AIR FORCE MAGAZINE
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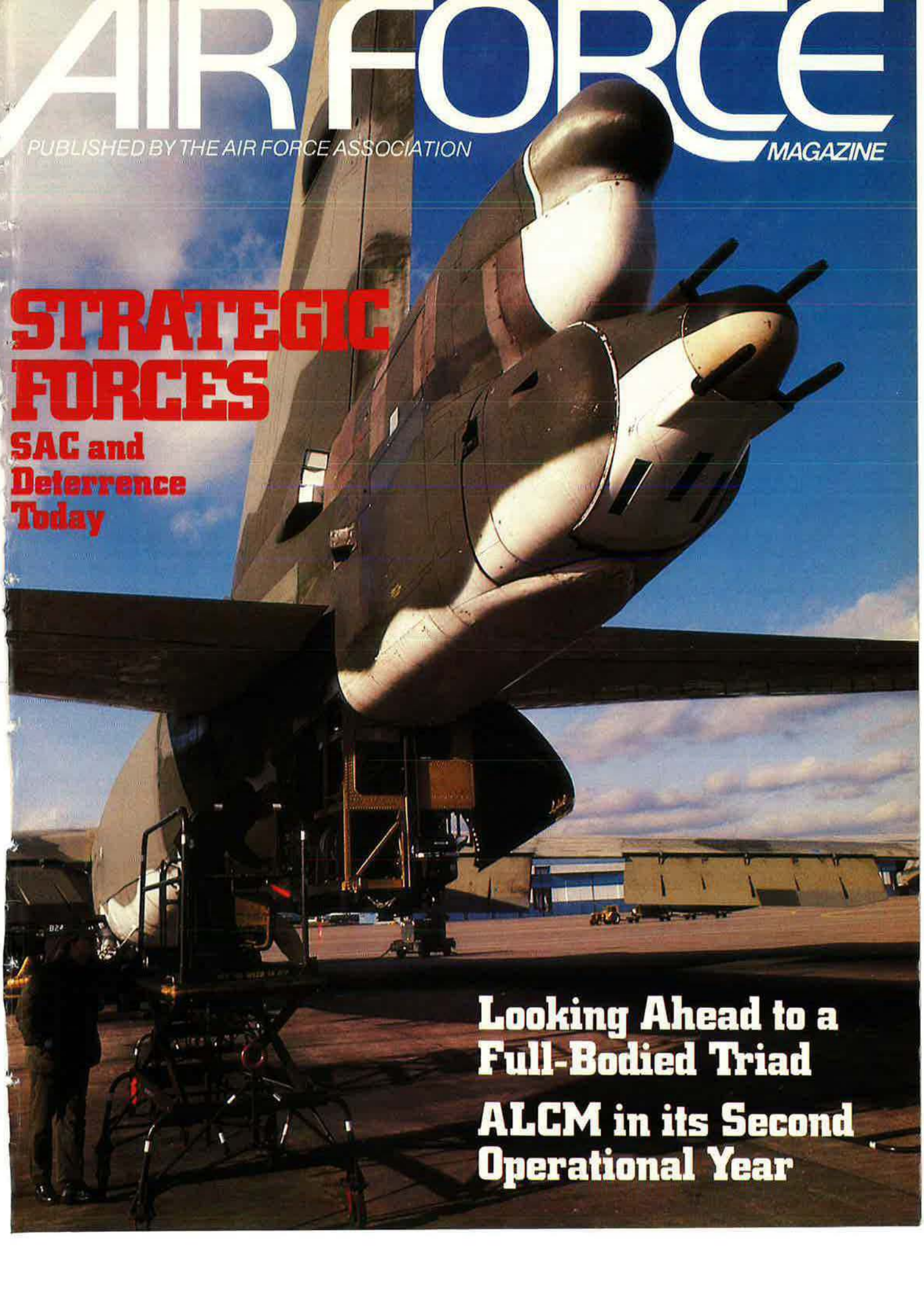

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One reason: design and part commonality with other GE engines in the F101 family. Another reason: exceptionally low fuel consumption for such a high-performance engine.

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perience akes the difference

As the core engine for the B, the F101 shares technology components with a family of engines that are setting stan- ls for a host of different aircraft. F404 on the F/A-18 attack er. The CFM56 on the KC-135R er and commercial jetliners like new-generation DC-8s and the 737-300. And, in flight testing, 110 on the F-16 and F-14 ers.

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FEBRUARY 1984
VOLUME 67, NUMBER 2

AIR FORCE MAGAZINE

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About the cover: SSgt. Gary Ratajczak looks on as A1C Larry Hannum works on the fire-control unit for the tail guns of a B-52G at Griffiss AFB, N. Y. A special section on "Strategic Forces" begins on p. 40. (Cover photo by Art Director William A. Ford)

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AN EDITORIAL

A Grotesque Notion

WHEN people were leaving the armed forces in droves a few years back, Congress decided that the troops didn't understand the system under which they were being paid.

The services were directed to send out statements showing the real compensation package—pay, benefits, allowances, *and tax advantage*—calculated down to the penny for each individual member. Congress has often confirmed that it regards the tax exemption on housing and subsistence allowances as part of "regular military compensation (RMC)." Since 1965, the tax-exempt status of allowances has been considered when military pay levels were established.

And what Air Force supervisor has not spoken of tax advantages and indirect forms of compensation when called upon to explain to airmen why they get smaller paychecks than civilians doing comparable work?

To some in the Internal Revenue Service, however, these tax advantages seem a little too good. A proposed ruling floated by IRS last year would have disallowed any portion of a home-mortgage interest deduction that was attributable to a tax-free military housing allowance. The ruling came dangerously close to implementation, but, just before Christmas, IRS was told to back off. The future of the mortgage deduction for military people would be decided by the Administration and Congress, not by the Treasury Department.

If there is to be a reevaluation, it should be broad enough to take all of the pertinent factors into account.

Military families must move frequently, and not by choice. They go where the nation needs them. They do not control the timing of their moves, or the destinations. The difficulty—and the cost—of finding a place to live at each new station is one of the least-appealing aspects of military service. The expenses are compounded by constant additions to a collection of rugs, draperies, and appliances that never seem to fit in the new place, and by a house full of furniture that the moving companies describe with the ubiquitous "M&S" ("marred and scarred").

There are never enough on-base quarters for everyone. Adequate rentals are not always available. Often, home ownership is a necessity as well as an investment. Military homebuyers may earn profits when they resell—or they may have big problems if ordered to move when the housing market is down and interest rates are high. Either way, they are unlikely to match the equity built up by civilian neighbors who bought when interest rates were in single digits.

Most military families lose money when they move. Unlike many in the private sector or elsewhere in federal service, they pay for their own house-hunting trips, and their realtors' fees are not reimbursed. Dislocation allowances and mileage payments are miserably inadequate.

The Pentagon says that the ruling as proposed by IRS would work out to a pay cut of between four and six percent for military homeowners. Some, who counted on the tax deduction when they bought, would no longer be able to meet their monthly payments.

Remember that tax-free allowances are to the government's advantage, too. Housing and subsistence allowances are factored out of "regular military compensation" when retirement annuities are computed. By basing retirement pay on less than a member's full active-duty paycheck, the government reduces its long-term financial obligation.

Whatever merits, if any, the IRS proposal may have in the narrow context of tax-code legalities, it is a grotesque notion that military families have some unfair advantage because of their housing allowances.

—JOHN T. CORRELL, EXECUTIVE EDITOR

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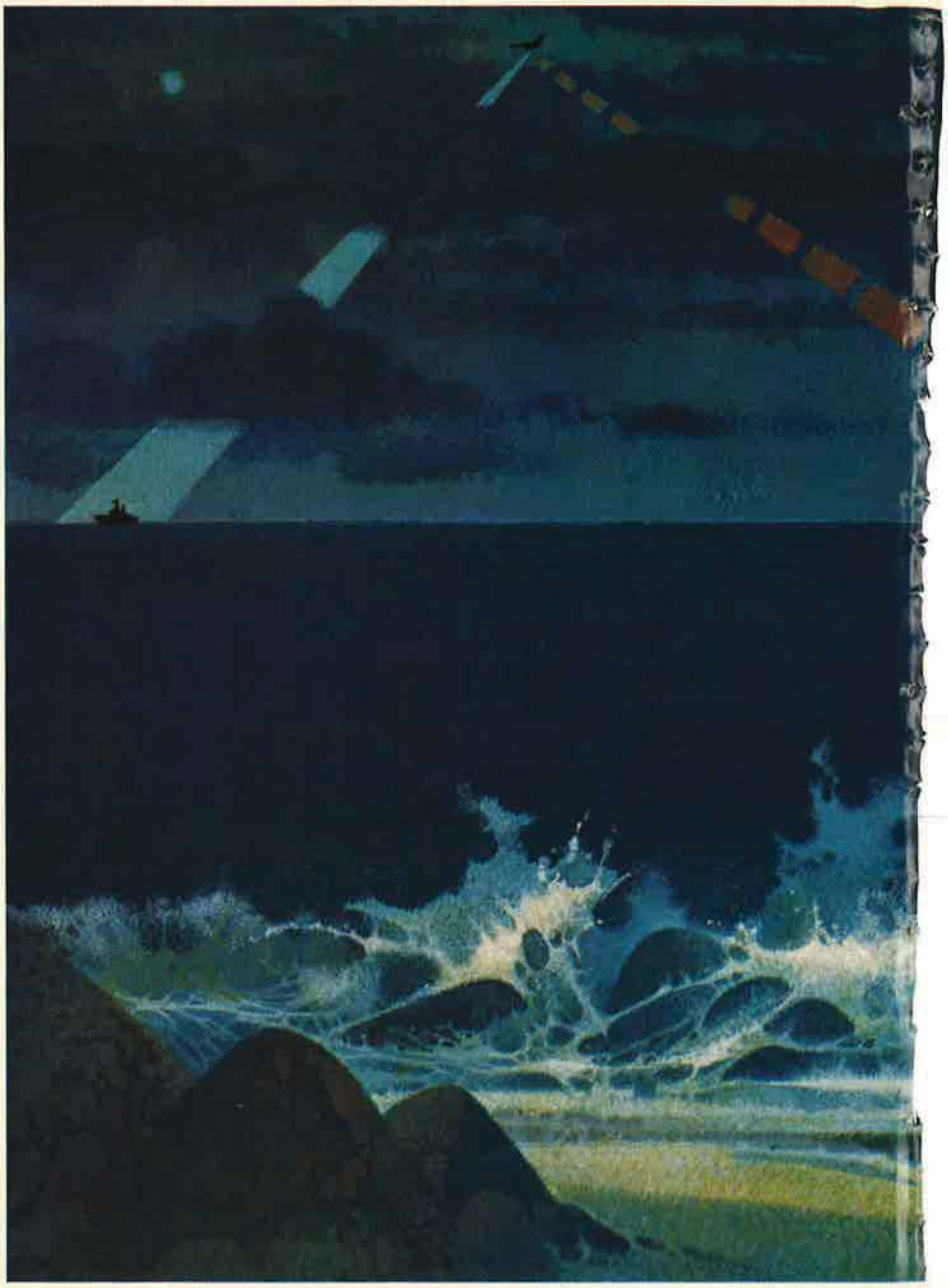

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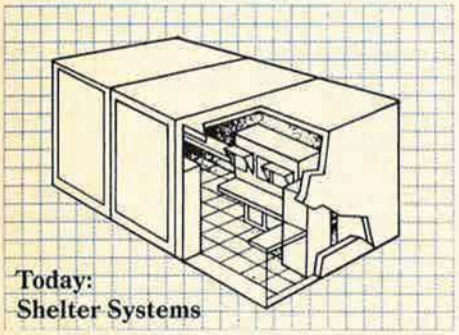

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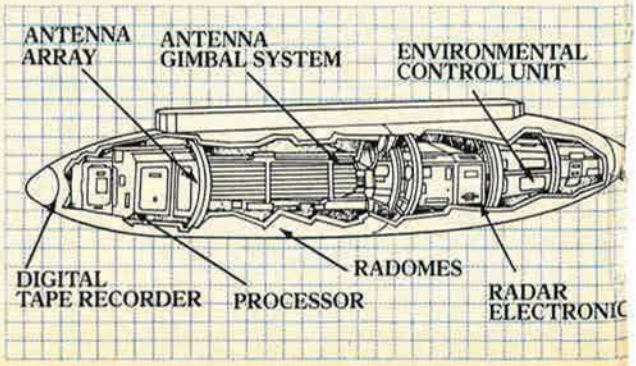

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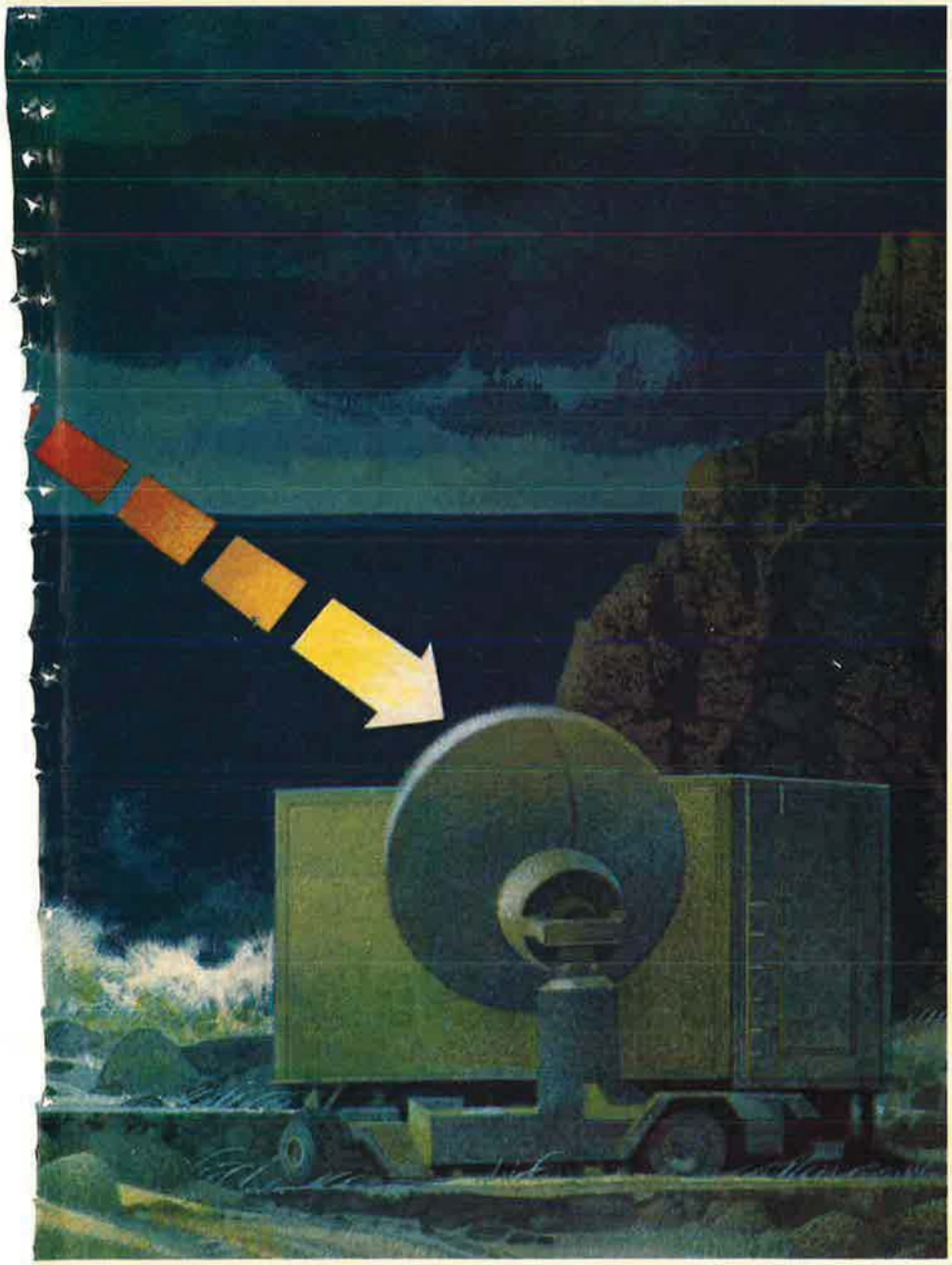
BY GOODYEAR



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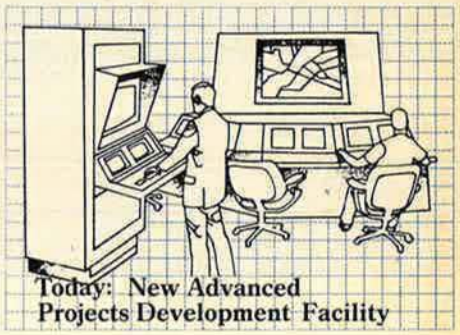

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Military Retirement

The more I read AIR FORCE Magazine, the more alarmed I become by an attitude almost universally shared by your writers: the instant and reflexive recoiling from any hint of changing the way things are done within the Defense Department. Any change, no matter how potentially sound, is instantly dismissed as unworkable because it will have a "negative impact on retention and national security." Vincent C. Thomas, Jr.'s attack on the Private Sector Survey on Cost Control in the Federal Government is just the latest example of this mentality *("What the Task Force Forgot," December '83, p. 54).*

Thomas ends up being as shortsighted as he claims the members of the Survey to be. He rejects out of hand any inference that the Air Force pension system needs changes, seemingly overlooking the very arguments to the contrary that he presents in his article. Any pension plan that takes up more than half of an organization's payroll has problems that need to be addressed, and they will have to be addressed sooner or later. But, of course, such a suggestion is blasphemy; it would have a "negative impact on retention and national security."

The purpose of a pension is not so much to keep people working as it is to reward them once their career is over. People generally finish out careers because the work is satisfying and interesting and because they see a good chance for advancement. Yet Lt. Gen. Kenneth Peek, the Deputy Chief of Staff for Manpower and Personnel, calls the military pension system the Air Force's "number-one retention incentive." Does this mean that the only way we can keep large numbers of people in uniform is by offering them a huge pension? If so, this does not say much for the jobs we are asking people to do. I, for one, will stay in the Air Force only as long as the jobs I have are stimulating and contribute to the Air Force mission. No amount of pension money is going to keep me in a dead-end or make-work position.

Much is made of "pay comparability" in retention. It is very important; pay is what is used first to attract people to a position that needs filling. But no one will keep even the highest-paid job in the world if it is also the most frustrating.

There are many other things we must consider when talking about retention, things that never appear in AIR FORCE Magazine articles: a huge and obstructing bureaucracy, make-work jobs, rampant empire-building, pervasive waste and abuse, a performance evaluation system with no roots in reality, arbitrary and sometimes irrational leadership, official hypocrisy at all levels. Unless these things are addressed, no amount of pay will promote retention if there is somewhere else for our blue-suiters to go. But to consider making changes to remedy these problems is also blasphemy. It would have a "negative impact on retention and national security."

Much is made of the "special demands" of military service. Big pensions are necessary to compensate military members for having to be moved every two years, for having to live in awful places, for being separated from their families. This begs the question: How much of that is really, truly necessary? When was the last time someone with a bit of independence looked to see if it was really necessary to, say, transfer people every two or three years? Of course, to suggest such a thing is sheer heresy. It would have a "negative impact on retention and national security."

Eventually, changes will be made. The American people will become too smart to believe this constant hiding behind "national security," or simply too tired to care. Their elected representatives will become less frightened of the prospect of change than they are of the electorate. The cries of "no price is too high for a secure defense" will come to be discounted as the bleating of yet another special interest.

Unless such educated organizations as AFA start pointing out where changes can be made that really won't hurt national security, these changes will be made on an indiscriminate basis and truly will degrade our nation's defense. Denouncing all change, as is done now, will only make inevitable drastic and damaging change in the future.

Lt. Lance Charnes, USAF
Albuquerque, N. M.

I read "What the Task Force Forgot" by Vincent C. Thomas, Jr., with interest, but also with a degree of personal discomfort. He points out a major "blind spot" in the recent Private Sector Survey concerning the military retirement system. In estimating cost savings from changes in the retirement system, the Survey task force did not acknowledge potential impacts on force morale and readiness. However, Thomas's response to this error is as equally unbalanced as are the findings of the Survey itself. His objections to proposed changes in military retirement emerge as a kind of pained special pleading.

Any balanced consideration of the military retirement system must acknowledge two basic facts. Some (although not certainly all) military people do face special dangers and inconveniences in their service to the country. These special circumstances justify special compensations and rewards. To the degree possible, these rewards should be directed to the particular individuals

Submissions to "Airmail" should be sent to the attention of the "Airmail" Editor, 1750 Pennsylvania Ave., N. W., Suite 400, Washington, D. C. 20006. Letters should not exceed 500 words and should preferably be typewritten. We reserve the right to condense letters as may be needed. Unsigned letters are not acceptable. Because of the volume of letters received, it is not possible to print all submissions, and none can be returned. Photographs cannot be used or returned. Please allow lead time of *at least* two months for time-sensitive announcements.

F-15 Eagle pilots use the latest computer technology to manage advanced systems in their skyborne offices. Improvements give the F-15's unique "look-down shoot-down" radar 10 times the memory of a 48K personal computer. The F-15's central computer and armament control system will be enhanced by increasing storage and reducing pilot workload. Under the multistaged improvement program, the radar's memory eventually will increase to one million words (1,000K) and its processing speed will triple to 1.4 million operations per second. The resulting radar will have fewer parts and increased reliability. Hughes Aircraft Company builds the AN/APG-63 radar under contract to McDonnell Douglas for the U.S. Air Force.

A new computer system promises to reduce scrap and rework, thereby helping one Hughes group slash costs by an estimated $1.5 million annually. The Quality Information System (QIS), now under development, will compile and analyze data on how defects happen and how they are corrected. Information will be made available to manufacturing employees for immediate feedback and for use during production. Data will also be kept in a central historical file for future reference. QIS is expected to improve quality by spotting problems that stem from faulty design, poor supplier quality, and improper manufacturing methods.

Over 20 nations protect their sovereign airspace with command, control and communications systems produced by Hughes, the world's most experienced developer of automated air defense systems. The systems are comprised of air defense radars, computers, displays, and other electronic subsystems. Nations equipped with Hughes systems include Japan, Switzerland, the U.S., Spain, Canada, and European NATO members Belgium, Denmark, Greece, Italy, the Netherlands, Norway, Turkey, the United Kingdom, and West Germany.

A laser rangefinder instantly draws a bead on air and ground targets so U.S. Army gunners can shoot on the move with the SGT YORK Division Air Defense Gun System. The SGT YORK is armed with two 40mm guns housed in an armored turret mounted on a modified M48A5 tank chassis. The rangefinder pinpoints the distance to enemy helicopters and aircraft based on the instant it takes a laser burst to reach the target and reflect back. The gun's fire control computer uses this information to score a quick hit. Hughes delivered the first production laser rangefinder on schedule to the DIVAD Division of Ford Aerospace & Communications Corp.

The space shuttle's new "eyes, ears, and voice" have revolutionized future missions. The integrated radar and communications system, also called the Ku band radar because of its operating frequency, uses an antenna dish at the front of the cargo bay. The system lets shuttle crews talk to Earth or transmit TV, high-speed data, and payload telemetry through NASA's tracking and data relay satellites. Previously, crews could communicate with the ground less than 20% of the time because the spaceship passed beyond the range of ground stations. Now communications time increases to over 90% of a mission. The Hughes system also allows the crew to rendezvous with satellites. It pinpoints objects as small as 1 square yard from up to 14 miles away, or up to 345 miles if the object is equipped with an electronic signal enhancer.

AIRMAIL

who have earned them rather than to all retirees.

Likewise, it is simply not arguable that the lifetime compensations of military people are now "equitable" or "equivalent" to wages and retirement of highly competent individuals in the private sector. This is *not* simply an aberration of recent cost-of-living increases. It has for several years been common that twenty-year military retirees who enter a second career earn a considerably better lifetime wage than do civilians of similar skills and seniority.

The US society is now beginning a painful economic process. As our population increases in average age, we are finding that the productive effort of those now working may prove inadequate to support those who no longer work at the standard of living to which they have become accustomed. Social Security and Medicare (despite recent cosmetic changes) are on the edge of insolvency. In this situation, we cannot expect a favorable hearing when we plead for the preservation of special economic advantages. Our economy is running out of the productive capacity from which to create such privileges.

A Lieutentant Colonel

• *Author Vincent Thomas's continuing analysis of the Grace Commission's findings, "Expensive Ways to Save Money," appears on p. 60 of this issue.*—THE EDITORS

Tactics a Stepchild?

I was disappointed to see that your article, "A Roadmap to Tomorrow's Tactical Airpower" *(December '83, p. 42),* all too accurately reflected the content of the AFA Tactical Air Warfare Symposium on which it was based. Although the panel members were asked by the moderator, Gen. Russell Dougherty, USAF (Ret.), to amplify their comments in AIR FORCE Magazine, there is no evidence of this so far.

The Tactical Air Warfare Symposium included a panel on operations and tactics. Naturally, the audience expected to hear a discussion of the title subject. However, the panelists barely scratched the surface on the topic of operations, and tactics was not discussed at all. The entire symposium focused on a single subject: equipment. Equipment, to the virtual exclusion of other topics. New electronic and weapon systems were hailed as the solution to all possible problems.

Still, the panel received many questions dealing specifically with tactics and training issues. Among them were questions on the relative percentages of air-to-air and air-to-ground training for F-16s, on the need for single-ship and one-vs.-many training, on plans for updating the Aggressor program in terms of both equipment and tactics, and on the state of tactics development in USAF. Only a few of these questions were addressed, and then in a very perfunctory manner.

For example, the question on single-ship tactics was dismissed as being irrelevant. One panelist commented that since we do not intend to fight single-ship, it would be "stupid" to train that way. But good intentions aside, being forced to fight single-ship is a contingency that deserves to be considered. There is always a chance of losing mutual support because of the loss of a wingman or separation during a dynamic combat situation. Realistically, it is not always possible simply to disengage and return to base, as the panelist suggested.

There seems to be an appalling reluctance to address such issues beyond the walls of the Fighter Weapons School. Articles dealing with tactics (as opposed to switchology) are rare. Even the Soviets debate tactical questions on the pages of their aviation magazine. Where is our discussion and debate? It's difficult even to identify an interest in tactics as a field in itself.

No one would dispute the advantages of new equipment and new technology. But Vietnam taught us some very hard lessons about overreliance on systems to the neglect of solid tactical training. At a time when the Soviets are taking new strides in both fighter design and air combat tactics and training, it seems unconscionably sad and dangerous for us to brush aside tactics as a poor stepchild to technology.

There must be a way to break through our complacency in this area and to give tactics the serious attention it deserves.

Capt. Rana Pennington, USAF
Alexandria, Va.

Both Wrong?

First, thanks for your regular "Military Balance" issue. Each December I eagerly await it, making myself, no doubt, something of a bother to a friend of mine, an Air Force Reserve officer who so kindly lends me his copy once it arrives. As a physicist, I'm politically as well as professionally interested in the nuclear "balance," and the IISS report is a singularly comprehensive and credible source of information.

This December, though, I write about another thing that appeared in your pages: Gen. T. R. Milton's essay, "Setup for Nuclear Blackmail" *(p. 140).* As a "peace marcher" myself, I know there is a lot of disagreement, to say the least, between us and the many people who think more nuclear weapons are necessary for security. But let's not create disagreement where there is none.

In the last three years I've sat through scores of peace organization meetings and talked with people of many sizes and shapes and political persuasions. I have yet to meet anyone who thinks our only choice is between "Red" and "dead."

You may think we underestimate Soviet military intentions. You may doubt we know enough about the value of the weapons we are so eager to get rid of. You may think we're foolish to believe the most important ways to security are nonmilitary. But don't imagine we are not resolute in our defense of democracy and political freedom. Lech Walesa and the Czechs of 1968 are our heroes, too. We are well aware that we are the main immediate beneficiaries of our country's political freedom. We go around all the time criticizing the government, and we seldom even end up in jail for it.

I know peace activists are also guilty of misunderstanding the motives of our domestic political adversaries. Cries of "warmonger" are as common among us as cries of "defeatist" are among the Administration and the military.

Generally speaking, both are wrong. We all ought to remember that neither of us is going to get very far without the other. Whatever happens, we are going to sink or swim together.

Alfred J. Bersbach
Farmington, Me.

Eagle-Eyed Radar

I read your November 1983 article, "An Eagle for All Arenas" *(p. 43),* with great interest.

I was, earlier last year, the project manager and test pilot for a USAF evaluation of the same high-resolution radar (HRR) [aboard the F-15E dual-role fighter candidate]. In twelve test sorties, we verified the resolution as 8.5 feet in both range and azimuth, determined what that resolution meant tactically, and evaluated the

blind bombing capability of the system.

In short, I found that the HRR system afforded a unique long-range, low-altitude, night, in-weather capability that would definitely enhance the air-to-ground capability of a dual-role fighter.

Maj. David C. Spencer, USAF
Edwards AFB, Calif.

AFROTC Det. 045

Air Force ROTC Detachment 045 of San Jose State University is now conducting a historical background search. We are very interested in keeping in touch with all former Detachment 045 faculty and graduates.

If you were commissioned out of San Jose State's detachment or served as faculty or know of someone who has, please contact us. Responses should include name, year of graduation/commission (if applicable), history of assignments to date, any words of advice or encouragement, and any additional leads on historical information.

Please respond to the address below.

Lance Donnelly
Unit Historian
AFROTC Det. 045
San Jose State University
San Jose, Calif. 95192

Research Symposium

The fifty-second Military Operations Research Symposium (MORS) will be held June 5–7, 1984, at Fort Leavenworth, Kan., and hosted by the Combined Arms Operations Research Activity. The theme will be "Evaluating C³I Systems."

The deadline to request applications for registration is May 2, 1984. A "Secret" clearance and certification of need-to-know are required for attendance.

For more information or to request application forms, contact the MORS office at (703) 751-7290.

Natalie S. Addison
Military Operations Research Society
Alexandria, Va.

Chanute History

The History Office at Chanute AFB, Ill., is planning to publish a pictorial history book of the base from its beginning in 1917 to the present. Anticipated completion of this project is December 1984.

Chanute is the oldest Air Force technical training center and the third oldest base, and we believe that it has a proud history that needs to be told. It is our belief that the best photos and records of Chanute's early years are in possession of private citizens who are former Chanuters—people who either were stationed here during military service or who worked here as civil service employees.

Photos or documents loaned to the base will be copied and returned. Loaned or donated items will be acknowledged if published. Please contact the address below.

CTTC/HO
Attn: Mr. Weckhorst
Chanute AFB, Ill. 61868

AIRMAIL

Parks College

During World War II nearly ten percent of all US Army Air Forces pilots and hundreds of mechanics were trained at Parks Air College on the Cahokia, Ill., campus, and at our branches in Sikeston and Cape Girardeau, Mo., Jackson, Miss., and Tuscaloosa, Ala. Parks, founded in 1927, is the country's oldest aviation institution, and is now known as Parks College of St. Louis University.

As we prepare for our sixtieth anniversary in 1987, we are anxious to make contact with Army Air Forces veterans who trained at Parks. We ask that they drop us a note and include any reminiscences of experiences here, information on their current careers, or news of classmates.

Letters may be sent to the address below.

Nita S. Browning
Director of Public Relations
Parks College of St. Louis University
Cahokia, Ill. 62206

F-105 Restoration

The Hill AFB, Utah, Restoration Club is currently in the process of restoring an F-105D aircraft, tail number 59-1743, for the purpose of putting it on display in our soon-to-be Aerospace Park and Museum. In order to provide this aircraft in true and accurate markings, we are looking for any and all information concerning this aircraft when it was assigned to the 388th Tactical Fighter Wing, Korat AB, Thailand, in September 1968.

We would also like any information on the whereabouts of Col. Paul P. Douglas, who was the commander of the 388th TFW and pilot of this aircraft.

Any information on Colonel Douglas or this aircraft would be appreciated.

TSgt. Ted A. Taylor, USAF
3376A Saratoga
Hill AFB, Utah 84056

MASDC Boneyard

I am writing a second book on the Military Aircraft Storage and Disposition Center (MASDC) at Davis-Monthan AFB, Ariz. I would like to contact any Air Force personnel who have been employed at or who have flown aircraft into the Center, or who may have photographs taken there that would be suitable for publication. I am particularly interested in the years prior to 1975.

Please contact me with any information at the address below.

Philip D. Chinnery
70 Carnarvon Dr.
Hayes
Middlesex UB3 1PX
England

Ten Years to Remember

I would like the help of readers to locate a film that I have heard of but never seen, entitled *Ten Years to Remember.*

The film was developed for contractors and showed nothing but early missile failures blowing up on the launch pad. It was made to impress manufacturers with the need for exceptionally high-quality control for the fledgling missile programs.

I'd like a copy donated to our District 214 film library in exchange for a tax-deductible letter.

Dale Hugo
Prospect High School
801 W. Kensington Rd.
Mount Prospect, Ill. 60056

310th AREFS

I am in the process of tracing the history of the 310th Air Refueling Squadron, and I need the help of readers.

I have traced the squadron back to January 25, 1967, when it first moved to Plattsburgh AFB, N. Y. Prior to that date the 310th AREFS was located at Walker AFB, N. M., which has since been closed down.

Any information about the squadron—who commanded it and any other trivia—will aid my research. Please send any information to the address below.

Lt. Jonathan B. Woods, USAF
Historian
310th AREFS
Plattsburgh AFB, N. Y. 12903

Civil Air Patrol

I am collecting Civil Air Patrol pho-

tos, insignia, uniforms, manuals, stories (particularly stories about search and rescue missions), etc., from 1941 to the present. The information I collect will be used in writing a history book about the Civil Air Patrol.

If any readers have anything listed above that they would like to donate or to sell to me, please contact me at the address below.

Timothy A. Dearhamer
1517 S. Poplar
Broken Arrow, Okla. 74012

Collectors' Corner

In 1953 I served with SAC at Smoky Hill AFB near Salina, Kan. My specialty was in airborne radio mechanics, and my group was the 40th Bomb Wing. Also, I was in the 40th Air Refueling Squadron and 40th Armament and Electronics Squadron.

My desire is to obtain patches and emblems of these units. Anyone with such items is asked to contact me at the address below.

Bill Jackson
104 N. Lois Lane
Richardson, Tex. 75081

I am a novice collector of USAF and USAAF wings and am having difficulty in finding books or other publications that provide assistance in determining the age of given wings. I know that styles have changed over the years, as have the materials used in the manufacture of the wings.

Can any readers offer any help in obtaining materials that would assist in dating various wings?

Maj. Charles C. Blanchard III, USAF (Ret.)
8265 S. W. 93d Ave.
Miami, Fla. 33173

I'm hoping some reader will be able to come to my aid.

I've requested a military funeral and have been putting together a uniform to be buried in—the original uniform I was mustered out in was burned in a fire. It has been quite a task locating a set of ODs of World War II vintage, but I now have a complete uniform, with the exception of the following articles. I need two hash marks, five Hershey bars, and a set of tech sergeant chevrons that we used to wear on our Ike jackets.

Please contact me at the address below.

Earle R. Harris
245 Rubber Ave.
Naugatuck, Conn. 06770

Where Are You?

I am seeking information about my father, SSgt. Ned H. Mertz, who was killed in action on April 6, 1945. He was an armorer and tail gunner on a B-17, 549th Bomb Squadron, 385th Bomb Group, stationed at Great Ashfield in England. He was reported MIA on October 6, 1944, and was confirmed KIA on April 6, 1945.

As I was orphaned at his death, I only recently obtained this information. I would greatly appreciate hearing from anyone who might be able to furnish me any more information about my father.

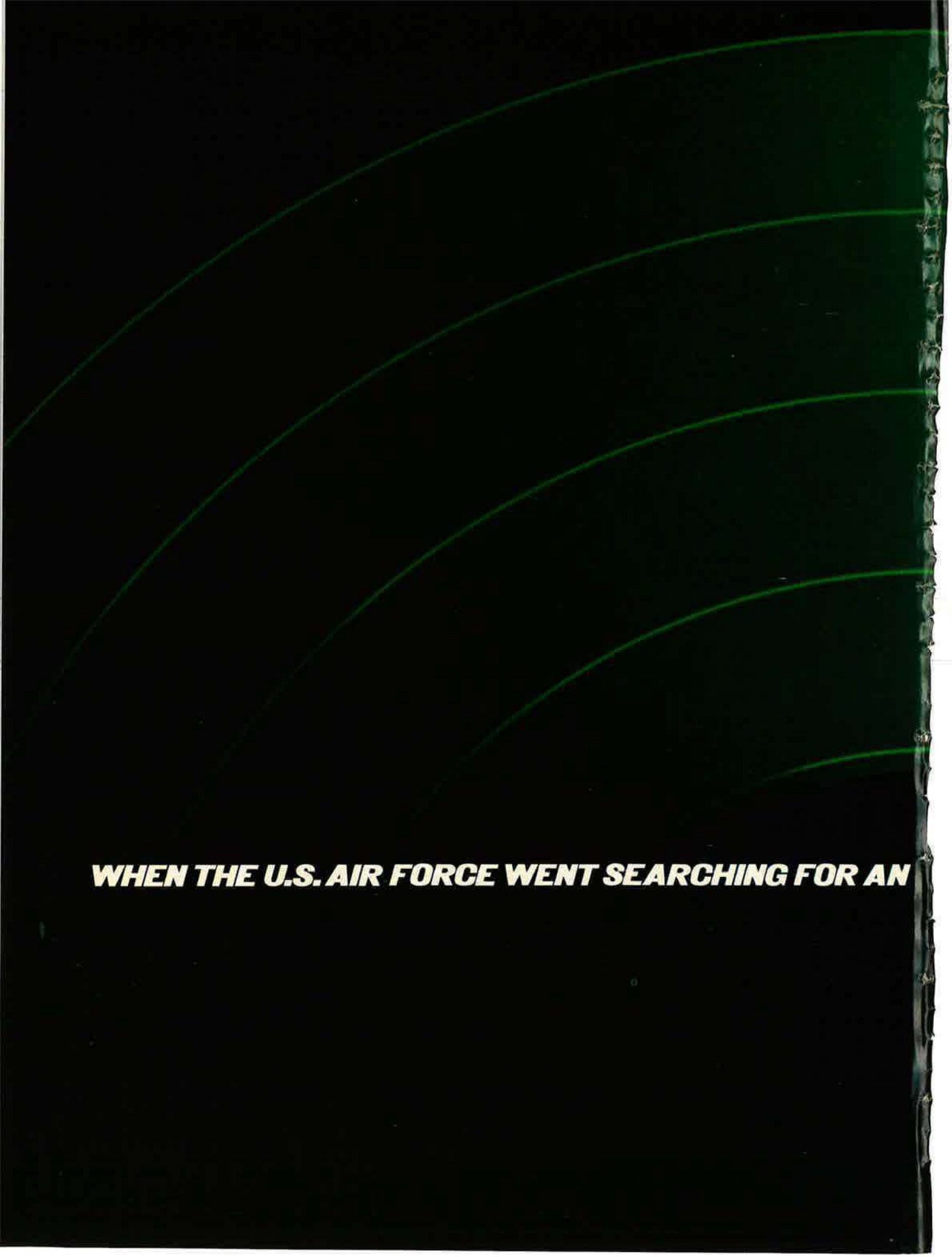
Barbara Varga
2402 Welsch Dr.
New Braunfels, Tex. 78130

I am trying to locate some old Air Force friends of mine.

I would like to hear from anyone who worked in the data-processing office at Williams AFB, Ariz., from 1962–65, and from anyone from the 3773d School Squadron who attended the 3750th Technical School at Sheppard AFB, Tex., from November 1961 to approximately March 1962.

Please contact me at the address below.

Kenneth R. Lafy
1969 Norwood Lane
State College, Pa. 16801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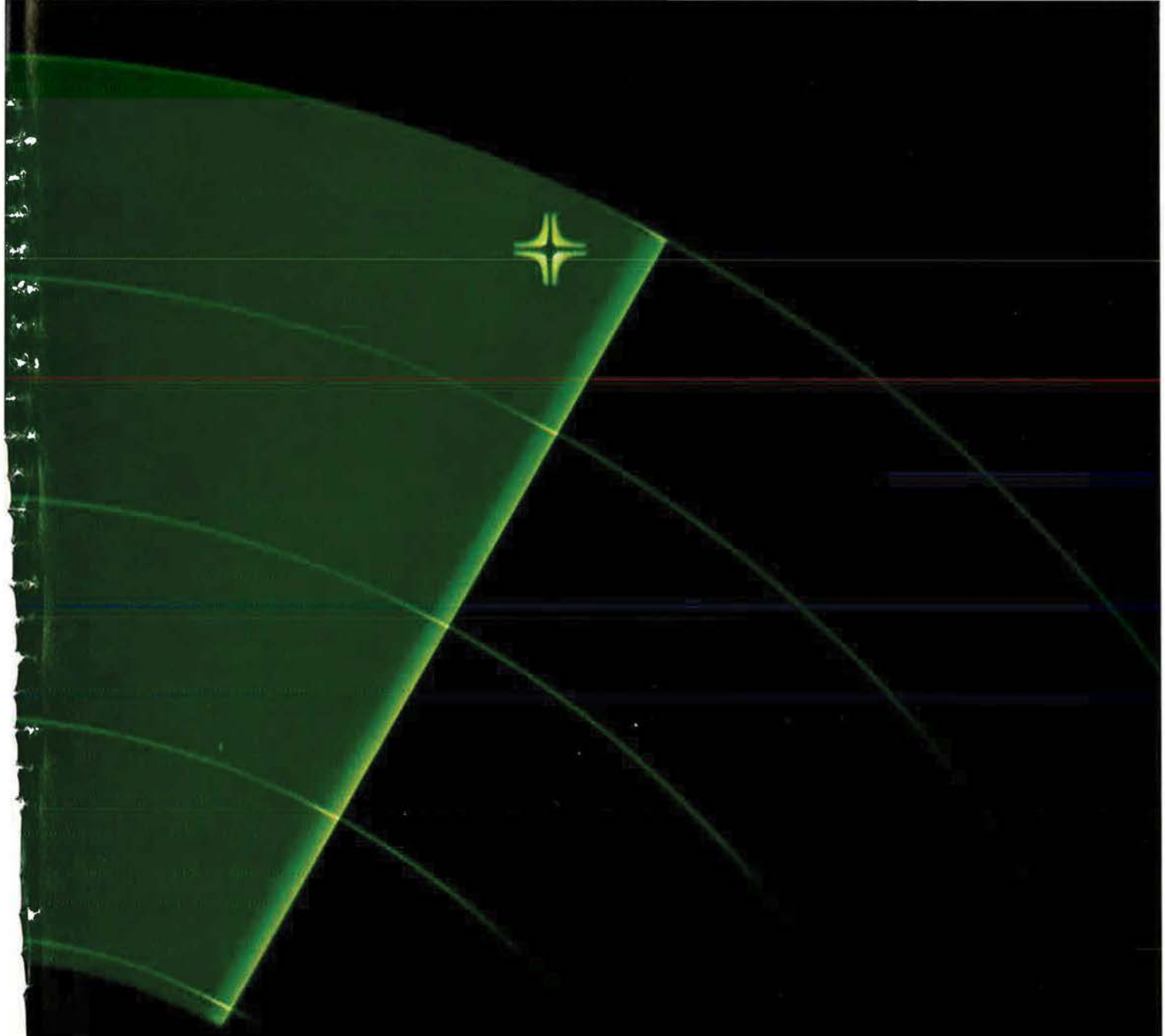

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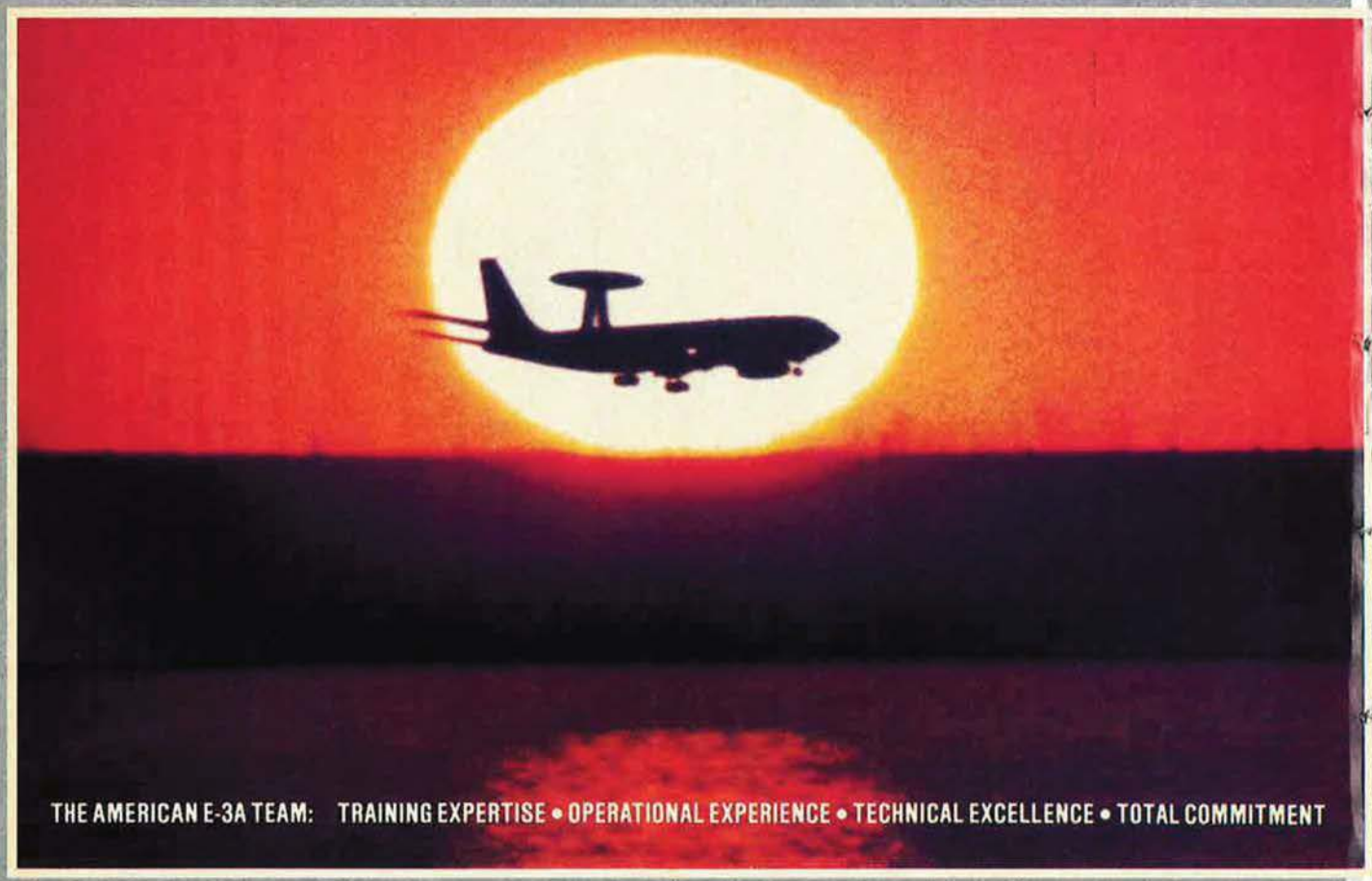

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IN FOCUS...

Approach Set on Space Radars

By Edgar Ulsamer, SENIOR EDITOR (POLICY & TECHNOLOGY)

Pentagon opts for a long-term program leading to a versatile high-performance system by the year 2000.

Washington, D. C., Dec. 28

Even though the Soviets have had a space-based military radar system, known as Rorsat, in operation for years, the US is still decades away from fielding an operational satellite constellation that can detect and track strategic and tactical targets on the oceans, in the air, and on land. But the Pentagon took an important, albeit tentative, step late in 1983 when Deputy Secretary of Defense Paul Thayer settled a long-festering dispute within the national security community over technological approaches to such a system.

OSD's decision went in favor of a long-term technology program recommended by the blue-suit Air Force and some elements of the Navy, thereby terminating a short-term concept based on well-established technologies that had the support of some senior civilian Pentagon leaders and elements of the intelligence community. The latter approach centered on designs by MIT's Lincoln Laboratory employing tried and true methods of building radars.

While this approach appears highly reliable and relatively risk-free—and is in use in a nonmilitary space system—it was judged to require excessive amounts of power, impose considerable weight penalties, and provide only limited performance. Also, this short-term concept would limit the radar satellites to low-orbit (below 1,000 km) operations, meaning both a relatively short lifespan because of "decaying orbits" and the need for very large numbers of satellites to provide global coverage.

The Lincoln Laboratory design was also thought to be confined mainly to the detection and tracking of surface ships, similar to the capabilities of the Soviet Rorsat system. While this system could have been expanded by moving toward much larger antennas and greater power levels than originally proposed, this was not deemed cost-effective, especially since the capability to deal with aircraft and cruise missiles would have been inadequate. Lastly, the Lincoln Laboratory concept was thought to be quite vulnerable to jamming.

By dropping the short-term solution, the Defense Department probably assured that advanced technologies relevant to future space-based radar systems will be pursued in a building-block fashion. The prospects are that these individual efforts will eventually coalesce into a high-performance, versatile system, but probably not before the year 2000. Three fundamental elements of the long-term solution—as envisioned by the Defense Advanced Research Projects Agency (DARPA) and R&D elements of the three services—will continue to receive intensive attention.

