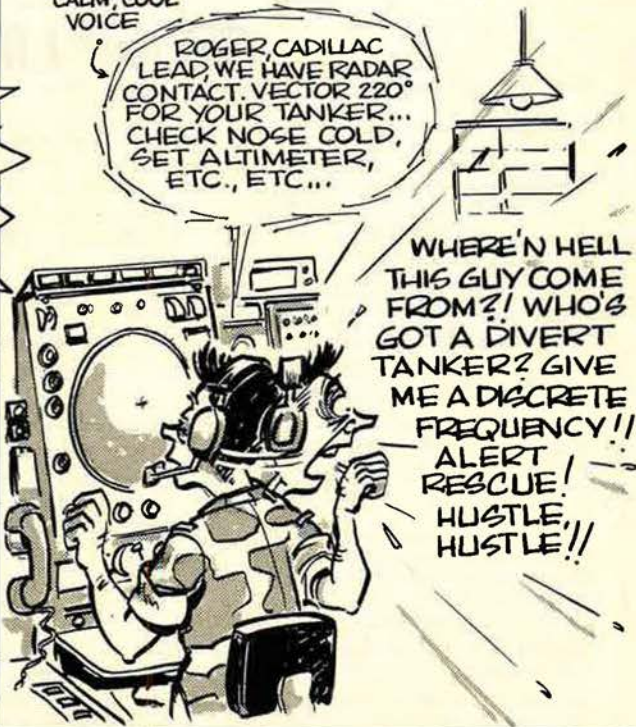
HAVE A HAPPY! (NO CANDLES, PLS! IT'S FULL OF JET-A)

HERE'S A BELATED TIP OF THE VISOR TO THOSE UNKNOWN, UNSEEN, & UNSUNG GCI "SCOPE DOPES." IN SEA, THESE PITTABLE MOLE-LIKE CREATURES LABORED IN DARK ROOMS FOR UP TO 18 BUTT-NUMBING HRS PER SHIFT. THEY OFTEN HAD 40 ACFT ON FREQUENCY, ALL BS-ing AT ONCE, FOUR TANKERS, and A DOZEN RECEIVERS "UNDER CONTROL..."

FAR BELOW-

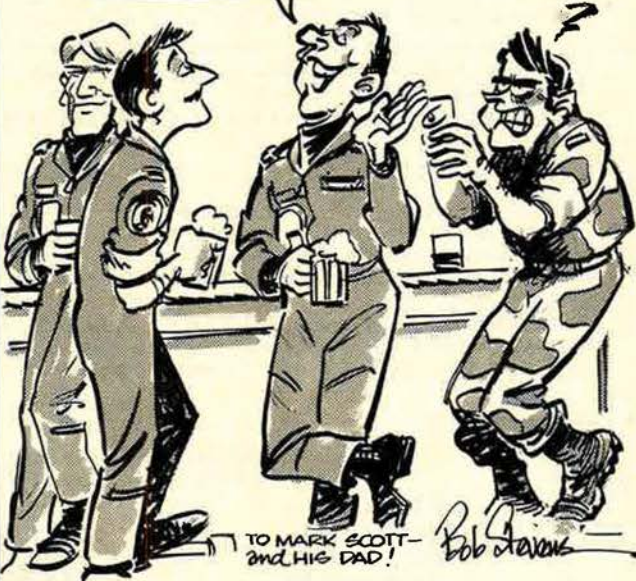
CALM, COOL VOICE

ROGER, CADILLAC LEAD, WE HAVE RADAR CONTACT. VECTOR 220° FOR YOUR TANKER... CHECK NOSE COLD, SET ALTIMETER, ETC., ETC...



LATER THAT EVENING-

YAAAS, GOT A BIT LOW ON FLUMES COMIN' BACK. TOOK A JOLT FROM A PASSIN' TANKER. NO SWEAT!



TO MARK SCOTT and HIS DAD!

The new Collins GRC-171A(V)4 is a colocatable ECCM multi-channel transceiver with space-saving frequency agile filter built right in. ■ This frequency agile UHF AM / FM Have Quick radio eliminates the need for external assets, which allows the use of multiple radios in transportable shelters, control towers, command posts and other space-limited installations. ■ Since the basic GRC-171 is already the standard air traffic control radio for the Air Force, the new GRC-171A(V)4 minimizes additional logistic support costs. This new GRC-171 is also wave form adaptable for international use. ■ For details 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.**

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**Rockwell
International**

...where science gets down to business

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General Industries / A-B Industrial Automation

**"WHEN YOU BUILD 100,000 OF ANYTHING,
YOU GET PRETTY GOOD AT IT."**



SRAM-II
SHORT RANGE ATTACK MISSILE

Maybe you remember the Katydid, Talos, Honest John, and the Nikes. Some of these missiles go back almost 40 years. About the time I joined this company.

Today you know us for Dragon, SMAW, Tomahawk and Harpoon. They're missile systems which for four decades have helped put credibility into America's defense posture.

Forty years and 100,000 missiles have taught us a lot about guidance: Radar, laser, infrared, Tercom. We designed and today build the terrain-correlation guidance system for the land-attack Tomahawk.

Our work with metals and composites has led to major advances in airframe technology. And we've selected and integrated sure-fire propulsion systems — turbo fans and ram-jets, liquids and solids, single and multiple stages. Systems that do the job.

Today, we're ready with the people, the facilities and equipment, and the dedication to meet the demand for even more advanced, more reliable and supportable missile systems. As we've done for the past 40 years.

John F. Yardley
President
McDonnell Douglas
Astronautics Company