The pivotal technology underlying the advanced space-based radar concept is known as the TR (for transmit and receive) module and opens the door to an advanced synthetic aperture phased-array radar. The idea behind this approach is to generate the radar signal right at the face of the antenna, divide it up between many thousands of small elements, and distribute it across the array. Between 50,000 to 90,000 of these tiny radar units would be arrayed over an area some thirty meters in diameter.

While solid-state TR modules are already in existence—both Raytheon and GE have produced working examples—they are prohibitively expensive. The first order of business, therefore, is to bring these devices down in price to affordable levels. This will require mass-production techniques patterned after the way the electronics industry turns out microchips. All services and DARPA are working toward this goal.

Development of an advanced on-board signal processor (AOSP) is another key element of crucial importance to a space-based radar system. The concern here is to come up with a very reliable and survivable on-board computer using gallium arsenide circuitry that can resist the electromagnetic pulse and other radiation effects produced by nuclear detonations. DARPA and other elements of the Defense Department have worked on the AOSP project for about five years and have made considerable progress.

The third technology challenge associated with an advanced space-based radar is a lightweight, highly efficient, on-board power and power distribution system. Relevant work here is being carried out by the Air Force Avionics Laboratory, with DARPA defraying the bulk of the cost.

If these technology programs can be brought to fruition and melded into a workable system, the consequences to both strategic and tactical warfare may well turn out to be revolutionary. As presently envisioned, such a system would operate at an altitude of about 5,000 kilometers and would be capable of detecting, tracking, and, when linked with a proper command and control system, targeting in near-real time a variety of bogeys extending from cruise missiles to aircraft and ships at sea. The individual satellites could be made to fit into the existing Space Shuttle by folding the arrays in the manner you would fold an umbrella.

For the moment, there is no definite assurance that such a system would be impervious to hostile jamming. On the other hand, experts associated with the program believe they have definitive notions for solving the problem. Confidence is already high that a phased-array radar can be made to resist side-lobe—as opposed to the main-beam—jamming simply by suppressing the side lobes. If this is so, the main problem is solved, because main-beam jamming is quite difficult to do.

Beyond that, in the case of solid-state, electronically agile radar designs, the beam moves across the

face of the array rather than being fixed in the center of the system, as is the case with conventional designs. As a result, the jammer would actually have to track the beam, which is quite difficult to do, especially since it is easier to move the radar beam than it is to track and jam it. Additionally, it may be possible to cope with main-beam jamming by "nulling" the antenna, meaning the selective use of narrow-band filters to reject—either in frequency or direction—specific jamming signals.

Assuming that a full-fledged constellation of US radar satellites will be deployed around the turn of the century, a central question from the military operator's point of view is whether or not the system will be able to detect and track low-observable, "stealthy" targets, which by then will probably be commonplace. As in the case of jam-resistance, there is as yet no clear-cut answer. The difficulty in making predictions on this score stems in part from the circular nature of the assumptions about what advanced radars can "see," the degree to which aircraft, remotely piloted vehicles, cruise missiles, and other air-breathing platforms can become "invisible," and the point at which their radar returns become indistinguishable from natural background clutter.

It is theoretically possible that ever-more-powerful radars proliferated to an extreme degree could detect targets with extremely small radar cross sections. In practice, a host of economic and operational considerations militates against such an assumption. It is, nevertheless, tempting to suggest that, as the cost-effectiveness of new radar designs increases, so will their ability to cope with many low-observable targets.

The ultimate fate of space-based radar systems may be influenced by the outcome of this tug-of-war as well as by the role that will be assigned to them as part of the new Strategic Defense Initiatives, referred to as "Star Wars" by the media.

Why NATO's Conventional Forces Need Shoring Up

Gen. Bernard W. Rogers, the Supreme Allied Commander, Europe, and Commander in Chief of US European Command, recently counseled against decoupling NATO's nuclear deterrence policies from its conventional warfare strategies on grounds that there is no enforceable "firebreak" between them. Talking to a group of defense analysts in Washington, D. C., General Rogers espoused continuation of the Alliance's Flexible Response strategy, he opposed a "no first use" nuclear policy, and he strongly favored strengthening NATO's conventional forces.

Treating nuclear and conventional deterrence as an integer, General Rogers warned, however, that ACE's (Allied Command Europe) deficiencies in conventional capability "strain the credibility of our deterrence because a potential aggressor knows that NATO's escalation to nuclear weapons would invite at least as much devastation on us as we could inflict on him." It follows, therefore, that a potential attacker might "doubt our resolve to make a drastic move to nuclear weapons rather than accept the outcome of a conventional battle."

At the root of the problem, he said, is the fact that the gap between the military capabilities of the Warsaw Pact and NATO is widening, even though the Alliance's conventional forces are getting stronger. As a result, "instead of possessing genuine flexibility for executing our strategy of Flexible Response, ACE's current military posture will require us—if attacked conventionally—to escalate fairly quickly to the first use of nuclear weapons in order to halt the attack. This is [caused by] a lack of adequate sustainability: manpower, ammunition, and war reserve material to replace losses and expenditures on the battlefield."

Backing up the last-resort character of nuclear forces must be the perception on the part of the Soviet Union that NATO has a "reasonable" chance of "frustrating conventional attack by conventional means." Beyond this level of deterrence, "NATO's nuclear weapons, coupled with the uncertainty of our first-use option, must continue as a critical source of deterrence for convincing a potential aggressor that the risks of any aggression outweigh any possible gains," General Rogers contended.

While there are "no obvious indications that the Soviet Union intends to attack Western Europe, provided our deterrent posture remains credible," it is imperative to thwart the "paramount Soviet goal" of dictating the fate of Western Europe "without having to fire a shot," he pointed out. Political and economic intimidation is the menace likely to face Europe if the Soviets are not kept from achieving broadly superior military forces, according to General Rogers.

Rejecting the notion that Soviet intimidation of Western Europe is not in the cards, ACE's commander pointed at a specific road map Moscow was following to create that option:

- First, to convince Western nations that they should forgo military improvements that might offend the Soviet Union.
- Second, to encourage the adoption of Western foreign policies that at least condone, if not support, Soviet actions and ambitions.
- Third, to promote Western governmental policies and popular attitudes supportive of Soviet aims, such as the securing of favorable financial and trade arrangements.
- And, finally, and encompassing all others, to split Western Europe from the United States politically and militarily.

Attainment of this set of objectives by the Soviets, General Rogers argued, "would severely erode the ability of Western European nations to deter overt aggression and would disintegrate our Alliance." The symbiosis of nuclear and conventional capabilities affects deterrence of war as well as of intimidation, but takes on a different coloration in the case of the latter. The reason is that "conventional forces deter by conveying the prospect that an aggressor will be prevented physically from occupying defended territory. Obviously, this basis for deterrence is more reassuring than the first use of nuclear weapons, which would invite major retaliation on our territory. Even between nuclear powers, it is primarily the imbalance of conventional forces that can be exploited for intimidation and coercion because the threatened use of such forces is more credible than threatened use of nuclear weapons."

General Rogers refuted claims that raising the nuclear threshold would signal a diminution in NATO's will to escalate to nuclear weapons and, thereby, make conventional war more likely. "Improving our conventional forces by no means implies an inherent reduction in NATO's resolve to resort to nuclear weapons, if necessary. Indeed, the resolve required to sacrifice [economically] in order to improve conventional forces testifies to the strength of our resolve to do whatever is necessary to protect ourselves."

Lastly, he stressed that adequate deterrence requires that, at a minimum, "we have high confidence that our conventional forces are strong enough to protect our military means of escalation and to provide the time

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[needed to implement] our strategy of Flexible Response."

Modernization of NATO's conventional forces needs to be governed by a number of cardinal considerations, the most obvious of which is the principle of Forward Defense, according to General Rogers: "Adherence to Forward Defense is supported by military rationale as well as political needs. . . . We should also keep in mind the complementary relationship between the requirement for holding the first echelon of attacking forces and . . . attacking the follow-on forces. Both missions are essential for ensuring Forward Defense."

Washington Observations

★ The White House and the Defense Department settled a turf fight within the Pentagon over who would run the new Strategic Defense Initiatives (previously known as the "Star Wars" or Defense Against Ballistic Missiles) organization and the amount of funds allocated to it in the FY '85 Defense budget. The SDI office will report directly to the Deputy Secretary of Defense and will have direct oversight over five functional program elements involving the individual services and agencies of the Defense Department. These program elements comprise surveillance, systems survivability, directed-energy weapons, conventional ballistic missile defenses, and battle management. Specific details about the SDI organization are to be worked out within a thirty-day period. SDI funding was set at $2.3 billion, or $560 million more than assigned to these functions in FY '84.

★ The President's pending decision concerning the nation's long-term space goals is likely to allow for the ultimate creation of a lunar base that could serve both national-security as well as nonmilitary scientific and other purposes. If there is a commitment to a manned space station, it will probably serve as a stepping-stone to a lunar base. Such a step would not constitute a US attempt to claim sovereignty over that site or the moon as a whole.

★ Technical difficulties have caused a number of delays in testing the F-15-launched US ASAT in its first spaceflight. At this writing, a test launch is reportedly imminent, but is limited to an attempt to aim the antisatellite weapon against an imaginary point in space. Congressionally imposed strictures and the Administration's concern about the political sensitivity of a full-up test against an actual satellite account for the compromise of a "point in space" intercept attempt.

IN FOCUS...

Meanwhile, DARPA Director Dr. Robert Cooper told Congress that the US needs to carry out full operational tests of ASAT and place enough ASATs into operation to deny the Soviets the option of targeting ground and sea-based targets with space-based sensors on a real-time basis. The Soviets, he said, are moving toward such a capability. He cited in this context a number of Soviet satellite systems, including Rorsat, Eorsat, and the USSR's counterpart to this country's Navstar Global Positioning System, Glonas.

Dr. Cooper stressed that the confluence of two technologies—the ability to perform real-time targeting by means of surveillance satellites and the advent of sophisticated "smart" weapons in the manner of the Assault Breaker concept—presage broad and revolutionary capabilities on the part of both the US and the Soviet Union for real-time targeting by space-based sensors. The size of some receivers of data from the GPS network has shrunk to that of a pack of cigarettes, according to the DARPA Director. Space-based laser designators, he told Congress, could be used to "paint" targets on the surface of the oceans, on land, or even in the air and space, and to guide weapons against them. The effectiveness of such an approach could be compounded by the use of "stealthy" delivery systems coupled with medium- and long-range delivery systems.

Dr. Cooper told Congress that stealth, meaning low-observable characteristics encompassing radar, infrared, visual, sound, and others, represents the most revolutionary military aeronautics technology since the jet engine and the swept wing. The payoff of stealthy platforms, linked to real-time targeting from space and effective standoff weapons, is the ability to shoot at an opponent "from the dark." In the view of some defense scientists, the survivability of stealthy air vehicles may eventually be threatened by ground-based air defenses employing laser and other directed-energy technologies. Defensive weapons of this type operate with the speed of light. Since even the stealthiest penetrators become "visible" to the eye as they approach in daylight, they might become vulnerable to rapidly reacting laser or particle-beam weapons.

★ Complementary research by elements of the Defense Department and NASA has bolstered the long-term prospects for supersonic, and eventually hypersonic, vehicles and boost-glide weapons. NASA Administrator James M. Beggs recently told Congress that "long-range cruise missiles utilizing supersonic-combustion ramjets (scramjets) and high-density hydrocarbon fuels may be the first generation of operational hypersonic vehicles, followed later by very-high-altitude Mach 5–7 cruise airplanes used for strategic reconnaissance. There is also renewed interest in a hypersonic maneuvering airplane capable of sustained operation both in the atmosphere and in low orbit. It would utilize a combination of scramjet and rocket propulsion to match the trans-atmospheric envelope and would probably have horizontal takeoff as well as landing capability."

In the same vein, DARPA reported that high-lift-to-drag-ratio hypersonic vehicles could be operational in the late 1990s. Over a shorter term, the payoffs from supersonic cruise and maneuver, when combined with advanced beyond-visual-range missiles and stealth technologies, could provide the next US fighter design with "favorable combat exchanges of ten to one or more, far in excess of F-15 and F-16 capability," according to Defense Department analyses.

★ Teal Ruby, a potentially revolutionary space-based infrared sensor that detects air-breathing vehicles against the "clutter" of the earth's surface, is to be launched, presumably by the Shuttle, from Vandenberg AFB, Calif., either late in 1985 or early in 1986, according to DARPA. Teal Ruby is thought to be a highly promising tool for detecting stealthy aircraft.

★ Defense Department officials registered surprise over delays in the first launch of the Soviet Union's new heavy-lift launch vehicle that has been sitting on its launch pad at the Tyuratam complex for several months. The vehicle is thought to be capable of launching payloads in a range of between 300,000 and 400,000 pounds into low earth orbits. DARPA Director Cooper told Congress last year about the theoretical threat that such a system might be used in violation of the Outer Space Treaty to place heavy nuclear weapons into space and de-orbit them on command. ■

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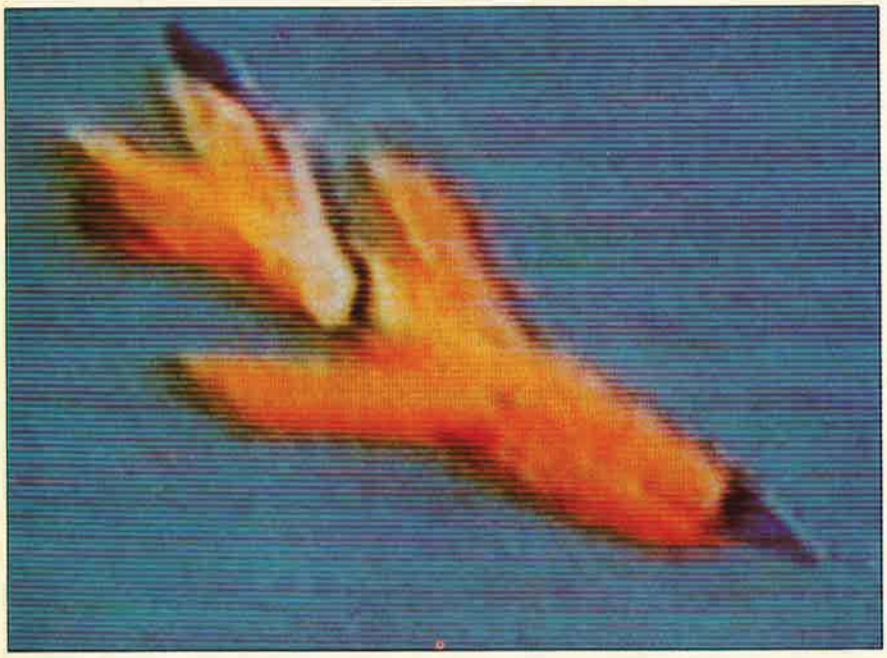
AEROSPACE WORLD
News, Views & Comments

By William P. Schlitz, SENIOR EDITOR



The Air Force and Navy have completed a series of in-flight experiments involving the Airborne Laser Laboratory (ALL). During the tests, the ALL destroyed a subsonic Navy BQM-34A target drone. The ability to designate and maintain an aimpoint precisely was also demonstrated in two other tests in which drones were damaged. The action took place off the Pacific coast.

Washington, D. C., Jan. 6

★ The Air Force has awarded McDonnell Douglas Corp. an additional $274.4 million for improvements to the F-15 Eagle air-superiority fighter. The funds for the multistage improvement program now total $361.1 million.

Delivery of the first F-15 with the improvements is scheduled for June 1985.

Upgraded will be the Eagle's radar, central computer, and programmable armament control system. In addition, the Eagle will also receive provisions to permit the use of the advanced medium-range air-to-air missile (AMRAAM), an antisatellite system, and the joint tactical information distribution system (JTIDS).

"This program will allow the Eagle to keep its formidable edge over threat aircraft for many years," said William S. Ross, vice president and general manager of the F-15 program at the company's McDonnell Aircraft division.

The aircraft radar's memory will be increased to 1,000,000 words and its processing speed could triple to 1,400,000 operations per second. "This will accommodate future systems and allow changes to be made via programming only—with no hardware changes necessary," officials noted.

Additionally, use of the latest in electronics technology is expected to increase radar reliability by twenty-five percent. Because of new, more compact computer chips, the radar will contain fewer parts.

The aircraft's central computer is to be upgraded to store four times as much data and process it three times faster than at present. Twenty percent greater reliability is also expected.

The third major component to be improved is the aircraft's programmable armament control system. The current armament control panel is to be replaced by a single, multipurpose, five-inch color video screen. Linked to a computer, the armament control system will be programmable, allowing for the addition of future weapons—including advanced versions of the AIM-7 and AIM-9 and the new AMRAAM missile. The control system video will be the first use of a full color display in an operational fighter aircraft.

★ The Air Force has taken possession of the first prototype radar threat warning system. Designated AN/ALR-74(V), it is slated for installation and integration aboard an F-16 Fighting Falcon at the General Dynamics plant at Fort Worth, Tex.

Destined for first-line tactical aircraft, the system is to equip F-16, F-4E, and A-10 aircraft. Litton Industries' Applied Technology Division, Sunnyvale, Calif., is to deliver sixteen prototypes and associated test equipment under contracts totaling more than $50 million.

Considering USAF's possible requirement for 2,600 systems, production potential for the AN/ALR-74(V) is estimated at more than $1 billion. First production contract could be awarded in mid-1984.

Such systems warn aircrews that they are being illuminated by hostile threat radars and indicate the direc-

Cyclops, an inspection device, helps Hughes Aircraft's Steve MacDougall check the artwork design of printed circuit boards for advanced radar systems. Production of the extremely accurate radar systems is the work of the company's Radar Systems Group in El Segundo, Calif.

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tion, identification, and relative danger of the enemy signals to the aircraft.

The remaining prototypes are to be completed early this year with flight testing at Eglin AFB, Fla., to begin in March.

The system consists of five line-replaceable units. The receiver and receiver-controller perform data collection via advanced computers designed by Applied Technology.

★ AFSC's Electronic Systems Division, Hanscom AFB, Mass., has awarded a $77 million contract for a radar system to detect sea-launched ballistic missiles off the US southeastern coast.

The ten-story-tall, dual-faced phased-array radar of the PAVE PAWS variety is to be built and tested at Robins AFB, Ga., by Raytheon Co.'s Equipment Division, Wayland, Mass.

The radar is to be similar to those operating at Otis ANGB on Cape Cod in Massachusetts and at Beale AFB, Calif.

The windowless, concrete-and-steel triangular building's two sloping walls will each house 5,354 individual antennas. From each of the faces computer-directed beams will look out 3,000 nautical miles. They will cover 240 degrees horizontally and eighty-five degrees vertically. The solid-state radars will also keep watch on earth-orbiting satellites.

The radar should be operating by late 1986. The contract includes an option for a fourth PAVE PAWS system near Goodfellow AFB, Tex.

★ In another Electronic Systems Division development, Air Force personnel who operate computerized radar surveillance and command and control equipment aboard Airborne Warning and Control System (AWACS) aircraft are to receive better training with less flying time.

ESD has awarded a $14.2 million contract to Logicon, Inc., San Diego, Calif., for additional data processors and operator consoles to be married to one of the two AWACS training simulators at Tinker AFB, Okla.

The contract calls for delivery of the equipment in January 1986 and contains an option for delivery of a second set by April 1986.

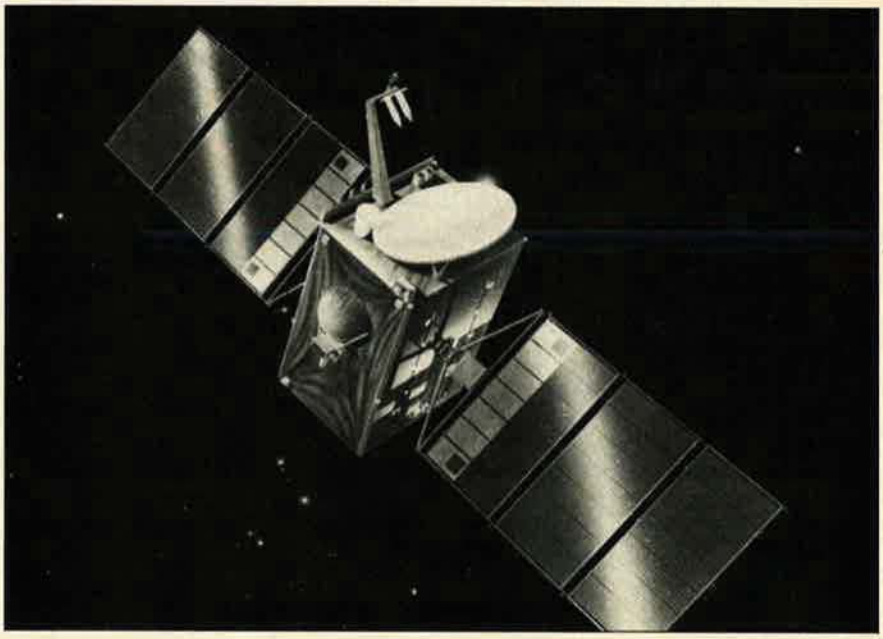
Artist's concept of the Experimental Test Satellite (ETS-V), the first geosynchronous, three-axis stabilized satellite to be designed, built, and launched by Japan. Lockheed Missiles & Space Co. is to provide the earth sensors similar to those flown in such US communications satellites as INTELSAT-V.

AEROSPACE WORLD

AWACS aircraft—modified Boeing 707s—make possible the tracking of friendly and hostile aircraft at distances exceeding 250 miles.

★ The Air Force has given the green light for the design of a tethered aerostat antenna demonstration model.

Rolls-Royce has started a new series of tests to investigate plenum chamber burning (PCB), a method of thrust augmentation for future supersonic vertical/short takeoff and landing military aircraft. A Pegasus 2 vectored-thrust turbofan engine fitted with PCB has been installed in a Harrier airframe in an open-air test site operated by the Ministry of Defence at Shoeburyness, Essex, the UK. The test program aims to determine the engine's response to various levels of intake temperature distortion due to hot gas reingestion and the effect of different methods of reducing it at a range of heights and airframe attitudes. The tests will also determine the effect of hot exhaust gases on ground surfaces.



As aircrews can attest, Sparrow and Sidewinder air-to-air missiles are indeed powerful friends in tight spots. Friends a pilot can count on.

Sparrow AIM-7F, besides proving itself in combat, has continued to demonstrate outstanding launch reliability. Meanwhile the latest version, Sparrow AIM/RIM-7M, has successfully completed the final phase of Operational Test and Evaluation with missile firings from fighter aircraft and naval surface vessels. During this test phase, all reliability goals were met and the newest Sparrow has been approved for service use on the F-4, F-14, F-15, and F-18 aircraft.

The AIM/RIM-7M has a new guidance and control section and is now in full production at Raytheon. It features an advanced monopulse seeker and digital signal processor for improved look-down, shoot-down capability in severe clutter and ECM environments.

Sidewinder, the short-range, heat-seeking missile, has been called man's best friend in a dogfight. And rightly so. The dependable AIM-9L has proved its all-aspect, launch and leave capability. This Navy-designed Sidewinder is on all U.S. first-line fighters and increasing numbers of other free-world aircraft. Sidewinder is also on fixed-wing attack aircraft and helicopters as a self-defense weapon.

For the newest generation Sidewinder, the AIM-9M, Raytheon, as a prime industrial support contractor, is currently delivering the guidance and

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The tethered aerostat antenna program has been initiated to offer an alternative to the operation of VLF transmitting facilities in the event of emergencies. It is one of a number of Air Force initiatives to assure communications following an emergency. *(See January '84 issue, p. 26.)*

"Since ground-based VLF operations lack survivability," noted officials, "under certain conditions rapidly deployable aerostats may be utilized as reconstitutable VLF communications platforms."

Under a $3 million contract, Westinghouse Tethered Communications has proposed use of its Small Transportable Aerostat Relocatable System (STARS), a 25,000-cubic-foot aerostat designed to operate at altitude of 3,000 feet with a special Kevlar tether doubling as an antenna.

The company is to be responsible for all mooring and ground support subsystems in addition to installation and flight tests of the total system. It will also undertake the training of personnel to operate the aerostat.

According to officials, the company is the only one in the world devoted exclusively to the design, fabrication, installation, and operation of aerostat systems.

The company has participated in surveillance programs for an oil company, a number of overseas communications programs, and cold weather aerostat survival tests for the Air Force Geophysics Laboratory. Currently, it is working with the US Customs Service to develop aerostats for interdicting Caribbean-area drug traffic.

★ The Air Force has tested successfully the Air Cushion Equipment Transportation System, or ACETS, platform designed to eventually carry a 60,000-pound load.

The platform was designed and constructed by Bell Aerospace Canada Textron, Grand Bend, Ontario, as part of a joint program sponsored by Aeronautical Systems Division's Flight Dynamics Laboratory.

The tests are being conducted over rough terrain at Grand Bend.

ACETS "floats" on air ducted through the platform by ASP-10 engines (derivatives of the Pratt & Whitney PT-6) into open rubber cushions/skirts beneath the platform at three sites along its length. The effect is similar to that of a hydrofoil that floats on air above water.

The platform has also undergone off-runway tow tests in crosswinds up to twenty-six knots and has demonstrated its ability to clear the maximum obstacle height for which it was designed.

The platform is a derivative of the Alternate Aircraft Takeoff System originally designed for launching combat-configured tactical aircraft from battle-damaged airfields.

Currently, USAF equipment transporters use tires, which have limited capability when in rough or muddy ground. With ACETS, the Air Force will be better able to move aircraft and equipment around a damaged airfield with little or no repair to the damaged runways, access ramps, roads, and taxiways.

FDL program manager Gerald R. Wyen noted: "We assume that air-

The Air Force has successfully tested the Air Cushion Equipment Transportation System designed to move aircraft—on ducted air—over rough terrain or damaged taxiways or runways. The platform was designed and built under a joint US/Canadian program. See adjacent item.

A unique new British aircraft, the Firecracker NDN-1T, is designed to help foreign students transition to advanced jet trainers. The service is being provided by Firecracker Aircraft Ltd., Isle of Wight, the UK.

craft probably will be located in shelters some distance from the damaged runways. The question then becomes one of getting the aircraft to the runway over currently unmanageable terrain. The Air Force has rapid runway repair crews capable of a certain amount of patching up, say within several hours. That patch job still is going to leave bumps in the road."

The system is to be tested for a total of fifty hours over a variety of surfaces—rugged, icy, and snow-laden—as well as on the grassy and uneven ground characteristic of runways in good weather. While a standard pickup truck tows the platform, a program is under way to incorporate a self-contained movement/direction system.

★ NASA propulsion researchers, in an effort to improve the fuel efficiency of future aircraft, are taking the turboprop of the 1950s and '60s and reshaping it for the 1980s and beyond.

The new turboprop—a cross between early propeller concepts and the turbofan engines of modern jet aircraft—is evolving from NASA's Aircraft Energy Efficiency program stud-

Biocybernetics—Beyond the Leading Edge of Technology

"Controlling an airplane with thought commands is a long way off and may never come about," according to Col. Robert D. O'Donnell, a researcher at Wright-Patterson AFB, Ohio.

"But thought command could be a godsend in a strictly medical role. If it ever can be done, paraplegics might walk again and amputees might use artificial limbs almost as well as real ones.

"But Wright-Patterson is not conducting any research into thought control of a system," he emphasized, in response to recent reports that the Air Force is researching that area.

However, the Colonel, who is chief of the Workload and Ergonomics Branch of Aerospace Medical Research Laboratory's Human Engineering Division, is conducting research on the human brain and the electrophysiological signals it emits.

Purpose of his research is to design work stations or cockpits and crew stations for future aircraft. He does this by measuring the electrical output from the brain to determine how hard people are working at a given task, when they're overloaded, when they're too fatigued to go on, and when they are at their best or peak performance.

And he's working way out front, ten years or more, on the leading edge of aerospace technology to ensure that the fighters, bombers, and spacecraft of the future—although ultrasophisticated—are not too sophisticated for humans to handle.

The general area of research dealing with the use of physiological signals to modify the performance of a system is called biocybernetics. Colonel O'Donnell distinguishes between two types of research: closed loop and open loop.

Closed loop is when a person's physiological signal, such as an electrocardiogram (EKG) or electroencephalogram (EEG), is fed directly to a machine and affects what the machine does. This is what most people refer to as thought control, and no research of this type is being conducted at Wright-Patterson. Although Colonel O'Donnell is watching scientific literature in this area for future applications, he's skeptical about it.

Colonel O'Donnell explained his skepticism in using biocybernetics to control an aircraft by pointing out that a person can physically throw a switch or push a button almost as quickly as he can think about it. "You might save a few ten-thousandths of a second, but that's hardly worth the tremendous investment of money and personnel resources it would take to perfect such a system," he emphasized.

He doesn't completely discount other uses of closed-loop biocybernetics, however, and noted that it has great possibilities in the medical community.

Open-loop biocybernetics deals with using a person's physiological responses to determine the best way to design or configure a system, such as a cockpit. This is Colonel O'Donnell's area for research and he gave two examples of what can be done.

The brain's signal can be used to determine people's capabilities, how they respond, what they respond to best, and whether or not they process a certain kind of information differently than another kind. Once that determination is made, a system can be changed to fit the person.

For instance, some people may not process data as fast as others, so designers may provide a slower system, computer, or information flow to match a person's processing speed. If a person's abilities can be learned through biocybernetics research, then perhaps people can be better matched to missions, jobs, systems, and work centers. Even better, work stations can be designed with flexibility for change so as to accommodate individual workers.

Checking a pilot before a flight might be a good use for biocybernetics. Decisions could be made on whether the system should be configured differently for that day, the type of mission he would do best, and even if he should fly at all.

"People have good days and bad," Colonel O'Donnell noted. "And no two pilots fly exactly alike. One may read a map better than another, but the second person may react a split second faster. By knowing this we can compensate by configuring the cockpit for the individual—put the switch in the best position for each pilot and perhaps provide more detailed maps for some.

"That's off-line," he explained. "It's human engineering done before the actual mission to help the operator work optimally with his machine."

Another example of open loop would be monitoring the pilot in the aircraft. By checking the person's state during a flight, we may be able to decide if he or she should fly another mission or whether or not the person is overloaded on that mission or in need of rest before another mission.

This analysis is important for two reasons, noted Colonel O'Donnell: "One, we want to successfully complete the mission. And two, we want the safest possible environment for our people to ensure that they'll survive."

To achieve these open-loop goals, the Colonel's group is using ultrasophisticated sensing and analysis equipment. In addition to miniaturized electronic brain-wave detectors, research is under way with a sensor that permits measurement of the magnetic field generated by the brain's activity and which surrounds a person's head. This permits measurements to be taken without touching the person.

The instrument used to measure the electromagnetic field generated by a person's brain is called SQUID, for Semiconducting Quantum Interference Device. In the form used at Wright-Patterson, it consists of two coils supercooled to four degrees Kelvin (colder than 400 degrees below zero Fahrenheit).

When an electric flow is introduced into a coil at that temperature, it flows almost forever due to lack of resistance. The magnetic field to which the coils are exposed generates the only resistance to its flow; therefore, changes in the coil's electrical flow tell what magnetic field is around it.

"There's nothing bizarre about this," Colonel O'Donnell pointed out. "It's a straight physical relationship between the electricity in the brain and the magnetic field it generates. We simply measure that field with a detector in a supercooled environment. By using this method, we can get to signals that are generated by the smaller pieces of brain tissue, making this potentially more precise than the EEG."

He said that while the Air Force has high hopes that these techniques will be extremely useful in the areas of cockpit design and operator monitoring, they are still highly experimental. "The possible applications of open-loop biocybernetics are exciting enough. That makes it easy to be patient while we wait and see if closed-loop applications will be of value to the Air Force."

—BY GENE HOLLINGSWORTH

ies begun in response to the 1973 oil embargo and sharply rising fuel prices.

These studies identified possible aeronautical propulsion technology having a combined potential for improving the fuel efficiency of future aircraft by fifty percent.

Test results make the advanced turboprop look particularly attractive for short/medium haul markets currently served by the DC-9 and the Boeing 727 and 737 aircraft with capacities of 120 to 150 passengers.

Upgrading propeller efficiency for flight at higher speeds of modern jet transports is a major technological hurdle today.

For example, an aerodynamic effect known as "compressibility" limits the speed at which conventional propellers can operate efficiently. Working with the propeller industry, NASA's Lewis Research Center in Cleveland has taken advantage of several technology advances in blade structure and aerodynamics to dramatically reshape the propeller.

Design for the advanced turboprop consists of eight or ten highly swept blades that are about half as thick as conventional units and that are on a single engine shaft.

Reducing thickness and providing sweep at the tips delays compressibility effects and drag and noise-producing supersonic shock waves, researchers declare.

Other technical challenges for the turboprop include reducing engine noise and vibration, finding the most aerodynamically efficient mating of the engines to the airframe, and reducing propeller and engine gearbox maintenance.

NASA plans to award a contract next year to an American airframe manufacturer for research leading to high-speed flight tests of a large-scale advanced turboprop. Tests would be scheduled for early 1987.

★ At Scott AFB, Ill., AFCC has reorganized data automation and communications activities under a new Deputate for Teleprocessing.

In addition the command has established a new Deputate for Combat Communications to oversee functional activities related to wartime planning and use of combat-communications resources.

AFCC provides the Air Force a wide range of communications and data automation support as well as combat-communications resources.

The reorganization resulted from the rapid evolution of data processing and communications technologies and merger of these technologies through integrated information systems, officials said.

The realignments, conducted without increases in AFCC manpower authorizations, will "continue the progress made . . . in managing merged communications and data resources," noted Maj. Gen. Robert F. McCarthy, AFCC Commander.

★ At the strong urging of Defense Secretary Caspar W. Weinberger, President Reagan has chosen William Howard Taft IV, the Defense Department's general counsel, to succeed Paul Thayer as Deputy Secretary of Defense. Mr. Thayer resigned the post effective January 12 to devote himself to defending against a civil suit filed by the Securities & Exchange Commission. The SEC alleged that Mr. Thayer, prior to his Pentagon service, wrongfully disclosed "insider" stock-trading information to eight people while serving on the boards of LTV Corp., Allied Corp., and Anheuser-Busch Companies. Mr. Thayer said the suit was "entirely without merit."

★ **NEWS NOTE—A conference on air leadership** is to be held April 13–14, 1984, at Bolling AFB, D. C. The Air Force Historical Foundation, the American Military Institute, and the Military Classics Seminar are the sponsors. For additional information, write to Wayne Thompson, Office of Air Force History, Bolling AFB, D. C. 20332. ■

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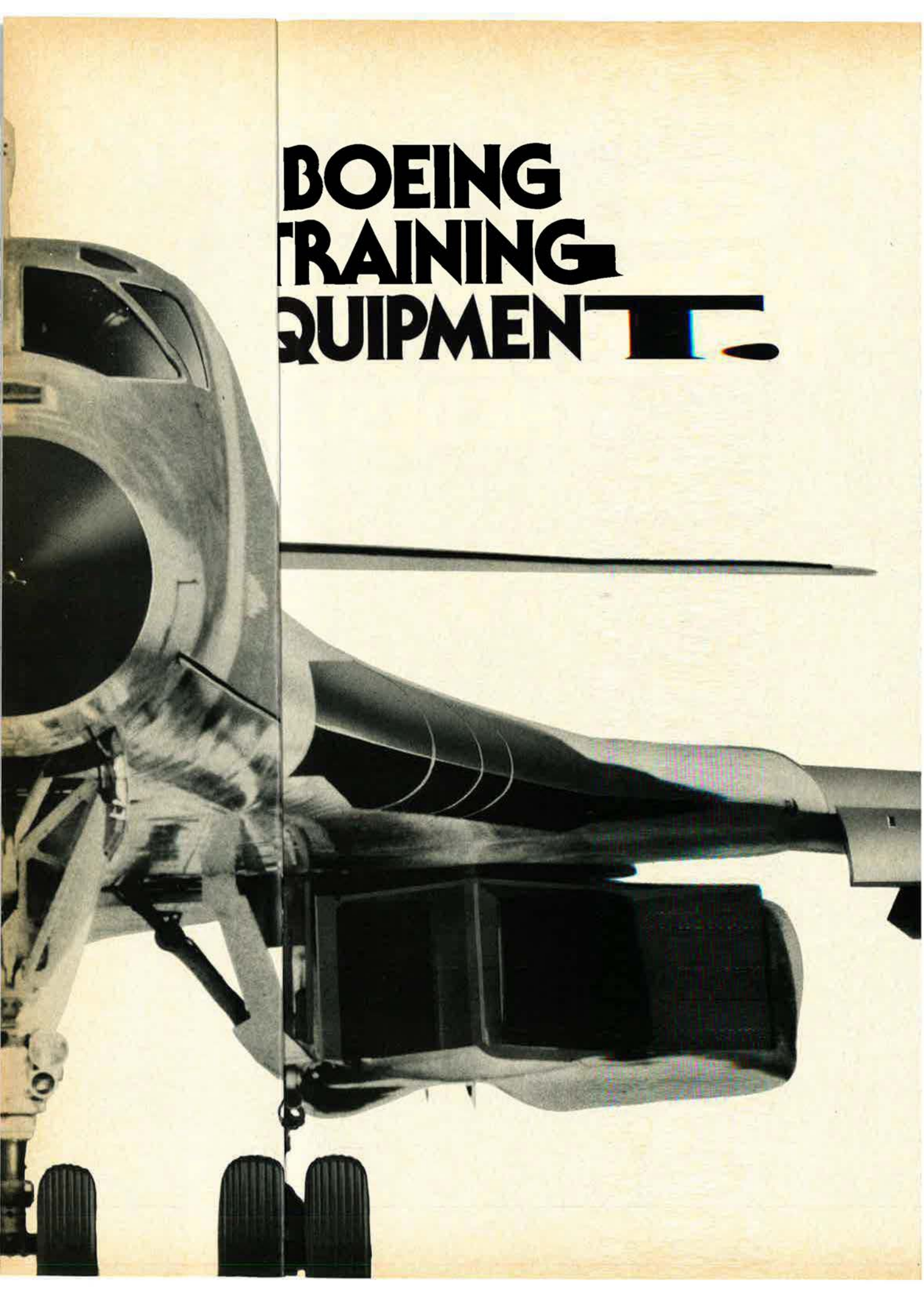

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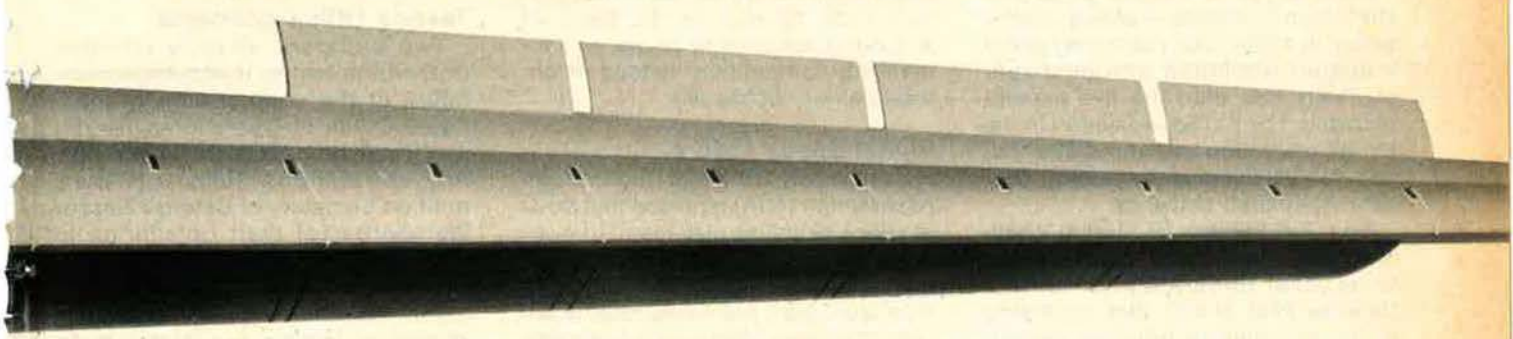

CAPITOL HILL

By Kathleen G. McAuliffe, AFA DIRECTOR OF LEGISLATIVE RESEARCH

Washington, D. C., Dec. 23

FY '85 Defense Spending

Congressional and Pentagon sources think the FY '85 budget for DoD may go lower than the $305 billion currently forecast before the President submits it to Congress next month. The $305 billion would allow about a ten to twelve percent real growth rate. This does not include Department of Energy (DoE) funds for nuclear weapons development and production, expected to be some $8 billion.

Sen. John Warner (R-Va.), a member of the Senate Armed Services Committee, said recently that $300 billion and a five percent real increase would be the maximum allowed by Congress in its FY '85 budget resolution. The basis for this assumption is the decision by the Democratic caucus in the waning days of the first session of the Ninety-eighth Congress to accept no more than five percent real growth for defense.

However, some key congressional staff claim Congress—fearing a rising deficit in an election year—may adopt a budget resolution providing substantially less than the five percent increase. The FY '85 projection in the FY '84 resolution was about $297 billion for all defense—including DoE defense-related activities.

Sen. Ted Stevens (R-Alaska), chairman of the Senate Appropriations defense panel, told Deputy Secretary of Defense Paul Thayer that according to his calculations fourteen percent real growth was required in FY '85 to accommodate those systems authorized in FY '84. He is concerned that there will be no funds available to increase manpower and readiness accounts because the bulk of modernization costs come in FY '85.

Secretary Thayer said that original Administration projections provided for about a twenty percent increase for FY '85. But this goal could not be met. Outright cuts would be made, therefore, causing significant program delays. He reiterated, however, that the Administration would achieve its defense goals, albeit at least one or two years later.

Reforming Spares Buying

Sen. William V. Roth, Jr. (R-Del.), plans to propose legislation directing institutional reform in the spare-parts buying process. The Senator, chairman of the Governmental Affairs Committee that investigated DoD spares procurement, blamed a lack of competition, small order quantities, and inadequate pricing reviews as some root causes of reported pricing abuses.

The proposed legislation would require procurement officials to check the national parts supply system and any used parts that could fill the requirement before purchasing spares from a contractor. Further, contractors would be required to indicate in a bid whether they would actually manufacture the part or would have to buy it from another source.

Similarly, lowering the required spares audit threshold from $500,000 to $100,000 should ensure more complete pricing reviews. Finally, the proposal would establish personnel performance ratings on the basis of achieving reasonable prices and increasing competition instead of on-time delivery schedules.

Soviet Space Future

Congress's Office of Technology Assessment (OTA) reported that Soviet space activities may result in a sophisticated, permanent, large-scale, manned space station with Shuttle-type launchers providing routine access to various platforms in low-earth orbit. The study also concluded that the Soviets could put men on the moon and undertake a journey to Mars in the next twenty years. The Soviets believe that a large number of its citizens will one day live in space, and they are looking toward a permanent settlement of their people on the moon and Mars, according to OTA. Hence, Soviet space ventures are now providing the data and experience required to design habitats and equipment that will allow individuals to reside in space over long periods of time.

The study comes just as NASA is urging the Administration to consider establishing a manned civilian space station.

Defense and the Economy

The Congressional Budget Office (CBO) reported to Congress that the economy will continue to grow over the next few years and defense spending will pose "little risk of rekindling inflation." The CBO analysis assumed a five percent real growth in defense through FY '86. However, it suggested that even if the Administration and Congress decide to increase that level, the economy could accommodate the shift without any significant adverse effects on such key economic factors as long-term productivity gains or employment. CBO director Rudolph Penner told a congressional panel that even if DoD budget authority for FY '84–86 were to experience no real growth, rather than the assumed five percent, unemployment, capacity use, and the deficit would not change dramatically.

Testing Office Concerns

Two Senators recently charged DoD with intent to thwart implementation of the congressionally mandated Office of Operational Testing and Evaluation. Sens. David Pryor (D-Ark.) and William V. Roth, Jr. (R-Del.), notified Secretary of Defense Caspar Weinberger of their objections to what they perceive as plans to weaken the weapons testing office. Those plans "redefine" operational testing so that all testing, except that done before final production decisions, would be considered developmental testing and, therefore, would remain the responsibility of the Under Secretary for Research and Engineering, as is now the case.

The legislators, primary sponsors of the legislation creating the office, asked Secretary Weinberger to nix plans to establish policy on operational testing matters and to define responsibilities of the directorate until a director is chosen. They believe these plans would deny the office any real role in production decisions.

The office was to have been operational November 1, 1983. ■

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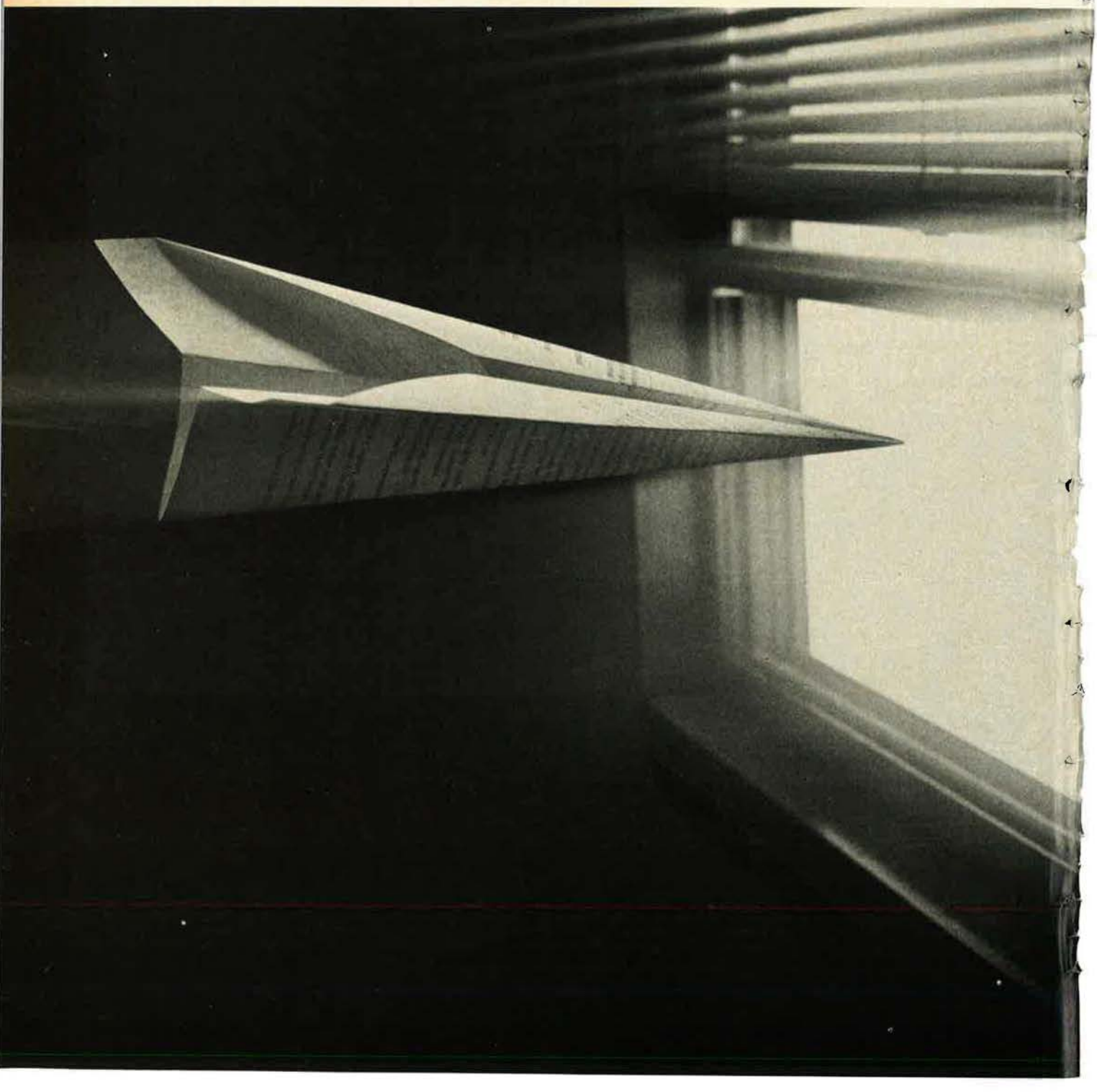

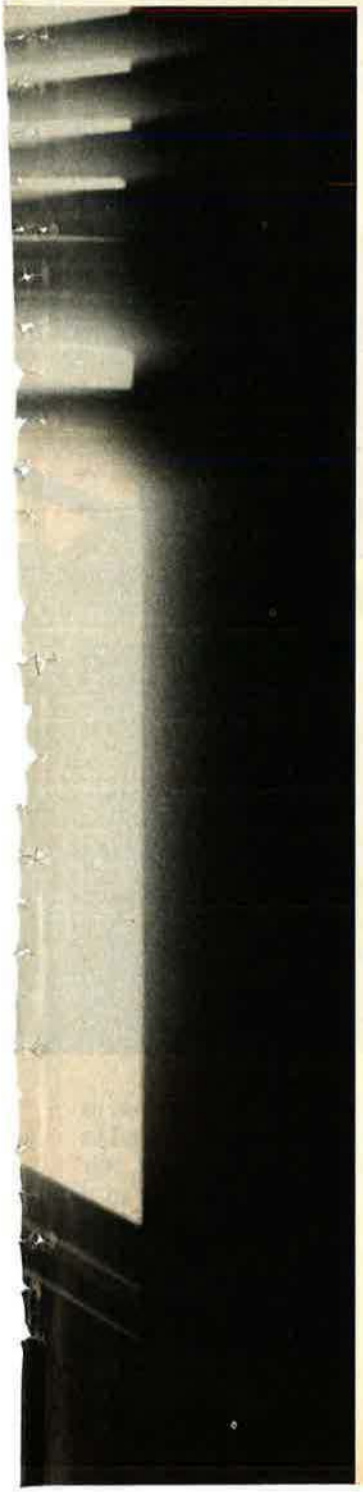

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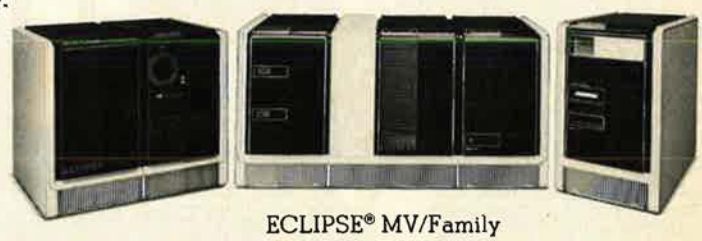

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Deterrence TODAY

BY JOHN T. CORRELL
EXECUTIVE EDITOR

New strategic systems are coming, but for now SAC's top priority is to keep the B-52 and Minuteman in shape to provide a credible deterrent.

—Photos by George Hall

THE Air Force has been trying to field new strategic systems for twenty years, but until lately it had not gotten very far. The B-70 and the B-1A bomber programs were canceled outright. The MX missile was long mired in a political bog. Even as the strategic advantage slipped away to the Soviet Union, loud voices were protesting that the United States already had too many strategic weapons.

Finally, it appears that the B-1B bomber and the Peacekeeper missile are on the way, but in making the case for them, the Air Force has had to talk candidly about the limitations of its existing systems.

The B-52 has been in service longer than any previous bomber in US history, and has flown more than twice as long as its designers envisioned. Its days as a potential penetrator of enemy defenses are numbered. The Minuteman missile poses a reduced risk to Soviet ICBM silos now that many of those sites have been superhardened. Minuteman itself has become more vulnerable to new generations of highly accurate Soviet missiles.

It would be a mistake, however, to look only at these limitations and to conclude that the Strategic Air Command is waiting around in a position of weakness until its new weapons are ready. While Peacekeeper, the B-1B, and the advanced technology bomber (ATB) will be required to preserve SAC's striking power a few years from now, SAC

today remains a potent force against the current threat.

Priority on Current Force

Senior SAC planners say that, as modified, the B-52 should be able to penetrate Soviet defenses for at least the remainder of this decade. The air-launched cruise missile (ALCM), now operational with three bomb wings, enables the B-52 to attack targets from greater distances. The small fleet of FB-111A medium bombers is superb at low-level penetration. Command control and communications links have been upgraded for all SAC forces. Missiles, bombers, and command posts have been given additional protection against electromagnetic pulse (EMP). A major refurbishment program is under way for Minuteman missiles and launch facilities, and the accuracy of Minuteman II and III is being improved.

—USAF photo by MSgt. Robert Wickley

Both the B-52 (left) and Minuteman (above) have remained in service longer than expected. Strategic modernization is needed, but existing weapons have been improved and are still effective against the current threat.

"Tradeoff decisions have to be made in order to fund the modernization program, but my highest priority is to keep the current inventory in the best possible condition so that it can continue to be a credible deterrent to war," says Gen. Bennie L. Davis, SAC's Commander in Chief.

"Those who are not involved with it on a daily basis get the impression that we don't really need to modify and update existing systems because the B-1 and the MX are just over the horizon. The fact of the matter is that they are *not* just over the horizon. We attain an initial operational capability with the B-1B and MX in 1986. Development of the new small missile and the advanced technology bomber will take us until the early 1990s."

Indivisible Airpower

As always, SAC's first responsibility is readiness to deliver nuclear weapons in execution of the Single Integrated Operational Plan (SIOP). There is a new emphasis, however, on nonnuclear operations.

With airpower of all sorts at a premium, interservice and intercommand mission boundaries appear to be fading in importance. A concept that SAC calls "indivisible airpower" is taking hold, and says that forces ought to be employed according to capability and targets to be hit, not by hidebound tradition or absolute separation between strategic and tactical roles.

Because of its global reach and large payload, SAC has been tasked with non-SIOP missions all along. SAC's B-29s were employed extensively in the Korean War, and its B-52s in Vietnam. Today, a large portion of SAC's B-52 force is tasked for conventional operations in support of the European, Atlantic, Pacific, Southern, and Southwest Asia theaters.

In 1983, B-52s at Loring AFB, Me., achieved limited operational capability with the antiship Harpoon missile, to be employed in coordination with the Navy for defense of sea lanes. SAC bombers also perform mine-laying and sea-surveillance missions.

Theater CINCs would like to have even more strategic support from SAC. The B-52, if modified, would be well suited to providing that support, but there are two significant problems.

Munitions and Numbers

The most immediate one is lack of appropriate munitions. Emerging technology points toward standoff conventional weapons of great accuracy and effectiveness—but that's in the future. At present, SAC has nothing good in its nonnuclear stockpile for attacking major theater targets.

"All we have for the conventional role are gravities and Harpoon," says one SAC briefer. "Against runways, 750-pound bombs are no good. They just bounce. The British used 2,000-pounders in the Falklands, and that didn't do it."

The medium-range air-to-surface missile (MRASM) might have satisfied SAC's need for a standoff conventional weapon, but Congress canceled it last year in favor of a substitute to be named later.

Among the possibilities being discussed to fill the gap is a long-range attack weapon in the 1,000-pound class with a standoff range of perhaps 150 nautical miles, carrying either a unitary warhead or submunitions. Another option would be some conventional derivative of ALCM.

The second problem in making more B-52 support available is a looming shortage of B-52s. SAC has 168 G models and ninety-six H models with which to cover its SIOP and conventional tasking. All of the older B-52s have been retired.

SAC's plan has been to convert the B-52Hs to cruise missile carriers by the end of 1986 and to employ both G and H models with ALCM until the early 1990s. Ninety B-52Gs are now designated as ALCM carriers. After 1986, the plan called for most theater support to come from the non-ALCM B-52Gs.

Last year, however, the Defense Resources Board (DRB)—as a cost-savings measure—ordered early retirement in 1988 for the ninety ALCM Gs *(see October '83 issue, p. 14)*. If the DRB decision stands, SAC would lose 1,080 ALCM stations and be left with a smaller B-52 fleet to meet the growing demand for its services.

The B-52 Adapts

The B-52 is a survivor.

Between 1955 and 1962, SAC took delivery of 742 of the big bombers. With the retirement of the last D models in 1983, only 264 aircraft from that original fleet remain.

The designers intended the B-52 to operate at high altitudes, but when surface-to-air missiles came into use, that was no longer possible. It became a low-level penetrator. Since then, the B-52 has undergone a long string of modifications to keep it one jump ahead of the threat.

Terrain-avoidance radar and other improvements permit it to barrel along at 400 feet above the ground. Development of the short-range attack missile (SRAM) gave it a counterpunch against defenses it might encounter en route to the target. Decoy missiles and new electronic countermeasures (ECM) reduced its vulnerability.

But Soviet defenses improved, too. Some 7,000 ground-based radars ring the Soviet Union. A variation of the Ilyushin Il-76, able to pick out low-flying aircraft from ground clutter in the radar returns, is coming along as a Soviet answer to the Airborne Warning and Control System (AWACS). The MiG-31, the first Soviet fighter with true look-down/shoot-down capability, is now being deployed.

Shoot and Penetrate

Currently, the B-52 is transitioning from strict penetration tactics to shoot-and-penetrate. It would launch its ALCMs at high altitude against distant targets, then drop down and push to the radar warning line at low altitude, jettison its pylons, and continue on to deliver its other weapons in a classic penetration tactic.

Its ability to perform in this role is based in part on the expectation that defenses will have been "attrited" somewhat by ballistic missiles when the B-52s arrive to begin their penetration routes.

As the B-1B and the advanced technology bomber come into active service and as Soviet defenses improve still further, the B-52's SIOP role will become that of a standoff ALCM carrier. It will no longer be used to deliver SRAM or gravity weapons.

The B-52 is in the midst of yet another round of mission-enhancing modifications. The Offensive Avionics System (OAS) gives it improved navigation, radar, and data-processing features necessary to its employment of ALCM. The G model B-52s are getting electronic jammers to use against radars operating in the seek-and-acquire mode.

The Bomber and the Analysts

Deskbound analysts have been proclaiming—prematurely, as it turns out—the demise of the manned bomber for the past quarter century. The B-70 was supposed to be the follow-on to the B-52, but the prevailing wisdom of the 1960s was that it represented an obsolete concept, and so it was killed. The analysts said further that the B-52 was near the end of the road.

"But, as usually happens, the offense responds to the defense," says Lt. Gen. George D. Miller, Vice CINCSAC. "We took the B-52 which was designed to fly at high altitudes and began to fly it at low altitudes to get underneath the radar. We developed some different weapons like the SRAM. We changed the ECM suite to combat the radars and we modified the routes that the aircraft would fly. Where we weren't able to avoid the defenses, we set up direct attack on them. So by the early 1970s, we were able to penetrate with about the same degree of probability that we [had] in 1960."

The next successor planned for the B-70 was the B-1A, and the analysts were soon back with the same old story. Their viewpoint was one of the considerations in cancellation of the B-1A. Through all of this, the B-52 kept plugging away.

"Our analysis today shows that we're capable of penetrating pretty well with the airplane we have in the inventory now," General Miller says. "Its probability of survival through the defenses is not quite as high as it used to be. We understand that. But the airplane is capable of penetrating. And there is every indication that, in spite of the proliferation and improvement in Soviet defenses, we're going to be able to penetrate well into the foreseeable future with the B-1B."

Bomber Alert

The B-52 contributes forty-five percent of the total megatonnage of the strategic triad of ICBMs, SLBMs, and bombers. The airfields from which it operates, however, cannot be hardened to any appreciable extent against preemptive attack, so a fast getaway is important.

At any given time, some thirty percent of the bomber force is on alert. The usual positioning is to park each B-52 on an individual ramp angling into the runway. If the situation warrants, the aircraft can be moved forward from this "Christmas tree" pattern and onto the runway. Time to launch is reduced also by prepositioning of switches or even by having crews on alert in the aircraft. A quick start modification in the 1970s introduced a cartridge charge that cranks all eight engines simultaneously and winds them up in a hurry. The six or eight aircraft in the Christmas tree pattern can be airborne in a couple of minutes.

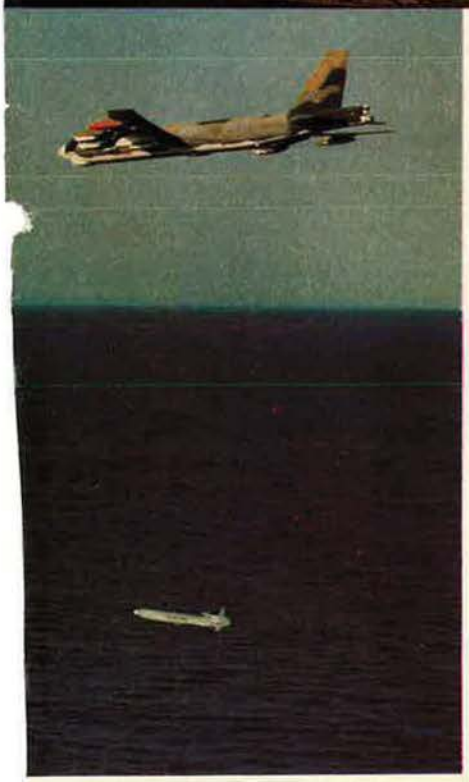
Since getting the bombers airborne does not send SAC to war,

General Davis (above) takes his turn as airborne emergency actions officer on Looking Glass. B-52s stand alert in "Christmas tree" pattern (top right). ALCM (bottom right) enables the B-52 to attack targets from greater distances.

the B-52s can be launched by CINCSAC as a precautionary measure. Without specific orders from the National Command Authorities to proceed to their targets, they will subsequently return to base.

SAC says it has taken steps to reduce the amount of time required to bring the remainder of the B-52 force on alert and to get it into the air.

Some modifications in progress for the B-52 are intended to correct deficiencies attributable to aircraft age and vintage technology. The highest priority here is to update the B-52's vacuum-tube strategic radar, the mean time between failures of which is down to eight hours. The modification promises a sevenfold improvement. The autopilot, its technology rooted in the 1940s, fails



about every thirty hours and malfunctions at dangerous times. It has been known to pitch the aircraft up during aerial refueling and to give trouble in low-level flight.

ALCM

The air-launched cruise missile is now operational with B-52G wings at Griffiss AFB, N. Y., Wurtsmith AFB, Mich., and Grand Forks AFB, N. D. More wings will be in business soon: Fairchild AFB, Wash., in April, Blytheville AFB, Ark., in January 1985, and Barksdale AFB, La., in December of 1986.

At present, ALCMs are carried only on wing pylons of the B-52, but the Common Strategic Rotary Launcher (CSRL), now in development, will allow internal carriage in the bomb bay as well. The CSRL will accommodate ALCM, SRAM, gravity bombs, or whatever standoff weapons are forthcoming.

The CSRL will give the B-52 flexibility in reconstituting for another mission after an ALCM strike. It will have the option to reload with the most advantageous weapon, which may not be ALCM. Today, specialized equipment—which might not be available at one of the recovery bases—would be required to remove internal ALCM racks from a B-52, and the process is cumbersome.

An advanced cruise missile is in prospect, but ALCM planners are looking at ways to get the most out of the current model, and perhaps to improve it. They speak of "clobber analysis," meaning how finely the tradeoff can be cut between flying ALCM at the lowest possible altitude and the danger of clobbering it into the ground. Today's ALCM is thrust-limited. A more powerful engine would make it more agile in negotiating rough terrain—especially on hot days when lift is robbed by thin air—and enable it to hug the ground more closely in flight.

Titan Deactivation

Titan II, the aging, liquid-fueled heavyweight of the missile force, is being phased out after more than two decades of service. The first of the retiring Titans was taken out of its silo in October 1982, and another one is being pulled every forty-five days until deactivation is completed in 1987.

Although Titan is less accurate than Minuteman and has become something of a support problem in recent years, its big warhead can still put some formidable targets at risk. "There is as much difference in the size of warheads as there is between cannon balls and BBs," Gen. Russell E. Dougherty, USAF (Ret.), AFA's Executive Director and former CINCSAC, said to the Senate Armed Services Committee in 1982. "It takes lots of BBs to make up a cannon ball."

The retirement of Titan was an economic decision primarily. Money had to be found for strategic modernization.

"Had unlimited resources been made available, I would have preferred certainly to keep Titan IIs in the inventory because of their contribution," General Davis says.

Little notice has been taken by the public of the Titan deactivation—or of the retirement of all the B-52Ds, for that matter. These were strategic force reductions made without reciprocal reductions by the Soviet Union.

"We have retired in this past year about twenty-five percent of our B-52s," says General Miller. "I don't see that mentioned in the newspapers. And we haven't received much credit for the fact that we're retiring the biggest missile in our inventory."

Concerns About Minuteman

Until Peacekeeper is fielded, the main burden of preserving the ICBM aspect of deterrence will be borne by 450 Minuteman IIs and 550 Minuteman IIIs. Minuteman was designed for a ten-year operational life, and most of the force has exceeded that already by a considerable margin.

Accuracy and yield have been improved by modifications over the years, and a silo upgrade program completed in 1980 has given additional protection against blast, shock, radiation, and electromagnetic pulse. Work is in progress to

provide Minuteman even greater accuracy.

Major action has begun to correct the deteriorating physical condition of the missiles and the launch facilities, which are showing the effects of age.

The eventual breakdown of propellant in the upper stages of the missiles had been predicted and has now come about. Second stages are being repoured and nose tips are being replaced. When a missile is pulled for refurbishing, a substitute is emplaced so that no silos are left empty as the periodic maintenance proceeds.

The silos and launch control facilities have been eroded by water seepage and are in need of general renovation. The program to restore them is called Rivet Mile. It will begin in 1985 and continue through 1993. It will also incorporate some upgrading, especially in increased hardening for the facilities.

The big concern about Minuteman is the hard-target shortfall.

Since the mid-1970s, the Soviet Union has hardened or superhardened most of its ICBM silos and control facilities, and it appears that most of them will be superhard by the 1990s. The Minuteman warhead, based on technology developed in the early 1960s, was never designed to attack targets hardened to these levels.

Soviet hard-target capability, however, has been improving by leaps and bounds. Late model SS-18 and SS-19 systems have significant destructive potential against US ICBM silos. The damage could be compounded by Soviet targeting of each US silo with additional warheads.

—Photo by Art Director William A. Ford

Aircraft used to collect strategic intelligence information include the SR-71 (top) and the U-2 (above). SAC also operates RC-135s in the reconnaissance role, and the TR-1, a new version of the U-2, is being produced. The air refueling capability of the KC-10 (right) is three times that of the KC-135, and it also carries an impressive cargo load.

Progress in C³I

The strategic modernization plan laid out by the Reagan Administration puts unprecedented emphasis on command control communications and intelligence (C³I).

"I think we have made more progress over the last three years in C³I—in real terms and in terms of investing in the future—than we made in the past twenty-five years," General Davis says. "Certain very endurable C³I systems we can't get by the day after tomorrow. We're fixing the things we can fix in the near term, and in fact we have already fixed some of them."

SAC command posts and the missile and bomber fleets are now outfitted with Air Force Satellite Communications System (AFSATCOM) links, full operational capability having been achieved in 1983. The SAC Digital Network (SACDIN) of high-speed, secure landlines will begin operating in mid-1985. The network of voice and data communications channels is varied and redundant by design, so that command and control can be maintained even if some parts of the system fail or are destroyed. An unusual part of the network is the Emergency Rocket Communications System (ERCS), which integrates a commu-

—Photo by Art Director William A. Ford

KC-135 tanker crews log approximately forty-six percent of SAC's flying hours and meet refueling needs of aircraft from many commands.

nications package instead of a warhead into a Minuteman missile payload. It can transmit to ground stations and aircraft on two UHF frequencies simultaneously.

Messages from the National Command Authorities fan out to the alert forces through SAC's underground command center at Offutt AFB, Neb., or from its backup, the EC-135 airborne command post—called "Looking Glass" because its capabilities are a mirror image of those in the underground facility.

The Red Telephone

When the alerting network is activated in Washington, the message is patched through immediately to the waiting missile and bomber crews. When a controller in the SAC command center picks up the fabled red telephone—the Primary Alerting System of dedicated land lines—he can speak directly and instantly to 200 operating locations, including every missile launch control center and each bomber and tanker wing. Data on everything from weather to progress of a strike force is available in the SAC Automated Command Control System (SACCS) for use by the battle staff.

Looking Glass crews know they will not take over unless what they refer to as "an event" has occurred and the underground command center is out of business.

"We are just the opposite of a first-strike weapon," one Looking Glass officer says. "We wouldn't need this alternate command post if we had first-strike intentions. The Soviets don't have anything like it."

Twenty-six SAC general officers—including General Davis—take their turns as the airborne emergency actions officer aboard Looking Glass, there to take command of battle forces if need be. At least one airborne command post has been in the air every minute since February 1961.

Minuteman missiles can be launched not only by the primary launch control center but also by any LCC in the same squadron or by the airborne command post. This compels the Soviets to target all 1,000 missile silos if they want to knock out the Minuteman force. They can't do it by striking the launch control centers alone.

The E-4 was considered as a replacement for the EC-135 Looking Glass aircraft and even flew some missions. USAF decided to stick with the -135, though, because of the cost of acquiring and operating E-4s. Since Looking Glass flies constantly, the fact that the E-4 consumes three times as much fuel as the -135 was a significant consideration.

Pacer Link, a modification program for the EC-135, will begin shortly and add EMP protection, update communications, and create more work space for the battle staff through miniaturization of electronics.

—Photo by George Hall

The FB-111 operates at extremely low altitudes, but it carries less of a payload than does the B-52.

Although not chosen for the Looking Glass job, the E-4 is in operation as the National Emergency Airborne Command Post to be used by the National Command Authorities in the event of war. The E-4 has moved inland from its previous location at Andrews AFB near Washington, where it was vulnerable to submarine-launched ballistic missiles. It operates now primarily from Offutt, with forward basing at Grissom AFB, Ind.

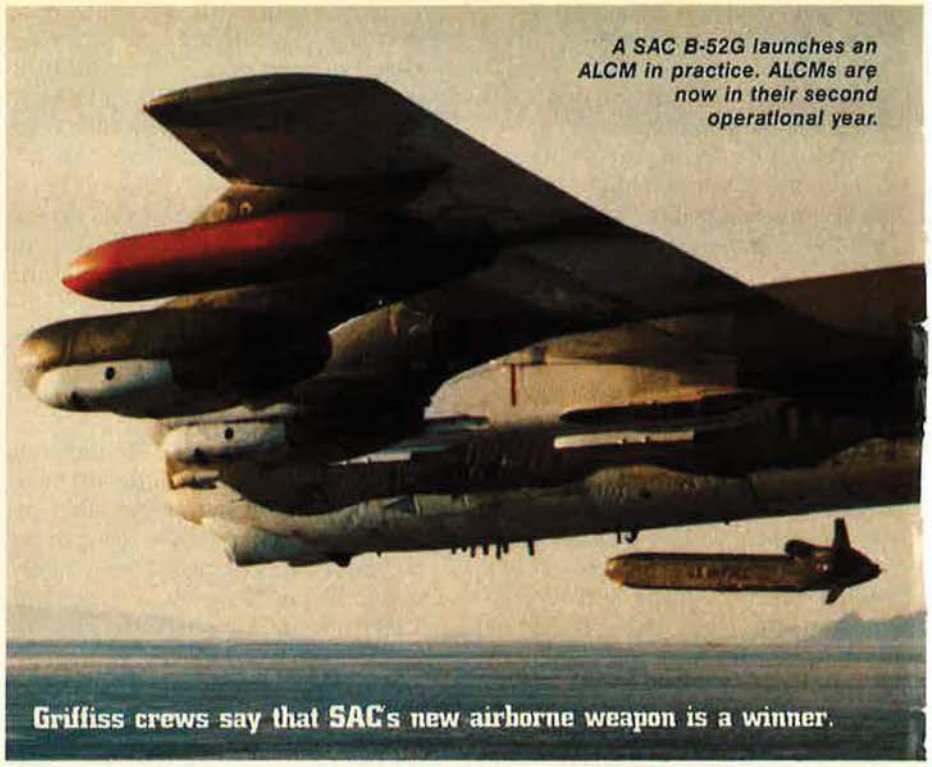
Fundamentals of Deterrence

"Deterrence is a product of two factors," General Davis says. "First we must have—and the Soviets must perceive that we have—the capability to deny them their goals at any level of conflict.

"Second, we must have—and the Soviets must perceive that we have—the will as a nation to exercise that capability in defense of our national interests. Pronouncements about an assured retaliation with nuclear weapons must be credible."

The strategic US triad of submarine-launched ballistic missiles, land-based ICBMs, and manned bombers is, for the time being, ample for that.

"What deters the Soviets," General Davis says, "is the knowledge that the gain on their part from initiating a strategic nuclear exchange would not be worth the resultant damage to their homeland." ■



A SAC B-52G launches an ALCM in practice. ALCMs are now in their second operational year.

Griffiss crews say that SAC's new airborne weapon is a winner.

ALCM in Its Second Operational Year

BY CAPT. PATRICIA R. ROGERS, USAF
CONTRIBUTING EDITOR

THE air-launched cruise missile (ALCM) is rounding into fighting trim with Strategic Air Command's 416th Bombardment Wing at Griffiss AFB, N. Y. As the first SAC wing to receive ALCMs, the 416th took on the tough job of making the missiles combat-compatible with the wing's sixteen B-52G bombers. That job has involved much testing of the bomber-missile system in the air and on the ground and is far from finished. But the 416th, beginning its second year of ALCM operations, exudes confidence that it has the ALCMs well in hand.

ALCM reached initial operational capability in December 1982, when the wing's bombers were pronounced capable of standing routine alert with a full complement of cruise missiles aboard. Such operational status did not mean that the ALCM testing program had ended. But it did signify that the cruise missiles had come into their own in relatively short order.

High Promise

The high promise of the ALCMs' strategic standoff capability was a major reason why President Carter ruled against B-1 bomber production in 1977. For USAF's strategic penetration mission, Mr. Carter opted instead for the ALCM. He also looked forward to their introduction as SAC operational weapons by Fiscal Year 1981.

President Carter was not far off. The first ALCM was delivered to the 416th Bombardment Wing in January 1981, and nine months later the ALCMs attained operational status at Griffiss.

The reason for the delay was that the production-model ALCMs still needed considerable testing and evaluation aboard bombers. Concurrency of development and production is fairly typical of new weapon systems. In the case of the ALCMs, however, such concurrency has been especially pronounced. This has resulted in the discovery of many problems. But it has also brought forth, at the hands of the 416th Bombardment Wing, solutions arrived at solidly in actual practice.

The gray ALCMs look menacing hanging off the wings of the B-52Gs. Two white pylons, one on each wing, pack six ALCMs apiece. Each ALCM is twenty feet, nine inches long, and can travel a distance of about 1,500 miles at low altitude. During a launch, the ALCM's twelve-foot-span wings pop out and the F107-WR-101 turbofan engine kicks in to propel the missile at subsonic speeds. Weighing only 141 pounds, the engine produces some 600 pounds of thrust.

ALCM is always launched at a predesignated area planned in the mission and flies complicated routes to its target using an inertial navigation system and a terrain contour matching (TERCOM) guidance system. TERCOM compares surface characteristics, gathered by bouncing a radar beam off the ground, with computerized maps of the flight route stored in the guidance set to determine its position. As the ALCM nears its target, the TERCOM comparisons become more specific until it hits its target.

As part of the follow-on operational test and evaluation, Griffiss crews launched ten ALCMs between September 1982 and November 1983. They liked what they saw. "The CEP [circular error probable] is quite low," said Col. Walter E. Webb, Commander of the 416th Wing. "She's right up to specifications in terms of being a very accurate system."

B-52 crews from Griffiss launch ALCMs over the Utah Test and Training Range. Once launched, an ALCM is chased by from two to four F-4s from Edwards AFB, Calif., with remote control capabilities over the missile as a safety precaution. Once the flight to target is over, the missile climbs to 15,000 to 18,000 feet and deploys a parachute. Then a helicopter from Hill AFB, Utah, recovers the missile in midair and brings it back to the base for inspection and tests. Finally, the ALCM is shipped back to Boeing in Seattle for refurbishment and reuse by SAC.

Originally the Air Force planned to buy 4,348 ALCMs. But it cut the buy to 1,739 in December 1982 because it had decided to develop a follow-on advanced cruise missile *(see also page 50).*

The Place To Be

However, this has not dampened the enthusiasm among aircrews for the current weapon system. They clearly regard it as a major enhancement of their bombers, which are being modernized in other ways as well. As Capt. William Ennis, a B-52 pilot, puts it: "Griffiss is the place to be in SAC. We have the magic of the Offensive Avionics System [OAS] downstairs [in the navigator's station] and ALCM with its standoff capabilities."

OAS seems like magic when compared to the old vacuum-tube analog system that OAS replaced. With the push for ALCM, the new avionics system already planned for the B-52 had to be modified for the cruise missile. OAS, a sophisticated electronics package, substantially modernized the B-52 by using solid-state digital systems.

"The OAS has been a big help," said Maj. Brian H. Cioli, a flight commander and radar navigator in the 668th Bombardment (Heavy) Squadron. "The navigation has been so accurate that you can spend a lot more time looking at and accessing the terrain and providing accurate inputs to the pilot."

With the original 1950s technology avionics, the navigator or radar navigator was more of a maintenance man than part of a navigational team. They came aboard with screwdrivers, pliers, spare vacuum tubes, and numerous other parts that might break down in flight and take the navigator or radar navigator away from working with the rest of the aircrew. The high cost of repairing the system was one of the reasons for replacing it.

The OAS figures strongly into a successful ALCM launch because the OAS's computers relay the ALCM mission to the missile's computer via connector cables between the B-52 and the missile. First, the actual missions are developed at the Joint Strategic Target Planning Staff at SAC headquarters in Omaha and sent to Griffiss. Two sections at Griffiss, the Bombing-Navigation Branch and Operations Plans, cut mission tape cartridges working with a computer system called Mission Data Planning System. These cartridges, somewhat similar to those used in a videotape cassette recorder, are called Data Transfer Unit Cartridges (DTUC). Operations Plans also makes up training tapes specifically for Griffiss aircrews.

When the crews prepare for a real or simulated launch, the navigator carries four DTUCs in a container resembling a large fishing tackle box. He puts them into the OAS system. The first cartridge has the B-52 mission profile; the second contains all the data concerning the simulated ALCM mission for that day; the third cartridge holds the executive program, which basically tells the OAS computers that they are OAS computers and not word processors; and, finally, there's the recorder, or "stool pigeon." It records inputs about most of the important aspects of the flight for later use in maintenance and operations analysis. It also records certain types of crew errors—hence the nickname.

Launching ALCM

The ALCM can be launched automatically by the OAS or manually by the aircrew. Either way, the navigator and the pilot must set specific knobs before the weapon will release. While ALCM is normally launched at high altitude, both high- and low-altitude simulated launches are practiced by the crews.

Before any simulated or actual launches, the navigation team constantly monitors the OAS, which feeds information to the ALCM computers via cables.

Prior to an actual launch, the copilot starts shifting fuel to maintain the B-52's center of gravity. A pylon with six ALCMs on it is the length and weight of an F-16. To counterbalance this load on the wings, extra fuel is stored in the aft fuel tanks. As the ALCMs are launched, fuel is transferred forward to keep the aircraft's nose from pitching up.

Crew members have described an actual launch as a "loud clunk" or a "shuddering of the aircraft" as the ALCM is ejected from the pylon.

While ALCM has brought an added operational dimension to the B-52, the maintenance troops have borne a large part of the problems inherent in concurrent development.

"We have had to do the impossible quickly," said MSgt. Steve Cochran, NCOIC, Missile Munitions Maintenance, 416th Munitions Maintenance Squadron.

His good-natured attitude is characteristic of the wing as a whole and has helped bring the ALCM on line in the projected time frame. Even though many people—especially in the 416th Munitions Maintenance Squadron and the 416th Avionics Maintenance Squadron—worked twelve-hour days seven days a week for fifty-five of seventy-eight weeks

—Photos by Art Director William A. Ford

LEFT: Practice loading of an ALCM pylon on a B-52G. ABOVE: A1C Gary Beatty operates a Portable Control Unit (PCU) for the ALCM trailer.

between July 1981 and December 1982, they can still manage to joke about it.

In fact, bringing the ALCM on line meant working out glitches in the design of the weapon, the test equipment for it, and the technical orders for both.

For instance, the original process for mating a missile-laden pylon with a B-52 wing took four to eight hours because the load crew couldn't see where the pylon locked onto the hard points of the wing.

"A cry went up from the wing," said Colonel Webb. " 'Hey, I think we're going to have problems loading the pylon,' and Boeing redesigned it so that munitions maintenance people could visually see the whole process."

Under the present system for mating pylon to wing, it takes only one and a half hours. A five-man load crew accomplishes the task with the aid of the MHU-173/E, a huge trailer with a computer and Portable Control Unit. Once rolled into place, its four huge pads lower hydraulically, removing the weight from the wheels. Then it has a whole range of motions to help marry the pylon to the wing.

In another example, a fiberglass fairing was needed for the ALCM pylon to prevent buffeting of the aircraft during flight, but it wasn't all that easy to attach once the pylon was on the B-52. Engineers designed a costly gadget to attach it, but SSgt. James W. Mackey, Jr., the Loading Standardization Crew Team Chief, suggested pairing it with the pylon before it was mated to the wing. This worked.

Imaginative People

There are many other instances of this kind of ingenuity and initiative in the wing. But besides innovation and hard work, the ALCM has simply brought a lot of day-to-day working changes to the maintenance complex. A big, industrial-type facility, the Integrated Maintenance Facility, was constructed specifically for ALCM.

The Boeing-made missile is shipped directly to the IMF where it is uncrated and inspected visually. Then it is placed on a test stand and connected by cables to an Electronic Systems Test Set, a computer that can check the ALCM's internal circuitry.

Once maintenance personnel have checked out six ALCMs and the pylon they are carried on, the MHU-173/E trailer takes them to an alert aircraft or stores them in drive-through igloos that hold up to four pylons loaded with six ALCMs each. The pylons have to be tested again within a year, and the ALCM engines must be changed every thirty months.

"If the balloon goes up, there are fewer flight-line checks for ALCM than other missiles," said Lt. Col. Donald F. Campbell, Acting Deputy Commander for the 416th Combat Support Group and the original 416th Wing ALCM project officer.

While the ALCM has meant a lot of hard work for the wing, that work has not gone unrecognized. The wing has received several awards, among which are the Air Force Outstanding Unit Award for 1982, SAC's Outstanding Munitions Maintenance Squadron for 1982, and the Barrentine Trophy and Best Crew Chief Testing Trophy at the 1983 SAC Combat Weapons Loading Competition.

"I'm quite proud of what we did here," said Colonel Campbell. "We always had the capability to do the things we said we did. But it took the very imaginative people in this wing to work around problems."

These imaginative people are still working out the bugs in the ALCM.

"We're still on the steep part of the learning curve with regard to ALCM," said Colonel Webb. He explained that it takes five to ten years to understand fully the operational capabilities of a weapon system. It is clear by now, however, that ALCM is a going concern. As the Colonel put it: "We are well pleased with the capabilities of the system." ■

Fully armed with ALCMs, a B-52G of SAC's 416th Bombardment Wing at Griffiss AFB stands routine alert under sentry protection.

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STAYING AHEAD IN THE RACE TO TOMORROW.

A Full-Bodied Triad

Finally, USAF is making real progress on its ICBM and bomber programs, but strategic modernization could still fall victim to fiscal cannibalism.

BY JAMES W. CANAN
SENIOR EDITOR

THE US strategic modernization program that President Reagan promulgated in October 1981 is falling into place. In limbo for several years, new strategic weapons are now making appearances on test ranges or in aerospace plants. Others, to follow, are being designed or developed. Altogether they hold high promise for a full-bodied triad of US strategic forces well into the twenty-first century.

Much credit goes to the President's Commission on Strategic Forces, a bipartisan panel of defense experts headed by Lt. Gen. Brent Scowcroft, USAF (Ret.), who served as National Security Advisor to former President Ford. In its report of last April, the so-called Scowcroft Commission buttressed and refined the rationale for the President's program and gave it enough impetus to get its most controversial element, USAF's Peacekeeper ICBM, through Congress.

Now Peacekeeper has passed initial flight tests and is headed for production. USAF's B-1B bomber, also a big beneficiary of Scowcroft Commission endorsement, is firmly on track. Second-generation air-launched cruise missiles (ALCMs) are starting to equip the B-52 bomber force. The Navy's Trident I submarine-launched ballistic missile (SLBM) and submarine-launched cruise missile (SLCM) forces are expanding. Strategic command control and communications (C^3) and strategic defense programs are receiving extraordinary attention for the first time in many years.

All fit the President's bill, with more in the offing. Development of USAF's "Stealth" advanced technology bomber (ATB) is coming along well. The small intercontinental ballistic missile (SICBM), which was roundly endorsed by the Scowcroft Commission, has caught on with USAF and is taking form on paper. So is the advanced cruise missile (ACM). And the Navy's Trident II (D-5) submarine-launched ballistic missile, of longer range and greater accuracy than the Trident I (C-4) missile, should be ready for sea duty in just a few more years.

So far, so good. "Our strategic modernization program is right where we want it to be," claims Richard D. DeLauer, Under Secretary of Defense for Research and Engineering. USAF officials, too, seem satisfied at this juncture.

"I am tremendously encouraged by the successes of the strategic modernization program we have under way," declares Col. E. M. Collier, Special Assistant for Strategic Programs to USAF's Deputy Chief of Staff for Research, Development and Acquisition.

Funding Pitfalls

It may be difficult, however, to sustain the presently brisk momentum of strategic modernization in all its forms. This is why USAF is taking care not to let up or to seem smug. "Strategic modernization is still our number-one priority," affirms Lt. Gen. Robert D. Russ, USAF's Deputy Chief of Staff for Research, Development and Acquisition.

Funding may be a near-term pitfall. When President Reagan announced his program nearly two and a half years ago, he called it one "that the nation can afford." Before too long, however, the nation's will, not its wherewithal, may be called into question.

Paying for the program will require only fourteen percent of the US defense budgets that the Administration is projecting over the next five years, Secretary DeLauer told AIR FORCE Magazine. But those budgets, and their projected spending on strategic modernization, may run afoul of a major slowdown in the rate of growth of defense spending. Such a slowdown began taking shape last year on Capitol Hill and may become more pronounced as part of a growing effort to cut the national debt without raising taxes out of bounds.

There are also the related dangers of fiscal cannibalism and of incoherence among the expanding elements of the strategic modernization program. For example, the development and testing of laser and other exotic technologies befitting the Administration's Strategic Defense Initiatives (SDI) program are expected to cost a bundle—at least $18 billion—over the next five years.

Pentagon champions of deterring nuclear attack by virtue of a strong triad of offensive forces are wary of SDI. It could drain not only funds but also the present sense of urgency from programs to modernize offensive strategic forces.

The SDI program can be accommodated in the overall context of strategic modernization so long as its technologies are nurtured at a prudent pace and not rushed prematurely into high-cost production programs, USAF officials believe. But many worry about its upshot.

"If I have an SDI system oriented to space, my Achilles' heel could become my offensive capability in the atmosphere," declares one USAF general. "The big question is: How would we manage the transition from reliance on offense to reliance on defense? This is where arms control could come into the picture. If there are fewer offensive weapons, the defense gets easier."

What it comes down to is that SDI and arms control are the wild cards in the strategic modernization game. Pending their coming into play, however, USAF is intent on leading from strength with the strategic-offense programs it has in hand.

Peacekeeper on Target

The Peacekeeper program now fits that category. Starting last June

LEFT: USAF Peacekeeper ICBM vaults from its Vandenberg AFB, Calif., test stand on December 20 en route to the mid-Pacific. ABOVE: B-1 prototype reconfigured as a B-1B takes off from Edwards AFB, Calif. (USAF photo by TSgt. Wayne Specht)

17, Peacekeeper flight tests, during which the missiles are launched from Vandenberg AFB, Calif., and travel more than 4,000 miles to the Kwajalein Missile Test Range in the Pacific, have been reassuring and more. "Accuracy has been phenomenal, just as we expected," says one officer in the Peacekeeper program.

Altogether, twenty such tests are scheduled through the end of 1987—the first nine from above-ground test stands, the remainder from silos replicating those in which the ICBMs will be emplaced at F. E. Warren AFB, Wyo. Construction of fifteen base-support buildings will begin at Warren this spring. Peacekeepers will start going into silos there in 1986, and the first ten missiles will be operational by the end of that year. The full complement of 100 Peacekeepers is expected to be operational by the end of 1989.

There are now 200 Minuteman III ICBMs on alert around Warren, with silos in adjoining corners of Wyoming, Colorado, and Nebraska. Modifications of half of those silos for the Peacekeepers will be relatively minor. The silos will not be hardened above present levels. But the Peacekeepers will be given added protection in the form of new shock isolation systems, and by means of the canisters in which they are designed to repose.

Peacekeeper is a four-stage missile configured to deliver ten reentry vehicles (RVs) to disparate targets at ranges of more than 5,000—probably closer to 6,000—miles. Its first three stages use solid propellants. Its fourth stage—the post-boost vehicle embodying up to ten RVs—gets its power from a liquid-propellant, axial-thrust engine. Eight small engines provide attitude control. The post-boost vehicle also contains the missile's guidance and control system and a deployment module.

The guidance system is the prizewinner. Peacekeeper's classified circular error probable (CEP) will be significantly tighter than the Minuteman III CEP, which is believed to be about 700 feet. Such accuracy, together with the Mk 21 RVs' payload, will make Peacekeeper the nonpareil hard-target destroyer in the US strategic arsenal.

The Beryllium Ball

At the heart of Peacekeeper's guidance and navigation system is the Advanced Inertial Reference Sphere (AIRS) with its highly advanced Inertial Measurement Unit (IMU). A "beryllium ball" weighing 450 pounds, the AIRS assemblage was designed for exquisite accuracy and, in keeping with that, great resistance to stress and temperature changes.

Unlike Minuteman III's gimbal-mounted, metal-touching-metal gyroscopes and accelerometers, those of Peacekeeper's AIRS are snugly suspended in a highly viscous fluorocarbon liquid, which gives them free play but shields them against environmental fluctuations and keeps them from being bumped around. AIRS's beryllium housing is also virtually impervious to the drastic changes of temperature that a ballistic missile undergoes in flight.

The demonstrated success of the AIRS system is the big reason why USAF is looking with favor on a lighter, smaller variant of it for the embryonic SICBM. Other kinds of guidance are also being considered, such as the stellar-updating system characteristic of the Navy's D-5 SLBM now in engineering development.

Navy sources claim that the D-5 missile's star-seeking guidance system, which is designed also to take advantage of signals from Navstar Global Positioning System (GPS) satellites, will make the D-5 a hard-target killer. Until the D-5 came along, benefiting from advances in digital electronics, such capability was beyond SLBMs. Their inertial guidance and navigation systems could not, and cannot now, compensate for the imprecision inherent in

determining their launching submarines' positions relative to the movement of the earth.

The D-5 will go a long way toward surmounting that problem, but maybe not wholly. As the Scowcroft Commission reported: "The D-5 missile's greater accuracy will . . . enable it to put some portion of Soviet hard targets at risk, a task for which the current Trident I [C-4] missile is not sufficiently accurate."

Even so, USAF is not wild about adopting D-5 guidance for land-based ballistic missiles. The Air Force makes much of the fact that Peacekeeper's guidance function is carried out by a totally self-contained inertial guidance and navigation system and that the missile is wholly independent of external navigational references or commands. Dependence on such references introduces an element of insecurity. For example, GPS satellites may not survive very long if the balloon goes up.

Trimming the AIRS system down to size for the SICBM will be a big challenge. It will have to lose about 150 pounds with no sacrifice of capability. The trick in the SICBM program will be to build a missile capable of delivering about 1,100 pounds of payload—the guidance system and an RV of about 430 kilotons—with the accuracy of Peacekeeper, and to base the SICBMs out of harm's way.

Sphere containing enough high explosives to simulate a one-kiloton nuclear blast awaits detonation at White Sands Missile Range, N. M., in a test of effects on small-ICBM model transporter/launcher vehicles.

In this artist's concept, a space-based laser fires on a target in orbit. Such weapons could emerge as part of the Strategic Defense Initiatives (SDI) technology program now being pursued.

Congress snapped up the Scowcroft Commission's strong recommendation for USAF reversion to single-warhead ICBMs on grounds that they would be easily verifiable weapons and thus conducive to future strategic arms control. As the Commission realized early on, the arms-stabilization allure of SICBM was the leverage that the Administration needed to get Peacekeeper through Congress.

But USAF paid a price. In its Fiscal 1984 military authorization bill, Congress mandated that SICBM weigh no more than 33,000 pounds, that it be based in a mobile mode, and that its major subsystems be tested prior to Peacekeeper's 1986 initial operational capability (IOC). Moreover, the first flight test of the small, single-warhead missile must take place before the fortieth Peacekeeper is deployed, as scheduled, in 1988—or else Peacekeeper deployment will end right there.

USAF is hoping for congressional amelioration of such strictures in coming years. Right now, however, says one USAF official, "We are tied to the congressional language and the bounds it puts on our engineering challenges."

Small Missile Advisory Group

To address those challenges, Gen. Robert T. Marsh, Commander of Air Force Systems Command (AFSC), formed the Small Missile Advisory Group under Gen. B. A. Schriever, USAF (Ret.), to devise a development and acquisition strategy for SICBM. The group's report of last June "provides the blueprint we need to achieve the congressionally mandated milestones," General Marsh declares.

Some of its highlights:

- A hard, mobile launcher for SICBM on DoD land areas, but also an option for fixed, hard-silo deployment as a dual basing mode.
- The weight-limitation mandate is "challenging but reasonably supported by technology projections."
- The SICBM program should have two parts: one, a baseline approach for making all possible use of systems developed for Peacekeeper, such as AIRS and the Mk 21 RV; the other, parallel development of subsequent technologies (perhaps ring-laser or optical gyroscopes, for example) for evolutionary improvements and cost reductions.
- USAF should shoot for a SICBM IOC in 1992.

SICBM basing is an imponderable. Given latter-day progress in the technologies of superhard missile silos and in fashioning transporter/launcher vehicles to withstand nuclear detonations, either course now seems possible. The questions will be: Which one? Or better both?

Last October 29, the Defense Nuclear Agency (DNA) conducted a test called "Direct Course Blast" at White Sands Missile Range, N. M. Simulating a one-kiloton nuclear detonation, 600 tons of high explosives were touched off atop a 166-foot tower. Positioned 475 feet to 1,030 feet from the tower were scale models of generic transporter/launcher vehicles built independently by DNA, the Air Force Weapons Laboratory at Kirtland AFB, N. M., and four aerospace contractors—Boeing, McDonnell Douglas, General Dynamics, and Bell Aerospace. Overpressures on

—From an original painting for the Air Force Art Program, by Attila Hejja

those vehicles, which were commonly characterized by curvilinear, ground-hugging shapes, ranged from ten to fifty pounds per square inch (psi).

The results were encouraging. They fostered optimism that USAF will be able to meet its design goals for SICBM transporter/launchers capable of withstanding twenty-five to thirty psi.

Even though Congress last year cut in half USAF's budget for silo-superhardening studies, such studies have already shown, as one congressional report put it, that "superhardening of ICBM silos to very high overpressures is feasible." Earlier, the Scowcroft Commission had reported "the capability to harden such targets as ICBM silos far in excess of what was thought possible only a short time ago."

The implications of this for Peacekeeper deployment may be at least as profound as they are for the follow-on small missiles.

Meanwhile, SICBM is in solid with SAC. "I support it wholeheartedly," asserts Gen. Bennie L. Davis, SAC's Commander in Chief. "It will compound Soviet targeting problems, and hence, hopefully, lead to a way to get at arms control in terms that the Soviets understand."

The Air-Breathing Leg

In its two-bomber program, USAF aspires to the same well-ordered progression of deployment that it foresees for Peacekeeper and SICBM. Once the B-1B goes into production in 1986, USAF will once again be in the reassuring situation of having a strategic bomber in the inventory, another in production, and a third (the ATB) in development. This has not been the case since the B-52 came into the force.

USAF officials are downright enthusiastic about the pace and execution of the B-1B preproduction program. "It gets high marks," declares General Marsh. "The B-1B flight test effort is moving faster than we planned, and the associate contractors—Rockwell, Boeing, AIL, and General Electric—are three months ahead of schedule. In fact, we anticipate an earlier-than-scheduled flight of the first production aircraft."

That flight was scheduled originally to take place in March 1985, with the B-1B IOC set for August 1986 and full deployment of 100 operational bombers for June 1988. Now all such dates may be moved up.

The cost picture looks good too. Congressional approval of multiyear B-1B procurement translates into at least $700 million of savings over the three-year production run, with special emphasis on bargain prices in buying titanium in wholesale lots. Ordering all titanium ahead of time also greatly eases contractors' concerns about long lead times for serial orders.

The B-1B will, in many ways, differ dramatically from the original B-1. For example, it will embody a new avionics system, forward-fuselage vanes of composite material, electronically controlled engines, a tail-warning radar, a movable weapons bay bulkhead, simplified overwing fairings, and enhanced capacity for external weapons and fuel.

The B-1B will carry about 100,000 pounds more fuel than the B-1. Its four F101-GE-102 turbofan engines, each generating 30,000 pounds of thrust, will give it low-supersonic capability at cruise altitudes and high-subsonic capability for penetration at altitudes of 300 feet or less, hugging the nap of the earth courtesy of its terrain-following radar.

In forgoing high supersonic capability (the original B-1 was designed for high-flying Mach 2 performance), the B-1B's variable geometry wings will sweep in shorter arcs toward the fuselage, and its engine inlets and exhaust nozzles will incorporate features for foiling radar and infrared seekers, respectively. The leading and trailing edges of its wings and tail surfaces will have radar-absorbent coatings.

Measures have also been taken to preclude radar returns from the metallic nooks and crannies inside the B-1B cockpit. Angular exterior surfaces characteristic of the B-1 have been smoothed and curved to deflect radar. Curtailing the sweep of the B-1B's wings makes it easier to reduce the radar cross section of its wing fairings, according to one source. For good measure, the B-1B's updated defensive avionics are designed to jam the entire spectrum of Soviet radar frequencies now as well as in the foreseeable future.

Such innovations give USAF confidence that the B-1B will be capable of penetrating Soviet heartland defenses well into the 1990s. By then, if all goes as planned, the ATB will be operational. As billed, the ATB will have a head-on radar cross section close to zero, whereas the RCS of the B-1B, while a tenfold improvement over that of the B-52, is about one square meter.

ATB Development

ATB development remains highly classified. Procurement plans, too, are closely held, even though some officials say that USAF is looking toward an operational fleet of 132 ATBs. One source claims that the ATB program is "going very well," having surmounted some initial scale-model problems, such as wing flutter on the deck, and now presents "no major technical risks."

Moreover, advanced-development testing shows that the ATB's RCS numbers are "extremely low—more than up to expectations," says still another source. ATB skeptics are not so sure. "It will be awful hard to hide an airplane that big," says one.

Funding for the ATB program is expected to increase sharply in the near future as the bomber proceeds into engineering development. First flight is said to be scheduled for 1986, and the ATB IOC for the early 1990s.

Despite USAF's oft-stated intent to fund the ATB program prudently but firmly through development, some ATB champions continue to fear that USAF will keep the program reined in until it is certain that total B-1B production is ensured. Some even suspect that USAF may eventually dump the ATB in favor of extending B-1B production into the 1990s.

Such apprehension motivated Congress, in its Fiscal 1984 military authorization report, to prohibit any diversion of ATB development funding to any other USAF program.

Defense Department and USAF officials dismiss that move as having been unwarranted. They look forward with increasing confidence to the sequential culmination of the two-bomber program, with the ATB taking over from the B-1B as SAC's principal penetrator by the mid-1990s, and the B-1B then superseding the B-52 in the standoff cruise-missile role and as a conventional-mission weapon system.

By the time this comes to pass, air-launched cruise missiles will probably have become a much different, fancier breed. USAF's advanced cruise missile (ACM) program has begun to generate a standoff strategic weapon for the 1990s and beyond. It will be extremely difficult to detect by radar. It may also have intercontinental range and supersonic speed, perhaps powered by a ramjet engine. In fact, ramjet propulsion is being considered in USAF's new study of a successor to the short-range attack missile (SRAM) for penetrating bombers.

Propulsion is the pacemaker in the ACM design and development program. Thrust limitations of the F107 turbofan in existing ALCM variants prevent them from taking full advantage of their optimal flight envelope. They cannot fly as low or in as severe terrain as USAF would prefer because their thrust is too low. Thus, USAF, in concert with the Defense Advanced Research Projects Agency (DARPA), is setting out to devise an ACM engine of much greater thrust-to-weight ratio and fuel efficiency. Meanwhile, the F107 engine is being upgraded on both counts.

The C^3 Umbrella

Modernization of strategic weapons may go for naught if command control and communications improvements do not keep pace. This is why President Reagan's strategic modernization program put a premium on C^3 upgrading.

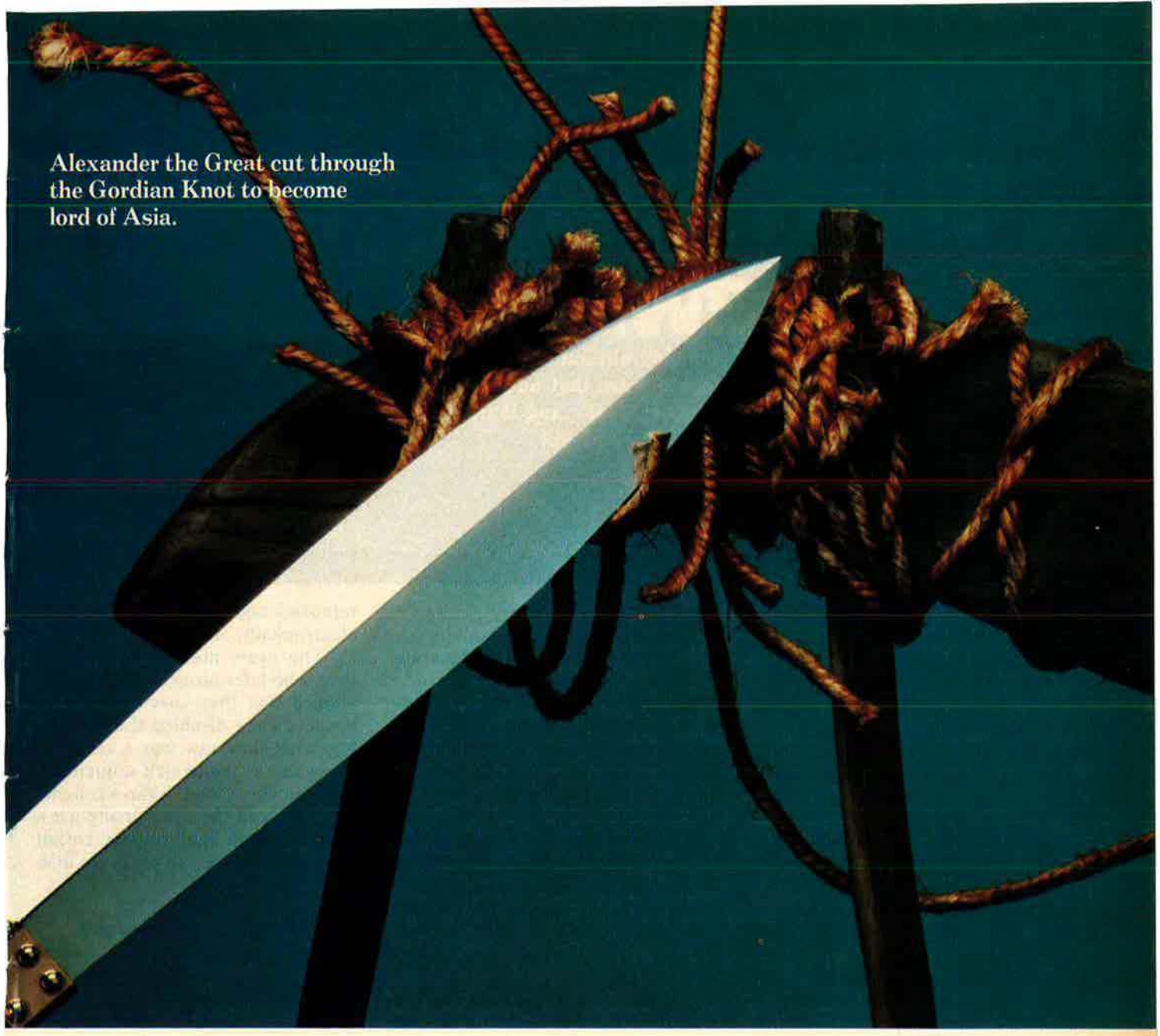
When the Administration took office, there was grave doubt that the US strategic C^3 system could survive nuclear attack. That doubt remains, but much is being done to dispel it for the future.

For example, some new, much-improved, hardened communications satellites, such as the third-generation Defense Satellite Communications System (DSCS 3) satellites, are coming on line. Others, such as the MILSTAR satellites, are being developed. Highly versatile as to missions, MILSTAR satellites will feature virtually jamproof communications for strategic and tactical forces.

Other examples of improvements abound. New very-low-frequency (VLF) receivers are being installed on bombers. The scope and redundancy of airborne and ground communications centers and nodes are being expanded in the name of survivability and enhanced performance, with much accent on mobility. A network of Ground Wave Emergency Network (GWEN) terminals, to handle VHF communications, is taking shape. And USAF's Air Force Satellite Communications (AFSATCOM) system is now in place aboard Fleet Satellite Communications (FLTSATCOM) satellites.

"We have made more progress over the last three years in C^3 than we have in the last twenty-five years," claims SAC's CINC General Davis. "But we have not yet arrived."

In view of anticipated fiscal constraints, C^3 improvements, too, may compete with weapon systems for funding in the years ahead. "The Defense Department is adamant about our addressing C^3, and we've placed a C^3 umbrella on top of everything," says one USAF officer. "We certainly need to improve our [strategic] connectivity, but there's a cost, and it scares you." ■



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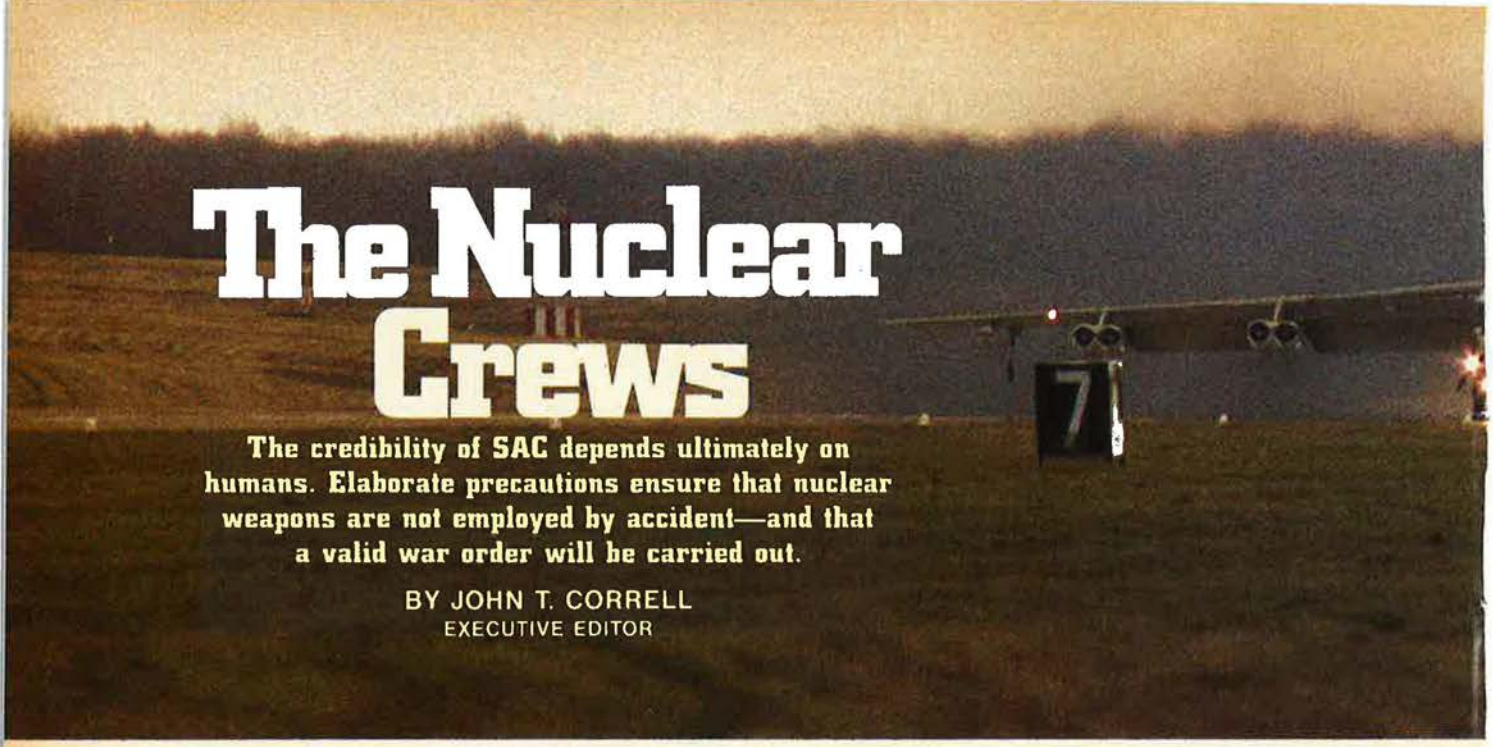

The Nuclear Crews

The credibility of SAC depends ultimately on humans. Elaborate precautions ensure that nuclear weapons are not employed by accident—and that a valid war order will be carried out.

BY JOHN T. CORRELL
EXECUTIVE EDITOR

A ROTARY beacon switches on suddenly and begins to sweep the SAC command post with flashes of red light. It signals that the red telephone has been lifted to activate the Primary Alerting System. Every missile crew and bomber alert facility in SAC is on the line in seconds, awaiting the message that might send them to war.

It has been happening this way for years, several times daily. So far, it has only been to test the system—constant checking to be sure the main lines to the nuclear forces are open.

The crews have never performed the ultimate mission—delivery of their nuclear weapons. They are aware, however, that unless they are ready to carry out the war order if it comes, there can be no credibility in SAC's retaliatory power to deter attack on the United States or its allies.

Senior SAC officials say the crews are ready. The crews say the same thing.

Contrary to the message of screen fantasies from *Dr. Strangelove* to *War Games,* elaborate precautions are in place to ensure that nuclear weapons are not employed by accident. In addition to procedural safeguards, the nuclear crews and others who work with nuclear weapons are selected carefully and monitored constantly. At the same time, there are measures to guarantee that a valid war order would be executed.

Jack Anderson's Story

But not everyone is convinced. Columnist Jack Anderson is among those who have doubts. In a *Parade* magazine article last August, Anderson speculated that missile crewmen are under intense mental pressures, would tend to disbelieve an order to fire, and might refuse to turn their launch keys. "I have concluded that there is a serious and widespread morale problem," he wrote. Anderson reported further that two former missile officers told him that a Titan II at McConnell AFB, Kan., was nearly launched by accident in 1980.

The most charitable conclusion that SAC and Air Force officials in the Pentagon can reach is that Anderson did not pay enough attention to the facts given to his reporter who researched the article for him. Nothing of substance that was told the researcher over a period of fifteen months appeared in the published article.

Since then, SAC and the Air Force have sought to present the missing facts to the public, and to give a comprehensive picture of how nuclear safeguards work.

Gen. Bennie L. Davis, Commander in Chief of SAC, told a Washington news conference that the supposed near-launch of the Titan II at McConnell was really only a combined systems check. Such checks are conducted periodically to assess continued system reliability. The firing mechanism had been removed, and the warhead had been electronically disabled.

"The crew members involved here who later brought the issue up alleged that they saved the world because they disabled the missile, but what they saw was a series of lights that is the launch sequence," General Davis said. "Various lights come on and then you finally get a missile launch light, but the circuit had been disabled to preclude missile firing."

Crew Association Outraged

Among those outraged by Anderson's interpretation of the event was the 321st Strategic Missile Wing Crew Members Association at Grand Forks AFB, N. D. Believing that *Parade* readers were misled and needlessly frightened about the competence and integrity of the missile force, the Association issued a public letter.

"Rather than preventing launch, the missile crew prevented a successful test," the Association said. "We are sure that such a colorful story makes entertaining press, but does not stand the scrutiny of objective analysis."

General Davis said the former crewmen would have been aware that they were participating in a combined systems check, so he was at a loss to explain their allegations. One of the men, he said, was released from the Air Force in an administrative action unrelated to this incident, and the other man was

B-52s on a training mission out of Griffiss AFB, N. Y., execute a minimum-interval takeoff. (Photo by Art Director William A. Ford)

court-martialed for falsified statements relating to the incident. General Davis declined to elaborate.

The Grand Forks crew association hotly disputes the contention that the missile force is reckless, demoralized, or unready to perform its duty.

"One of the few things that truly acts to lower our morale is to have our competence and integrity questioned by commentators who lack the credentials to evaluate us or our equipment," the association statement says.

Positive Control

B-52 bomber crews may be launched on warning as a precautionary measure, but without specific orders from the National Command Authorities, they do not go beyond their waiting orbits. In fact, the codes necessary to arm their nuclear weapons are not carried aboard the aircraft. These would be received as part of the "go code" to proceed. Even then, several crew members must act in coordination to arm the weapons.

In similar fashion, missile crews must await codes that are part of the launch order before they can fire their missiles, General Davis said.

A crew aboard Looking Glass, the EC-135 airborne command post, can fire any of the Minuteman missiles should a regular crew be disabled or decline to act. Or the missiles can be fired from alternate launch-control facilities on the ground.

"Two crew members can't cause a missile to launch or not launch, because somebody else will either do it for them or stop it from happening," says Lt. Gen. George D. Miller, Vice CINCSAC.

In the case of bombers, the "positive control" concept means that a communications failure could result in one or more B-52s not receiving the go code. They would return to base, leaving their targets uncovered.

Neither renegade crews nor malfunctioning computers could send SAC to war, no matter what the filmmakers think. That action can come only when the National Command Authorities are satisfied that a nuclear response must be made—and if they give direct, unambiguous orders for SAC to strike.

Personnel Reliability

At the outset of training and frequently thereafter, crews are asked how they feel about the nuclear mission. They can opt out of the assignment if they believe themselves unable to perform it. Throughout their tenure as nuclear crews, the slightest indication of a problem can lead to their decertification for nuclear-related duties, either on a temporary basis or permanently.

Such decertification would be done under the Personnel Reliabili-

The red telephone in the underground command post activates the Primary Alerting System.

ty Program (PRP). SAC has about 40,000 people in PRP status. About half of the SAC officer force and a third of the enlisted force are certified to work with or around nuclear weapons.

Illness, domestic problems, a death in the family, or any other stressful situation may lead to temporary PRP suspension. This is done without prejudice. Individuals are encouraged to request suspension if they're having difficulties, and crew members keep an eye on each other for signs of stress or instability.

SAC is on the lookout for people whose problems might be of a more lasting nature, and, in the past twelve months, some 2,250 people have been decertified permanently.

When it comes to nuclear crews, no chances are taken.

Retention Looks Good

If there is widespread unhappiness in the missile force, it is not reflected by retention trends. Even when all of the services had massive retention problems a few years back, SAC was keeping high percentages of its missile crew members, General Davis says. For FY '83, retention was up to eighty-nine percent for SAC missile operations officers completing their initial active-duty service commitments.

Retention rates for SAC pilots (eighty-four percent in FY '83) and navigators (eighty-five percent in FY '83) are also good. Reenlistment rates for airmen are a little better than the overall USAF average.

The current aircrew force is the youngest the command has had for a long time, part of the legacy of the poor retention years. There are overages in lieutenants but shortages in captains and majors. SAC has an overage of some 200 copilots, and one of its training thrusts is to upgrade them to qualification as aircraft commanders.

In 1977, SAC had 1,000 officers in the rated supplement, assigned to nonflying jobs but available for return to the cockpit to meet surge requirements. It currently has but 300 officers in the rated supplement and hopes to increase the number to 350 in the next year.

Safety trends and other indications so far show that the young force is performing well.

The Northern Tier

For years, SAC was concerned deeply about "the northern tier problem." Because of the importance of polar routes in SAC's strategic missions, many of its bases are situated near the northern borders of the United States. Many Air Force people viewed them as unattractive assignments.

That has become less of a problem in recent years. One reason may be a change in lifestyle preferences in American society at large, with a greater desire than previously to live apart from the urban sprawl. But some imaginative Air Force programs have helped, too.

Ironically, it appears that the appeal of a northern tier base is increased by the guarantee that one can stay there for an extended period. Air Force people, accustomed to being uprooted and reassigned after a short time on station, welcome the chance to settle down for a bit and let the kids go to the same school for awhile.

SAC has about 3,000 people in the Voluntary Stabilized Base Assignment Program at Minot and Grand Forks AFBs, N. D., K. I. Sawyer AFB, Mich., and Loring AFB, Me. They are assured of five years on station.

That program is for enlisted people only, but SAC is finding takers for three- and four-year stabilized tours on the northern tier that are offered to alert-pulling officer crew members.

Close-knit community life at these bases seems to have an appeal, and young people see greater opportunities to demonstrate their abilities in the smaller units.

Staying Sharp

SAC's first mission is to deter war. Only if it fails in that would it perform its secondary mission of actually waging nuclear war. Thus, the nuclear crews must stay sharp for a mission they practice constantly but have never performed.

Part of the solution is to rotate people between crew duty and staff assignments, thus providing new perspectives and diverse experiences.

SAC holds annual competition programs for both aircrews and missile crews. Trophies from these events are displayed with pride by the winners, and proficiency is enhanced by the competition.

Sharpness, however, goes beyond such things and depends on the attitudes of the nuclear crews themselves. And most people who have spent any time around SAC will agree that those crews practically radiate a special sense of pride and professionalism. They bear the responsibility well.

"I have no doubts whatsoever," says General Davis. "Our crews will do exactly as they are trained to do, and they will acquit themselves with great professionalism. The taxpayers should be proud of them." ■

Bomber crews at Griffiss enjoy the convenience of a family center adjacent to the alert area. (Photo by Art Director William A. Ford)

Harris technology aboard the B-1B

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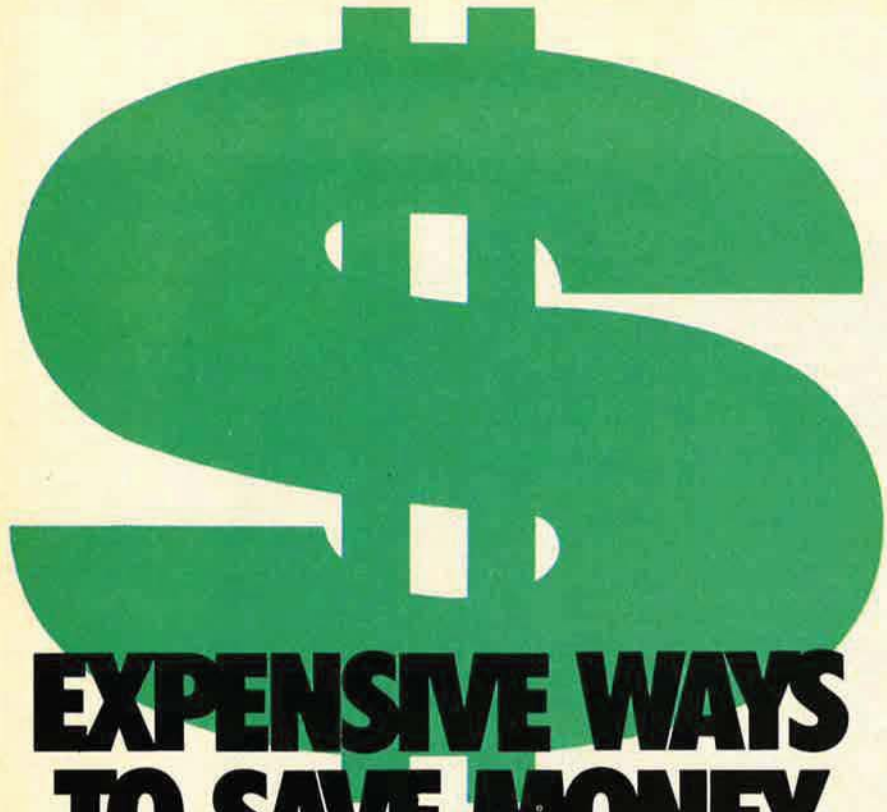

EXPENSIVE WAYS TO SAVE MONEY

Surely, the private sector executives would have considered impact as well as economy had they been planning for their own companies rather than for DoD.

BY VINCENT C. THOMAS, JR.

UNQUESTIONABLY logistics and industrial management were the strong points of the task forces of the commission headed by J. Peter Grace that undertook the formidable tasks of studying the Office of the Secretary of Defense and the individual military services. And well they should have been, because these certainly are the strengths of those obviously highly talented industry leaders who composed those task forces.

Yet, as task forces' members painstakingly documented proposed changes in management procedures that could lead to the saving of billions of dollars annually, they also accentuated two elements that should be cause for concern for those to whom may fall the herculean task of implementing many of their recommendations: First, the extent of control Congress has over the destiny of the Defense Department as a whole; and second, an apparent failure to measure the impact—and resulting cost—of certain of them that directly affect people. It will be these two aspects of the Grace task forces' scrutiny of OSD and the Air Force that will be addressed here.

Since people obviously cost money, it was inevitable that these two task forces seek to save sizable numbers of dollars in programs benefiting people. The eight recommendations falling into this category that will be touched on here would, in their view, result in savings of more than $4 billion if implemented. And these savings are, they contend, "fully substantiated and defensible." A ninth, which involves changes in PCS policy, is "substantially documented and supportable" and worth $331 million.

The task forces most certainly did not discriminate when it came to groups that would be affected by their proposals. Active-duty and Reserve personnel, officer and enlisted, dependents, and retirees would all be hit. And a rapid scanning of where these savings would be realized leads to an even-more-rapidly-arrived-at understanding of why *all* the recommendations met with Air Force opposition ranging from vigorous to intense.

The eight recommendations are: restricting CHAMPUS use; sharply increasing certain fees at medical installations and establishing a charge for outpatient visits; closing commissaries; restricting Selective Reenlistment Bonus payments; reducing entitlement to flight pay; reducing Air Force officer severance pay; elimination of dual pay for annual active-duty-for-training leave; and deferring retirement pay until unused leave has been expended.

Billfold Impact

It also becomes immediately apparent that if these recommendations were implemented tomorrow, thousands of officers and enlisted men could have the contents of their billfolds reduced in several different ways almost simultaneously: higher costs for food, a possible loss of reenlistment bonus, a possible loss of or reduction in flight pay, and a direct cost related to taking their spouses or children for treatment of ailments. The dollars involved in each circumstance would range from the $100 proposed annual limitation on the medical installation charge to quite sizable sums involved in larger grocery bills and the loss of bonuses and flight pay.

Yet the dollar impact could be negligible compared to that of the result of loss of incentive to remain in service. Here would be more graphic examples of chipping away at benefits—benefits already eroded steadily over the past decade. Unfortunately, the task forces were *not* given a requirement to ascertain impact of their proposed actions. The absence of such a requirement in the study assignment—and the lack of a manifestation of effort to ascertain impact—can only lead to a questioning of the validity of those portions of the study itself.

As this issue goes to press, there

exists a superb example of why hard evidence that a government still cares about those in uniform and about their dependents is absolutely essential, even in time of peace. That example looms large literally and figuratively. It is the nation's only active battleship, USS *New Jersey,* which departed Long Beach, Calif., in early June on her first deployment since being recommissioned. Her destination was the Pacific.

In late June, however, her presence off Central America was deemed necessary, so she steamed east, missing a much-anticipated port call in Hong Kong. She arrived off Central America in mid-July. A little more than a month later, she was once more in demand elsewhere, this time off Beirut. So she inched her way through the Panama Canal, fueled in Colón, Panama, and steamed east again. She cleared Gibraltar on September 21, and four days later was on station off Beirut with other ships of the Sixth Fleet. She's still there. She may still be there when this issue reaches its readers. And when she does finally head home, she will have more than 7,000 miles to travel before that first line is made fast to a pier in Long Beach.

That first deployment was supposed to be a short one, a little more than three months. But at the moment there is no scheduled date for her return, because her presence is not dictated by fleet commanders and scheduling officers, but by national needs. Except for early port calls in Hawaii and Japan, her crew has not been ashore on liberty. And most of the families of the 1,562 men aboard have no firm date to look forward to with anticipation. Christmas was unexpectedly lonely, indeed.

Yet her officers and men, and their wives and children, will endure.

Expensive Savings

Certainly the most telling example of why any study of this nature must look at ramifications of proposed actions as well as projected savings from those actions is the recommendation to eliminate or reduce Aviation Career Incentive Pay (ACIP) for those members who are not serving on regular and frequent flight-duty assignments. This issue, in a relative sense, is as old as the hills. It has been the subject of frequent intense debate in Congress during the past three decades. Finally, it became apparent that requiring aviators not in flying billets to log so many hours a month in order to maintain proficiency and to qualify for flight pay was both costly and inefficient. In 1974, Congress passed legislation that eliminated this requirement. The system resulting from this legislation, the Aviation Career Incentive Act (ACIA), has worked well; it has contributed to retention, has helped make possible a backlog of pilots and navigators for use in time of crisis, and has reduced turbulence among career officers.

The proposal to reduce flight pay entitlements should have been weighed in the context of its effect on aircrew retention and cost of training replacements.

Yet, despite the voluminous amount of data discussing this issue that undoubtedly was available to the task force, there is not a single word contained in its summary discussion of how it arrived at its recommendation that refers to the need for large numbers of trained aviation personnel to meet sudden wartime requirements. It would appear that if congressional and DoD leaders in their wisdom had indeed perceived that there was such a requirement, and had provided through legislation a means to fulfill it, any and all task forces seeking to bring about cost savings in DoD would of necessity reflect such thinking if they chose to address this particular issue as a potential for savings.

Nor, apparently, was consideration given to what might happen to retention of aviation personnel if ACIP were eliminated for some and reduced for others. The Air Force alone estimates that 1,525 experienced aviators would separate from the service by FY '88, and that 220 new pilots and ninety new navigators would be required annually. At a cost of $750,000 to train each pilot and $400,000 for each navigator, an annual expenditure of $200 million would be required. That is almost triple the estimate of annual savings within the Air Force arrived at by the Grace task force.

Not given even a mention is the problem of finding available and qualified candidates to fill the vacancies that would be created. The Grace OSD task force recommendation applied to all services. If it can be presumed that all would lose experienced aviators as the result of the implementation of this recommendation, then a battle over qualified young Americans most certainly would ensue. Further, it would come at a time when the overall manpower pool is declining, and when there are more seats than ever to be filled in commercial aircraft. Therefore, another consequence of this particular recommendation might well be an inability to recruit enough personnel to meet potential wartime or peacetime requirements.

Pay Comparability Doesn't Last

Although it is nowhere stated in so many words, it would appear that the thinking of those task forces studying OSD and the individual services was colored by a perception that may well have been correct at the time these studies began but could be completely erroneous by

The task force report reflects a belief that pay comparability for the military is here to stay. History has proven that comparability doesn't last long at all.

the time the studies were completed and final recommendations resulting from them readied for implementation. In the discussion of its approach, the OSD task force observed that "special pay and benefit provisions put in place when military compensation was unduly low are not corrected long after military pay has been brought competitive with civilian pay, both in government and the private sector." (The same perception is reflected in the Air Force task force report.) A review of the facts would suggest a different set of observations *(see chart)*. Even though military pay has achieved comparability with wages in the private sector from time to time, the situation was not sustained. History certainly has proven that comparability doesn't last long at all.

Certainly there is ample recognition on the part of individuals in and out of uniform that Congress exercises almost complete control over what the services may create, build, or buy. Most, however, might be greatly surprised to learn just how much control Congress would have over actions aimed at saving money. Congress's sphere of influence in this respect is far-reaching indeed!

The Air Force study unit stated in its executive summary that of the $12.5 billion in projected savings that its recommendations allegedly could achieve (the $15 billion resulting from changes in the military retirement pay system were not included), more than ninety percent required congressional approval prior to implementation. The OSD task force indicated that "more than eighty percent of the savings dollars can only be achieved if there is congressional concurrence."

To that statement it added an interesting observation: "In some cases, affirmative legislation is required. In others, successful implementation of a recommended change can only take place *if Congress refrains from blocking DoD's actions*. [Emphasis added.] For example, while legislation is not necessary to close a base, too many examples exist where such action has been blocked to say that implementation is in the hands of the Secretary of Defense."

Union Scale Contracts

In particular, those studying the Air Force had no illusions about the likelihood of certain of their recommendations requiring corrective legislation ever being implemented. After all, laws like the Davis-Bacon and Walsh-Healey Acts, which by virtue of strong union support have successfully withstood attempts to alter or repeal them for fifty-two and forty-six years respectively, are likely to be unchanged despite this task force's recommendations that the current OSD leadership seek to bring about changes.

The former legislation requires the Department of Labor to issue a "wage determination" for any federal construction project over $2,000. Since it is almost impossible to erect a tent for under that amount today, that means almost all DoD projects are affected. The resulting action usually establishes union-scale wages as the prevailing rates, even though the work involved may be in areas of the country where actual wages are much lower.

The Walsh-Healey Act is an example of existing legislation simply not reflecting modern-day business practices. One section of it prohibits work in excess of eight hours a day without paying overtime. Since it applies to any transaction over $10,000, at least fifty percent of all Air Force procurement contracts are affected. And that single prohibition effectively rules out certain companies from competing for government contracts. A major bus manufacturer, the Blue Bird Co., is an excellent case in point. For more than twenty years it has worked a four-day, forty-hour week. But under the Walsh-Healey Act it would have to pay its employees overtime for the hours worked over eight daily, even though their work week was only forty hours. And the government thereby is deprived of a major competitor whose absence, the task force believes, equates to a ten percent premium over what would be paid in a truly competitive atmosphere.

Repealing these two acts alone would, the study unit estimates, save the government almost $1.8 billion over a three-year period. And these are by no means the only legislative acts of this kind whose repeal or alteration could save hundreds of millions.

And when it comes to base closures—certainly one of the best ways to effect savings—Congress has erected a formidable system of barriers.

Legislative Roadblocks

In the mid-1970s, after some progress had been made in the years immediately preceding to realign the base structure to reflect a reduction in DoD's overall population from five million to three million people, Congress enacted a comprehensive legislative roadblock to further realignments and closures. It required DoD to prepare detailed studies of such proposed actions, with advance notice to Congress and the public, and to provide for congressional review of the completed studies before implementation.

This legislation not only gave opponents ample time to marshal their opposition and arouse public support against proposed closures, but also provided opportunities for indi-

Military Pay Gap

(By Percentage)

DATE	PATC	PAY RAISE	GAP
Oct. '72	5.8	6.0	+0.2
Oct. '73	5.4	7.3	+2.0
Oct. '74	6.4	5.5	+1.1
Oct. '75	9.0	5.0	−2.6
Oct. '76	7.0	4.8	−4.8
Oct. '77	6.9	7.1	−4.6
Oct. '78	7.9	5.5	−7.0
Oct. '79	7.8	7.0	−7.8
Oct. '80	9.1	11.7	−5.3
Oct. '81	9.7	14.3	Comparability Restored
Oct. '82	9.5	4.0	−5.5
Jan. '84	7.4	4.0	−8.7

The Professional, Administrative, Technical, and Clerical (PATC) scale is used to compare military pay with wages in the private sector. The pattern has been that comparability, even when achieved, is not long sustained.

viduals and groups to voice that opposition in person before congressional committees and individual members of Congress. Such delaying tactics obviously made it difficult indeed to gain congressional approval for implementation of a proposed closure or realignment.

But if that legislation proved not to be enough to halt such proposed actions, Congress smartly rose to the challenge of creating other impediments. After a proposed realignment of Air Force bases had been announced in 1979, Congress changed the existing law to require that proposal to be subject to congressional special reporting procedures. It also included a requirement for an environmental impact statement, despite the obvious cost of preparing it, the months that preparation would require, and an interpretation that it was not required. And this action was by no means an isolated case.

With such formidable opposition firmly entrenched, it is no wonder that there have been no realignment or base-closure packages put forth by DoD since 1979. The services themselves are often the allies of Congress when it comes to altering the base structure, for in many instances they are just as adamant in their opposition to these kinds of actions, even though savings and greater efficiency would result.

The difficulty in arriving at hard and fast conclusions and recommendations with regard to realignment of the military base structure was best exemplified by the OSD task force's acknowledgment of frustration. Said the group: "We were thoroughly frustrated by our inability to get usable data. It should be noted that no data were refused us. We reluctantly conclude that the many pressures that are brought to thwart each specific proposal have discouraged the assembly of usable data, at least at the OSD level."

Interestingly, the OSD task force based its estimates of potential savings from base closures and realignment on studies conducted by the Office of Management and Budget, an agency not charged with the responsibility for determining national security requirements. The study unit estimated savings at almost $8 billion over a three-year period, substantially less than OMB's educated guess of $2 billion to $5 billion annually. However, it characterized its estimates as only "substantially documented and supportable." In short, anything but firm!

The Questions Not Asked

In summation, the Grace Commission task forces' labors served a highly useful purpose in pinpointing the extent of control Congress exercises over the freedom DoD has to save as well as to spend and the tremendous sums of money that antiquated legislation costs the taxpayers. Its addressing of the base closure issue, which at the same time was both detailed and nebulous, likewise helps to explain why military bases have become so sacrosanct. Predicating estimates of savings on studies by an agency that could not possibly have enough truly solid information about the operational requirement for the existing base structure to soundly recommend specific closures and realignment amounts to an exercise in futility.

As for the "people" recommendations that were touched upon, more than anything else they cause puzzlement.

The task forces that studied the services and OSD had tremendous depth in managerial experience, leadership, and sheer talent. Obviously they had to have had extensive experience in dealing with people, and in particular with the members of their respective work forces. They certainly were aware of what factors lead to work stoppages and strikes. Presuming these assumptions are correct, then it is difficult indeed to visualize them presenting their respective labor forces a package that in essence reduced take-home pay, reduced or eliminated certain bonuses, made medical care more costly, and on top of that reduced retirement benefits without anticipating the worst of reactions from their workers.

Yet there is no evidence that, in reviewing their "people" recommendations for DoD, there was any reflection that the reaction by military people might be similarly negative and strong.

If indeed no such philosophical reflection took place because there simply was no initial requirement in their charter to consider the impact of these recommendations, then one wonders why these seasoned executives didn't themselves ask: "Why *isn't* there such a requirement?" They certainly would impose such a requirement if they were dealing with their own labor forces. Why would they not do so in dealing with those responsible for the safety of the nation? ■

Vincent C. Thomas, Jr., is Contributing Editor for Sea Power *Magazine, the official publication of the Navy League of the United States. A Navy veteran who retired in 1970 with the rank of captain, Mr. Thomas served as the Navy League's Executive Director from 1971 until 1982. This is his second article for* Air Force *Magazine on the work of the Grace Commission; see December issue's "What the Task Force Forgot."*

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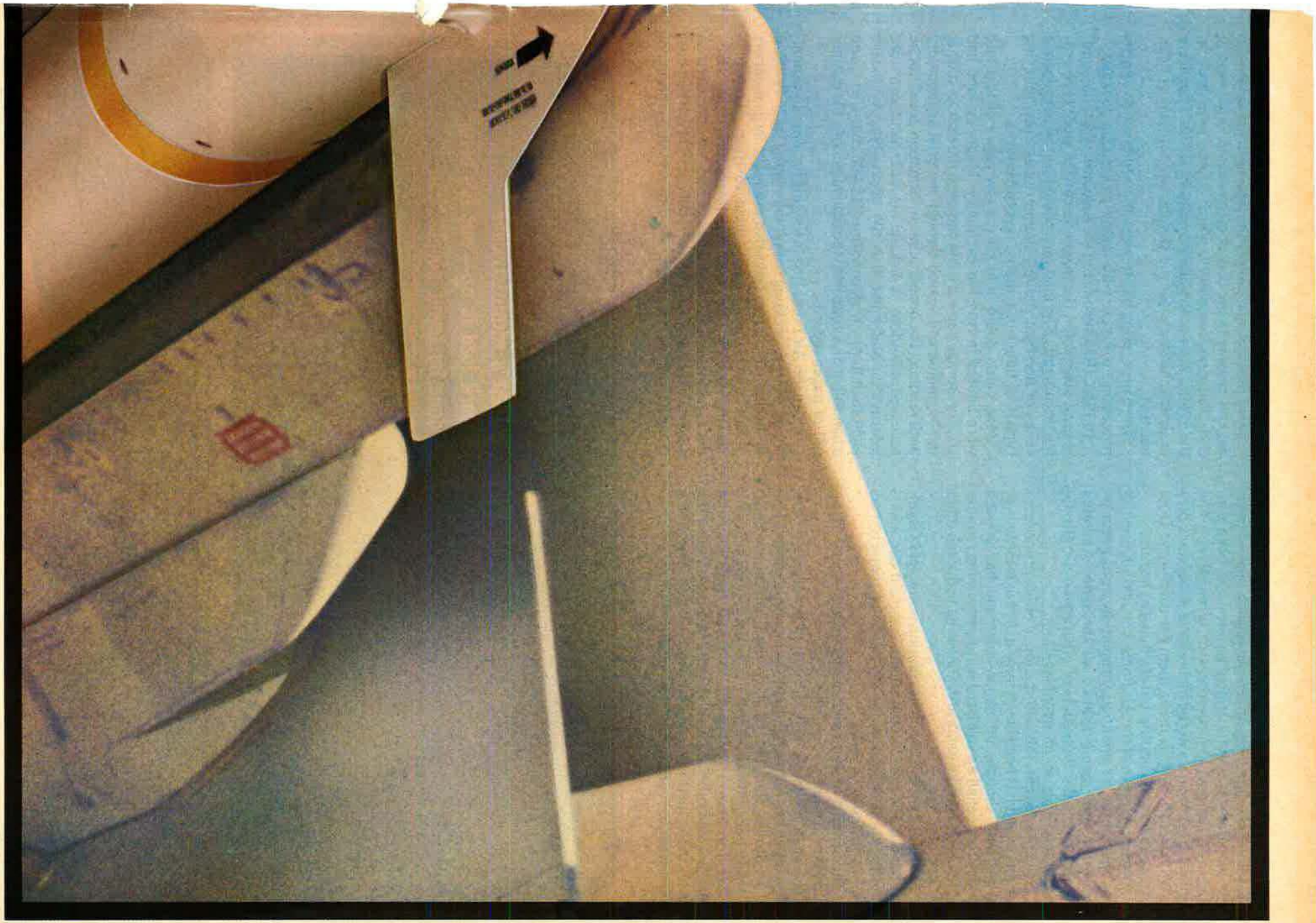


The Word-Processing Revolution

USAF's administrative work load is up—but it's being done by fewer people than before.

BY LT. COL. ROBERT W. NICHOLSON, USAF

THE Air Force, always a leader in big computers, has joined the small computer revolution that is overthrowing the way administrative business has been conducted in the past. Word-processor terminals are fast replacing typewriters as the mainstay of paperwork production, and USAF is using them for everything from writing reports to getting out its flying schedules.

Already, a fourth of the Air Force's 60,000 administrative specialists are qualified formally in word processing, with more being trained all the time. And that doesn't count the thousands of others who use the tabletop terminals on an irregular basis.

To a great extent, this automation of office procedures parallels what has been happening in the business world. At present, though, no major command has enough money to meet all its validated word-processing requirements, so would-be users are competing with each other for priority.

The end of the electronic revolution is not yet in sight, but the Air Force is looking ahead as best it can and is tailoring its preparations to the needs of tomorrow as well as to those of today.

The benefits of word processing include speed, flexibility—and money.

Between 1960 and 1983, the cost of producing a business letter by traditional methods increased from $1.83 to $7. Studies find that the sixty-word-per-minute typist actually nets only about ten words once allowances are made for errors, retyping, omitted lines, format changes, and other factors. A word processor, once the text is in the memory, spits out words at rates exceeding 500 a minute, cutting cost and saving time.

Development of Word Processing

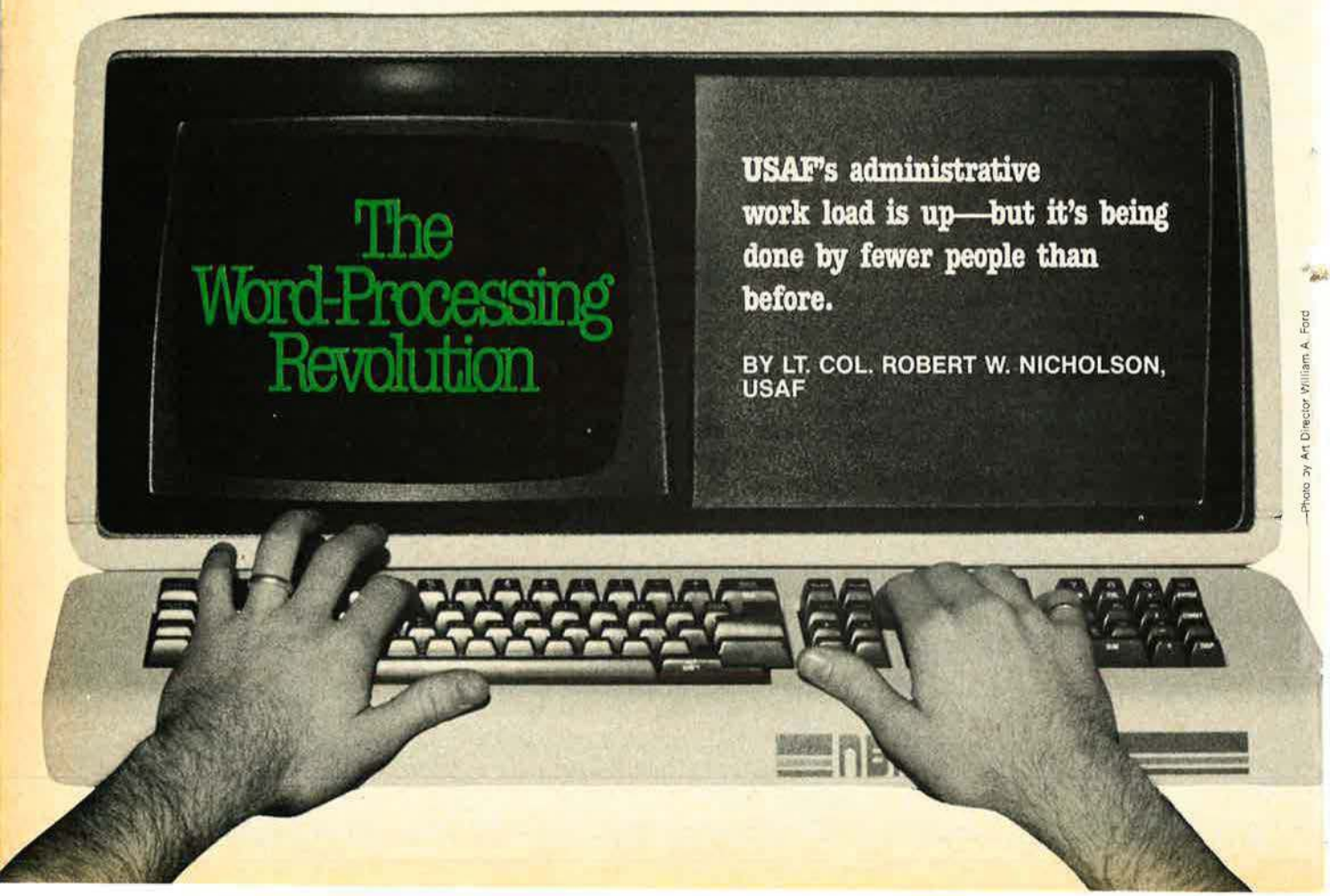
Word processing is simply the adaptation of automatic data processing to the task of electronic manipulation of text. Business computers, which gained popularity in the 1960s, were a virtual necessity by 1970. They were designed, however, for the storage and retrieval of data, not text.

Word processing had to await the combination of text-processing software with a data-processing package.

In 1960, IBM introduced the Selectric typewriter and, several years later, the magnetic card to store typewritten documents. The mag card could be used to prepare a series of personalized but similar documents, relieving typists of hours of tedious, repetitive tasks.

Mag cards could hold only a few pages of text and were limited in revision capability. Magnetic tape had greater storage capacity, but required the user to start at the beginning and search through material sequentially until reaching the proper area. Information could not be accessed at random. A disk, on the other hand, can store information and make it easily accessible. A modern eight-inch floppy disk can store 315,000 characters, and a handful of disks can hold the equivalent of a file cabinet full of paper records.

When the Air Force began looking for ways to capitalize on word-processing technology in the early 1970s, it focused on those functions that produced large numbers of documents requiring frequent revision. Word processing was ideal for preparing instructional materials, tests, regulations, and manuals. While copy prepared on a typewriter and then commercially set in type had cost from $25 to $35 per page, word-processing equipment



—Photo by Art Director William A. Ford

The goal of the Air Force's word-processing program is simple: "To achieve increased productivity."

permitted the typist to prepare camera-ready, justified copy (flush margins, left and right) for about $5 per page.

In many Air Force activities with heavy, constant typing work loads, the payback was immediate and dramatic. But was there an application for this expensive technology elsewhere, perhaps on the average base? Air Force administrative officers believed the answer was "yes" if work was concentrated to ensure a high level of keyboard utilization. Establishment of word-processing centers, with work coming in from many offices, appeared to be the way of the future.

The center concept worked when the task was to produce large volumes of straightforward material with stable priorities. But word-processing centers encountered the same resistance met previously by their predecessors, the typing pools. How could a genuinely urgent project be assured priority once it left the manager's immediate control? And if a typist had a question but the author was on the other side of base, how would the problem be quickly resolved? Finding staffs for centers also became a problem as grade structures were reduced and typists left for better jobs.

But perhaps the greatest objection to the concept came from managers who feared the loss of their secretaries to a word-processing center. Who would answer the phones, juggle the calendars, greet visitors, and handle the administrative chores?

Prices Come Down

Technology solved the dilemma in the late 1970s. Even as the equipment improved, prices began to come down. A memory typewriter that cost $6,000 in the middle of the decade could be had for about $1,200. Stand-alone word-processing systems that had cost as much as $20,000 were available for $10,000 or less. Whereas the early word processor was capable of only simple tasks, later systems could store and retrieve much more material, communicate with other equipment, hyphenate, check spelling, and even prepare graphics. Because of the addition of performance features, the drop in prices over the years was not as precipitous as that for digital watches or pocket calculators. It was, however, substantial.

It began to make economic sense to apply word-processing technology in larger offices, not just in centers. Today, in a complete turnabout, the Air Force considers any function with five or more keyboards a likely candidate for "contracting out" the work to civilian firms. If the word-processing center concept is not yet dead, it is certainly dying.

Although the Air Force probably has at least one model from each of the estimated forty-five manufacturers of word processors, its major suppliers are the giants of the industry—CPT Corp., IBM, Wang Laboratories, Lexitron, Burroughs, Lanier, and Xerox. And recent trends indicate that the large manufacturers will get an even greater share of Air Force business. Major air commands, in managing their word-processing programs, are striking favorable agreements for large numbers of systems, such as Space Command's recent 100-keyboard deal with CPT. The simple economy of scale—larger deals mean larger discounts—is partially responsible for this trend as MAJCOMs seek to reduce costs.

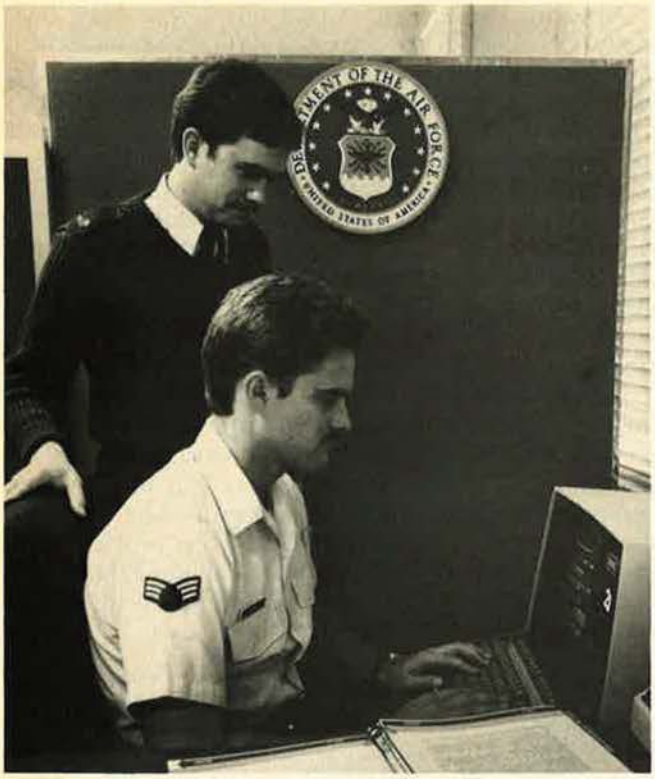
Another reason the field will probably narrow is that the large firms offer worldwide service and the guarantee of system compatibility. (About seventy percent of present Air Force word processors can be made to communicate with other machines across base or across the world. Although only twenty percent of the equipment is used to communicate today, that percentage is expected to rise as dedicated coaxial cable forms "local area networks" replacing telephone lines.)

USAF's Word-Processing Bible

The bible on word processing is Air Force Regulation 4-2, "Word Processing Management Program." In twelve pages, the reg outlines procedures and assigns responsibilities for authorizing and managing systems and implements applicable federal regulations. Word-processing equipment, according to the document, includes "but is not limited to" dictation recording and transcription equipment; automatic repetitive typewriters; stand-alone, text-editing typewriters (with or without video displays); shared logic systems tied to minicomputers; and keyboard systems used to access government or commercial computer services whose primary use is word processing.

The goal of the Air Force's word-processing program is stated simply in the regulation: "To achieve increased productivity." Because that often results in saving money, an implied goal of the program is cost reduction.

Such large manufacturers as CPT Corp. have snared the greater part of the Air Force's word-processor business.



Sgt. Russell Larison and SrA. Daniel Rogers (seated) experiment with the special applications of a Wang processor.

At one time, Hq. USAF approved all new installations of word-processing equipment. But since 1976 approval authority has been delegated to major air commands and separate operating agencies. The change resulted not only from a sharp increase in applications for word-processing equipment from bases but from the realization that MAJCOMs could judge better the priorities in their organizations and where and how to spend limited funds.

Since many Air Force functions have similar missions and staffs, word-processing equipment is authorized for certain offices in the Table of Allowances, right along with desks, chairs, and file cabinets. Once a representative word-processing justification study has been completed for a given function, the findings may be applied as a "basis of issue" to similar offices without additional justification.

In offices for which no basis of issue has been established, a justification study is required to establish the need for word-processing equipment.

One factor to be considered is the amount of labor saved with a word-processing system as compared to a manual typewriter. Management engineering studies have found that a GS-3 typist with a word processor can do the same amount of work in only fifty-five percent of the time. "Nontypists"—less proficient and less familiar with the keyboards—can produce a document in eighty-five percent of the time they would need on a manual system.

Another consideration is security. Obviously, word processors linked by cables to a central computer outside the office are subject to interception. But even stand-alone equipment emits signals that could be captured by monitoring devices. About a dozen companies offer word-processing equipment with key components or entire units shielded to prevent signal emission, but the shielding adds fifty percent to the basic price. A popular and less costly solution is to install equipment used for classified projects in vaulted offices. Unclassified documents protected by the Privacy Act—performance reports and letters of reprimand, for example—can be safeguarded by requiring a password to gain access to the computer, or by simply locking up the memory disks.

Buy or Lease?

There are a number of ways an Air Force manager can fund word-processing equipment, but the basic decision is whether to lease or buy. In the early days of word processing, leasing was the more popular choice because of the steep price and the uncertainties about equipment obsolescence. There was also apprehension about the basic value of word processing. But as word processing proved itself to managers, as prices de-

Words for a Weapons Wing

Lt. Col. Bill Smith of the 57th Fighter Weapons Wing, Nellis AFB, Nev., knows that word processors are "more than smart typewriters." He and the staff of the aircraft maintenance training division there have built programs to schedule 200 courses of instruction for the 2,500 maintenance specialists who service the wing's five different types of fighter aircraft.

An average of ninety classes conducted weekly each requires a fifteen- or twenty-page description on the voluminous weekly training schedule. One class entry, for a weapons loading course, for example, might call for a specifically configured F-4E to be in a certain parking spot along with specialized ground support equipment between certain hours of a certain day. Preparation of the schedule by typewriter used to begin Monday and was barely completed in time for reproduction and delivery on Friday.

Using word processors, things are much easier. A ten-digit program code was developed for each of the 200 course-days; the programs each took about five minutes to prepare. With the program built, a single piece of paper with about ninety code numbers represents a week's worth of classes. The word processor converts these codes into the lengthy descriptions and instructions for each course. A draft weekly schedule is available Tuesday for coordination and correction of errors. Changes are made easily to the schedule when certain aircraft, equipment, or students won't be available. All concerned get an early look at what they will be required to do the next week, long before the final version goes to press on Thursday. Besides saving time and labor, the new system assures that the right equipment and students are present when instructors begin classes.

The CPT Corp. word processors at Nellis have also been used in the unit's aircraft weight and balance program. Each time avionics boxes are installed or removed from an aircraft, or when weapons, fuel tanks, or equipment pods are added to the external stations, an aircraft's center of gravity shifts. To ensure that a given configuration of equipment and weapons does not cause an imbalance that might endanger flight, the aircraft must be jacked up and weighed—a process that takes ninety minutes. Nellis has established 500 different profiles for configurations of the base's 120 aircraft. Determining weights and balances, now done mathematically on word processors, takes only seconds.

More and more Air Force typists are becoming familiar with word-processing systems.

creased and software proliferated, the Air Force preference shifted from leasing to buying equipment. Nevertheless, procurement money is not always available so some leasing is still done.

Air Force administrators have made substantial use of "fallout" money to obtain word-processing equipment. Also, under the Fast-Payback Capital Investment Program (FASCAP), funds are made available to purchase equipment that will be amortized in two years and show tangible savings. In Fiscal Year 1983, 135 of the total of 243 approved FASCAP programs in the Air Force were for the purchase of word-processing equipment. Administrators proved that spending $4.5 million now would eliminate 172 staff positions, saving $6.8 million over two years and $24.7 million over five years.

When procurement money is not available, the Air Force's preferred option is the so-called "flat-top" lease-buy program. Following a three-year lease, the equipment becomes Air Force property. Next in preference is long-term lease with option to buy, followed by short-term lease. Every word-processing user is required to recertify a need for the equipment each year. Managers at major air commands look hard at renewals of leases beyond two years since that is generally considered the longest economical leasing period.

Once equipment is on hand, users must also submit monthly utilization reports. The reporting system monitors time-in-use instead of lines typed, as in the past. Machine time is considered a more accurate indicator than sheer volume. Although reviewers have authority to redistribute underused word processors, the experience has been that offices use the equipment more than was anticipated during the justification study, says Maj. Bernhard S. Hoenle of the Air Force administrative systems management division.

A log of monthly service calls is reviewed to give administrators a handle on the performance of contractors and manufacturers. There is less equipment downtime now than in past because word processors are more reliably built and replacement parts are modular. The most frequent breakdowns today are in printers because their moving mechanical parts wear out.

Lt. Col. Robert W. Nicholson is an Air Force public affairs officer who has written for this magazine previously. His last article, "In the Footsteps of Giants," October '83 issue, reported on the winners of AFA's annual aircrew awards. As research for this article, Colonel Nicholson learned to operate a word processor and, following an hour of informal instruction, used the system to prepare his manuscript.

Another reason equipment is seldom idle is ease of operation. More and more typists have become familiar with word processing, and the differences between keyboards are minimal. For the novice, there are instructional software disks and desktop minicourses that provide rapid orientation.

Applying the Technology Efficiently

In a 1981 analysis of the word-processing programs of a dozen Defense Department agencies, the Defense Audit Service found much to criticize and little to applaud. In sharp departure from the tone of most of the document, however, the auditors noted: "Our intent was not to single out any one DoD component as the best or worst manager. . . . Unlike the other DoD components, however, the Air Force did demonstrate to us that their management of word-processing resources was quantifiable. Because records were available, we were able to determine more clearly the benefits of using their word-processing resources. In many instances USAF has done an exemplary job of identifying those benefits."

Nevertheless, Col. James H. Delaney, the Air Force Director of Administration (DA), feels that USAF administrators can do more to streamline office procedures and free people from the purely mechanical and repetitive aspects of their work. In the past, DA missed opportunities to show the senior leadership how to apply state-of-the-art technology in the office.

"But we've taken off our green eyeshades and bureaucratic masks now," he says, "and have begun to address office management problems, telling commanders how to solve them. Previously, we didn't inject ourselves into office automation problems in which we had a legitimate interest. Now we're working to posture the DA career field as consultants to leadership on the management of information, not simply on applications of the equipment. Word processing is just a beginning."

Soon, office microcomputers may send mail electronically, sort and distribute messages, serve as central filing systems, and schedule appointments, travel, and meetings.

The establishment of the new headquarters office of the assistant chief of staff for information systems (AF/SI) has blurred the lines of responsibility for office automation. At present, because of its telecommunications and data-processing orientation, AF/SI provides the technical expertise that AF/DA applies to the management of office administration.

Although no one in the Air Force who has used word-processing systems doubts that they improve productivity, quantifying that improvement is sometimes elusive. In most cases, no one is fired when a word-processing system is installed. Instead, people move to another, usually understaffed office. And most typewriters are not suddenly declared excess and sold; they are redistributed on base or kept to do jobs too small for word processors.

Perhaps the final measure of merit is the performance of administrative staffs in the wake of personnel cuts at a time when information needs are expanding. Fewer people are producing more correspondence, more reports, and more publications and are doing so because of the increased efficiency of text-processing systems. ■

VIEWPOINT

DoD and the Bell Breakup

By Gen. T. R. Milton, USAF (Ret.), CONTRIBUTING EDITOR

The military will be high on the list of those not helped by the antitrust decision.

Ma Bell, free at last from the relentless pursuit of antitrust lawyers, is off into the exciting new world of telecommunications and information processing. The rest of us, meanwhile, can look forward to an exciting new world of uncertain and more expensive telephone service. Our superb American telephone system has been dismantled, and while Judge Harold Greene is still being hailed in some quarters as a Solomon, and Rep. Tim Wirth (D-Colo.) continues to take bows as a prime mover behind AT&T's breakup, the applause is dying down. There are, it seems, second thoughts beginning to surface, along with the realization that telephone rates are going to jump.

In agreeing to the divestiture, Ma Bell not only gained freedom to compete in new, and probably more profitable, marketplaces; she also shed the vexing responsibilities that go with being a regulated monopoly. In her bad old monopoly days, Ma Bell was duty-bound to service isolated and unprofitable customers, whether a farmer at the end of the line or a defense radar in Concrete, N. D. Revenue from other operations, principally long distance, comfortably took care of the losses, and AT&T stock became the widow's safe haven.

While it was turning into an investor's sure thing, the Bell System, because it was an efficient monopoly, also became essential to national defense. With the world's finest communications already in place, there was little reason, beyond prudent minimum redundancy, to spend Treasury money on a different system. Since the system in place belonged to AT&T, it made good sense to let AT&T maintain it. Over the years, the working relationship between Bell and the military services grew truly symbiotic. The parting, thus, is difficult.

George Orwell doubtless chose the year 1984 for the title of his noted book because it was, in 1948, suitably distant for the kind of sardonic prophecy he had in mind. Like the marvelous World of Tomorrow that had the 1940 World's Fair's tourists goggle-eyed, Orwell's grim vision of 1984 has not come to pass. And yet there is just a hint of 1984 "newspeak" in the justification for this breakup. But never mind; it's done, and we will go on from there. The Defense Department, of all those affected, will probably have to pick up the most pieces.

> Steps taken in anticipation of the AT&T breakup include new dedicated military satellite systems, increased military use of commercial satellites, and a ground wave emergency network under construction.

First of all, the military services must adjust to a disruption of long-standing procedures. Before the breakup, they called Ma Bell when there was a problem, and that was that. The twenty-two regional companies that made up the Bell System have now been cut loose. The tight old system is thereby fractured, and so is the expertise. A breakdown will now take several calls, depending on whose responsibility it turns out to be.

To continue in this gloomy vein in the manner of losing football coaches, the new service will be less responsive but more expensive in tax dollars, to say nothing of the cost to you and me. One knowledgeable military communications expert estimates an immediate increase of twenty to thirty percent for the same service AT&T was providing before Solomon handed down his judgment. And while, as we have seen, it will cost more, the service will also be slower—unless, that is, the Defense Department is willing to pay a premium for expeditious handling.

Well, there is no use looking back to the good old days when our telephone system was the envy of the world and Americans abroad were insufferable in boasting about it. As in other areas that were once a matter of national pride—education comes to mind—we like to fix things that aren't broken. Now, in defense, certainly, there must be a major effort to repair the damage done by the fixing.

Happily for our peace of mind, defense communicators have been taking steps in anticipation of the AT&T breakup. There are new dedicated military satellite systems going into orbit, along with increased military use of commercial satellites. A ground wave emergency network—GWEN, naturally—is under construction. Together with all this, the services will have to increase their own in-house maintenance and management capabilities. Where these additional people will come from is anybody's guess, but one way or another, they will have to be found.

In recognition of the defense difficulties caused by its breakup, AT&T has proposed the creation of a Federal Services Division. This new organization would serve to some degree as a single point of contact for the Defense Department in dealing with leased communications systems. The proposal must receive official approval, and that is by no means certain so soon after the antitrust triumph.

Meanwhile, AT&T, having been thrown into the briar patch, is on its way to a sun-kissed hill, just like Joel Chandler Harris's Brer Rabbit. The rest of us, especially the older rest of us, are left to wonder why progress must be so destructive. ■

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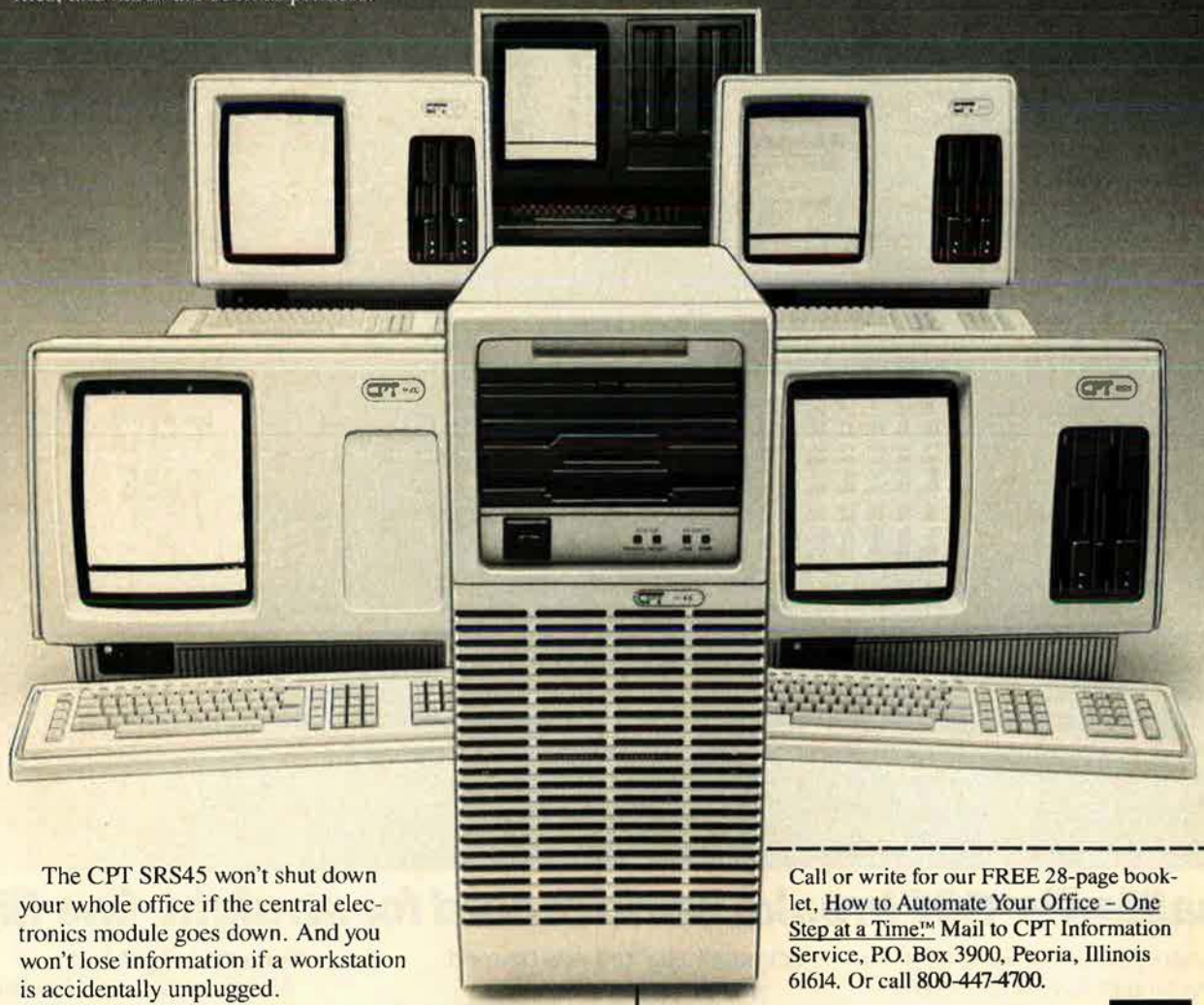

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Challenger 601 breaks world record for straight-line flight

Shortly before seven o'clock on the evening of August 23, 1983, Canadair Challenger 601, serial #3002, registration C-GBXH, took to the sky over Calgary, Alberta, and proceeded to add a paragraph or two to the history of general aviation.

As it turned out, the 601 actually flew on airways a total of 7,176 kilometers (3,875 nautical miles, or 4,459 statute miles), but for record purposes, only the great circle distance between Calgary and the airfield on which the Challenger 601 ultimately alighted was claimed.

For the record, then. The Challenger 601 set a new distance for straight-line flight for business jet aircraft in the 16,000 to 20,000 kilogram weight class, flying from Calgary, Alberta, Canada to London, England. Officially, 7,023.5 kilometers. Or 3,792.4 nautical miles, or 4,364 statute miles, non-stop.

The personnel, the weight.

The flight crew consisted of Martin Sommerard, Senior Executive Pilot, and Ian McDonald, Director of Production Flight Test.

Also on board was Howard Goldberg, President of the Royal Canadian Flying Clubs Association, a the official observer for the Federatio Aeronautique International (FAI).

Also on board were three other crew members: G. Piat, Manager, Flight Operations Services, R. Booth, Flight Test Engineer and F. Tessier, Foreman, Preflight.

As the interior of the aircraft was not yet finished to customer specifications, the aircraft had extra ballast

of 1,845 kilograms, or 4,068 lbs., added to simulate the weight of a fully finished interior. Bringing total ramp weight to 42,085 lbs.

Total flight time was nine hours and four minutes.

Average speed: Mach 0.74.

The FAI also ratified 18 world records set by the 601 for time to climb, altitude without payload and altitude in horizontal flight.

The point.

As proud as it makes us, the essence of this achievement is not just a demonstration of the fact that an aircraft can fly far.

Indeed, with thousands of extra pounds of fuel feeding hundreds of extra pounds of engine, there are corporate jets that can fly even farther.

This record, however, was set by a very large, wide-body aircraft that also happens to be the most fuel-efficient intercontinental corporate jet in the world.

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To find out more about the record-breaking trip of the Challenger 601, and just where that might leave you and your company, the man to speak with is Mr. James B. Taylor, Senior Vice President of Canadair Ltd. Call him at (514) 744-1511.

Or write Canadair Ltd., P.O. Box 6087, Montreal, Canada H3C 3G9.

canadair challenger

The Annapolis Connection

The salty saga of Naval Academy graduates who rose to star rank in the Air Force.

BY MAJ. GEN. ROBERT A. ROSENBERG, USAF

THE Air Force has a small cadre of members who share a special heritage. We are Naval Academy graduates commissioned in the Air Force. Today, some of these former midshipmen are among USAF's senior leaders, and include Gen. Lawrence A. "Larry" Skantze. Recently appointed Vice Chief of Staff, he is the first Annapolis graduate to pin on four stars in the Air Force.

How did Naval Academy graduates become Air Force officers? How did the Naval Academy prepare us for an Air Force career? And who in this group achieved star rank?

Lt. Gen. Lewis H. Brereton was one of the first midshipmen to make an Air Force name for himself. The World War II Army Air Corps leader graduated from the Naval Academy in 1911 and was first posted to an Army Coast Artillery unit. In 1913 he became one of the earliest Army pilots and in 1921 worked with Billy Mitchell in the controversial ship-bombing experiments. Later, he was the first of his class to earn two stars.

General Brereton held commands in most theaters of operations during World War II and saw action in many of the war's important campaigns. Commander of the Far East Air Force in 1941, he then helped form the Tenth Air Force for operations in China-Burma-India.

In 1942, he was sent to the Mideast to command what was to become Ninth Air Force. There, he helped in the defeat of the Afrika Korps and organized the bombing raid against the Romanian oil fields at Ploesti.

Among other commands in the latter stages of the war, General Brereton led the 1st Allied Airborne Army.

Besides General Brereton, Maj. Gen. Hugh J. Knerr was an Annapolis graduate of the pre-World War II era who pinned on stars. A 1908 Annapolis graduate, he received his pilot training at Rockwell Field, Calif., in 1917. In the mid-1930s he became Chief of Staff of the General Headquarters Air Force. During World War II he served concurrently as Deputy Commander of US Strategic Air Forces in Europe and as Commanding General of Air Technical Service Command in Europe. In January 1948 he became USAF's first Inspector General, and he retired the following year. A profile on General Knerr appeared in the October '78 issue of AIR FORCE Magazine.

No Longer a Rarity

With 1947's National Security Act establishing the Air Force as a separate service, Naval Academy graduates who became Air Force officers were no longer a rarity. Twenty-five percent of both West Point and Annapolis graduates were permitted to accept regular commissions in the Air Force.

The policy became effective with the Class of 1949, when fifty-five Annapolis graduates were granted Air Force commissions. One was Robert S. Berg, now retired as a brigadier general. In the Class of 1950, 171 received Air Force commissions out of 691 graduates. Of the seven who earned stars, one is still on active duty. Maj. Gen. Leighton R. Palmerton is Commander of the NATO Airborne Early Warning Force, the senior US military official responsible for implementing the operational phase of the NATO AWACS program.

Maj. Gens. Howard M. Estes, Jr., Daryle E. Tripp, and Philip J. Conley, Jr., and Brig. Gens. Edward Mendel and Dennis B. Sullivan are retired. Maj. Gen. Lovic P. Hodnette, Jr., is deceased.

About twenty-five percent of the 725 graduates of the Annapolis Class of 1951 entered the Air Force. Brig. Gens. Thomas P. Conlin and David M. Mullaney are now retired. Seven members of the next class earned stars and five remain on active duty. Maj. Gen. William B. Maxson, recently assigned to SAC's Fifteenth Air Force as Vice Commander, is one.

Lt. Gen. James R. Brickel, Deputy Commander in Chief, US Readiness Command, and Vice Director, Joint Deployment Agency, graduat-

TOP: Gen. Lawrence A. Skantze, the first Annapolis graduate to achieve four-star rank in the Air Force, at pinning-on ceremonies with wife Pat. ABOVE: Portrait of a midshipman.

ed with the Class of 1952. He remembers that the prospect of twenty-five percent of the graduates entering the Air Force was received with mixed emotions at Annapolis. Since all had to be volunteers, "There was the view held by some that choosing the Air Force meant rejection of the Navy. Nearly everyone who made that selection in the early years of the policy did so against a backdrop of the national controversy over the roles of the Air Force and the Navy in strategic warfare (the famous 'Revolt of the Admirals' was one outcome of the related policy decision). There were—and still remain—some hard feelings that time is slowly healing," he added.

Infiltration to the Top

General Skantze graduated with the Class of 1952. He offers several vignettes: "I vividly recall early guidance to me as a new midshipman that one of the dedicated missions of the Naval Academy graduate was to keep the world safe from West Pointers." That is a truly difficult task—even today—since General Skantze works for Air Force Chief of Staff Gen. Charles A. Gabriel; Lt. Gen. George Miller (USNA '53), Vice CINCSAC, works for CINCSAC Gen. Bennie L. Davis; General Brickel, Deputy CINC of Readiness Command, works for Gen. Wallace H. Nutting, USA; and yours truly works for CINCNORAD Gen. Jim Hartinger. All our bosses are West Pointers!

General Skantze went through a ritual no Air Force volunteer at boat school avoided: "As a First Class midshipman having declared my intent to go to the Air Force, I was ushered into my company officer's office to explain why I had chosen to desert the Navy, which resulted in an interesting conversation about challenges and opportunities. Having spent all of my enlisted time at sea and with rumors that the Navy was forming an Antarctic Ocean battle group, I was not too enthused about returning to that natural habitat."

LEFT: Class of 1952's William B. Maxson is currently a major general and Vice Commander of Fifteenth Air Force. BELOW: A moment of relaxation with grandson Eric.

As a first lieutenant, Skantze became the aide to Maj. Gen. George Finch, Commander of the Fourteenth Air Force. "I was mischievously introduced by him to Navy admirals as a Naval Academy graduate who had seen the error of his ways."

Other 1952 graduates still on active duty are Lt. Gens. Bruce K. Brown and Richard K. Saxer. General Brown was recently assigned as Commander of Alaskan Air Command and pinned on his third star in September 1983. General Saxer assumed duties as Director of the Defense Nuclear Agency in August 1983. Retired are former astronaut Lt. Gen. Thomas P. Stafford and Brig. Gen. William W. Dunn.

Eight graduates of the Class of 1953 earned Air Force stars. Of the two on active duty, General Miller recently officiated at a unique ceremony at Norton AFB, Calif., at which three former Naval Academy graduates were retired: Brig. Gen. Charles W. Lamb (also Class of 1953) had been Director of Regional Engineering for the Peacekeeper missile; Col. Lawrence B. Molnar, Class of 1953; and Lt. Col. Robert A. Mazik, Class of 1957.

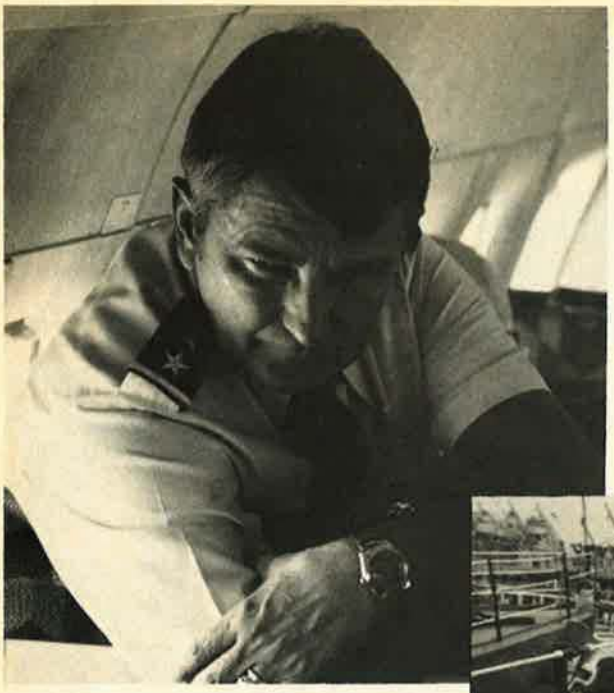
Maj. Gen. Stuart H. Sherman, Jr., is the other 1953 graduate still on active duty. General Sherman is currently Staff Director of the fifth Quadrennial Review of Military Compensation in Washington, D. C. AFRES Brig. Gen. Thomas R. Pochari is Mobilization Assistant to the Commander of the Air Force Acquisition Logistics Division. Other retired class members include Maj. Gen. Richard G. Collins and Brig. Gens. Robert A. Foster, Harold E. Gross, and Donald A. Vogt.

The Class of 1954 produced the most Air Force general officers—eleven, of whom seven are still on active duty.

Outcasts at the Academy

Volunteering for an Air Force commission produced midshipmen who were somewhat outcasts at the Naval Academy. Maj. Gen. William E. Thurman, currently Deputy for B-1B at Aeronautical Systems Division, recalls when the brigade was assembled to hear representatives of each of the services on what they had to offer:

"The Air Force speaker gave a fine presentation. The first question asked by a midshipman was, 'If someone selects the Air Force and doesn't like it, can he come back to



LEFT: Lt. Gen. John S. Pustay, USAF (Ret.), entered the US Naval Academy with the Class of 1954. BELOW: As a Navy enlisted member before appointment to the Academy and subsequent commissioning in the US Air Force upon graduation.

the Navy?' The Naval Academy Superintendent jumped to his feet and whirled to face the brigade. He shook his fist and shouted: 'If anyone goes into the Air Force, we don't want them back in the Navy!' His outburst had just the opposite effect. When additional spaces were given to the Air Force above the initial quota, long lines formed to volunteer for these spaces. Our class totally filled its Air Force quota."

Recently retired Lt. Gen. John S. Pustay, a 1954 graduate, remembers attending a formal dinner at Bancroft Hall. Such occasions were designed to bring first classmen together with the Academy's senior leadership and distinguished guests. Seated next to a senior naval officer, the midshipman was quizzed on his career prospects. When he indicated his intent to seek an Air Force commission, the effect was predictable: "It was strange that for the rest of the evening—and the dinner had literally just begun when the subject came up—I was no longer able to attract the attention of my distinguished partner for any kind of conversation," he remembers.

Even after four years in the Air Force, John Pustay's class ring would still generate comment. While stationed in Japan, he was going through the reception line at a formal affair when he came to an American vice admiral—Vice Commander US Forces Japan—who immediately noticed his class ring. "He then said very loudly, 'Ah ha, you are a Naval Academy graduate, one of those turncoats!'" General Pustay related. "Indeed, with a smile on his face but in a very loud voice he added, 'You can be called a Benedict Arnold.'"

Embarrassed, the then first lieutenant had the presence of mind to reply, "There is one big difference, Sir—Benedict Arnold was wrong and I am right." When the admiral responded, "By golly, I know we produce the right kind of people!" it all ended in a very positive, friendly, and lighthearted manner, General Pustay recalls.

I remember the time my own class ring almost did me in. I was selling raffle tickets at the Olathe Naval Air Station to raise funds for the Air Force Aid Society when the commanding officer noticed my ring, called me a traitor, and said if I weren't off his base in five minutes I'd be in his brig! I left as quickly and as graciously as I could.

Proper Preparation

Brig. Gen. (Maj. Gen. selectee) Aloysius G. Casey, currently Commander of the Ballistic Missile Office, believes that the Annapolis background was an advantageous way to prepare for an Air Force career:

"The fixed curriculum of that era was too rigid and did not challenge the students enough but was a sound basis for future graduate work," he noted. "I think I was the only one in my navigation class at Ellington Air Force Base who could solve the trig problem without the HO 249 tables because we had been drilled in it at Annapolis," he added.

"Perhaps more important than the technical aspects, I do believe the variety of Naval training and background, mixed with our early exposure to SAC, TAC, etc., equipped the Annapolis graduates with a broader view than our contemporaries in the Air Force," General Casey explained.

He added: "There is a certain realization that comes from having lived aboard a capital ship and being integrated into its operation that is indelible. In sum, I think the Navy-trained folks were a little broader—less bureaucratic—thus more effective."

Maj. Gen. William W. Hoover, Deputy Assistant Secretary for Military Applications, Defense Programs, Department of Energy, was another 1954 graduate. He reminisces:

"I suppose, like many of us at the Academy, I really didn't know what I wanted to do when I grew up and more or less stumbled into the Air Force. For me the prospect of flying seemed like an exciting replacement for varsity sports. Being on the ground floor of a fledgling service seemed more challenging than going into the old-line Navy. And somehow being at sea for several years didn't seem to be the proper tonic after being cooped up for four years," he explained.

"Nonetheless, what I learned at the Academy, the values it gave me, the seed of duty and service to country that was planted carried over very well. They have been the basis for whatever success I enjoyed or whatever contribution I have made to the Air Force," General Hoover noted.

"Quite frankly, I think we did bring a heritage—something different than the old Army Air Corps,

LEFT: Midshipman Robert A. Rosenberg graduated with the Class of 1957. Here, with wife Marjorie. ABOVE: Currently Vice Commander in Chief of NORAD.

the long gray line of West Point, or the kid fresh from civilian life—that not only has served the Air Force well but has given it some of its uniqueness."

Other graduates of the Class of '54 who earned stars are Lt. Gen. Robert T. Herres, Director, Command Control and Communications Systems, OJCS; Maj. Gen. Kenneth D. Burns, Commander, Thirteenth Air Force, PACAF; Maj. Gen. John A. Brashear, DCS/Operations, SAC; and Maj. Gen. Joe P. Morgan, Director of Space Systems and Command Control and Communications, DCS/Research, Development and Acquisition, Hq. USAF. On the retired list are Maj. Gen. Richard T. Boverie and Brig. Gens. Rano E. Lueker and Eugene M. Poe, Jr.

Historic Event for USAF

The year 1954 saw a major event in Air Force history that would limit to a select few the unique Annapolis/Air Force heritage: the establishment of the Air Force Academy. Included was a provision that each cadet at the US Military Academy and Air Force Academy and each midshipman at the Naval Academy be given the opportunity to state a preference as a commissioned officer of the Army, Navy, Air Force, or Marine Corps. The twenty-five percent maximum was halved to twelve and a half percent. Also provided for was recision of the agreement under which West Point and Annapolis graduates could volunteer for commissioning in the Air Force.

Four graduates from the Class of 1955 wear stars. Maj. Gen. Peter W. Odgers, Commander of the Air Force Flight Test Center, is one: "I think all the midshipmen who sought commissions in the Air Force did so with the thought that they could contribute to this young service. Coupled with that, for those with a sincere thirst to fly, was the prospective thrill of piloting the world's most modern jet aircraft," he added.

"It was with these noble intentions that I embarked on a flying career in USAF. This eventually led to my becoming an experimental test pilot, receiving a master's degree, and experiencing the rewards of command. USNA graduates contributed significantly to the maturing and development of a professional Air Force. I like to feel that we held the fort until the Air Force could form its own academy and produce graduates," explained General Odgers.

Brig. Gen. Pintard M. Dyer III, Commander of SAC's 12th Air Division, noted: "My experiences at the Naval Academy aided me invaluably in my rise toward the 'stars.' The honor and integrity of the Academy will remain with me always. The teachings and leadership drills have helped me over and over again; and even though I can look back and occasionally poke fun at what I did and what I was supposed to have accomplished, I realize now that what I learned at the Academy, in great measure, has made me what I am today. Now all I need is a copilot who understands me when I say, 'Okay, helmsman, ten degrees to port.' "

Other 1955 graduates are Maj. Gen. Monroe W. Hatch, Jr., SAC Chief of Staff, and Maj. Gen. William A. Anders, AFRES, Mobilization Assistant to the DCS/Research, Development and Acquisition, Hq. USAF.

A 1956 graduate now retired is Maj. Gen. Emil N. Block, Jr. The other three "star" graduates are Maj. Gen. Spence M. Armstrong, recently assigned as Chief, US Military Training Mission, Saudi Arabia; Maj. Gen. Ralph H. Jacobson, Director of Special Projects, Office of the Secretary of the Air Force, and Assistant Vice Commander, Space Division, AFSC; and Brig. Gen. (Maj. Gen. selectee) Thomas C. Brandt, DCS/Intelligence, SPACECOM.

Brig. Gen. Melvin G. Alkire, Class of 1957, now Deputy Director of Engineering and Services, DCS/Logistics and Engineering, Hq. USAF, thinks that Annapolis "book learning" provided a good basic education that has held up well during his twenty-six years of active duty, but it was not the formal education that made the difference. "I'd have to put emphasis on plebe year—as we knew it then. A Marine Corps instructor said it best at the time: 'The rigors of plebe year are as important as any class you take'—and so we learned."

Brig. Gen. Richard J. Toner pinned on his star in September 1983. Also from the Class of '57, he is currently the Chief of Staff's Executive Officer. Brig. Gen. Charles

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Maj. Gen. Robert A. Rosenberg is currently Vice Commander in Chief of NORAD and Assistant Vice Commander of Space Command. A 1957 graduate of the Naval Academy, he holds a master's degree in aerospace engineering and is a graduate of the Industrial College of the Armed Forces. General Rosenberg has spent the better part of his career specializing in space systems. He has served in top assignments at the Pentagon and with the National Security Council at the White House.

M. Duke, Jr., AFRES, is Mobilization Assistant to USAF Recruiting Service. The fourth 1957 graduate to don stars is yours truly.

I had flunked my Navy commissioning physical because of bad eyesight. Destined never to fly, I asked the Air Force liaison officer at USNA if the Air Force would take me. "Of course, young man—we'll send you to missile school—why, some day the Air Force will even be in space." That was in January 1957. By October Sputnik was up and the space race was on with me involved from the very start! Today, as Vice CINCNORAD and Assistant Vice Commander of Space Command, I look back warmly on the blessing of having been given weak eyes.

Other High Risers

Brig. Gen. Samuel H. Swart, Jr., a 1958 graduate, is Commander of SAC's 57th Air Division. Also of that class is Brig. Gen. James B. Davis, Director of Personnel Programs, Hq. USAF.

Brig. Gen. Donald L. Cromer, Class of '59, is Director, Space Systems, Office of the Secretary of the Air Force. The other 1959 graduate, Brig. Gen. Cecil W. Powell, is now Assistant DCS/Operations at Hq. USAFE. Eighty-two of their classmates received Air Force second lieutenant bars. In 1960, there were fifty-nine Air Force commissions, forty-seven in 1961, eighty-one in 1962, and fifty-six in 1963.

But the pipeline from the Naval Academy was to be cut back further, so chances for Air Force stars became even less likely.

In 1963, then Secretary of the Navy Fred Korth took unilateral action to bar future Annapolis graduates from accepting Air Force commissions. From the previous five graduating classes, nearly 400 had gone into either the Air Force—the majority—or Army, while only eight from the other service academies had accepted Navy commissions.

Secretary Korth exercised his statutory prerogative of nonconsent to transfers of Naval Academy graduates starting with the Class of 1964, when only four received Air Force commissions.

The Class of 1965 produced ten Air Force officers. In the decade beginning in 1968, only three graduates were commissioned by the Air Force.

In 1978, General Davis, then Air Force DCS/Manpower and Personnel, and Admiral Watkins, then Deputy CNO/Manpower, Personnel and Training/Chief of Naval Personnel, agreed informally to exchange a few graduates.

In 1978, six Annapolis graduates accepted Air Force commissions, and in 1979 nine did so. However, the Navy decided to shut down interservice transfers again beginning with the Class of 1980. Reasons cited were the critical need for nuclear power officers and the need for officers in the Unrestricted Line (eventually eligible for command at sea), where severe shortages loomed.

Transfer Policy

Then-Secretary of the Air Force Hans Mark recommended to his Navy counterpart that at least a one-for-one interservice transfer program be considered, citing the exceptional circumstances in which cadets and midshipmen desired transfers.

The USAF interservice transfer policy was that approval would be recommended when a cadet demonstrated that the decision had been carefully thought out, that there was the likelihood of being a more effective officer in the other service, and that he or she had familiarity with Air Force career opportunities as well as those in the other service.

Items considered as evidence of this last criteria were to include family tradition, earlier application to the other service academy, participation in academy exchange programs with the other service, career opportunities available only in the other service, and a desire to join a prospective spouse in the other service.

In December 1981, Secretary of the Navy John Lehman signed a memorandum of understanding agreeing to Navy/Air Force interservice transfers. Secretary of the Air Force Verne Orr signed in January 1982, with the option to be effective with the Class of 1982. That year's graduation saw nineteen midshipmen commissioned in the Air Force and three cadets accepting Navy commissions. Subsequently, the Navy proposed a ratio of exchange no greater than two to one.

Commencing with the Class of 1983, a balanced program was to be maintained whereby the gains and losses for each service were to be equitable over a reasonable period, with a one-to-one ratio the objective over the long haul. In 1983, five Air Force Academy graduates accepted Navy commissions and an equal number of midshipmen donned Air Force blue.

The first Annapolis graduate to earn four stars, General Skantze's path has often crossed that of fellow graduates of his own and the other academies. Noting the friendly, three-service rivalry that is part of the special heritage, he told this story:

As Commander of Aeronautical Systems Division at Wright-Patterson AFB, Ohio, he had "constant interfaces with the West Point Mafia led by the then Commander of AFLC, Gen. Bryce Poe [USMA '46]. At his retirement banquet in 1981, attended by his classmate Gen. Lew Allen, I presented him a replica of a page from the Naval Academy yearbook, *The Lucky Bag*, in which we inscribed his picture and provided a write-up of him as a closet midshipman. He will not admit it today but he became teary-eyed, and while the plaque has always hung in an honored place in his home, he will probably take it down after reading this."

General Skantze noted the rapid passage of time. Flying the left seat of a T-39 en route to San Diego, he gave a lift to a brand-new Marine second lieutenant. Extolling the virtues of Annapolis and excited about his first assignment, the Marine asked, "General, have you ever been to the Naval Academy?" General Skantze replied, "I am Class of '52." Following a moment of silence, the young officer responded, "But that was thirty years ago!" General Skantze's concluding comment: "You're damn right!"

Like the enthusiastic Marine lieutenant, perhaps there is an officer among the few Naval Academy graduates permitted to accept an Air Force commission who has the right combination of brains, skill, and acumen to earn Air Force stars.

This youngster may join that small group who rose from Navy roots to share the special Annapolis/Air Force heritage. Only time will tell. ■

THE NEW PRIORITIES

Air Force leaders look at defense issues, from space to the tactical battlefield.

BY EDGAR ULSAMER, SENIOR EDITOR (POLICY & TECHNOLOGY)

FROM "floods" of USAF combat aircraft that lack adequate basing and support in Europe and quirks in British laws dealing with antiwar protesters on US bases to the likely makeup of a prospective unified Space Command and the Pentagon's diverging views on how and when to build a crucial space-based radar system, AFA's National Symposium, "The Air Force Today and Tomorrow: The New Priorities," illuminated a host of critical defense issues.

Air Force Secretary Verne Orr, the keynote speaker of the program held November 17–18, 1983, in Los Angeles, Calif., predicted that eventually a unified Space Command would be headed by an Air Force officer, with the US Navy providing the deputy commander. The reasoning behind such an arrangement, he said, is that military space operations require a unified approach to avoid "duplication, frustration, and a lot of extra expense"; that the Air Force is the principal user of space, followed by the Navy; and that the precedent of unified commands on land, at sea, and in the air ought to be extended to the new medium of space.

So far as strategic defense—and its potential extension into space—is concerned, he felt that there would be no arguments with the Army over roles and missions, in part because of the close cooperation between the two services and their chiefs of staff. Acknowledging "different views" within the Pentagon and the services on a space-based radar system, Secretary Orr said the choice was between taking a short step ahead and spending a modest amount of money—although still involving "billions" of dollars—and a "long, long step and spending a great deal more money, but [having] nothing to show for it for a number of years."

At the root of the problem is the "age-old question, 'Do you take something now that won't be as good as what you [could] have later or do you wait and get something much better, but always with the thought that when you are ready for that, there will be something [better yet] on the horizon?' " The current debate, he said, is over which approach should be taken. He predicted that the Pentagon eventually will decide to launch a space-based radar program, "but I have no idea how advanced [a system will be picked] or how soon." *(See also "In Focus . . ." p. 17.)*

Asked about the concept of manufacturers' warranties for weapon systems—currently a popular idea in Congress—Secretary Orr said the Air Force will insist on at least the same kind of warranty that manufacturers give on similar products to other purchasers. He warned, however, that "there is no free lunch," with the result that industry will raise prices enough so it won't lose on warranties. The old approach of avoiding such price increases by correcting "our own mistakes" may not have been the ideal solution either, but no one should pretend that "all of sudden, out of the goodness of their hearts, manufacturers are going to start to make warranties and say, well, we'll just eat that added cost," Secretary Orr told the AFA meeting.

Critical Tactical Air Needs

USAF Chief of Staff Gen. Charles A. Gabriel highlighted the dramatic improvements in the Air Force's flying safety record that in 1982 and 1983 culminated in the lowest accident rate in USAF's history. Even more significant, he pointed out, is the fact that "we achieved these records while flying increased hours under much more demanding and realistic training conditions than in the past."

The Air Force's accident rate has plummeted from a staggering thirty-six major accidents per 100,000 flying hours in 1950, to seventeen in 1955, to three in 1978, 2.3 in 1982, and 1.7 this year. He explained that if the accident rate had remained at the 1978 level over the past five years, "we would have lost ninety-six more airplanes than we actually did. That's five squadrons of aircraft that the Air Force is flying today, worth about half a billion dollars. Even more important, many lives were saved."

USAF can put aircraft on the ramp in Europe, but the infrastructure to support them is woefully lacking.

By paying attention "up front," the Air Force and industry together are building aircraft that are "sounder to fly and easier to maintain. System safety engineering, which identifies and corrects hazards early in design and development, is paying big dividends," according to General Gabriel. "The F-15 destroyed rate, 4.5, is one-half that of its predecessor, the F-4, at a comparable point in service. The F-16 has achieved the best record of any single-engine fighter we've ever flown. And the A-10, flying in the demanding and unforgiving low-altitude regime, has constantly bettered our most hopeful predictions." But these successes are not restricted to fighters because "cargo aircraft—the C-5, C-141, and C-130—[also] have had a decreasing accident rate over the last ten years, and our aging B-52s are doing very well."

In its quest to boost further its flying safety record, he said, the Air Force will concentrate on hardware as well as human factors. In the first instance, the alternate fighter engine for the F-15 and F-16 will be a 4,000-cycle engine, compared to the 900 cycles of the original F100 engine. Mishaps caused by human error, "the most promising area for further safety improvements, [cause] us to think carefully about the way we train and how we fit the machine to the man." General Gabriel said modern high-performance aircraft test "our aircrews to the limit—mentally and physically. As mission demands increase, we must make sure that our efforts in the broad area of human factors engineering—displays, 'switchology,' and the like—really do our crew members a service, not make the job tougher."

Turning to requirements in the tactical arena, General Gabriel stressed the importance of the dual-role fighter, a potential derivative of either the F-15 or F-16 to take over from the F-111 that "can't go on forever" in exclusively providing the crucial all-weather, low-level, night capability. Exercise after exercise in Europe underscores the fact that under adverse weather conditions "the only thing that turns a wheel is the F-111," he said. Yet because of attrition, the F-111 won't be able to carry that load indefinitely, so "we need to take what we have got, the F-15 or the F-16, and give it that capability to add on to the F-111." Terming the dual-role fighter essential, General Gabriel expressed the hope that the program would survive the next budget cycle in the Pentagon and Congress.

Inadequate Sustainability

General Gabriel, seconded by USAFE's Commander in Chief Gen. Billy Minter, expressed major concern about the fact that the US and NATO, in case of a major conflict with the Warsaw Pact forces, would run out of weapons and ammunitions before adequate resupplies could become available. While US forces in Europe nominally should be able to sustain combat for sixty days, although "not always with the preferred munitions, the problem is going to be with our allies who have anywhere from seven to thirty days, and it's hard to get a handle on exactly how many." Adding that the sustainability of all NATO forces depends on various scenario-dependent factors, General Gabriel reiterated that the available stores probably will not last "long enough [and that] we're probably going to have to redistribute some of what we have got in order to continue having allies to fight with us."

General Minter pointed at a range of problems afflicting NATO and US forces in Europe, including the paradoxical circumstance that while USAF "can literally flood the continent with airplanes in about ninety-six hours . . . and put down squadrons all the way from Norway to eastern Turkey," the infrastructure to support them on a sustained basis is woefully lacking. The only accomplishment of such a deployment, General Minter told the AFA meeting, would be "to put a large number of airplanes at risk," for, once there at some seventy bed-down locations, "they have nothing behind them."

Sitting out in the open, without adequate fuel stores to support surge operations and lacking sufficient quantities of ammunitions, USAF's reinforcements lack fundamental support at this time. Ironically, if this flood of USAF airplanes had the necessary support in place in Europe, it would "have the potential for literally averting war." The intrinsic capability of such an armada, backed by proper combat support, "can give Ivan a great deal of pause," he suggested.

Air Defense Concerns

Another major concern of USAFE is the fact that "air superiority is the primary mission of airpower, and we are not in that good a posture," mainly due to deficiencies in air defense and command and control, according to General Minter. The principal flaw in the air defense arena is that most of the surface-to-air missiles in NATO are obsolete.

(A major step toward redressing this crucial problem was taken a few days after the AFA meeting when the US and West German governments agreed to a $3 billion plan to build a joint air defense network in Germany. The system, whose cost will be borne evenly by the two countries, is to protect US and German bases in the latter's territory using US-made Patriot and European-

Ironically, the Air Force has no organic airlift capability. MAC assets would be assigned to the unified commanders in wartime.

made Roland missiles manned by West German troops.)

General Minter described the then-pending arrangement as bedding down Patriot missiles in special "forward" missile zones and using Roland as a point air defense weapon. Potentially capable of boosting air defense significantly in that country, the plan, according to General Gabriel, calls for the US to buy Patriot SAMs and the Germans to buy Roland SAMs to protect both US and German installations, such as main bases and collocated bases that at present are protected only by German 30-mm guns.

General Minter told the AFA meeting that the US-West German accord ought to serve as a model for similar arrangements with other NATO countries, such as Holland and Belgium. But even a comprehensive beefing-up of the Alliance's air defenses, coupled with the command and control improvements resulting from NATO AWACS, leaves what General Minter termed a "fatal deficiency"—the absence of a NATO identification system. He said he found it disconcerting that commanders of the Vulcan or Chaparral units at NATO air bases refer to themselves as the potentially "worst enemies" of the aircrews they are meant to protect because of their inability to tell friend from foe.

The technical solution to the problem exists, he stressed, but would entail some tough negotiations among the NATO member nations and considerable give and take, along with investments of "millions" of dollars. The alternative, continuation of the status quo, however, would mean that billions upon billions invested in tactical airpower and air defense in Europe would go for naught under certain circumstances, he said.

An interim solution to the identification problem is being pursued by NATO in the form of "indirect" methods of IFF (identification, friend or foe) that are expensive and sidestep the real issue, he told the AFA meeting. These approaches center on following and correlating tracks on air traffic control radars and thereby spotting potential foes through the process of elimination. Even though it fails to correct the key weaknesses this way, "you don't [have to] make any hard choices about who is going to build the IFF" and who will pay for it, according to the head of USAFE.

Another "imperative" that cries out for resolution, according to General Minter, "is a survivable air base structure in Europe," encompassing main operating as well as collocated operating bases. Specifically the need is for chemical warfare (CW) protection and hardened facilities to support an adequate sortie rate for all forms of tactical air operations. Stressing that both offensive and defensive CW capabilities are essential from USAFE's point of view, General Minter said the current situation was "debilitating."

The prospects are that the Soviets would use chemical weapons "right from the start" of conflict in Europe: "We know they have the capability, they have demonstrated that they can and will use it, and that's going to compel us to take what chemical defensive measures we can." USAFE's current chemical defense "doesn't amount to too much," and may even be counterproductive because it reduces "by a large factor" the productivity of aircrews and ground personnel.

As a result, the mere threat that the Soviets might use CW weapons—a reasonable presumption—will degrade USAFE's performance significantly because of the excessive physical burden imposed by the CW protective gear currently in use. In addition to modernizing defensive CW measures, there is an equally pressing need to develop a chemical offensive capability for deterrent purposes, according to General Minter.

No Organic Airlift

The ironic fact that the Air Force, which brought into being the most modern and capable airlift force in history, "has no organic airlift capability" is troublesome to USAFE, according to General Minter. Since MAC "belongs" to the Joint Chiefs of Staff and its forces in case of war would be assigned to unified commanders who make the decisions on deployment priorities, USAFE is made "hostage to that system and set of priorities. . . . When you have ground troops engaged . . . you can pretty well determine where the priorities are going to go . . . on a twenty-four-hour basis, seven days a week."

As a result, he predicted that within a thirty-day period "we will have a backlog that will probably exceed 80,000 tons of critical components and cargo." The current airlift arrangement, he suggested further, also might hinder the evacuation of casualties, the bulk of whom presumably would be "retrograded to the United Kingdom . . . and strategic airlift isn't going to do that. It's going to require intratheater airlift. . . ."

Another sticky problem for USAFE—and other US forces in Europe—is the congressionally imposed European troop strength ceiling. The FY '83 troop strength ceiling in Europe was capped at the FY '82 level by Congress. The FY '84 level was pegged at some 315,000 US forces in Europe, including Greenland and Iceland, with a provision that this level, subject to specific actions by the President, can be increased to 320,000. These ceilings, General Minter said, collide with requirements for additional manpower on the part of both the Air Force and the US Army that result from such

Air base survivability is the cardinal problem on NATO's southern flank.

new high-priority programs as Pershing II and GLCM, the ground-launched cruise missile.

Under certain conditions, he explained, some of the additional manpower needed to operate these systems could be exempted from these ceilings by the President, but there are other new systems coming into the inventory where this won't be possible. In the latter category are the intelligence-gathering TR-1s and associated ground stations as well as the EF-111 electronic warfare aircraft, he explained. The new ceilings also militate against deploying a third C-130 squadron in Europe, where it is badly needed: "The troop strength ceiling [causes] us to go to priorities, to determine exactly what we are going to keep in theater, and what we are going to bring in."

Stressing that certain fundamental force structure programs and aspects are classified, General Minter confined himself to the statement that "we have worked hard to produce them and field them." These programs were conceived because of the threat in Europe, they were justified to Congress accordingly, "and, obviously, if we are going to use them, we [must] deploy them in Europe. That's where they have the greatest utility and the fastest payback for us."

The perturbations caused by the troop strength ceilings, General Minter warned, "have the potential for disrupting either our priorities or the way we go about satisfying them." The exact outcome, he added, is not yet clear because these priorities are being scrubbed at various rungs of the hierarchical ladder until a final decision is made. As a consequence, "there won't be much more said about [individual issues] until such time as decisions are implemented and you begin to see a change in the mix of the force structure in Europe.

"And when you see airplanes that have been there for some time coming out of Europe, it's really going to raise some eyebrows. It has the potential for sending a signal to our NATO friends that perhaps we are not maintaining our support [of the Alliance], and that, in itself, is debilitating." Any move that impairs the capabilities of the forward-deployed forces, in turn, compounds the airlift problem, he said.

General Minter reasoned that forces and weapon systems needed in Europe at the outbreak of war that are not there would have to be introduced at a time when the airlift capacity is already overloaded. Gen. Bernard W. Rogers, Supreme Allied Commander, Europe, subsequently told this reporter that the congressionally mandated European troop strength ceilings indeed pose major military and political problems and that Washington's recognition of these problems was lacking.

Problems With Protesters

Another development of grave concern to USAFE is a tentative plan to "civilianize" certain categories of support slots in the fighter wings in Europe as part of the so-called host nation support program. Referring to this program sarcastically as a "brilliant initiative" that has proved difficult to fund, General Minter stressed that "you can't take a support slice out of [a fighter] wing and expect it to function." The contention is that because USAFE employs local civilians at a lower ratio than does the US Army in Europe, an upward adjustment is required. A Catch-22 aspect of this and similar schemes already in effect stems from the fact that a large percentage of the US military support personnel in wartime would be shifted to base defense and similar wartime tasks. In the case of civilianized support slots this obviously would not be possible, USAFE's Commander in Chief pointed out.

While USAFE concentrates its primary efforts on NATO's central region, there is no reason to feel complacent about the conditions on the Alliance's southern flank. Air base survivability is the cardinal problem in that region also, and the only improvements "we can hope to get for many years are a few aircraft shelters. We don't have adequate munitions [or] adequate storage for those munitions. . . . The NATO pipeline is not in too good a state right now, [and POL especially] will be a problem," according to General Minter.

Although USAFE's CINC does not expect protesters in various European countries to succeed in halting the deployment of GLCMs and Pershing IIs, he warns of a special circumstance with regard to the situation in England: "There is no penalty for trespass." The protesters, he said, "cut a hole in the fence [protecting Greenham Common or other military facilities used by USAFE], they come in, the [British] police escort them off the base, and release them [a few miles away from the base]. Just as soon as they can, they are back, hacking away at the same old hole. Now, we have had some serious incidents. We have caught people on top of hardened aircraft shelters at Upper Heyford. The really serious matter here is that there is one fence that they really shouldn't try to cut a hole in or even try to penetrate for any reason. And when they do, I'm afraid somebody is going to get hurt, probably killed because the [British as well as the US] rules of engagement provide for that. And, of course, then you have created a martyr, and there is going to be quite a hue and cry."

The protester problem at the GLCM base near Comiso in Italy is less severe and is caused mainly by outsiders ranging from militant agitators from Rome to

The Soviets can draw down our forces to a greater degree than we can draw down theirs.

protesters imported from England, Germany, and the US, according to General Minter. By contrast, the people of Comiso, he said, "like the United States Air Force. They think our officers, NCOs, and airmen are the finest people that have ever come to town. They bitterly resent the presence of the 'antis.' "

The View From SAC

The dramatic shift over the past fifteen years in the overall balance of military power away from the US has brought the world face to face with an "increasingly confident Soviet Union—a nation willing to flex its military muscle to further its political goals around the world," Gen. Bennie L. Davis, Commander in Chief of Strategic Air Command, told the AFA meeting. The US response is a vigorous "two-track program to reinforce strategic stability. We are undertaking the first comprehensive modernization of our strategic forces since their initial deployment in the 1950s and 1960s. Simultaneously, we are negotiating toward a strategic arms agreement that will provide for balance and a stable deterrence at lower force levels."

Rejecting the notion that these goals are at odds with one another, he stressed that "strategic arms modernization is necessary in any arms-control regime, short of mutual and total strategic nuclear disarmament. And a well-conceived reduction agreement can place limits on the size of the modernized force we need for deterrence."

Terming strategic strength "the number-one item on the national agenda" and deterrence the "bottom line," General Davis underscored the paramountcy of "denying the Soviets whatever goals they may be after at any level of nuclear warfare. That is the crux of deterrence. . . . With over 7,500 warheads in their land-based intercontinental and submarine-launched ballistic missile force alone, the Soviets have many options short of an all-out attack, and our forces need to be able to retaliate in ways that are appropriate. By appropriate, I mean proportional to the attack, effective in limiting escalation and further damage to us and our allies, and oriented toward reestablishing deterrence and stability. Today's forces cannot fully support these goals."

At this time, he said, the Soviets have "a far greater capability to draw down our forces than we have against theirs. If that disparity is allowed to grow, it will eventually place undesirable constraints on the form and credibility of US retaliation. The problem is worsened by two factors. First, the US stresses deterrence and retaliation, while the Soviet Union stresses taking the initiative and preemptive strikes in crisis. Second, the Soviets have emphasized defenses to a much greater degree. Without modernization, surviving US forces will have a reduced capability for retaliation."

At the same time, modernization is "key to reaching an equitable agreement that substantially reduces force levels on both sides." The Soviets are not likely to give up the important advantages they have achieved in a number of areas until "we have fully demonstrated our commitment to a modernization program that will neutralize these advantages. We have yet to do this as a nation. We continue to fund our new systems—the Peacekeeper, the B-1B—but the annual battles in Congress demonstrate that the consensus is very fragile."

Paced Modernization

Stressing that this consensus must not be permitted to erode—especially since "we have, as yet, no new aircraft on the runway, no new missile in the silos"—he said that even if an arms-reduction agreement is reached, modernization remains of critical importance. "At reduced levels, stability and high-confidence deterrence will require modern, capable forces," according to General Davis. "We will need the B-1B and Peacekeeper more than ever. And beyond . . . the advanced technology bomber and the new small missile."

Because the Air Force will deploy only small numbers of new ICBMs and strategic bombers, such older systems as the B-52 and Minuteman "will have to carry a substantial share of the deterrent burden" for many years to come. In the case of the B-52, General Davis stressed the aircraft's potential for major continuing contributions to "deterrence and warfighting below the nuclear level." He added, however, that a key deficiency "is an effective conventional standoff weapon for use in a variety of roles."

General Davis, along with several other speakers at the AFA meeting, rejected unequivocally allegations that the Air Force would prefer buying additional B-1Bs beyond the 100 aircraft currently planned and forgo development and acquisition of the advanced technology ("Stealth") bomber. The "coherent and logical way" of having one type of bomber in the inventory, another one in production, and a third in advanced development is as sound today as it was in the past, he said, adding that the Air Force supports "both programs on a commonsense basis." While the B-1B takes advantage of "all the technology available today," ATB will provide for the threat "way into the future, mid-nineties [and] early twentieth century."

General Davis spoke out strongly also in behalf of the small, single-warhead ICBM (SICBM), terming it a sig-

nificant plus operationally, with regard to arms control, and as far as stability is concerned. While MIRVed ICBMs provide a great deal of capability, they also complicate the planner's job because of the need to fit the "footprint," meaning the area within which individual warheads of a given MIRVed missile can be assigned to specific targets, into the overall targeting plan. By comparison, SICBM, because of its accuracy, mobility, and single-warhead configuration, will provide SAC's planners with "a lot of operational flexibility," General Davis pointed out.

While there is no pressing need to replace the high-performance SR-71 Blackbird at this time, General Davis said it was not too early to plan for a follow-on system, probably in the form of a transatmospheric vehicle. With the SR-71 almost twenty years old, he said, the characteristics of a follow-on design must center on "something that is certainly very fast, that can avoid the threat, that has phenomenal range, that . . . has a down-link capability—[in short], a ground-launchable hypersonic vehicle that has global capabilities and can be de-orbited" rapidly and flexibly.

Arms-Reduction Considerations

Since 1972, the Soviet Union has "tripled its number of strategic nuclear weapons [and dedicates] at least twelve to fourteen percent of [its] Gross National Product to defense, or basically double what the United States spends on defense relative to GNP," Ambassador Kenneth L. Adelman, Director of the US Arms Control and Disarmament Agency, told the AFA meeting. The US, by contrast, is not joining the Soviet arms race and has "not been racing at all. Our increase in strategic weaponry has been at a much slower pace. The destructive capability of our strategic weapons is today sixty percent less than that of the Soviets. Looking at our total nuclear stockpile, the number of US nuclear weapons is at its lowest level in twenty years and the megatonnage of our nuclear weapons is only a quarter of what it was in the late 1960s. In more graphic terms, we have deployed today some 8,000 fewer nuclear weapons than in the 1960s," according to Ambassador Adelman.

In terms of theater nuclear weapons in Europe, the US has withdrawn 1,000 nuclear weapons from Europe since 1980 and is in the process of removing an additional 1,400 weapons, according to the ACDA Director. For each new, modern weapon that the US may deploy in Europe, more than five older types will have to be taken out pursuant to a decision agreed to by the members of the Alliance in 1979. The Soviets not only failed to reciprocate, but instead have built and deployed some 360 intermediate-range SS-20 nuclear-armed ballistic missiles carrying more than 1,080 warheads.

Anticipating the Soviet walkout at the bilateral Intermediate-range Nuclear Forces (INF) talks in Geneva that occurred a few days after the AFA symposium, Ambassador Adelman characterized such an action as "ironic and unjustified." The US, he pointed out, continued to negotiate for years even though the Soviets persisted in deploying new nuclear weapons in Europe at the rate of one new SS-20 a week and, since the negotiations started, "fielded over 100 additional SS-20 systems with some 300 warheads." The only way to keep the Soviets from walking out on the INF talks, he suggested, is "to give them a monopoly on these missiles. All their proposals have had the same bottom line: hundreds of these missiles for them and zero for us."

He added that if the Soviets were serious about wanting an equitable agreement, they would have stayed at the negotiating table because "the US will negotiate as long as necessary to reach a sound settlement. We are also prepared at any time to reverse our missile deployments [of Pershing IIs and GLCMs] if such a settlement is achieved."

Problems of Compliance

The Reagan Administration, the ACDA Director pointed out, does not "seek to link arms-control efforts to other areas of Soviet behavior" but cannot prevent Soviet behavior from affecting arms control, "like it or not. This is inevitable in a democracy, where neither the public nor its representatives can place aspects of Soviet conduct in totally separate boxes. Soviet adherence to existing arms-control treaties or to pledges on their part also raises perplexing problems."

Stressing that the US cannot turn its back on "evidence" of Soviet arms-control violations, he said that "if we are serious about arms control, we must be equally serious about problems of compliance." He added that the Administration was in the midst of a comprehensive review of Soviet acts possibly in violation of various arms-control accords. Ambassador Adelman said it is "particularly tragic that the use of chemical warfare in Asia continues today in violation of international agreements, international law, and civilized behavior. These actions by the Soviet Union or its allies have accounted for an estimated 10,000 deaths among the Afghan hill peoples and Asian peasants."

In the chemical warfare area, the ACDA Director disclosed that the US is launching comprehensive efforts to "rid the world of all chemical weapons [that] have the potential for becoming the poor countries' weapons of mass destruction."

Recent US attempts to interest the Soviets in a "mutual, guaranteed build-down of ballistic missile warheads and bomber platforms" have not found a positive response, Mr. Adelman explained. This concept would reduce the number of missile warheads by a third on both sides and would offer a promising beginning toward START, the strategic arms reduction talks adjourned by the Soviets.

General Gabriel also expressed support for such a type of strategic build-down, telling the AFA meeting "we are very serious about it. . . . We would like to come down at a prescribed percentage rate over time [and] end up at verifiable, equitable, significantly reduced levels. . . . There are a number of different formulas to get there, but we are serious about trying to achieve it, whichever one will work for us." ■

(The second, concluding report on AFA's National Symposium on the Air Force's future will appear in the March issue of Air Force *Magazine.)*

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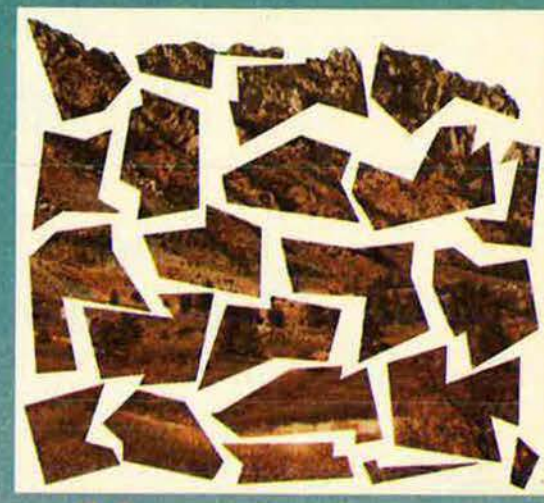

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PARTNERS IN AIRLIFT

By 1988, Civil Reserve Air Fleet enhancement will increase USAF's cargo-hauling capability by more than twenty percent.

BY WILLIAM P. SCHLITZ
SENIOR EDITOR

THE US's civil airlines have augmented military airlift in every national defense emergency dating back to World War II.

But it was the use of civilian aircraft during the Berlin Airlift and the Korean War that brought this major resource into sharp focus—at least in the eyes of President Harry S. Truman. He noted the piecemeal fashion in which civilian planes were utilized and ordered a more formal arrangement.

In March 1952, DoD and the Department of Commerce signed a memorandum of understanding detailing what civil assets were available and under what defense emergency circumstances they could be mobilized. Civil aircraft volunteered by the US carriers came to be known as the Civil Reserve Air Fleet (CRAF).

"And while the equipment of the CRAF has changed over the years," noted Lt. Col. James M. Murphy, "the basic agreement is still in effect, although now with the Department of Transportation." Colonel Murphy is the focal point for CRAF issues on the Air Staff in the Pentagon.

"It must be remembered that the Secretary of Transportation sets the priorities and allocations of the nation's civil transportation assets in a defense or national emergency. Of course, DoD works with the Secretary in predesignating airlift assets and preplanning their use," added Colonel Murphy.

"A fine line has to be drawn," the Colonel explained, "because while the military will have its requirements, the domestic airlift transport system would also have to be kept operating in an emergency. All this is embodied in Executive Order 11490, currently under revision by DoD and the Department of Transportation.

"At the heart of the CRAF fleet are such long-range international civil airliners as wide-body McDonnell Douglas DC-10s, Boeing 747s, or Lockheed L-1011s. These undoubtedly would be used to deploy troops and cargo overseas in a contingency. Drawing off these assets to augment military airlift would cause some initial disruption of the airlines' US domestic infrastructure. But the majority of the civil fleet is not composed of the wide-body aircraft, so adjustments would be made to replace those coast-to-coast continental jetliners with shorter-range aircraft," Colonel Murphy said.

DoD keeps track of what CRAF assets are available at any given moment through Military Airlift Command Form 312, a monthly capability summary "that lists the aircraft right down to individual tail numbers," noted Colonel Murphy.

Updating the summary is the responsibility of Hq. MAC, Scott AFB, Ill.

Activation of the CRAF Fleet

"To contend with contingencies," explained Colonel Murphy, "CRAF is organized incrementally to allow us to tailor the activation to fit the emergency and at the same time control the impact on the domestic economy.

"For example, Stage I can be called into play by the MAC Commander in Chief. In essence, it is an expansion of peacetime business designed for a low-level

A stalwart of the Civil Reserve Air Fleet is this wide-body Boeing 747 owned by United Air Lines.

—Photo by Art Director William A. Ford

emergency to help MAC maintain aerial port levels and support requirements for conventional worldwide 'channel'—routine airlift—cargo movement when the command's organic airlift assets have been diverted," the officer explained.

For Stage I, fifty-one CRAF aircraft—mostly cargo—have been earmarked to be ready for on-loading within twenty-four hours after notification of a mission. These aircraft would take over scheduled flights from which MAC's organic airlifters had been diverted—to, say, the Pacific and Africa.

Stage II—to be ordered by the Secretary of Defense—would be short of full mobilization and involve 100 CRAF aircraft, seventy-two of which would be long-range international types. These also would have to be ready for duty twenty-four hours after mission assignment.

Stage III would entail a full mobilization in the face of a defense or national emergency declared by the President or Congress, and would provide almost fifty percent of the nation's airlift capability. In this event, all 373 CRAF aircraft—of which 321 are long-range international—would stand ready within forty-eight hours of mission notification. To emphasize the importance of CRAF intertheater augmentation, MAC has a total of just 268 C-141s it can count on.

"Viewed from another angle, if in an emergency we were to deploy to reinforce our NATO allies, about ninety-five percent of the troops and thirty-five percent of the cargo would be hauled aboard CRAF aircraft," noted Brig. Gen. John E. Griffith, Director of Transportation, in the Office of the DCS/L&E, Hq. USAF.

Leading Incentive

MAC takes pride in the fact that in peacetime its transport crews train by airlifting cargo and troops just as they would fly wartime missions—much of this activity worldwide. Military cargo above MAC's capacity and the majority of the passengers are transported by civilian carriers.

In fact, it is this peacetime business that is a leading incentive for a civil airline to designate aircraft to CRAF. This peacetime business is monitored very carefully by the Assistant for Civil Air at Hq. MAC, where a formula has been devised to allocate business to airlines based essentially on the percentage of their CRAF capacity.

"In a Stage III activation, the government would be empowered to commandeer civil airlift assets if CRAF didn't exist to contribute such capability on a voluntary basis," explained Colonel Murphy. "In lesser emergencies the government has no such authority and so provides an incentive for voluntary participation by the airlines. The money the carriers earn hauling military cargo and passengers constitutes this incentive," he added.

"Each year, Hq. MAC determines the size of the CRAF," noted Col. Phil Louden, Assistant for Civil Air, DCS/Plans, Hq. MAC. "In this, we have frequent contacts with the carriers to develop and maintain mutually agreeable procedures."

The Assistant for Civil Air also ensures that selected CRAF aircraft are integrated into such exercises as the annual Reforger deployment to Europe (during which CRAF participation is mostly as transatlantic troop transport).

"This gives the aerial port people at both ends and the involved Army commanders the opportunity to become familiar with the civil aircraft," noted Colonel Murphy. "We tell them where to land and when they do it's our responsibility to assure that the passengers are processed and standing by and that the cargo is properly weighed, sorted, and loaded. It is essential training for load planners, loadmasters, and the Army personnel involved," he said.

"Significant numbers of CRAF aircraft are convertible—capable either of operating as cargo or passenger aircraft," noted Colonel Louden. "During Exercise Team Spirit '83, for the first time ever the Air Force contracted for a World Airways DC-10 to be converted from the passenger to the cargo mode. The aircraft then completed three missions overseas before returning to home base at Oakland IAP, Calif., for reconversion to its passenger role. The Air Force and the airline found this initiative to be mutually instructive," Colonel Louden added.

Routinely, CRAF aircraft fly out of major aerial ports in CONUS to bases overseas and in the process blue-suit personnel stay current in how to load and service them. "These day-to-day operations also help keep us familiar with the airplanes and what we can and can't carry aboard them," Colonel Murphy noted.

When CRAF aircraft are activated, MAC assumes control and generates missions through the Crisis Action Team at Scott. And while the carriers retain operational control of their aircraft and crews, "we use the pilots, cabin attendants, and maintenance and organizational structure for our benefit," explained General Griffith.

Mission Segments

To conduct DoD's airlift mission, CRAF assets are organized into four segments: long-range international, short-range international, domestic, and Alaskan.

As noted previously, long-range international is tailored to support MAC operations worldwide, would constitute the largest demand for airlift capability, and thus is the major element of the CRAF fleet. Besides the wide-body aircraft, and because of the shortage in cargo-carrying capability, such narrow-body aircraft as the McDonnell Douglas DC-8 and Boeing 707 with sufficient range are included in this segment.

Short-range international would support airlift of cargo and passengers from CONUS to bases at such offshore locales as Greenland, Iceland, and the Caribbean. Convertible 727s and DC-8 freighters are among the aircraft ticketed for this CRAF role.

The domestic segment is made up of such short- and medium-range aircraft as the DC-9, L-100, and L-188. In peacetime, the majority of this fleet serves both the Air Force's Logair and Navy's Quicktrans systems to haul high-value items on a daily basis from depots to installations in CONUS.

Finally, the Alaskan segment provides airlift to Alaskan Air Command's bases and is currently composed of 737s and L-100s, aircraft choosen because of their ability to perform in the often severe Alaskan weather.

CRAF Enhancement Program

"Except for a handful of special-situation aircraft—in war we'd probably get them too so we're working to integrate even these into the system—all of the US's civil, long-range, cargo-capable airliners are included in the CRAF inventory," noted Colonel Murphy. "And yet DoD still has a major shortfall in cargo airlift capability."

To shore up the situation, the CRAF enhancement concept was born in the early 1970s. The idea has two aspects: To modify existing wide-body passenger aircraft for outsize cargo airlift capability and to equip such new aircraft coming off the assembly lines with it.

"Last September, we took a giant step in the program when Pan American World Airways agreed to the modification of nineteen of its 747s to cargo convertibility," Colonel Murphy said. "The project is to be initiated early in 1985 and at the expected completion date in 1988 will have increased the CRAF cargo-hauling capability by more than twenty percent," he added.

Of the move, MAC Commander in Chief Gen. Thomas M. Ryan, Jr., said this: "These nineteen aircraft will add almost 3,000,000 ton-miles of bulk and oversize capability to the CRAF, and that's going to take a nice slice out of that airlift shortfall."

Boeing Aircraft Co. is to undertake the modifications at an estimated cost of $622 million. It will mean installing stronger cargo floors, a cargo door, and roller and rail systems.

"Besides the modification costs, other charges also will accrue," explained Colonel Murphy. "For example, we'll have to reimburse the airline for loss of revenues during down-time when the aircraft are being modified. Additional operating costs include—because of the heavier weight—greater fuel consumption, higher landing fees, and bigger crew salaries, among others," he added.

As an incentive, DoD plans to pay "up front" these additional operating costs for the twelve-year term of the contract after an aircraft is returned to the airline following modification.

"Even so, we're not talking about a whole lot of money," noted Colonel Murphy. "The average cost of retrofitting a Boeing 747 and the subsequent operating charges will total $26.7 million in Fiscal Year 1983 dollars. That is one-sixth what it would cost the Air Force to buy and operate aircraft with similar capabilities. But the primary benefit is the added cargo airlift augmentation available to the nation," he pointed out.

"That would then be free to us, standing ready when we needed it," the Colonel added, "a real bargain for the taxpayer."

"This cost-effectiveness has been recognized by the Congress and other authorities and is why we have been able to get the CRAF Enhancement Program in the defense budget and keep it there," said General Griffith. The program may eventually include other wide-body aircraft.

"For a long time, Congress has encouraged us to pursue the CRAF enhancement concept and has appropriated money fairly regularly since FY '78 to support the program," the Colonel noted. "Toward the close of the recent appropriation process, we executed a successful retrofit contract that was beneficial in nailing down $100 million in the FY '84 budget to support the program," he pointed out.

Why not plan for the retrofit of many more long-range, wide-body passenger liners for the cargo-carrying role?

"The US's civil aircraft are probably the best commercial bulk haulers in the world," explained Colonel Murphy, "and very efficient at what they do. But while important to us, CRAF aircraft don't solve all the problems. They simply don't have the capabilities of the C-5 and C-141 fleets, such as much bigger cargo openings, stronger floors, and the like," the Colonel explained.

"Besides, our job is to get the most out of the CRAF

program, and the enhancement effort will be one way of doing that."

As for equipping passenger aircraft on the assembly line with cargo convertibility, "US airlines haven't placed many recent orders for new wide-body aircraft. We have, however, accomplished that with a DC-10 delivered to United Air Lines in September 1982.

"Thus, we currently are oriented toward the retrofit of existing aircraft and are tightening up the contractual structure associated with that program," Colonel Murphy declared.

"You can appreciate the complexity of putting together a contractual arrangement under which aircraft are being modified under a defense contract, yet DoD doesn't own the aircraft and there are no military specifications. What we'll go with is FAA certification," he explained.

In any reinforcement of our NATO allies, long-range CRAF aircraft like this TWA Lockheed L-1011 would be used mostly in a troop-ferrying role across the Atlantic.

Another heavy-hitter in the CRAF ranks is this McDonnell Douglas DC-10 flown by Northwest Orient.

Short-range international passenger and cargo airlift is to be provided by such aircraft as this United 727.

Toward the Future

"We understand that competition for defense dollars, the state of the economy, and other factors such as the health of the airlines might impact adversely on the enhancement program up the road," noted General Griffith, "so we're keeping an eye open. One positive possibility, though, is that the other US flag carriers will recognize the potential benefits that are to accrue to Pan American under the enhancement program and offer their aircraft for modification," he added.

In other news in the CRAF program, MAC spokesmen representing the US government have been negotiating the integration of NATO civil wide-body cargo aircraft into CRAF contingency planning.

"Under the NATO Civil Air Augmentation plan, we have firm commitments from nine allied nations involving thirty-seven cargo and twenty-two passenger aircraft," noted General Griffith.

MAC negotiators are currently working out the technical and operational agreements that, in effect, would call for the use of the aircraft to reinforce the alliance specifically. Belgium, Norway, Portugal, and the Netherlands have already signed.

"And while we don't have the same contractual call on those aircraft as we do on our CRAF fleet, there is no reason to believe that if it were a matter of survival, those countries wouldn't be forthcoming with the assets identified thus far," the General added. Active negotiations are also under way with other NATO nations.

On the other side of the globe, a similar agreement for use of Republic of Korea civil airlift assets is also being formalized.

As for participation of CRAF aircraft in exercises, "I would like to see that continue at about the same rate as heretofore," General Griffith said. "We don't have to exercise the CRAF fleet per se—they do it on their own every day."

An interesting aspect of CRAF fleet aircraft is their high utilization rate. "Civil aircraft average nine to eleven flying hours a day depending on the individual carrier," the General noted, "so they are already flying at a rate we would want them to in a contingency. MAC transports log two to three hours daily and thus the organic force would have to surge to get up to the CRAF rate in wartime," he added.

General Griffith pointed out that CRAF aircraft are "spared and crewed" at a much higher ratio per aircraft. "In the fight for spares, we're doing well in MAC, but we're not quite there yet."

General Griffith underlined the openhandedness of the airline executives when it came to the CRAF program—flatly terming them "patriots." "I don't know of any other US industry that has made such a total commitment to serve," he commented.

And while none of the CRAF stages has ever been formally activated, the significant airlift capability the fleet provides is truly representative of the "Partners in Airlift." ■

THE BULLETIN BOARD

By James A. McDonnell, Jr., MILITARY RELATIONS EDITOR

Thunderbirds Gear Up For New Year

Members of the 1984 US Air Force Demonstration Team—better known as the Thunderbirds—have been selected by Hq. TAC, and this year's schedule will start next month. Leading the group in their F-16 Fighting Falcons will be Maj. Lawrence Stellmon, of Hot Springs, Mont., who flew the number-four aircraft as slot pilot last year.

The two wingmen are both repeats from 1983—Capt. Steven R. Chealander, of Bakersfield, Calif., will stay in number-two aircraft as left wing. Capt. Howard W. Attarian will repeat in number-three aircraft as the right wingman. He's from Fairview, Kan.

Last year, Maj. Schumpert "Hoss" Jones, Ruston, La., flew number five as the lead solo pilot. This year he'll pilot Thunderbird number four in the slot position. Taking his place as lead solo will be Capt. John R. Bostick, who hails from Water Valley, Ky. Last year he flew number-six aircraft as second solo pilot.

Moving into that position for 1984 will be Kokomo, Ind., native Capt. Patrick J. Corrigan, who joins the team from Incirlik, Turkey. Two other pilots will serve a second year with the team: Maj. James W. Bailey, from Penn Yan, N. Y., will again fly number-seven aircraft as team logistics officer, while narrator and advance man for the second year will be Capt. A. R. Minkel, from Boulder, Colo., who flies the Northrop T-38 Talon.

The Air Force is looking for a pilot/narrator and an operations officer for the team for the 1985 and 1986 show seasons. Selectees, to be chosen shortly after the application period ends next month, will report to Nellis AFB, Nev., Thunderbird home base, in September of this year. Pilot applicants must have less than ten years of service—operations officer candidates less than fourteen. Both selectees must be on unconditional flying status and have at least 1,000 hours in jet fighters. Local CBPOs have all of the details.

Major Veterans' Health Care Bill

President Reagan has signed legislation expanding the health-care benefits available to the nation's veterans. This demonstrates the Administration's "strong commitment to the welfare of America's veterans," the President said at the signing.

Sen. Alan Cranston (D-Calif.), ranking Democrat on the Veterans' Affairs Committee, credited with giving the major thrust to the bill in the Senate, commented, "[We] . . . need top-quality medical and rehabilitation programs in veterans hospitals.

"Today's battles are creating tomorrow's VA hospital patients," said Senator Cranston, former chairman of the committee, as he saluted the passage of what many observers have called, from several viewpoints, a "major veterans health bill."

- The bill gives Vietnam veterans permanent eligibility for readjustment counseling from the VA. In other words, as Senator Cranston points out, there is no longer any "termination date for the program." This means, he said, that there is "an unequivocal message to veterans served by the program that there is a continuing commitment by Congress and the nation."
- The bill establishes an Advisory Committee on Women Veterans and requires the VA to ensure that "all health-care facilities are able to provide appropriate care, in a timely fashion," for any disability unique to women veterans eligible for care. VA has already moved with alacrity to set up this program. *(See "Bulletin Board," December '83 issue.)*
- The bill also requires the VA to furnish preventive health-care services, especially while treating service-connected-disabled veterans (but also in treatment of nonservice-connected problems). This measure undoubtedly will lead to better overall health for veterans.
- The bill requires the VA to contract out to an independent firm for epidemiological studies of veterans exposed to radiation from nuclear explosions. There is much controversy about this point and, as the studies progress, much more controversy will undoubtedly be generated. While the Agent Orange studies of Vietnam vets have provoked a lot of media interest, it's easy to overlook that some 250,000 veterans participated in the original US nuclear weapons testing program in the 1940–50 time frame and that about 130,000 servicemen were

CMSgt. James M. Gracie, recently named Connecticut ANG Honor Person of the Year, proudly displays his unique license plate. Chief Gracie is based at Bradley IAP, Windsor Locks, Conn. (Photo by SMSgt. John J. McHugh, ConnANG)

among the occupation troops in Hiroshima and Nagasaki following the atomic bombings there. Many of these veterans—or their survivors—believe that inadequate attention has been paid to their problems, and this provision may well prove to be among the most complex of the bill.

• The bill provides for adult day health care—as opposed to nursing-home care—and community residential care that will enable the VA to offer an alternative to "costly and perhaps unnecessary institutionalization of older veterans," according to Senator Cranston. He pointed out that more than 11,000,000 veterans of World War II are rapidly approaching age sixty-five, and he estimated that by 1990 "about sixty percent of all males over sixty-five will be veterans."

VA Administrator Harry N. Walters praised Congress for its support of veteran benefits and indicated that the VA would act promptly to carry out provisions of the new law. Informed observers are awaiting with interest the implementation of this bill—many believe that it will set a pattern for VA health care that will persist and be an example into the next century.

Defense Attaché Duty Vacancies

The Directorate of Attaché Affairs, Air Force Intelligence Service, is looking for enlisted volunteers for Defense Attaché duty. Vacancies for administrative types (AFSC 702XO) and aircraft mechanics experienced in C-12 turboprop duties (AFSC 43174 A) abound. Assignments are located worldwide at US embassies in world capitals. According to the AFIS, the duty is "challenging, interesting, rewarding, and offers eligible personnel an opportunity to observe and work with the US diplomatic corps."

Capt. Andrew "Doc" Fass and Wink Martindale, TV game show host, share a smile as "Doc" donates $5,000 of his winnings to the City of Hope.

New appointees to the Air Force Retiree Council, shown here with chairman Maj. Gen. A. J. Dreiseszun, USAF (Ret.), center, are, from left: CMSAF Dick Kisling, Capt. Bob Nelson, Lt. Col. Ted C. Rytel, Col. Clifford J. Craven, General Dreiseszun, Maj. Larry F. Garrett, CMSgt. Hanns W. Doehle, Col. Victor J. Sampson, and Col. John G. Nelson. All those pictured are Air Force retirees. (USAF photo)

Only members currently stationed Stateside may apply. An interesting facet is that all assignments have automatic concurrent travel for married people and a civilian clothing allowance. Eligible people are encouraged to contact Hq. AFIS/INH, Fort Belvoir, Va. 22060; MSgt. Robert Becker or Sgt. Robert Withrow, AUTOVON 354-6036.

Air Force Officer Donates Quiz Show Winnings

Capt. Andrew Fass, an electronic warfare officer and navigator from Eglin AFB, Fla., recently defeated thirteen opponents in thirteen days of head-to-head competition on the television quiz show "Tic Tac Dough." He answered ninety-one of ninety-seven questions correctly and won the biggest one-match pot in "Tic Tac Dough" history—$26,700.

As a follow-up to his success, Captain Fass donated $5,000 to the City of Hope Cancer and Major Disease Center in Duarte, Calif. He selected this organization because "the medical center offers free care to victims of cancer, leukemia, and other major diseases. Thousands of servicemen, federal employees, and their families benefit from the City of Hope each year" *(see photo).*

City of Hope President Abe Bolsky said, "We could not be happier that this serviceman has chosen City of Hope for his generosity. In addition to supporting one of America's pioneering programs in bone-marrow transplantation for leukemia patients, Captain Fass will be helping to fund lifesaving research into such areas as how brain cells communicate; and a new drug proposal for Alzheimer's disease; and a test that can read the heredity messages found in every human cell for possible genetic defects, such as sickle-cell anemia."

Air Force Retiree Council Studies Retirees' Needs

Members of the Air Force Retiree Council met at AFMPC, Randolph AFB, Tex., at the end of 1983, for the eleventh consecutive year. Under the chairmanship of retired Air Force Maj. Gen. A. J. Dreiseszun, the Council, representing all areas of the country, developed initiatives and resolutions designed to improve retiree and survivor benefits and programs.

Among other briefings given to the Council, AFA's Assistant Executive Director for Defense Manpower, Ben Catlin, delivered an update on AFA's policy initiatives in the retiree area. Newly appointed to the Council was AFA's Retiree Advisor, retired CMSAF Richard Kisling *(see photo).*

AFA—as is the Air Force—is vitally concerned with the needs of the growing Air Force retired population. Chief Kisling will serve to advise AFA President Dave Blankenship on the ways that AFA might best support the retiree constituency of AFA's membership. Chief Kisling's service on the Air Force Retiree Council should admirably complement this effort.

DoD notes that there now are some 1,500,000 military retirees. Of that number, most reside in California, with Texas close behind. Interestingly enough, the Air Force retiree locations exactly duplicate this sequence. The fewest retirees from all services are located in Guam, followed by North Dakota and Vermont. For the Air Force, the fewest are in the Virgin

Islands, followed, in order of increasing magnitude, by Guam and Puerto Rico.

US Jaycees Honor Air Force Pilot

A record-setting Air Force Reserve helicopter pilot has been named by the US Jaycees as one of the Ten Outstanding Young Men of America for 1984. H. Ross Perot, Jr., an AFRES second lieutenant from Dallas, Tex., is the youngest honoree of this year's ten selectees. He is twenty-five years old.

In selecting Lieutenant Perot, the Jaycees cited his daring, first-ever around-the-world helicopter flight, completed in 1981. During his thirty-day trip, Perot set twenty-six world records and escaped many hazards, including being threatened with death by the Soviet Union if he entered their restricted buffer zone. At the successful conclusion of this flight, he received many awards, including the Federal Aviation Association Gold Medal presented by President Reagan. He is currently undergoing USAF pilot training.

1984 Voting Slogan Contest Winner

The Federal Voting Assistance Program has selected the winner of its 1984 voting slogan contest, and he's an Air Force captain now attending Squadron Officer School at Maxwell AFB, Ala.

Capt. Mel Waters won with his suggestion, "When People Vote, People Listen." He will receive a certificate signed by the Secretary of Defense, and his slogan will be used in the national media campaign of the FVAP.

Runner-up was Indiana National Guard 1st Lt. James A. O'Brien, of La Porte, Ind., for "America—I'll Vote For That." Honorable Mention winners included that of Air Force civilian Mary Belmont, Travis AFB, Calif.: "Vote . . . It's An Equal Opportunity."

More than 5,000 entries were submitted. Judges included Sen. Charles McC. Mathias, Jr. (R-Md.), Chairman, Senate Committee on Rules and Administration; Rep. Augustus F. Hawkins (D-Calif.), Chairman, Committee on House Administration; Collingwood Harris, Associate Director, National Advertising Council; and Ms. Dorothy Ridings, President of the League of Women Voters of the US.

THE BULLETIN BOARD

Short Bursts

Recently celebrating her 102d birthday in California was World War I nurse **Louella Luhrman.** The VA says she's the **oldest US female veteran.** Oldest male veteran, at 109, is Spanish-American War survivor **Harry Chaloner,** of Florida.

The Air Force has okayed the **half-staff lowering** of the US flag at installations where a civilian employee—and US citizen—dies. Base commanders have the final say, just as they always have had for active-duty deaths. The idea first surfaced as a suggestion from Travis AFB, Calif., civilian employee **Beatrice L. Olyer.**

Empire Airlines has joined **US Air** and **Frontier Airlines** in offering **discounted military leave fares.** Empire, which serves major cities in New York state, plus Boston, Hartford, and Washington, D. C., is offering an across-the-board fifty percent discount off regular coach fare for both members and dependents.

Clinical social workers can now provide **mental health services** without physician supervision and be eligible for CHAMPUS reimbursement.

Country and western entertainer Mickey Gilley stands beside an SR-71 at Beale AFB, Calif., where he recently met with members of SAC's 9th Strategic Recon Wing. (USAF photo by A1C John Adams)

Most health plans do require such supervision, but CHAMPUS has been testing the new procedure since 1980 and has found it works well. It also saves money. The workers must, of course, be licensed or certified. They still must have a physician's supervision when treating psychiatric problems.

Retirees—and surviving spouses—have two national toll-free **hot lines available for problem solving.** The Air Force Accounting and Finance Center provides experts on pay-related issues on **1-800-525-0104.** Call between 8:00 a.m. and 4:00 p.m., MST. AFMPC controls the other hot line, which will take calls on all other retiree matters, at **1-800-531-7502,** from 9:00 a.m. to 11:00 a.m.; 1:00 p.m. to 3:00 p.m., CST.

The VA reminds newly **totally disabled veterans** that those found totally disabled for six months or more may apply for a waiver of premiums on National Service Life Insurance. Also, spouses of all veterans drawing disability benefits should be aware that their entitlement to benefits ceases upon final divorce.

At Eielson AFB, Alaska, Maj. Eric Larson (left) delivers a $13,345 check to Col. E. J. "Coupe" DeVille, representing the proceeds of a fund-raising drive. The money will be used to buy a glider for the Alaska Civil Air Patrol Youth Glider Program at Fairbanks International Airport.

On learning that Alabama Gov. George C. Wallace had misplaced his World War II medals, retired Army Maj. Gen. Clyde W. Spence (left) contacted USAF. The Air Force came through, and Air University Commander Lt. Gen. Charles G. Cleveland (center) cooperated in presenting the Governor his Air Medal, the Asiatic-Pacific and American Campaign Medals, the World War II Victory Medal, and the Good Conduct Medal. (USAF photo)

Air Force Surgeon General **Lt. Gen. Max B. Bralliar** has received the **Distinguished Alumni Award** of the Alton Ochsner Medical Foundation, only the third time it's been awarded in thirty years. The award goes to alumni who have distinguished themselves "over and above the normal call of the medical profession." General Bralliar served his residency in surgery and proctology at the Ochsner Foundation Hospital, New Orleans, La. His military medical career includes a stint with NASA where he supported fifteen manned spaceflights, including all manned Skylab flights and the Apollo-Soyuz mission.

Rep. Thomas A. Daschle (D-S. D.) wants the VA to go back to using **upright memorial markers on veterans' gravesites.** The Agency went to flat markers a year or so ago partly as an aid to mowing maintenance. The Congressman—whose constituency probably is particularly conscious of this—notes that the new stones allow snow to cover grave identification.

IRS reminds military members that **unreimbursed moving expenses** in connection with a PCS **may be deductible.** The same goes for monies spent to sell an old house and buy a new one, house-hunting trip expenses, and temporary living expenses. There are many ins-and-outs and those eligible should send for free IRS publication 521, "Moving Expenses," IRS, Taxpayer Service Division, Washington, D. C. 20224, before making any claims.

The military—along with the rest of the country—is getting, on the average, **just a bit older.** DoD figures note that ten years ago almost sixty percent of the force was under twenty-five. Now, only half is. ■

THE FORGOTTEN FRONT

BY JOHN L. FRISBEE

It was a small campaign by World War II standards, fought under the most miserable conditions in a virtually unknown corner of our own backyard—the Aleutian Islands.

MASSACRE Bay, Amchitka, Umnak, Dutch Harbor. Names dimly remembered by most Americans. They are part of a forgotten front of World War II. Yet the fifteen-month campaign on that front saw one of the bloodiest and most costly battles of the war in relation to the number of men involved, the last and longest classic gun duel between capital ships, and one of the most successful large-scale clandestine operations in the history of warfare. It was a campaign in which airmen faced two opponents—the enemy and the weather—with losses more than four to one in favor of the latter. And it was the only campaign of World War II fought on North American soil—the Aleutian Islands. The Aleutians extend, like the curved tusk of a prehistoric mastodon, some 1,200 miles westward from the Alaska peninsula to within 650 miles of Asia.

The 124 islands, islets, and rocks that comprise the Aleutian chain are treeless and largely volcanic in origin, with mountain peaks reaching up to 9,000 feet. Along this chain the relatively warm Japan Current meets cold air masses that sweep from Siberia across the Bering Sea, producing the world's worst flying weather with almost constant precipitation and fog. Many of the islands have only eight to ten clear days a year and all are battered frequently by the infamous williwaws—winds of hurricane velocity that have been clocked at more than 100 miles an hour. Add to that surface temperatures that sometimes drop to zero, ankle-deep mud on warmer days, and icy sea water in which survival is measured in minutes, and you have one of the most difficult, frustrating areas in which to conduct military operations.

On June 3, 1942, planes from a Japanese carrier force, hidden by dense fog, bombed one of the few American bases then standing in the Aleutians, launching an invasion of the island chain and one of the toughest campaigns of the war.

The Belated Buildup

When the Japanese struck, the Alaska Defense Command was, at best, partially prepared. Although Air Corps pioneers like Billy Mitchell and Hap Arnold had advocated basing units in Alaska, the decision to do so was not made until war had broken out in Europe. The command might not have been even partially prepared had it not been for an energetic, unorthodox, air-minded Infantry colonel, Simon Bolivar Buckner, Jr., who rose to three-star rank before the campaign ended.

When Buckner arrived on the scene in July 1940, there were no military airfields in Alaska or the Aleutians, no roads connecting sites for future bases, no adequate communication system, and only one short railroad. Buckner was convinced that any attack on North America would come through the Aleutians, which also could provide bases for an invasion of Japan should we go to war with that country. He believed that defense of Alaska had to be based on airpower and told Army Chief of Staff Gen. George C. Marshall he "would rather have one squadron of heavy bombers than a whole division of infantry."

By March 1941, Buckner had enough fields completed to bring in the 36th and 73d Bombardment Squadrons with a total of fifteen obsolete B-18s, and the 18th Pursuit Squadron with twenty equally ob-

solete P-36s. This composite group formed a nucleus for the Eleventh Air Force, which was activated in February 1942, and was the entire air strength in Alaska on December 7, 1941, when the Japanese attacked Pearl Harbor. After that, reinforcements began to arrive in driblets, most of the crews green, with little instrument flying training and no cold-weather experience. Alaska and the Aleutians were to remain a low-priority theater. Buckner and his air commander, Maj. Gen. William O. Butler, seldom had more than 200 combat aircraft operational.

General Buckner believed it essential to extend the reach of his air element by constructing airfields on some of the Aleutian Islands. Before the Joint Army and Navy Board approved building bases to the west, Buckner diverted funds to secretly construct airfields at Cold Bay, near the tip of the Alaska peninsula, and on Umnak Island, some 250 miles further west. The strip at Umnak, like others to follow, was steel mat laid on the spongy tundra that covers most of the islands.

On May 20, 1942, the first combat planes flew into the partially completed strip. It was so soft that it tossed landing fighters thirty feet into the air. The steel mat rippled ahead of bombers landing or taking off. Nevertheless, by June 3, Umnak had a squadron of P-40s, six Martin B-26s, two B-18s, and a B-17 used for reconnaissance. Two days later the 55th Fighter Squadron (pursuit units had been redesignated as "fighter" by this time) arrived with its P-38s, the first to be sent to a combat theater. They shared tents, mud, fog, and C-rations with the earlier arrivals.

While airfields were being built, the Navy had completed a base at Dutch Harbor, between Cold Bay and Umnak. The fighters were there to protect it, but there was no reliable warning system. Only two primitive radars were in operation.

LEFT: From recaptured Attu, at the end of the Aleutian chain, AAF B-24s and B-25s could reach Japan's Kurile Islands. Attu's mountains were a formidable obstacle to the US forces who retook the island in one of the bloodiest battles of the war.

Dutch Harbor

The Japanese attack on June 3 had two immediate objectives: to destroy the US Navy base at Dutch Harbor and to occupy Attu and Kiska Islands at the western end of the Aleutian chain. After the Doolittle raid on Tokyo in April, the Japanese decided to protect the home islands better by extending their defense perimeter to the north, east, and south. It was never their intention to use the Aleutians as a base for attacking Alaska or the West Coast, but simply to deny the Americans use of the westernmost islands.

Strategically, the attack was planned as a diversion for the Battle of Midway, scheduled for the following day, June 4. Adm. Isoroku Yamamoto hoped to divide what was left of Adm. Chester Nimitz's Pacific Fleet after the losses it had taken in the Coral Sea, destroy the remaining aircraft carriers, seize Midway and the western Aleutians, and perhaps negotiate a peace.

Fortunately, Nimitz did not take the bait. In May, the Navy had broken the Japanese code and Nimitz knew in general, if not in detail, Yamamoto's plan of battle. Nimitz believed correctly that Midway would be a carrier fight. He sent five cruisers and four destroyers under Rear Adm. Robert A. Theobald, who was in overall command of Aleutian operations, to reinforce the eight World War I destroyers based in Alaskan waters. Nimitz's four carriers soundly defeated the

The flight line at Adak was typical of conditions at Aleutian bases during most of the campaign. P-39 Airacobras and P-40 Warhawks are among the fighters on the hardstand of this hastily built airstrip.

Japanese at Midway in one of the decisive battles of World War II.

Unwisely, Yamamoto split his own fleet, sending two carriers, two heavy cruisers, and two destroyers to attack Dutch Harbor, supported by a force of four cruisers, nine destroyers, and three transports lying to the west, ready to occupy Attu and Kiska. The Japanese intelligence was not on a par with that of the US. Yamamoto believed there was a large force at Dutch Harbor and that the nearest combat planes were at Kodiak Island, 550 miles east. The Japanese expected to surprise the Americans completely.

With strategic warning that an attack was imminent, aircrews at Umnak and Cold Bay were on alert from dawn to dusk—at that time of year, from 0400 to 2300 hours. On June 2, a Navy Catalina PBY patrol bomber spotted the Japanese task force through a break in the fog, but could not maintain contact. The following morning at 0545, Capt. Tadao Kato launched his aircraft from a position about 180 miles south of Dutch Harbor. US fighter planes at Cold Bay were scrambled, but did not reach the scene until after bombs-away. They were in time to shoot down one Japanese plane and damage another, and one was knocked down by flak. The unreliable radio system failed to alert fighters at Umnak. In that first day's attack, twenty Americans were killed and a barracks destroyed.

Late the following afternoon, the Japanese dive bombers and fighters struck again from their carriers, which still were concealed by fog. This time the P-40s at Umnak shot down four of eight attacking planes before the task force began its withdrawal to support the landings at Attu and Kiska that took place on June 6 and 7. In all, the US lost forty-three men killed and fifty wounded, two P-40s, one B-17, and several planes that were lost or wrecked in bad weather. The campaign began much as it was to continue—in fog, uncertainty, and confusion.

One Gray Island After Another

For a week after Dutch Harbor, the whereabouts of the Japanese naval force remained a mystery. A Navy weather detachment at Kiska stopped transmitting on June 7, but fog blanketed the island. Air Force bombers, Navy PBY amphibians, and ships of all descriptions searched in vain along the chain and into the Bering Sea. On June 10, an Air Force bomber went down through a hole in the clouds over Kiska Harbor and was fired on. Five B-17s and five B-24s left Cold Bay immediately, refueled at Umnak, and set out for Kiska, more than 600 miles to the west. Thus began a campaign of interdicting sea lines of communication, attrition, and harassment of the Japanese garrisons, interspersed with infrequent air-to-air combat, that was to last for nearly fifteen months. It would be almost a year before enough US troops were available for an assault on the islands.

Kiska lay farther from Umnak than Berlin from Eighth Air Force bases in the United Kingdom. B-17s and B-24s could reach the island only with extra tanks and a reduced bomb load. P-38s to defend the bombers against float-equipped Japanese fighters needed two auxiliary tanks and luck just to make it. The obvious answer was airfields closer to Kiska, which would also allow the bombers and fighters—P-38s, P-39s, and P-40s—to take advantage of breaks in the rapidly changing Aleutian weather.

At the end of August 1942, Army engineers landed unopposed at Adak, about 350 miles west of Umnak and 250 miles from Kiska. Ten days later, a lagoon had been filled in, a runway laid over it, and the first combat planes touched down. Kiska Harbor now was within comfortable range of medium and heavy bombers and fighters. On September 14, twelve B-24s and twenty-five fighters bombed and strafed Japanese installations with the best results so far. Four Zero float planes were shot down, but two P-38s collided in the dogfight and were lost. No more missions against Kiska were flown out of Umnak now that the runway at Adak was operational.

The Japanese knew they could not stop these attacks or protect convoys carrying reinforcements and supplies without land-based fighters. The highest priority on both Kiska and Attu became construction of a runway—by hand, since they had no heavy equipment. For the next twelve months, Japanese troops struggled to complete landing strips on the islands, only to have the work of a few days during bad weather wiped out by bombers and strafing fighters. The diary of a dead Japanese soldier on Attu com-

plained that "these strafing attacks by American fighter planes are enough to make a demon cry."

But from Adak, Attu still lay beyond the range of most Air Force fighters. The next move forward was to Amchitka, 285 miles from Attu and only eighty-five from Kiska. Army engineers landed on the island January 11, 1943, in the face of a raging storm with eighty-knot winds and twenty-foot surf. The engineers and Navy Seabees drained and filled a lake to make a runway, under attack from time to time by the few float planes left at Kiska. At the end of January, Lt. Col. Jack Chennault, son of Maj. Gen. Claire Chennault of Flying Tigers fame, brought a squadron of P-40s to Amchitka. The next day, two attacking float planes were shot down; Japanese strikes from Kiska ceased altogether by mid-February. The P-40s soon were joined by P-38s, medium bombers, and a squadron of B-24s.

American troops landed on Amchitka in January 1943. A month later, fighters were operating from the new airstrip, and by March medium and heavy bombers were striking Kiska. Here trucks haul sand for runway foundations. The Japanese never were able to complete runways at Kiska and Attu.

In good weather several strikes a day were launched against Kiska, which the Americans hoped to recapture before Attu. By mid-April the Japanese had no float-equipped fighters left, no runway for land-based fighters, and not much chance of reinforcements, so effective was the sea/air blockade.

At the end of October 1942, the Navy had moved several of its surface ships to the Solomon Islands. After that, the blockade was enforced largely by submarines, Air Force bombers, and Navy Catalina PBYs. The lumbering 100-knot Catalinas were indispensable in the Aleutians. They carried twenty hours' of fuel, flew when nothing else could get airborne, and were used for patrol, bombing, rescue, and even to lighter supplies to the beachhead during the Battle of Attu. By March, the Air Force alone was credited with sinking or crippling at least forty Japanese ships. No supply convoy reached the Japanese garrisons after December 1942. The flak, however, remained heavy at both Kiska and Attu, with large concentrations of guns and automatic weapons around the small targets that were characteristic of the Aleutians.

Hazards and Heroics

The Alaska theater (which is to say the Aleutians) was the only combat theater of World War II that produced no aces, though Lt. (later Col.) John B. Murphy, credited with three victories in the islands, later became an ace in Europe. This was due to an absence of targets, not to lack of skill and courage on the part of US pilots. It took plenty of both to fly in that weather factory.

The beastly weather was exacerbated by complete lack of navigation aids west of Umnak until late in the campaign, frequent Arctic static that make low-frequency radios useless, constant icing, charts that often were inaccurate, the paucity of emergency landing strips, and no formal rescue service. The lethality of Aleutian weather combined with these factors is illustrated by a mission of January 18, 1943. Seven heavy bombers, five mediums, and six fighters—a relatively large force by Aleutian standards—attacked Attu from their base at Adak. Weather closed in and six of the eighteen disappeared without a trace.

There were no comfortable barracks and often no hot meal waiting at the end of a long battle with flak and weather. Aircrews shared with the ground echelon some of the most miserable living conditions of World War II. For weeks after a new field opened, everyone lived and ate in tents that often had several inches of muddy water on the floor and that were frequently blown down by the violent Aleutian winds. The men were completely isolated from the outside world with little in the way of recreation. Always there was the cold, gray, wet weather—particularly hard on maintenance crews whose work was done mostly in the open. About the time Quonset huts, showers, and maintenance hangars went up, it was time to move west to a new field.

Not everyone had the mental and physical stamina to withstand that life week after week, month after

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John L. Frisbee was Editor of Air Force *Magazine from December 1969 until his retirement in June 1980. During a distinguished Air Force career, from which he retired as a colonel, he served as fighter and bomber pilot, planner on the Air Staff and at major commands, and as a teacher and leader of young men at West Point and the Air Force Academy. He served as special assistant to the Secretary of the Air Force. He holds bachelor's degrees in economics and Latin American studies, a master's in international relations, and is a graduate of the Armed Forces Staff College and the Canadian National Defence College. His "Valor" series is a regular monthly feature of this magazine.*

month. A sense of humor helped. Crews from the 36th Bomb Squadron brought a tree from the mainland to Umnak and christened it "Umnak National Forest." The tree was for the exclusive use of "Skootch," a dog belonging to the CO, Col. William O. Eareckson, who was one of the most colorful and fearless characters of the Arctic war.

Brian Garfield, in his book *The Thousand Mile War* (Doubleday, 1969), quotes this bit of verse about an Aleutian veteran at the Pearly Gates, written in the summer of 1943 by WO Boswell Boomhower.

"What have you done," St. Peter asked,
"To gain admission here?"
"I've been in the Aleutians
For nigh unto a year."
Then the gates swung open sharply
As St. Peter tolled the bell.
"Come in," said he, "and take a harp.
You've had your share of hell."

Actor Charlton Heston saw a brighter side to Aleutian service, at least in retrospect. Immediately after his marriage he was sent to the Aleutians where he served two years as a B-25 radio operator/gunner. "At least," he said, "it got me safely through the first two perilous years of matrimony, when the incidence of divorce is the highest."

The Battle of Attu

In January 1943, the cautious Rear Admiral Theobald, who had commanded US forces in the Aleutians since before Dutch Harbor, was replaced by a hard-driving, decisive veteran of the Coral Sea, Midway, and Guadalcanal, Rear Adm. Thomas C. Kinkaid. His orders were to clear the Japanese out of the Aleutians. The enemy was believed to have from 600 to 1,000 troops on Attu and about 8,000 at Kiska. Both garrisons were suffering from lack of supplies caused by the blockade.

Kinkaid submitted to the Joint Chiefs of Staff a plan for invading Kiska. There was not enough shipping available for an operation of that size, but the recapture of Attu was approved. Over the protests of Kinkaid and General Buckner, the Army's 7th Motorized Division, training in California for assignment to North Africa, was selected for the landing. D-Day was set for May 7, 1943, by which time the division had to be reequipped for cold-weather combat and troopships with their escorts assembled.

While that was going on, Admiral Kinkaid set up a surface naval blockade of Attu and Kiska with six ships. Japanese Admiral Hosogaya attempted to run the blockade in late March with four new heavy cruisers, four destroyers, and three large transports. He was met on March 26 in the vicinity of the Komandorski Islands, about 500 miles west of Attu, by Rear Adm. Charles H. McMorris's task force of two old cruisers and four destroyers. For three and a half hours raged this last battle between capital ships with no aircraft involved, until the Japanese withdrew, short of ammunition, believing US bombers were on the way (they were bombing up at Adak and couldn't reach the battle in time), and not knowing that one US cruiser, *Salt Lake City,* lay dead in the water behind a smoke screen. Thus did Admiral Hosogaya snatch defeat from the jaws of victory, and end up on the beach for it. No Japanese convoy reached Attu after that.

As D-Day approached, the US assembled a force of three battleships, six cruisers, nineteen destroyers, one escort carrier, and enough transports to move the entire 7th Motorized Division. They were—or would have been, if the weather had cooperated—supported by 222 Air Force planes, twenty-five Navy planes aboard the carrier, and one Royal Canadian Air Force squadron, opposed by an estimated fifteen float planes. This overwhelming air superiority was largely nullified by adverse weather that closed out the possibility of support operations.

The invasion force was kept at sea by stormy weather for six days until May 11, when troops went ashore unopposed at Holtz Bay, Massacre Bay, and on the west side of the mountainous island. They rapidly discovered that the Japanese garrison numbered about 2,600 fanatical fighters rather than a small force of retreads; that wheeled and tracked vehicles and heavy artillery were of no use on the soft, snow-covered tundra; that US troops were not properly equipped for ten-degree weather; and that initial combat experience comes at a high price.

On May 22, several Mitsubishi bombers based at Paramushiro, one of the northernmost of Japan's Kurile Islands and now part of the Soviet empire, bombed naval vessels in Holtz Bay, but with little damage. The next day, another bombing attack resulted in the only air combat at Attu. Five bombers were shot down, three of them by Lt. Frederick Moore.

By May 28, Japanese combat strength had been reduced to about 800, concentrated in a small area near Chichagof Harbor. Before a last desperate counterattack, the Japanese killed all their wounded who did not commit suicide. The counterattack failed. Some 500 survivors committed suicide with hand grenades. Only twenty-eight Japanese were taken prisoner.

Five hundred and fifty Americans were killed on Attu and 1,148 were wounded. Nearly 2,000 were victims of exposure, in many cases resulting in the amputation of frostbitten limbs. This first Army amphibious island assault was a bitter, costly experience that planners and commanders did not soon forget.

Kiska: The Great Vanishing Act

Army engineers soon had runways operational at Attu and at Shemya, thirty miles to the east and the only flat island of the Aleutian chain. These fields brought the B-25s as well as B-24s within range of Japan's Kurile Islands. The first attack on Japanese territory since the Doolittle raid of April 1942 took place on July 10, 1943. Eight B-25s were believed to have hit Paramushiro, with uncertain results. A week later, six B-24s bombed an airfield and ships in the harbor at Paramushiro, but, more important, came home with photographs to supplement skimpy intelligence on Japanese installations in the northern Kuriles.

The invasion of Kiska was set for August 15. Eleventh Air Force was built up from 292 aircraft to 359. An invasion force of 34,000 properly equipped American troops and 5,000 Canadians was assembled for the operation. The US Navy provided a force of nearly 100 capital

This rubble resulted from US bombing of Kiska. Wreckage was all the Japanese left on the island. After US forces recaptured Attu and as the joint American-Canadian invasion of Kiska was being planned, the Japanese pulled out.

and supporting ships and transports.

As D-Day drew near, Air Force pilots, who hammered the island every flyable day, brought back reports of reduced activity on Kiska, tapering off to no visible activity and no flak by the end of July. Had the Japanese left, and if so, how could they have evaded the screen of Navy ships and patrol bombers? Admiral Kinkaid and General Buckner thought the Japanese might have holed up in caves and tunnels. Buckner wanted to put a reconnaissance party ashore, but Kinkaid decided on a full-scale invasion. It would, he said, be good training in any event.

The landings went ahead on schedule, only to find the island deserted. On the afternoon of July 28, the Japanese had slipped into Kiska Harbor under cover of fog and, in two hours, embarked more than 5,000 troops aboard two cruisers and six destroyers. Three days later, they were back at Paramushiro, ending one of the greatest secret rescue operations of the war.

The invasion of Kiska was not without casualties, however. In the fog, more than twenty men were killed and fifty wounded by their inexperienced and somewhat trigger-happy comrades. Booby traps took the lives of several more.

Little luster was added to the reputations of senior commanders who had sent several thousand men against an island that had been bombed heavily for two weeks after the enemy departed. Uncharacteristic caution on the part of Admiral Kinkaid and General Buckner, no doubt, was fruit of the Attu experience. And as always in the Aleutians, the fog of nature thickened the fog of war.

* * *

After the evacuation of Kiska there was no more fighting in the Aleutians except for one small attack on Attu by nine Japanese bombers in October 1943. Sporadic US strikes against installations in the Kuriles continued until August 13, 1945, two days before V-J Day. In all, about 1,500 sorties were flown against these Japanese islands.

The Eleventh Air Force flew nearly 4,000 combat sorties in the Aleutians, dropped 3,500 tons of bombs (many of them through an overcast on dead-reckoning runs), and destroyed about seventy Japanese aircraft in the air and on the ground. Forty Air Force planes were lost in combat, most of them to flak, and 174 to other causes, generally weather-related.

After the shooting stopped, there remained a possibility that the Aleutians would become a base for invasion of the Japanese home islands. Runways at Adak, Shemya, and Amchitka were built up to B-29 standards but were never used by the Superforts.

All US forces in the Aleutians were reduced drastically after the Kiska affair, but, for both strategic and political reasons, continued military occupation of the chain was essential. For one thing, Soviet intentions during and after the war were not known.

What can be said of the Aleutian campaign? The Eleventh Air Force tied down anywhere from 40,000 to 70,000 Japanese troops in the Kuriles and Hokkaido and more than 400 aircraft that were needed badly in the Central and South Pacific. On the other hand, 10,000 Japanese troops and a handful of planes diverted from other and strategically more important fronts some 100,000 US troops, a relatively strong naval force, and an average of 200 combat aircraft. The US could better afford the diversion than could the Japanese.

As a result of the campaign, the United States built permanent bases for the defense of our northwest frontier, and the military services gained a great deal of experience in cold-weather operations. In any event, it would have been unthinkable not to respond to enemy occupation of American territory.

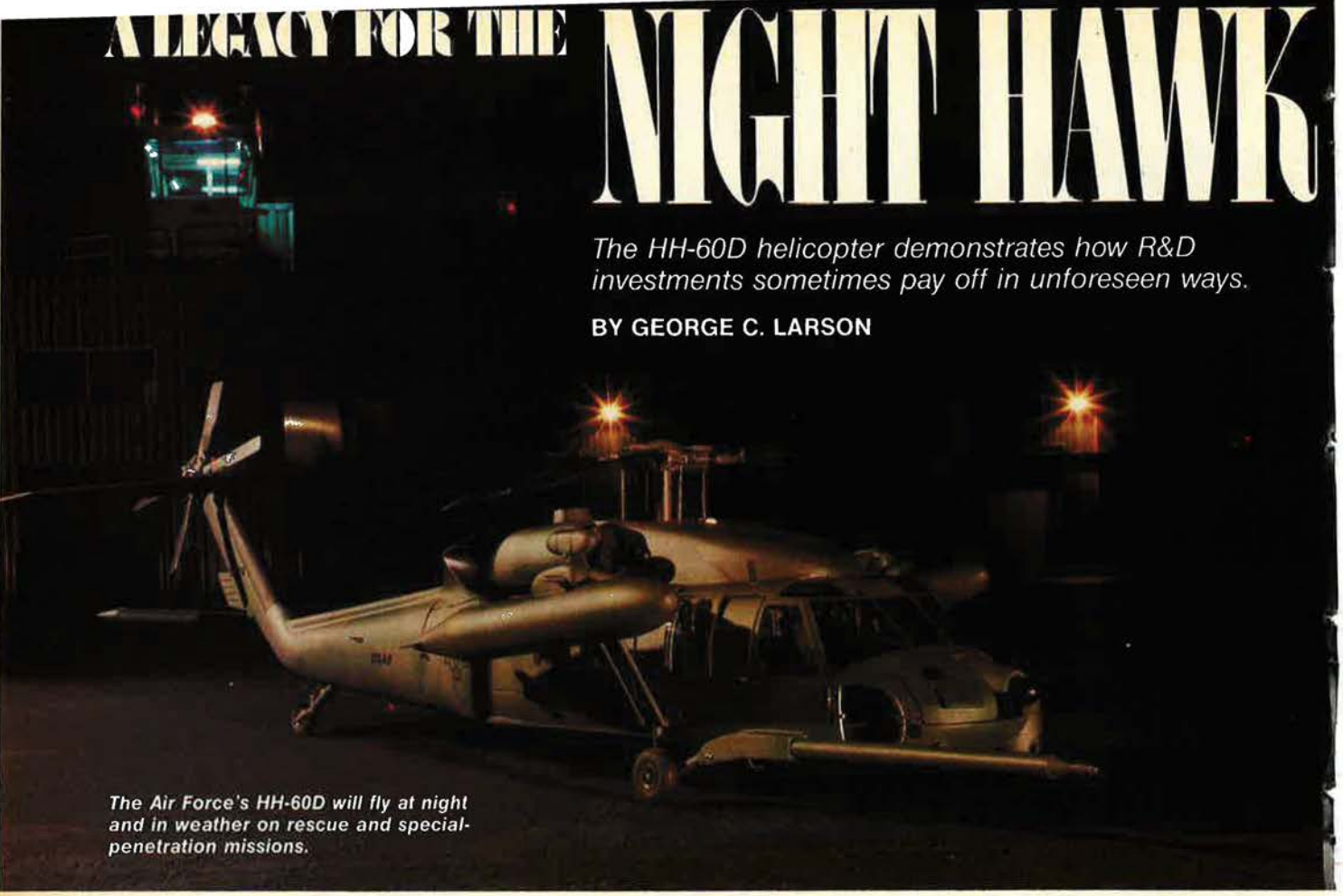
Perhaps Naval historian Samuel Eliot Morison was right when he wrote that "both sides would have done well to leave the Aleutians to the Aleuts." Logic may be on Admiral Morison's side, but neither combatant saw it that way at the time.

It can be said that no Americans of World War II served on a front that continuously tested both mental and physical fiber as did the cold, gray, wind-lashed, unforgiving Aleutians. That forgotten front should be remembered, and so should the men who fought, suffered, and sometimes died at those dismal northern outposts. ■

A LEGACY FOR THE NIGHT HAWK

The HH-60D helicopter demonstrates how R&D investments sometimes pay off in unforeseen ways.

BY GEORGE C. LARSON



The Air Force's HH-60D will fly at night and in weather on rescue and special-penetration missions.

THE price for development of a new system is paid back in ways that may be well publicized or quite obscure. The early space program is one example of the former case. But the need to advertise the benefits of R&D investment is real: When any organization presents its case for a new system, it often does so defensively. Critics of research and development are more numerous than researchers and developers, and it has ever been thus.

"Development" is just that, and the word ought to be accepted at face value. If the developers got everything right the first time, there might be reasonable grounds for suspicion. But development programs all too often encounter questions about why a system isn't perfect the first time out.

The current HH-60D Night Hawk program is a case study in the payback from an investment in systems development made years earlier. It is also a story guaranteed never to make the front page. The program exemplifies the application of mature systems that were once themselves the objects of development programs undertaken at considerable cost and with countless iterations along the way in the quest for optimal performance. Ultimately, those development programs delivered a series of off-the-shelf, operational systems that can be applied in previously unconsidered ways to provide a mission and machine that would have to be described as peripheral to the rationale for designing the system in the first place.

Off-the-Shelf Aircraft

The HH-60D Night Hawk, an aircrew rescue and special missions helicopter capable of night and all-weather low-level penetration missions, was developed in response to an October 30, 1980, Aeronautical Systems Division Program Management Directive seeking to modernize the aging helicopter fleet. A primary ground rule throughout the program has been the use of off-the-shelf systems. By one report, the complete HH-60D system will utilize approximately ninety percent existing hardware and seventy percent software derived from other military programs.

The airframe is a derivative of the Sikorsky UH-60A Black Hawk, a combat utility transport helicopter in service with the US Army. A related Navy aircraft based on this same airframe is designated the SH-60B LAMPS Seahawk. Sikorsky will modify the basic H-60 airframe to the HH-60D Night Hawk configuration. The Federal Systems Division of IBM will act as prime contractor for systems integration and completion.

One significant yet often overlooked group in the organizations developing the H-60 variants is a joint service program managers group that meets every three months to exploit agreed-upon initiatives to seek commonality wherever practical. Their efforts have focused primarily on the airframe and have resulted in extensive applications of composite materials. An important area currently under investigation is a composite-spar rotor blade system that offers extended

service life, provides virtual freedom from corrosion, is fatigue-resistant, and enhances survivability despite battle damage. The rotor blade system is also lighter in weight and is expected ultimately to prove less expensive to manufacture than the all-metal blades of the previous generation of helicopters.

Advanced technology in helicopter airframe design is at the core of the requirement. Older combat helicopters such as the HH-3 and the HH-53 are more maintenance-intensive and more susceptible to battle damage than the newer generation and are more vulnerable and more easily detected in a hostile environment. In addition, their maintenance-hour-per-flight-hour requirement reduces their availability in both peacetime and war.

The Air Force development team went beyond the interservice commonality in the airframe. They also applied, to the maximum extent, existing military systems in the following areas:

- Multimode radar sensors.
- Forward-looking infrared sensors.
- Night-vision light-amplification equipment (crew goggles).
- Cockpit controls and displays, to include primary flight instruments and navigation situation displays.
- Avionics system architecture and digital information transfer.

Because the HH-60D is a helicopter, certain conditions are imposed. Weight is critical in helicopters because of its profound effect on installed horsepower requirements, range, payload, and hover performance. Therefore, modifications to the existing systems would concentrate on weight-reduction opportunities. As one of its requirements as system-integration contractor, IBM had to keep its package to a total of 1,650 pounds.

A fundamental characteristic of the Night Hawk is the extensive use of off-the-shelf components.

In addition, helicopters enjoy a flight regime that encompasses very low airspeeds all the way down to zero at a hover. Modifications to systems with relevant flight-dynamic components would have to extend hardware and software designs based upon fixed-wing applications to provide the required low-speed performance.

Total System Integration

Although the goal of off-the-shelf utilization was paramount, it is important to emphasize that the individual subsystems would be assembled into an entirely new, integrated system unique to the HH-60D. And this total system integration is key to the Night Hawk's anticipated superiority.

The HH-53 Super Jolly Green Giant had the capability for development of night and adverse weather low-level flight, and, in 1977, a requirement for systems to support such a flight regime—known as Pave Low—was issued. When the H-60 airframe appeared, offering reduced maintenance requirements and improved survivability, an ASD study in 1978 examined the possibility of squeezing Pave Low into an H-60-size aircraft. The study revealed that a MIL-STD-1553B-based architecture would allow for such a concept. The 1553B bidirectional data bus was already USAF standard and required no further development specifically for the HH-60D program.

Whereas Pave Low represented the *addition* of navigation and sensor computers and displays to an already crowded cockpit, the HH-60D is designed *around* its avionics. One indication of the work load in the Pave Low HH-53 may be seen in the requirement for two pilots and two flight engineers to handle the flow of information. The HH-60D Night Hawk will be designed for a crew of three, and further studies are examining whether or not the third man—a flight engineer—could be eliminated with no deleterious effect on mission performance.

The result of system integration in the HH-60D is profound, and the benefits transcend the obvious. Computers monitor both navigation and engine operation, unloading the human crew and alerting them "by exception" on cathode-ray tube (CRT) multipurpose displays only when an abnormal condition is sensed. Flight instrument symbols are combined in similar CRTs with the exterior scene depicted by multiple, complementing sensors. The HH-60D Night Hawk panel contains only sixteen displays, six of which are mechanical backup instruments that are not part of the normal scan.

Unlike the Pave Low HH-53, cockpit lighting is designed from the beginning to be compatible with night-vision goggle systems. All sources of light emit only in the green wavelengths, to which the goggles are insensitive.

The navigation/communication group will constitute the highest percentage of government-furnished equipment for the HH-60D—no new development, no modifications. Current-generation transceivers and receivers are used throughout, integrated into the 1553B digital data bus for tuning input and data output. Most individual boxes incorporate built-in test equipment (BITE) and fault isolation capability, meaning that they can test themselves for every function they are designed to perform and can identify and remember faults whenever they occur—even in flight. A supplementary software package called the Maintenance Test Program will be resident in the Memory Loader Verifier package, enabling ground crews to test any line-replaceable unit (LRU) using minimum skill levels.

"Stretched" Radar

The multimode radar is a modified version of the radar portion of the LANTIRN pod developed for the A-10 and F-16. According to Ron Lambdin, lead avionics engineer for the Night Hawk program at Wright-Patterson AFB, Ohio, this radar sensor "stretches the off-the-shelf concept in some respects" because of the differences in helicopter airspeeds and flight dynamics. "The fixed-wing terrain-following algorithm would fail at low airspeeds down to hover," Lambdin said.

The LANTIRN radar performs

terrain-following chores only, whereas the same system installed in the HH-60D will add terrain avoidance, ground mapping, and air-to-ground ranging (applications missing in the A-10 and others), requiring some new hardware and software development. The radar interface, where the hardware and software changes are implemented, is new and unique to the Night Hawk, and the basic cooling system for the radar has been changed to an air-cooled system to save weight. Applying the air cooling to the radar is described as a "difficult" challenge in this airframe, and a considerable portion of the development engineering will be expended here.

A terrain-following algorithm called ADLAT, originally developed by Calspan, will replace the Pave Low software and provide better fidelity. In addition, the pilot can initiate a turn without inducing a climb because the computer stores all obstructions within ± 15° of the flight path, and there is no delay in waiting for the radar antenna to scan the new flight path looking "into the turn"—the computer range-weights this feature to provide a safety margin. Maximum climb angle is computed continuously, based upon available power and gross weight.

The FLIR sensor is a modified Navy AAS-36 used aboard the P-3C antisubmarine patrol aircraft, and development of the technology embodied in it goes back to the late 1960s, according to ASD. Modifications are restricted to the turret and outside sensor optics; the turret's slewing response rate has also been increased to accommodate the required helmet-mounted display response times. A laser rangefinder incorporated in the original system has been eliminated to aid in fitting the FLIR, and total weight is down about a third, with turret diameter reduced from about twenty inches down to sixteen inches. A very wide field of view—one of three fields of view that can be selected by the crew—can be projected onto a helmet-mounted display similar to that used by Army AH-64 attack helicopter crews.

NVGs and Moving Maps

Night-vision goggles (NVG) require complete control of cockpit lighting, and their sensitivity to wavelengths at the red end of the light spectrum requires that any light sources lacking corrected color be selectively turned off during NVG operation. On the HH-60D, all panel lighting was tailored to both NVG use and normal vision. A P-43 phosphor was selected for the CRT displays, and integrated panel lighting is filtered incandescent. The resulting "NVG cockpit" is bathed in a blue-green light, adequate for unassisted vision and a color to which the NVGs are insensitive.

The goggles themselves are an outgrowth of Army developments intended originally for ground troops and later modified for helicopter use. The most recent generation, the AVS-6, is the first to be developed specifically for aviation use. The most significant difference in the panel lighting is the absence of use of color in the master caution and annunciator functions, which are transferred instead to the multifunction displays.

One of the newest systems aboard the HH-60D will be a remote map reader. The map reader is not unique to the Night Hawk, though; similar systems are in development for the F-16XL and F-15E dual role fighter candidate aircraft. These new-generation map readers are capable of display through the video portion of the multifunction displays (MFDs) without the need for intermediate optical stages. Ground crews load sixty-foot-long rolls of 35-mm film images of regional maps at the start of the mission, but there the similarity to earlier projection-type map-display systems—with their heat, weight, and bulk—ends. A "flying spot scanner"—a technique that's been undergoing development for about four years for converting the film image directly to color video—presents a high-resolution image on any MFD tube selected by the crew. Thus, a moving-map display can be combined with other flight symbology directly and in a compact, lightweight package. The HH-60 development team anticipates that this approach to map information for navigation will become the USAF standard.

Getting It All

Did the off-the-shelf philosophy ever prevent the team from getting the systems it wanted aboard the HH-60D? What about fly-by-wire? Or VHSIC (Very-High-Speed Integrated Circuits)?

"We think we have all the systems needed to meet the user's requirement," says Ron Lambdin. Eventually, the helicopter is also expected to incorporate the Air Force AN/ARQ-46 Electronic Survivor Location Equipment (ESLE) when it becomes available. Together with complementary AN/PRC-112 aircrew packs, ESLE will enable the Night Hawk to derive range and bearing information on as many as six individual airmen, then fly flight-director-coupled approaches to a hover and pickup. A cluster of circular-polarization spiral antennas in the belly of the HH-60D would be added with this equipment.

From the dual MIL-STD-1750 computers to control data, the 1553 data bus standardization throughout, and complete dual redundant architecture, this completely integrated sensor, display, and control subsystem creates an aerospace rescue and special operations helicopter with a remarkable gain in capability over the helicopters it will replace.

But the gains are largely harvested from research and development into avionics systems that were not necessarily originally conceived for the rescue mission. Some of the off-the-shelf systems will receive modifications that vary in extent from system to system, but the basics were all there because money was spent as much as twenty years ago on the basic science and technology that provides the foundation for every progressive step in Air Force capability. ■

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JANE'S

ALL THE WORLD'S AIRCRAFT SUPPLEMENT

FEBRUARY 1984

First prototype of the Agusta A 129, under development for Italian Army Aviation

AGUSTA

COSTRUZIONI AERONAUTICHE GIOVANNI AGUSTA SpA: 21017 Cascina Costa di Samarate, Gallarate, Italy

AGUSTA A 129 MANGUSTA (MONGOOSE)

Preliminary design of this light anti-armour helicopter, originally as a derivative of the Agusta A 109A, began in 1978. This was soon replaced by an all-new design, which underwent several changes of configuration before entering its final stages in 1980. The first A 129 (MM590/E.I.901) was rolled out on 9 September 1983 during the ninth European Helicopter Forum at Stresa, Lake Maggiore, and made its initial flight at Cascina Costa, near Milan, on 15 September, piloted by Comandante Luciano Forzani.

Initially, the A 129 is intended for service with the Italian Army, primarily for specialised attack against armoured targets with anti-tank or area suppression weapons, and will have full night/bad weather combat capability. It is also suitable for the advanced scouting role. Studies were carried out of a version to meet the Franco-German HAC/PAH-2 requirement, and Agusta has proposed other possible export versions with different engines (General Electric T700-GE-701 or -401) and/or alternative avionics and equipment.

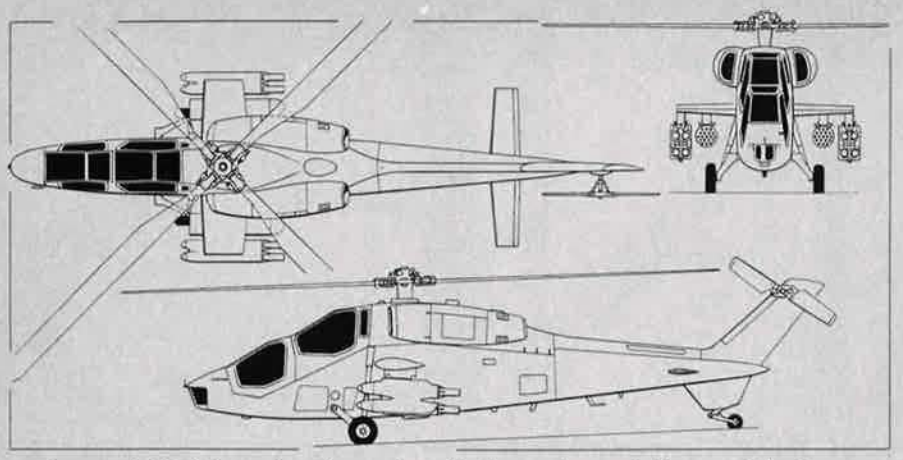
Funding to date (70% by the Italian government and 30% by Agusta) covers the building of four flying prototypes, a ground test aircraft, and a systems prototype. The ground test vehicle was due for completion in January 1984, to be followed by first flights of the second and third prototypes in February and June 1984. The flight test programme is planned to total 2,160 hours, and to continue into 1985.

Italian government approval has been given for an initial production batch of 66 A 129s, of which 60 will equip two Italian Army Aviation operational squadrons, the other six being used for training. Subject to a production go-ahead, scheduled to follow the completion of flight testing, the A 129 is planned to enter service in 1986. A requirement exists for an additional 30 aircraft, plus reserves, to equip a third operational squadron. The first production Mangusta is expected to be ready by early 1985, permitting deliveries to start in the third quarter of 1986.

The following description applies to the A 129 prototypes, except where indicated:

TYPE: Light anti-tank, attack, and advanced scout helicopter.

ROTOR SYSTEM: Fully articulated four-blade main rotor and two-blade semi-rigid delta-hinged tail rotor, each with elastomeric bearings and low-noise tips (various tip designs to be evaluated before production). Main rotor blades, which have a very low vibration level, each consist of a glassfibre spar, Nomex honeycomb leading- and trailing-edge, stainless steel leading-edge abrasion strip, frangible tips, and skin of composite materials. They are designed to have a ballistic tolerance against hits from 12.7 mm ammunition, but are expected also to have considerable tolerance against 23 mm hits. Hub has a swashplate of glassfibre composites; all mechanical linkages and moving parts are housed inside the rotor mast to eliminate foreign object damage, decrease icing problems, and reduce radar signature. There are no lubricated bearings in the rotor



Agusta A 129 light anti-tank, attack, and advanced scout helicopter *(Pilot Press)*

head. Main rotor actuators by Dowty Boulton Paul/Nardi. Tail rotor blades are also of composite materials, with a stainless steel leading-edge, and are also tolerant to 12.7 mm hits.

ROTOR DRIVE: Transmission rating is 895 kW (1,200 shp) (two engines) and 626 kW (840 shp) for single-engined operation; power input into transmission is at 27,000 rpm. All driveshafts, components, and couplings ballistically tolerant to 12.7 mm hits. Main transmission has integral independent oil cooling system; intermediate and tail rotor gearboxes are grease lubricated. Transmission and gearboxes are designed to continue to operate safely for at least 30 min without oil (45 min already demonstrated). Accessory gearbox forward of main transmission. In normal operation, accessories are driven by main gear train, but on ground they can be engaged by a pilot-actuated clutch which connects No. 1 engine to the accessory section without engaging the rotors. Rotor brake fitted, to stop rotors quickly while the two engines run at ground idle, one driving the accessories.

WINGS: Cantilever mid-mounted stub wings, built of composite materials, aft of rear cockpit in plane of main rotor mast.

FUSELAGE: Conventional semi-monocoque structure of aluminium alloy longerons and frames. Honeycomb panels in centre-fuselage and fuel tank areas. Composite materials, making up 45% of total fuselage weight (excluding engine) and 16.1% of total empty weight, are used for nosecone, tailboom, tail rotor pylon, engine nacelles, canopy frame, and maintenance panels. Total 'wetted' surface area of airframe (excl blades and hub) is 50 m² (538.2 sq ft), of which 35 m² (376.7 sq ft) (70%) are of composite materials. Small and narrow frontal area. Rollover bulkhead in nose and rollover bar in forward fuselage for crew protection; armour protection for vital areas of power plant. Overall infra-red-absorbing paint finish. Airframe has a ballistic tolerance against 12.7 mm armour-piercing ammunition, and meets the crashworthiness standards of MIL-STD-1290 (vertical velocity changes of up to 11.2 m; 36.75 ft/s and longitudinal changes of up to 13.1 m; 43 ft/s).

TAIL UNIT: Sweptback main fin, with tail rotor mounted near top on port side. Small underfin, serving also as mount for tailwheel. Tailplane mid-mounted on tailboom in line with fin leading-edge. All tail surfaces built of composite materials.

LANDING GEAR: Non-retractable tailwheel type, of Magnaghi/Messier-Hispano-Bugatti design, with single wheel on each unit. Hydraulic shock strut in each main unit. Gear designed to withstand hard landings at descent rates of up to 4.6 m (15 ft)/s.

POWER PLANT: Two Rolls-Royce Gem 2 Mk 1004D turboshaft engines, each with a max continuous rating of 607.5 kW (815 shp) for normal twin-engined operation; intermediate contingency rating of 667 kW (894 shp) for 1 h; a max contingency rating of 708 kW (952 shp) for 2½ min; and an emergency rating (S/L, ISA) of 772 kW (1,035 shp) for 20 s. Engines for production aircraft will be licence built partially in Italy by Piaggio. Two separate fuel systems, with crossfeed capability; interchangeable self-sealing and crash resistant tanks, self-sealing lines, and digital fuel feed control. Tanks can be foam-filled for fire protection. Single-point pressure refuelling. Infra-red exhaust suppression system and low engine noise levels. Separate independent lubrication oil cooling system for each engine. Provision for auxiliary (self-ferry) fuel tanks on inboard underwing stations.

ACCOMMODATION: Pilot and co-pilot/gunner in separate cockpits in tandem. Elevated rear (pilot's) cockpit. Each cockpit has a flat plate low-glint canopy with upward hinged door panels on starboard side and Explosive Technology blow-out side panel for exit in emergency. Energy absorbing armoured seats (to MIL-S-58095 standards).

SYSTEMS: Hydraulic system includes three main circuits dedicated to flight controls and two independent circuits for rotor and wheel braking. Main system operates at pressure of 207 bars (3,000 lb/sq in) and is fed by three independent power groups, two integrated and driven mechanically by the main transmission, the third integrated and driven by the tail rotor gearbox. Dual actuators are provided for main and tail rotor flight controls. Electrical system includes dual fly-by-wire systems as backup for mechanical control system, and separate fly-by-wire control system for tail rotor, with mechanical backup. Full automatic stabilisation equipment standard. Automatic fire extinguishing system.

AVIONICS AND OPERATIONAL EQUIPMENT: All main functions of the helicopter are handled and monitored by a fully integrated Harris Corporation digital multiplex system (first installation in prototype 003) which controls com, nav, flight director, autopilot, fly-by-wire, transmission and engine condition monitoring, fuel/hydraulic/electrical systems monitoring, aircraft performance, caution and warning systems, and rocket fire control. The IMS (integrated multiplex system) is managed by two redundant central computers, each capable of operating the system independently. They are backed by two interface units which pick up outputs from sensors and avionic equipment and transfer them, via a system of redundant 1553B data buses, to the main computers for real-time processing. Processed information is presented to the pilot and co-pilot/gunner on separate graphic/alphanumeric head-down multi-function displays (MFDs) with standard multi-function keyboards for easy access to information, including area navigation and synthetic waypoint map, weapons status and selection, radio tuning and mode selection, caution and warning, and display of aircraft performance. The IMS computer can store up to 100 waypoints, or a maximum of ten flight plans with an average of ten waypoints each, and 100 pre-set frequencies and modes for HF, VHF, and UHF radio management. Navigation is controlled by the navigation computer of the IMS coupled to a Marconi Doppler radar and a radar altimeter. Synthetic map presentation of waypoints, target areas, and dangerous areas is shown on the pilot's or co-pilot's MFD.

The A 129 has a full day/night operational capability, with equipment designed to give both crew members a view outside the helicopter irrespective of light conditions. A Honeywell pilot's night vision system (PNVS) allows nap-of-the-earth (NOE) flight by night, a picture of the world outside being generated by the FLIR system inside the 'nose' of the PNVS (which is mounted at the nose of the aircraft) and presented to the pilot through the monocle of his Honeywell integrated helmet and display sighting system (IHADSS). Symbology containing the information required for the flight is superimposed onto the image, giving a true head-up reference. The co-pilot/gunner is also equipped with an IHADSS. For night anti-tank engagements, the TOW M65 target acquisition and missile guidance unit will be augmented by a FLIR, either the US FACTS (FLIR Augmented Cobra TOW Sight) or an equivalent European system. This vision equipment can also be used during daylight, especially the integrated helmet sight, which provides automatic weapon aiming and reduces reaction time against unexpected targets. Although not yet requested by the Italian Army, the A 129 has provision to install a mast mounted sight (MMS) for target acquisition, TOW missile tracking, laser ranging, laser designation (*e.g.*, for Hellfire launch), and automatic laser tracking of targets designated by other air or ground lasers. An MMS would give the A 129 greater flexibility and survivability by allowing it to aim and fire from behind trees or other terrain features. Feasibility studies for an MMS have already been carried out successfully by Agusta in co-operation with Martin Marietta.

Active and passive self-protection systems (ECCM and ECM) will be standard on the Italian Army A 129. Passive electronic warfare systems will include an Elettronica/E-Systems or Perkin-Elmer radar warning receiver, and a Perkin-Elmer laser warning receiver, which can detect enemy radars or lasers locked on to the helicopter and signal them to the crew for evasive action or the appropriate use of active countermeasures. The latter will include an ITT radar jammer and Sanders infra-red jammer, and a Tracor chaff/flare dispenser.

ARMAMENT: Four underwing attachments, the inner pair stressed for loads of up to 300 kg (661 lb) each, the outer pair (at wingtips) for up to 200 kg (441 lb) each. All four stations incorporate articulation which allows pylon to be elevated 3° and depressed 12° from armament datum line. Initial armament of up to eight Hughes BGM-71A TOW wire-guided anti-tank missiles (two, three, or four in pod suspended from each wingtip station); with these can be carried, on the inboard stations, either two 7.62, 12.7, or 20 mm gun pods, or two launchers each for seven 2.75 in air-to-surface rockets. For general attack missions, rocket launchers can be carried on all four stations (two nineteen-tube plus two seven-tube). Alternatively, is able to carry six Rockwell AGM-114A Hellfire anti-tank missiles (three beneath each wingtip); eight Euromissile Hot missiles; two gun pods plus two nineteen-tube rocket launchers; or grenade launchers.

DIMENSIONS, EXTERNAL:

Main rotor diameter	11.90 m (39 ft 0½ in)
Tail rotor diameter	2.24 m (7 ft 4¼ in)
Wing span	3.20 m (10 ft 6 in)
Width over TOW pods	3.60 m (11 ft 9¾ in)
Length overall, both rotors turning	14.29 m (46 ft 10½ in)
Length of fuselage	12.275 m (40 ft 3¼ in)
Fuselage: Max width	0.95 m (3 ft 1½ in)
Height over tail fin, tail rotor horizontal	2.65 m (8 ft 8¼ in)

Height over tail, tail rotor turning 3.315 m (10 ft 10½ in)
Height to top of rotor head 3.35 m (11 ft 0 in)
Tailplane span 3.00 m (9 ft 10 in)
Wheel track 2.20 m (7 ft 3½ in)
Wheelbase 6.955 m (22 ft 9¾ in)

AREAS:
Main rotor disc 111.2 m² (1,196.95 sq ft)
Tail rotor disc 3.94 m² (42.42 sq ft)

WEIGHTS AND LOADINGS:
Weight empty, equipped 2,529 kg (5,575 lb)
Max internal fuel load 650 kg (1,433 lb)
Max external weapons load 1,000 kg (2,205 lb)
Max design T-O weight 3,700 kg (8,157 lb)
Max disc loading 33.3 kg/m² (6.8 lb/sq ft)
Max power loading 3.05 kg/kW (5.0 lb/shp)

PERFORMANCE (estimated):
At mission T-O weight of 3,665 kg (8,080 lb), at 2,000 m (6,560 ft), ISA + 20°C, except where indicated, the A 129 is designed to meet the following performance requirements:
Dash speed 170 knots (315 km/h; 196 mph)
Max level speed at S/L 145 knots (270 km/h; 168 mph)
Cruising speed 135 knots (250 km/h; 155 mph)
Max rate of climb at S/L 637 m (2,090 ft)/min
Hovering ceiling: IGE 3,290 m (10,800 ft)
OGE 2,390 m (7,850 ft)
Basic 2 h 30 min mission profile with 8 TOW and 20 min fuel reserves
Fly 54 nm (100 km; 62 miles) to battle area, mainly in NOE mode, 90 min loiter (incl 45 min hovering), and return to base
Max endurance, no reserves 3 h 0 min
g limits +3.5/−0

Full-scale mockup of the Beechcraft Starship 1 ten/twelve-seat business aircraft

BEECHCRAFT

BEECH AIRCRAFT CORPORATION; 9799 East Central, Wichita, Kansas 67201, USA

BEECHCRAFT STARSHIP 1

Beech announced on 3 October 1983 the first flight, on 29 August 1983, of an 85% scale version of a new turboprop powered corporate aircraft which is designated Starship 1. This scale version was built by Mr 'Burt' Rutan's Scaled Composites Inc, and Mr Rutan took part in the configuration study that led to finalisation of the design. In addition to this scale aircraft, which is providing valuable data for the full-size Starship 1, the company completed a full-scale mockup which was exhibited from 4–6 October at the National Business Aircraft Association meeting at Dallas, Texas. Comparatively few details of this new business aircraft have been released, but it is planned that certification of the full-scale version will be completed during 1985, with initial customer deliveries following immediately after. All available details follow:

TYPE: Ten/twelve-seat business aircraft.

WINGS: Cantilever mid/low-wing monoplane structure of advanced-technology composite materials and titanium. Compound swept wing, with wingtip winglets (which the company terms tip-sails) and a rudder in each winglet, mounted at the rear of the fuselage. Conventional ailerons and trailing-edge flaps.

FUSELAGE: Circular-section fuselage of fail-safe construction, using similar materials to the wings.

FOREPLANES: Low-set variable-geometry swept-back foreplanes, of similar construction to wings, each with an elevator.

LANDING GEAR: Retractable tricycle type. Wide-track main units retract inward into undersurface of wings.

POWER PLANT: Two Pratt & Whitney Aircraft of Canada PT6A-60 turboprop engines, each flat rated at 746 kW (1,000 shp) and driving a four-blade pusher propeller with spinner. Engines pod-mounted on the upper surface of wings. Fuel contained in integral wing tanks.

ACCOMMODATION: Pilot and co-pilot on six-way adjustable seats on flight deck, separated from cabin by bulkhead with door. Six basic interior configurations to be offered initially. Typical configuration for nine passengers on four individual swivelling and reclining seats with individual legrests and telescoping armrests forward, plus a three-seat and a two-seat divan, on each side of the rear cabin. Individual reading light and fresh air vent by each seat. Indirect cabin lighting. A sidewall console houses worktables and provides storage for cabin accessories. Refreshment centre. Forward and rear baggage compartments, both accessible in flight. Fully enclosed lavatory at forward end of cabin. 'No smoking' and 'Fasten seat belt' signs.

Flight deck of the Starship 1, with the multi-CRT panel specified for many next-generation business transports

The interior of the Starship 1 is as neat and uncluttered as the exterior

SYSTEM: Pressurisation system with max differential of 0.59 bars (8.5 lb/sq in) to provide a cabin altitude of 2,440 m (8,000 ft) at 12,495 m (41,000 ft).

AVIONICS AND EQUIPMENT: Flight deck CRT displays for all flight, navigation, and aircraft performance monitoring systems. Controls and switch layout suitable for two-pilot or training operations, but aircraft will be certificated for one-pilot operation.

DIMENSIONS, EXTERNAL:
Wing span 16.64 m (54 ft 7 in)
Winglet height, each 2.36 m (7 ft 9 in)
Foreplane span 7.76 m (26 ft 5½ in)
Length overall 13.84 m (45 ft 5 in)
Height overall 3.89 m (12 ft 9 in)

DIMENSIONS, INTERNAL:
Cabin (from forward to rear pressure bulkhead):
Length 8.05 m (26 ft 5 in)
Max height 1.67 m (5 ft 5¾ in)
Max width 1.67 m (5 ft 5¾ in)
Baggage volume (total, fore and aft) 1.42 m³ (50 cu ft)

WEIGHT:
Max T-O weight 5,670 kg (12,500 lb)

PERFORMANCE (estimated):
Max cruising speed 347 knots (644 km/h; 400 mph)
Max rate of climb at S/L 1,005 m (3,300 ft)/min

BOEING

BOEING AEROSPACE COMPANY: PO Box 3999, Seattle, Washington 98124, USA

BOEING ADVANCED AIRBORNE COMMAND POST

USAF designation: E-4

On 28 February 1973 the US Air Force's Electronic Systems Division announced from its headquarters at Hanscom Field, Bedford, Massachusetts, that it had awarded The Boeing Company a $59 million fixed price contract for the supply of two Model 747-200Bs to be adapted as **E-4A** airborne command posts (USAF serial numbers 73-1676 and -1677) under the 481B Advanced Airborne Command Post (AABNCP) programme. A further contract valued at more than $27.2 million was awarded in July 1973 for a third aircraft (74-0787); in December 1973 a fourth aircraft (75-0125) was contracted at $39 million. This was to be fitted with more advanced equipment *(see next page)* and designated **E-4B**.

The E-4s were intended to replace EC-135 National Emergency Airborne Command Post (NEACP) aircraft operated by the Strategic Air Command for the National Command Authorities. The EC-135 aircraft are military variants of the Model 707. The E-4 AABNCP aircraft are intended to provide the critical communications link between US national command authorities and the nation's strategic retaliatory forces during and following a nuclear or conventional attack on the United States. They would be able to operate in a nuclear environment if nuclear explosions disrupted currently used communications equipment. They are not, however, equipped for the actual launching of US ICBMs by means of electronic commands. This is a function of SAC's Looking Glass EC-135 aircraft, as distinct from the NEACP aircraft.

E-Systems won the contract to install interim equipment in the three E-4As. This involved transfer and integration of equipment removed from EC-135s, providing aircraft with increased endurance and the ability to carry an expanded battle staff. The E-4A's floor space can accommodate almost three times the payload of the EC-135.

The first E-4A flew for the first time on 13 June 1973, and was delivered to Andrews AFB, Maryland, in December 1974. The second and third, also consigned to Andrews AFB, were received in May and September 1975. In their initial form, they were operated as National Emergency Airborne Command Posts (NEACPs), and provided operational experience that proved invaluable in finalising the design of equipment installed in the E-4B.

The third and fourth aircraft differed initially from the first two in having General Electric CF6-50E turbofan engines, each rated at 233.5 kN (52,500 lb st), instead of the JT9Ds that were then fitted normally to aircraft of the 747 series; CF6-50Es were fitted retrospectively to the first two aircraft during 1976, and have since been upgraded to CF6-50E2 standard, to improve fuel economy and T-O thrust under high ambient temperature conditions.

Originally, the total planned force was six E-4Bs, comprising the fourth aircraft, two additional aircraft to be designed as E-4Bs from the outset, and the three E-4As brought up to the same standard retrospectively. Contracts covering modification of one E-4A to E-4B configuration, with options to modify the other two, were announced on 26 June 1980. The two options were duly exercised during December 1980 and October 1981, and the first E-4B conversion was redelivered to USAF on 15 July 1983; the second is due to be redelivered in May 1984, and the third in January 1985. Congress, however, denied SAC the necessary funding for the other two new E-4Bs, and instructed SAC to turn to less costly alternative aircraft. SAC is now studying possible alternatives.

Boeing, E-Systems, and a team comprising Electrospace Systems Inc of Richardson, Texas; Collins Radio Division of Rockwell International Corporation, Dallas, Texas; RCA Corporation of Morristown, New Jersey; and Burroughs Corporation, Federal and Special Systems Group, of Paoli, Pennsylvania, are responsible for designing and installing the advanced command post equipment in the E-4B. The first E-4B was delivered to the US Air Force in August 1975 in testbed configuration, with flight refuelling boom receptacle installed (in a small fairing on top of the nose) but without the planned command, control, and communications equipment. Next stage involved installation of the 1,200kVA electrical system (two 150kVA generators on each engine) designed to support the advanced avionics. Finally the operational systems were added, and the first flight of the fully equipped E-4B took place on 10 June 1978. US Air Force tests of operational capability began later that year.

The first E-4B (75-0125) was redelivered to the US Air Force on 21 December 1979, and entered service in January 1980. It has accommodation for a larger battle staff than that carried by the E-4A; an air-conditioning system of 226.5 m³ (8,000 cu ft)/min capacity to cool avionics components; nuclear thermal shielding; acoustic controls; an improved technical control facility; and new super high frequency (SHF) and dual Collins VLF/LF communications systems, the latter employing trailing shortwire and long-wire antennae of which the long-wire system has an antenna 4.3 nm (8 km; 5 miles) in length. The SHF antennae are housed in a dorsal fairing which is a recognition characteristic of the E-4B.

Strategic Air Command (SAC) is the sole operational manager of the AABNCP force. The main operating base for the E-4 fleet is at Offutt AFB, Nebraska.

ACCOMMODATION (E-4B): Up to 94 crew members on three decks. Upper deck contains flight deck and flight crew rest area. Access to main deck compartments is by aisle on starboard side: these compartments include NCA (national command authorities) area, conference room, briefing room, battle staff work area, communications control centre, technical control centre (where operators monitor and maintain quality of communications links), and crew rest area. Forward and rear lower lobes house electronic equipment, an onboard maintenance area, and a winch operator's station for the long-wire VLF antenna. The NCA's senior adviser conference room is equipped with a projection room, screen, and secure telephones at the conference table. Briefing room for second-level advisory staff contains a table, podium, and a viewing screen served also by the projection room. Battle staff area accommodates up to 30 crew members responsible for information flow into and out of aircraft; their two-position consoles contain work surfaces and facilities for communications and for data storage.

AVIONICS (E-4B): Command and control avionics, powered by 1,200kVA electrical power generation system, include 13 external communication systems operating through 46 antennae with configurations ranging from a small dish for SHF satellite links (in larger of two fairings aft of upper deck) to an 8 km (5 mile) trailing wire for VLF and LF communication. Ability to use satellite systems reduces dependence on ground stations and protects against jamming and direct tracking attempts. A long-range link, established with the high-power VLF system, resists atmospheric nuclear effects and is very difficult to jam. The HF, MF, VHF, and UHF bands provide additional two-way radio channels. Secure voice and teletype links are achieved through HF, UHF, and SHF bands, and the E-4B's high-speed secure-record communications equipment interfaces to the automatic digital network. The E-4B system is capable of tying in to commercial telephone and radio networks, and potentially could be used for radio broadcast to the general population. When it is on the ground it can also be connected to a ground communications network, which can be disconnected quickly. Other E-4B avionics and instrumentation include search radar in the nosecone, Tacan, VHF Omni navigation, dual ADF, dual radio altimeters, glideslope, and marker beacon receiver.

DIMENSIONS, EXTERNAL:

Wing span	59.64 m (195 ft 8 in)
Length overall	70.51 m (231 ft 4 in)
Height overall	19.33 m (63 ft 5 in)

DIMENSION, INTERNAL:

Floor area (three decks, total)	511 m² (5,500 sq ft)

WEIGHTS:

Max fuel weight	150,395 kg (331,565 lb)
Max T-O weight	362,875 kg (800,000 lb)
Max ramp weight	364,235 kg (803,000 lb)

PERFORMANCE:

T-O run for 8 h endurance	1,525 m (5,000 ft)
Unrefuelled endurance	more than 12 h
Mission endurance with in-flight refuelling	72 h

Boeing E-4B advanced airborne command post operated by USAF Strategic Air Command

FAIRCHILD

FAIRCHILD AIRCRAFT CORPORATION (a subsidiary of Fairchild Industries): PO Box 32486, San Antonio, Texas 78284, USA

FAIRCHILD 300

Fairchild announced on 3 October 1983, at the National Business Aircraft Association convention at Dallas, Texas, introduction of the Fairchild 300 to supersede the Merlin IIIC executive transport (details of which can be found in the 1983–84 *Jane's*), of which production ended in late 1982. The power plant is unchanged, the emphasis being primarily on aerodynamic and control system improvements for increased performance and enhanced handling, notably in roll. Externally apparent changes include the introduction of 0.76 m (2 ft 6 in) winglets and reshaped ailerons. Internally, the control system utilises larger cables and pulleys, requiring much reduced travel of the yoke for roll control. Certification to SFAR Pt 41 standards was expected in late 1983, permitting deliveries of the Fairchild 300 to begin by early 1984.

TYPE: Eight/ten-seat twin-turboprop executive transport.

WINGS: Cantilever low-wing monoplane. Wing section NACA 65_2A215 at root, NACA 64_2A415 at tip. Dihedral 5°. Incidence 1° at root, −1° at tip. Sweepback at quarter-chord 0° 54'. All-metal two-spar fail-safe structure of aluminium alloy, constructed in one piece. The main spar beams have laminated caps and these, in the centre-section, have titanium laminations. Hydraulically operated double-slotted trailing-edge flaps. Manually controlled trim tab in each aileron. Wingtip winglets. Goodrich pneumatic de-icing boots on wing leading-edges, with automatic bleed air cycling system.

The new Fairchild 300 (foreground) and Fairchild 400 twin-turboprop business transports introduced at the 1983 NBAA convention in Dallas

FUSELAGE: All-metal cylindrical semi-monocoque fail-safe structure of 2024 aluminium alloy, flush riveted throughout. Glassfibre honeycomb nosecap will accommodate a 0.38 m (15 in) weather radar antenna.

TAIL UNIT: Cantilever all-metal structure with sweptback surfaces and dorsal fin. Small ventral fin. Electrically adjustable variable incidence tailplane. Manually controlled rudder trim. Goodrich pneumatic de-icing boots on tailplane leading-edges, with automatic bleed air cycling system.

LANDING GEAR: Retractable tricycle type with twin wheels on each unit. Hydraulic retraction, with dual actuators on each unit. All wheels retract forward, main gear into engine nacelles, nose unit into fuselage. Ozone Aircraft Systems oleo-pneumatic shock absorber struts. Nosewheel steerable. Free-fall emergency extension system, with backup by hand operated hydraulic pump. Goodrich mainwheels with low pressure tubeless tyres, size 18 × 5.50, type VII. Jay-Em nosewheels and Goodyear low pressure tubeless tyres, size 16 × 4.40, type VII. Goodrich self-adjusting hydraulically operated disc brakes and anti-skid system.

POWER PLANT: Two 671 kW (900 shp) Garrett TPE331-10U-503G turboprop engines, each driving a slow-turning Dowty Rotol R.321 four-blade fully-feathering and reversible-pitch metal propeller with synchrophaser. In-flight windmill start capability. Continuous alcohol/water injection system optional. Integral fuel tank in each wing, each with a usable capacity of 1,226 litres (324 US gallons). Total usable fuel capacity 2,452 litres (648 US gallons). Refuelling point on each outer wing panel. Automatic fuel heating. Oil capacity 15.1 litres (4 US gallons). Engine inlet de-icing by bleed air. Electric oil cooler inlet anti-icing. Electric propeller de-icing. Flush mounted fuel vents. Single-point rapid defuelling provisions. Negative torque sensing, single red line/auto-start, automatic engine temperature limiting, and engine fire detection and extinguishing systems.

ACCOMMODATION: Crew of two on flight deck, each on four-way adjustable seat with shoulder harness; dual controls standard. Bulkhead with sliding door divides flight deck from cabin. Standard accommodation is for seven passengers with seats disposed on each side of a central aisle. Rapid relocation of seats and couches is made possible by continuous tracks recessed into floor, permitting layout to be varied according to mission, with max accommodation for ten, including crew. Private toilet compartment. Couches, tables, and refreshment centres optional. Passenger door at rear of cabin on port side, with integral airstair. Emergency exit on starboard side of cabin. Sliding door at rear end of cabin to separate it from the entrance vestibule. Baggage space in vestibule to accommodate 136 kg (300 lb); baggage and avionics in nose compartment, total capacity 272 kg (600 lb), of which 136 kg (300 lb) is nominally baggage. Accommodation pressurised, air-conditioned, and ventilated. Electrically heated flat glass windscreen panels. Two-speed windscreen wipers.

SYSTEMS: Garrett automatic cabin pressure control system: max differential 0.48 bars (7.0 lb/sq in), providing a sea level cabin altitude to 5,120 m (16,800 ft). Engine bleed air heating, dual air cycle cooling system, with automatic temperature control. Air blower system for on-ground ventilation. Independent hydraulic system for brakes. Dual engine driven hydraulic pumps, using fire-resistant MIL-H-83282 hydraulic fluid, provide 138 bars (2,000 lb/sq in) to operate flaps, landing gear actuators, and nosewheel steering. Electrical system supplied by two 28V 300A starter/generators. Fail-safe system with overload and overvoltage protection. Redundant circuits for essential systems. Two 350VA solid state inverters supply 115V and 26V AC. Two 24V 25Ah nickel-cadmium batteries for main services. Engine fire detection system and fire extinguishing system standard. Wing overheat detection system. Oxygen system of 0.62 m³ (22 cu ft) capacity with flush outlets at each seat; system with capacity of 3.26 m³ (115 cu ft) optional. Stall avoidance system comprising angle indicator, visual and aural warning.

AVIONICS AND EQUIPMENT: Two flight deck and four cabin speakers standard; provisions for installation of remotely mounted or panel mounted avionics, customer furnished weather radar, and autopilot. Collins EHSI-74 electronic horizontal situation indicator. Standard equipment includes pilot and co-pilot foot warmers; edge lit consoles, pedestal and switch panels; integrally lit instruments; annunciator panel with 48 indicators; internally operated control locks, individual reading lights and air vents for each passenger; heated pitot; heated static sources; baggage compartment, cargo compartment, entrance, map and instrument panel, ice inspection, retractable landing, navigation, rotating beacon and taxi lights; automatic engine start cycle; external power socket; and static wicks.

DIMENSIONS, EXTERNAL:

Wing span	14.60 m (47 ft 10¼ in)
Length overall	12.85 m (42 ft 2 in)
Height overall	5.13 m (16 ft 10 in)
Tailplane span	4.86 m (15 ft 11½ in)
Wheel track	4.57 m (15 ft 0 in)
Wheelbase	3.23 m (10 ft 7 in)
Propeller diameter	2.69 m (8 ft 10 in)
Passenger door (port):	
Height	1.35 m (4 ft 5 in)
Width	0.63 m (2 ft 1 in)

DIMENSIONS, INTERNAL:

Flight deck:	
Length	1.63 m (5 ft 4 in)
Volume	2.55 m³ (90 cu ft)
Cabin, excl flight deck and rear compartment:	
Length	3.23 m (10 ft 7 in)
Max width	1.57 m (5 ft 2 in)
Max height	1.45 m (4 ft 9 in)
Volume	9.09 m³ (321 cu ft)
Rear baggage compartment (pressurised):	
Volume, with toilet installed	2.12 m³ (75 cu ft)
Nose baggage/avionics compartment (unpressurised):	
*Volume, total	1.27 m³ (45 cu ft)

*Nominally 0.85 m³ (30 cu ft) for baggage

AREAS:

Wings, gross	25.78 m² (277.50 sq ft)
Ailerons (total)	1.31 m² (14.12 sq ft)
Trailing-edge flaps (total)	3.78 m² (40.66 sq ft)
Fin, incl dorsal fin	3.40 m² (36.62 sq ft)
Rudder, incl tab	1.80 m² (19.38 sq ft)
Tailplane	5.08 m² (54.70 sq ft)
Elevators	1.98 m² (21.27 sq ft)

WEIGHTS:

Weight empty, equipped	3,719 kg (8,200 lb)
Max fuel weight	1,969 kg (4,342 lb)
Max T-O and landing weight	6,001 kg (13,230 lb)
Max ramp weight	6,046 kg (13,330 lb)
Max zero-fuel weight	5,670 kg (12,500 lb)

PERFORMANCE (at max T-O weight, ISA, except where indicated):

Max level speed, optimum altitude at mid-cruise weight	300 knots (555 km/h; 345 mph)
Average cruising speed at 7,925 m (26,000 ft) for max range, with eight occupants	267 knots (494 km/h; 307 mph)
Stalling speed:	
flaps and wheels up	104 knots (193 km/h; 120 mph)
flaps and wheels down	89 knots (165 km/h; 103 mph)
Max rate of climb at S/L	792 m (2,600 ft)/min
Rate of climb at S/L, one engine out	228 m (750 ft)/min
Max operating altitude	9,450 m (31,000 ft)
T-O to 15 m (50 ft)	890 m (2,920 ft)
Accelerate/stop distance	1,370 m (4,495 ft)
Landing from 15 m (50 ft)	855 m (2,805 ft)
Range at high altitude profile, high speed cruising, with allowance for T-O, climb, descent, and 45 min hold:	
8 occupants	1,636 nm (3,032 km; 1,884 miles)
5 occupants	1,984 nm (3,677 km; 2,285 miles)

FAIRCHILD 400

Announced simultaneously with the Fairchild 300, on 3 October 1983, the Fairchild 400 is under development to supersede the current Merlin IVC (details of which can be found in the 1983–84 *Jane's*) as the long-body 16-seat aircraft in the company's executive range. By comparison with the Merlin IVC, the wing span is reduced by 1.83 m (6 ft) and the IVC's Garrett TPE331-11 turboprops are replaced by the -14UA version, each flat rated at 820 kW (1,100 shp). The control system improvements developed for the Fairchild 300 are embodied also in the 400, and a five-CRT Collins EFIS will be standard on production aircraft. A prototype was being flight tested in the late Summer of 1983. Certification is anticipated by early 1985.

Being, like the Merlin IVC, a corporate version of the Metro III commuter airliner, the Fairchild 400 differs primarily in its internal configuration, which provides more luxurious accommodation for 11 passengers as standard. Interior furnishing includes a large buffet cabinet with beverage and food

storage and preparation facilities, television, and stereo equipment. Its large cabin volume, and the availability of movable bulkheads and interchangeable cabin furnishings, makes it easily convertible to meet a company's airlift requirements in virtually any arrangement of passengers and/or cargo. The description of the Fairchild 300 applies also to the Fairchild 400, except as follows:

TYPE: Thirteen/sixteen-seat corporate transport.

WINGS: Generally as described for Fairchild 300, except that no winglets are fitted and span is 0.94 m (3 ft 1¼ in) greater.

FUSELAGE: Structurally similar to that of Fairchild 300, but longer.

POWER PLANT: Two Garrett counter-rotating turboprop engines, comprising one TPE331-14UA-801G and one TPE331-14UB-801G, each flat rated at 820 kW (1,100 shp), otherwise generally as described for Fairchild 300.

ACCOMMODATION: Crew of two on flight deck; 11 to 14 passengers in main cabin. Furnishing options, avionics, and equipment generally as for Fairchild 300, plus optional cargo carrying provisions. Capacity of rear baggage compartment (with toilet installed) 272 kg (600 lb). Nose compartment will accommodate 272 kg (600 lb) total of baggage and equipment.

DIMENSIONS, EXTERNAL:

Wing span	15.54 m (51 ft 0 in)
Length overall	18.09 m (59 ft 4¼ in)
Height overall	5.08 m (16 ft 8 in)
Tailplane span	4.86 m (15 ft 11½ in)
Wheel track	4.57 m (15 ft 0 in)
Wheelbase	5.83 m (19 ft 1½ in)
Propeller diameter	2.69 m (8 ft 10 in)
Passenger door (fwd):	
Height	1.30 m (4 ft 5 in)
Width	0.63 m (2 ft 1 in)
Cargo door (rear):	
Height	1.30 m (4 ft 3¼ in)
Width	1.35 m (4 ft 5 in)
Height to sill	1.30 m (4 ft 3¼ in)
Forward baggage doors (two, each):	
Height	0.63 m (2 ft 1 in)
Width	0.46 m (1 ft 6 in)
Emergency exits (three, each):	
Height	0.71 m (2 ft 4 in)
Width	0.51 m (1 ft 8 in)

DIMENSIONS, INTERNAL:

Cabin, excl flight deck and rear cargo compartment:	
Length	7.75 m (25 ft 5 in)
Max width	1.57 m (5 ft 2 in)
Max height (aisle)	1.45 m (4 ft 9 in)
Floor area	13.02 m² (140 sq ft)
Volume	13.88 m³ (490 cu ft)
Rear cargo compartment (pressurised):	
Length	2.34 m (7 ft 8 in)
Max width	1.57 m (5 ft 2 in)
Max height	1.32 m (4 ft 4 in)
Volume, with toilet installed	2.60 m³ (92 cu ft)
Nose avionics/baggage compartment (unpressurised):	
Length	1.75 m (5 ft 9 in)
*Volume, total	1.27 m³ (45 cu ft)

*Nominally 0.85 m³ (30 cu ft) for baggage

AREAS: As for Fairchild 300, except:

Wings, gross	27.01 m² (290.74 sq ft)

WEIGHTS:

Weight empty, IFR equipped	4,393 kg (9,686 lb)
Max fuel weight	1,969 kg (4,342 lb)
Max T-O weight	7,484 kg (16,500 lb)
Max ramp weight	7,552 kg (16,650 lb)
Max landing weight	7,110 kg (15,675 lb)
Max zero-fuel weight	6,260 kg (13,800 lb)

PERFORMANCE (preliminary, at max T-O weight, S/L, ISA, except where indicated):

Maximum cruising speed at:
- 4,570 m (15,000 ft): 345 knots (639 km/h; 397 mph)
- 6,100 m (20,000 ft): 347 knots (643 km/h; 400 mph)
- 7,620 m (25,000 ft): 346 knots (641 km/h; 398 mph)
- 9,145 m (30,000 ft): 337 knots (624 km/h; 388 mph)

Stalling speed:
- wheels and flaps up: 108 knots (200 km/h; 124 mph)
- wheels and flaps down at max landing weight: 95 knots (176 km/h; 109 mph)

Max rate of climb at S/L: 717 m (2,353 ft)/min

Rate of climb at S/L, one engine out: 137 m (448 ft)/min

Service ceiling at AUW of 7,257 kg (16,000 lb): 10,085 m (33,090 ft)

Service ceiling, one engine out, at AUW of 7,257 kg (16,000 lb): 5,015 m (16,455 ft)

T-O to 15 m (50 ft): 951 m (3,120 ft)

Landing from 15 m (50 ft) at max landing weight: 941 m (3,087 ft)

Range at max cruising speed at 9,145 m (30,000 ft), with 45 min reserves:
- Two crew only: 1,688 nm (3,128 km; 1,944 miles)
- 9 occupants: 1,591 nm (2,948 km; 1,832 miles)
- 16 occupants: 1,217 nm (2,256 km; 1,402 miles)

ROBERTSON

ROBERTSON AIRCRAFT CORPORATION; Snohomish County Airport, North Complex C-72, Everett, Washington 98204, USA

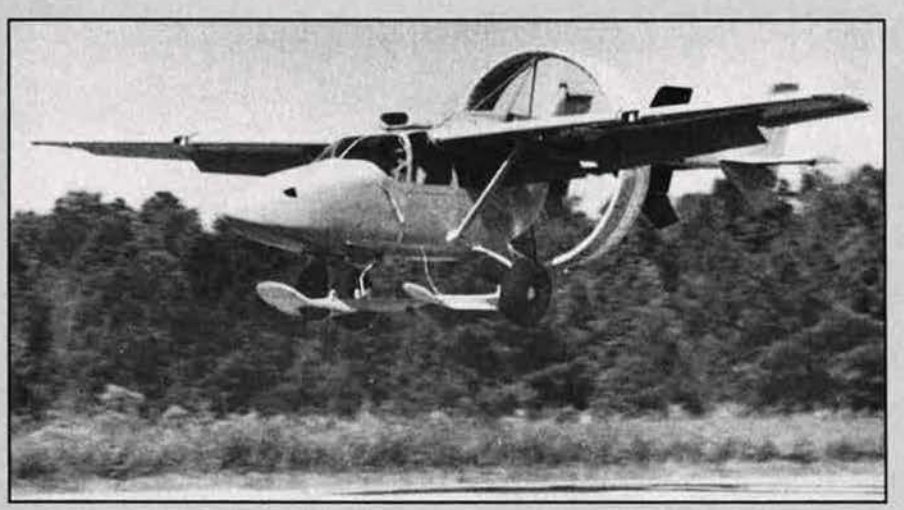
ROBERTSON/BRICO O-2ST

Designed by Brico Ltd of Arlington, Virginia, in conjunction with Robertson Aircraft Corporation, the prototype O-2ST (N997CJ) is a conversion of a Cessna O-2A which was undertaken by Robertson under subcontract to Brico and flown for the first time in the Summer of 1982. Flight testing was being completed in the Spring of 1983. The primary role of the O-2ST is apparently military, for such duties as covert surveillance or patrol of desert pipeline areas. Some reports have suggested that the new configuration makes the aircraft particularly suitable for clandestine operations, its high-flotation wheel-ski landing gear and ducted propeller permitting take-off and landing with little external noise on such surfaces as soft sand.

Modifications to the wings cover incorporation of a Robertson high-lift system comprising drooped ailerons, increased leading-edge camber, and the addition of stall fences on the upper wing surfaces. The tail unit is extensively modified, with the tailplane and elevator both extending outside the tailbooms, and a third, central, fin has been added; these changes have been made to improve low-speed controllability. The major modification covers removal of the standard power plant, the fuselage nose now being enclosed by an elongated streamline fairing which is assumed to contain ballast to offset the additional structure and weight aft of the CG. The ballast could be replaced by armament or surveillance equipment in a military production version. The rear piston engine is replaced by a 485 kW (650 shp) Allison 250-C30 turboprop engine which, via a specially designed Soloy transmission, drives a 2.59 m (8 ft 6 in) diameter propeller.

The O-2ST is available in basic form with its standard retractable tricycle landing gear, or optionally with the high-flotation fixed landing gear (low pressure balloon tyres and broad skis) fitted to the first prototype. The annular duct for the propeller, which is also optional, not only reduces external noise but is considered essential for soft surface operations by eliminating propeller vortices that would otherwise raise and disperse a cloud of dirt or sand. In addition, the duct is reported to increase low-speed thrust.

Two additional O-2ST prototypes were undergoing conversion in 1983, one of them powered by a 522 kW (700 shp) Pratt & Whitney Aircraft of Canada PT6A turboprop engine. Both have the forward fuselage lengthened to seat six people, or to accommodate two stretchers and two medical attendants. Subject to sufficient interest, the O-2ST could be put into production by Robertson, after acquiring the existing O-2A tooling.



Robertson/Brico O-2ST photographed during demonstrations from a soft sand strip at an airfield in Mississippi *(via Howard Levy)*

AIRTECH

AIRCRAFT TECHNOLOGY INDUSTRIES; Construcciones Aeronauticas SA, Rey Francisco 4, Apartado 193, Madrid 8, Spain; and PT Industri Pasawat Terbang Nurtanio, Lanuma Husein Sastranegara, Jalan Pajajaran 154, Bandung, Indonesia

Airtech is a joint company formed by CASA of Spain and PT Nurtanio of Indonesia to develop a 35/39-passenger twin-turboprop transport aircraft. Design and production work is shared 50–50 between the two companies.

AIRTECH (CASA/NURTANIO) CN-235

Preliminary design of the CN-235 was initiated in January 1980. Detail design work began a year later, and prototype construction started in May 1981. Two prototypes have been built, one in each country, plus static and fatigue test airframes. Simultaneous rollouts took place on 10 September 1983, and the first flight was made in Spain on 11 November. Deliveries from both production lines are intended to begin in December 1984, following November 1984 certification under FAR Pts 25 and 36, JAR 25, and ICAO Annex 16. Intended production rate is three per month in each country. CASA will market the aircraft in America and Europe, Nurtanio in Asia, with other markets shared as appropriate.

CASA builds the wing centre-section, inboard flaps, forward and centre fuselage; the outer wings,

Rollout of the Indonesian prototype of the CN-235 at Bandung, 10 September 1983

Simultaneous rollout of the Spanish prototype at Getafe, Madrid

outboard flaps, ailerons, rear fuselage, and tail surfaces are built by Nurtanio. Numerical control machinery is used extensively in the CN-235's manufacture. Design has been optimised for short-haul operations, enabling the CN-235 to fly four 100 nm (185 km; 115 mile) stage lengths before needing to refuel, and to operate from either paved runways or unprepared strips. The general configuration provides for extending the fuselage, if required in the future, to carry up to 60 passengers.

By September 1983, firm orders for the CN-235 totalled 106, for the Indonesian operators Deraya Air Taxi (10), Merpati Nusantara Airlines (14), and Pelita Air Service (10); the Indonesian Air Force (32) and Navy (18); and the Spanish airline Aviaco (22). Options were then held by Merpati (14), Prinair of Puerto Rico (5), and Automotores Salta of Argentina (4).

TYPE: Twin-turboprop commuter and utility transport aircraft.

WINGS: Cantilever high-wing monoplane. NACA 65_3-218 aerofoil section. Constant chord centre-section, without dihedral; 3° dihedral on tapered outer panels. Incidence 3°. Sweepback 3° 51′ 36″ at quarter-chord. Three main assemblies each consist of a machined fail-safe main box structure of aluminium/copper alloy, with main spars at 15% and 55% chord, plus leading- and trailing-edge structures. Inboard flaps on centre-section, outboard flap segments and ailerons on outer panels. Fail-safe attachment of centre-section to top of fuselage; large wing/fuselage fairing made of composites. Chemically milled skins. Leading-edges each made up of a false spar, ribs, and skin panels. Flap segments, each of 3.0 m (9 ft 10 in) span, have a machined aluminium spar, two sheet metal ribs of aluminium/copper alloy, and leading/trailing-edges of composite materials (glassfibre laminates with honeycomb core). Inboard and outboard pairs are interchangeable port/starboard. Flaps are single-slotted and actuated hydraulically by Dowty Rotol irreversible jacks. Ailerons, of similar construction to flaps, are statically and dynamically balanced and have duplicated flight controls. Servo tab in port aileron, trim tab in starboard aileron. Raked wingtips are of glassfibre. Pneumatic boot anti-icing of leading-edges outboard of engine nacelles.

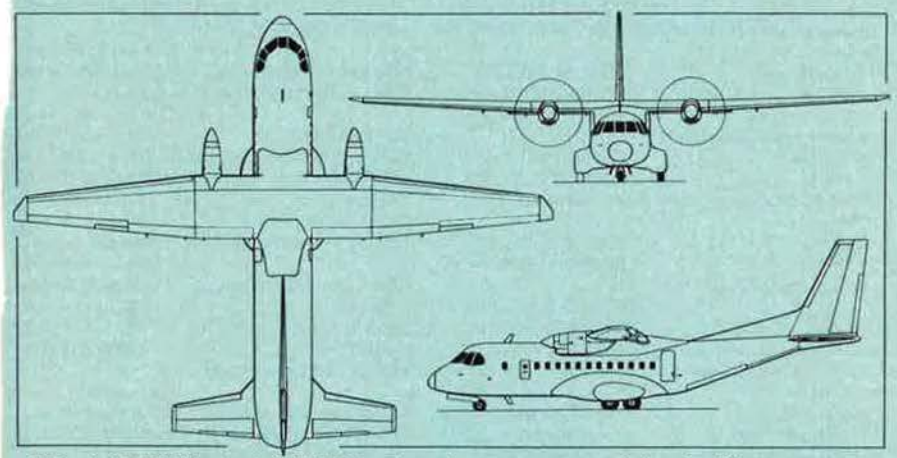
FUSELAGE: Conventional fail-safe pressurised semi-monocoque structure (including baggage compartment), built mainly of metal (aluminium/copper alloy) longerons, frames, stringers, and skin panels. Flattened circular cross-section, upswept at rear. Glassfibre nose radome, reinforced with glassfibre/Nomex honeycomb/glassfibre sandwich, forward of front pressure bulkhead. Forward pressurised section includes flight deck and bulkhead at front of passenger cabin. Central (passenger cabin) section is 19 frames long, at 508 mm (20 in) pitch. Rear fuselage, 15 frames long, includes rear cargo ramp and door, baggage compartment, and the tailcone, which incorporates the rear pressure bulkhead. Composite fairings on fuselage sides house some equipment and systems, in addition to retracted main landing gear.

TAIL UNIT: Cantilever structure, comprising swept-back fin and statically and dynamically balanced rudder, large dorsal fin, and non-swept fixed incidence tailplane with statically and dynamically balanced elevators. Main fin and tailplane boxes are two-spar aluminium/copper alloy structures, with detachable leading/trailing-edges and glassfibre tips. Rudder has glassfibre skin and Nomex honeycomb core. Rudder and elevators actuated mechanically. Trim tab and servo tab in rudder and each elevator. Pneumatic boot anti-icing of fin and tailplane leading-edges.

LANDING GEAR: Messier-Hispano-Bugatti retractable tricycle type with levered suspension, suitable for operation from semi-prepared runways. Electrically controlled hydraulic extension/retraction, with mechanical backup system for emergency use. Oleo-pneumatic shock absorber in each unit. Each main unit comprises two wheels in tandem, retracting rearward into fairing on side of fuselage. Mainwheels semi-exposed when retracted. Single steerable nosewheel retracts forward into unpressurised bay under flight deck. Dunlop 28 × 9.00-12 (12 ply rating) tubeless mainwheel tyres standard, pressure 5.17 bars (75 lb/sq in); low-pressure mainwheel tyres optional, size 11.00–12/10, pressure 3.45 bars (50 lb/sq in). Dunlop 8.50–10/10 tubeless nosewheel tyre, pressure 3.86 bars (56 lb/sq in). Dunlop hydraulic differential disc brakes; Dunlop anti-skid units on main gear.

POWER PLANT: Two General Electric CT7-7 turboprop engines, each flat rated at 1,268 kW (1,700 shp) to 33°C for take-off and driving a Hamilton Standard 14-RF11 four-blade constant-speed propeller with full feathering and reverse-pitch capability. Blades are of glassfibre, with metal spar and urethane foam core. Fuel in two 1,030 litre (227 Imp gallon; 272 US gallon) integral main tanks in wing centre-section and two 1,525 litre (335 Imp gallon; 403 US gallon) integral auxiliary outer-wing tanks; total fuel capacity 5,110 litres (1,124 Imp gallons; 1,350 US gallons). Single pressure refuelling point in starboard main landing gear fairing; gravity filling point in top of each tank. Propeller braking permits engine to be used as an on-ground APU. Oil capacity 14 litres (3.1 Imp gallons; 3.7 US gallons).

ACCOMMODATION: Crew of two on flight deck, plus cabin attendant. Standard accommodation in commuter version for 39 passengers in four-abreast seating, at 79 cm (31 in) pitch, with 20 seats to left and 16 to right of central aisle plus three-person bench seat at rear of cabin. Toilet, wardrobe, and galley standard. Baggage compartment at rear of cabin, aft of movable bulkhead; additional stowage in overhead lockers, capacity 0.04 m^3 (1.4 cu ft) per passenger. Can also be equipped as mixed passenger/cargo combi (*e.g.*, 18 passengers and two LD3 containers), or for all-cargo operation carrying four standard LD3 containers or two 2.24 m (88 in) wide pallets; or for military duties, carrying 30 paratroops and a jumpmaster. Other options include layouts for aeromedical or aerial photographic duties. Main passenger door, with integral stairs, aft of wing on port side, serving also as a Type I emergency exit. Type III emergency exit facing this door on starboard side. Crew door (forward, starboard) has built-in stairs, and serves also as a Type I emer-



Airtech (CASA/Nurtanio) CN-235 twin-turboprop commercial and military transport
(Pilot Press)

Airtech (CASA/Nurtanio) CN-235 commuter and utility transport photographed during its first flight, with landing gear extended

gency exit; a second Type III exit is provided, opposite this door, on the port side. Wide ventral door/cargo ramp in underside of upswept rear fuselage, for loading of bulky cargo. Accommodation fully air-conditioned and pressurised.

SYSTEMS: Hamilton Standard air-conditioning system, using engine compressor bleed air. Garrett electropneumatic pressurisation system (max differential 0.25 bars; 3.64 lb/sq in) giving cabin environment of 2,440 m (8,000 ft) up to operating altitude of 5,485 m (18,000 ft). Hydraulic system, operating at nominal pressure of 207 bars (3,000 lb/sq in), comprises two engine driven, variable displacement, axial electric pumps, a self pressurising standby mechanical pump, and a modular unit incorporating connectors, filters, and valves; system is employed for actuation of wing flaps, landing gear extension/retraction, wheel brakes, emergency and parking brakes, nosewheel steering, cargo ramp and door, and propeller braking. Accumulator for backup braking system. No pneumatic system. DC primary electrical system powered by two 400A Auxilec engine driven starter/generators, with two 45Ah batteries for engine starting and 30 min (minimum) emergency power for essential services. Constant frequency single-phase AC power (115/26V) provided at 400Hz by three inverters (two for normal operation plus one standby); two three-phase engine driven alternators, for 115V variable frequency AC power, are optional. Fixed oxygen installation for flight crew (single cylinder at 124 bars; 1,800 lb/sq in pressure); three portable units and individual masks for cabin attendant and passengers. Pneumatic boot anti-icing of wing (outboard of engine nacelles), fin, and tailplane leading-edges. Electric anti-icing of propellers, engine air intakes, flight deck windscreen, and pitot probe. No APU; engines, with propeller braking, can be used to fulfil this function. Hand type fire extinguishers on flight deck (one) and in passenger cabin (two); smoke detector in baggage compartment. Engine fire detection and extinguishing system.

AVIONICS AND EQUIPMENT: Standard avionics include two Collins VHF-22 com radios, one Telephonics DADS crew interphone, one Collins TDR-90 ATC transponder, two Collins VIR-32 VOR/ILS/marker beacon receivers, one Collins DME-41, one Collins ADF-60A, one Collins WXR-300 or WXR-270 weather radar, two Collins 332D-11T vertical gyros, two Collins MCS-65 directional gyros, two Collins EADI-85 ADI, two Collins EHSI-85 HSI, two Collins ERMI-85 RMI, one Collins ADS-65, one Collins ALT-55B radio altimeter, one Collins FGS-65 flight director, one Fairchild F-800 flight data recorder, and one Fairchild A-100A cockpit voice recorder. CRT displays for ADIs and HSIs optional. Other options include second TDR-90, DME-41, and ADF-60A, plus Collins HF-220 com radio, Telephonics PACIS PA system, Collins RNS-300 radar navigation, and one Collins APS-65 digital autopilot. Space provisions for GPWS and altitude presentation. Navigation lights, anti-collision strobe lights, 600W landing light in front end of each main landing gear fairing, taxi lights, ice inspection lights, emergency door lights, flight deck and flight deck emergency lights, cabin and baggage compartment lights, individual passenger reading lights, and instrument panel white lighting, are all standard.

DIMENSIONS, EXTERNAL:

Wing span	25.81 m (84 ft 8 in)
Wing chord:	
at root	3.00 m (9 ft 10 in)
at tip	1.20 m (3 ft 11¼ in)
Wing aspect ratio	11.27
Length overall	21.353 m (70 ft 0¼ in)
Length of fuselage	20.90 m (68 ft 7 in)
Fuselage:	
Max width	2.90 m (9 ft 6 in)
Max depth	2.615 m (8 ft 7 in)
Height overall	8.177 m (26 ft 10 in)
Tailplane span	11.00 m (36 ft 1 in)
Wheel track (c/l of mainwheels)	3.90 m (12 ft 9½ in)
Wheelbase	6.919 m (22 ft 8½ in)
Propeller diameter	3.302 m (10 ft 10 in)
Propeller ground clearance	1.658 m (5 ft 5¼ in)
Distance between propeller centres	7.00 m (22 ft 11½ in)
Passenger door (port, rear) and crew door (stbd, fwd):	
Height	1.70 m (5 ft 7 in)
Width	0.732 m (2 ft 4¾ in)
Height to sill	1.215 m (4 ft 0 in)
Ventral upper door (rear):	
Length	2.366 m (7 ft 9 in)
Width	2.349 m (7 ft 8½ in)
Type III emergency exits (port, fwd, and stbd, rear):	
Height	0.915 m (3 ft 0 in)
Width	0.508 m (1 ft 8 in)
Ventral ramp/door (rear):	
Length	3.042 m (9 ft 11¼ in)
Width	2.349 m (7 ft 8½ in)

DIMENSIONS, INTERNAL:

Cabin, excl flight deck:	
Length	9.65 m (31 ft 8 in)
Max width	2.70 m (8 ft 10½ in)
Width at floor	2.366 m (7 ft 9 in)
Max height	1.90 m (6 ft 2¼ in)
Floor area	22.12 m² (238.1 sq ft)
Volume	43.24 m³ (1,527.0 cu ft)
Baggage compartment volume	7.0 m³ (247.2 cu ft)

AREAS:

Wings, gross	59.10 m² (636.15 sq ft)
Ailerons (total, incl tabs)	3.56 m² (38.3 sq ft)
Trailing-edge flaps (total)	10.87 m² (117.0 sq ft)
Fin, incl dorsal fin	11.11 m² (119.6 sq ft)
Rudder, incl tabs	3.98 m² (42.8 sq ft)
Tailplane	21.20 m² (228.2 sq ft)
Elevators (total, incl tabs)	5.14 m² (55.3 sq ft)

WEIGHTS AND LOADINGS:

Weight empty, equipped (39 passengers)	7,950 kg (17,526 lb)
Operating weight empty	8,225 kg (18,133 lb)
Max fuel load	4,000 kg (8,818 lb)
Max payload	3,575 kg (7,881 lb)
Max T-O weight	13,000 kg (28,660 lb)
Max ramp weight	13,050 kg (28,770 lb)
Max zero-fuel weight	11,800 kg (26,014 lb)
Max landing weight	12,800 kg (28,219 lb)
Max wing loading	220 kg/m² (45.07 lb/sq ft)
Max power loading	5.13 kg/kW (8.43 lb/shp)

PERFORMANCE (estimated at max T-O weight, ISA, except where indicated):

Max level speed at 6,100 m (20,000 ft)	275 knots (509 km/h; 316 mph) EAS
Max operating speed (VMO)	220 knots (407 km/h; 253 mph) EAS
Max cruising speed at 4,575 m (15,000 ft), 95% of MTOGW	245 knots (454 km/h; 282 mph)
Stalling speed:	
flaps and landing gear up	91 knots (169 km/h; 105 mph)
flaps and landing gear down	74 knots (137 km/h; 85 mph)
Max rate of climb at S/L	542 m (1,780 ft)/min
Rate of climb at S/L, one engine out	210 m (690 ft)/min
Service ceiling	8,690 m (28,500 ft)
Service ceiling, one engine out, at 98% of MTOGW	4,725 m (15,500 ft)
T-O run	415 m (1,362 ft)
T-O to 10.7 m (35 ft)	600 m (1,969 ft)
FAR 25 T-O distance at S/L, one engine out	803 m (2,635 ft)
FAR 25 landing distance at S/L at max landing weight	1,050 m (3,445 ft)
Landing from 15 m (50 ft)	630 m (2,067 ft)
Landing run	340 m (1,116 ft)
Min ground turning radius	18.974 m (62 ft 3 in)
Range with max payload, max cruising power at 5,485 m (18,000 ft), 410 kg (904 lb) IFR fuel reserves	430 nm (796 km; 495 miles)
Ferry range with zero payload, conditions as above	2,000 nm (3,706 km; 2,303 miles)

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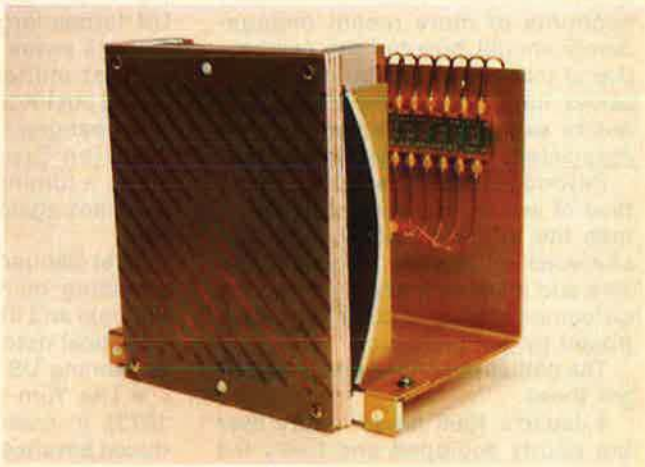
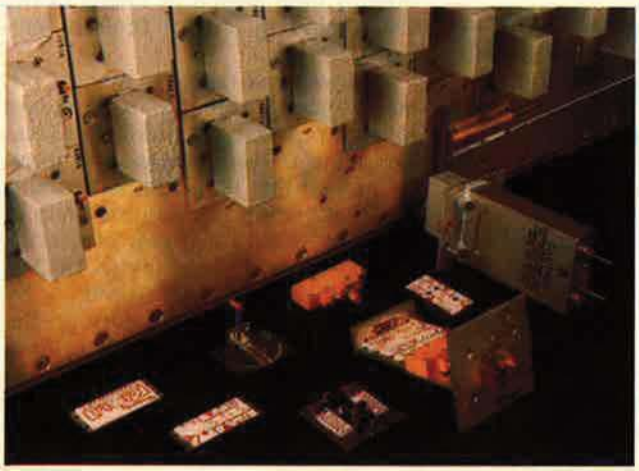


Line array with polarization-sensitive reflector.



Microwave-integrated circuits for phased arrays.

Testing phased array in compact antenna range.

AIRMAN'S BOOKSHELF

Decisive 20th Century Battles

Crossroads of Modern Warfare, by Drew Middleton. Doubleday, New York, N. Y., 1983. 320 pages with maps and bibliography. $17.95.

The author, military affairs correspondent for the New York *Times,* has taken on the difficult and controversial task of selecting sixteen twentieth-century battles whose military or political (or both) impact affected the course of history. The result is a thoroughly engrossing book that should be on the shelf of every military professional and history buff.

Some of the battles will be but dimly remembered by most of us. Detailed accounts of more recent engagements should broaden the perspective of many readers who may themselves have been participants. The author explodes a number of myths associated with some of these battles.

Beyond his lucid description of the flow of events, Mr. Middleton examines the influence of training and character on military leadership, errors and insights that influenced the outcome of battle, and the part often played by just plain luck.

The battles described and analyzed are these:

- Japan's 1905 naval victory over the poorly equipped and badly led Russian fleet in the Strait of Tsushima, a comic-opera affair had it not been for the 10,000 Russian casualties.
- The Marne (September 1914), which destined World War I to degenerate into four years of agonizing trench warfare.
- Jutland (May 1916), the last large-scale battle-line encounter in naval history.
- Cambrai (November 1917), when the first major use of tanks revolutionized land warfare.
- The Battle of France (May–June 1940), which eliminated France, the only major European land power on the Allied side.
- The Battle of Britain (July–September 1940), the first decisive battle to be fought in the air, which frustrated Hitler's plans to invade the British Isles and which turned the focus of his attention to the east.
- Midway, Stalingrad, Alamein, and Imphal-Kohima, four battles that, in the author's opinion, were turning points in World War II—the last-named, fought in eastern India, March–June 1944, and unknown to most Americans, was the greatest land defeat in Japan's history.
- Normandy (June 1944), the greatest amphibious operation of all time and a supreme example of planning, security, interservice cooperation, and logistics.
- Chongchon (October–December 1950), in which the Chinese entered the Korean War, forced the retreat of UN forces largely because of MacArthur's errors, and earned a reputation for military capability that affected post-Korean policy of the great and near-great powers.
- Dien Bien Phu (March–May 1954), a turning point in the struggle of Asians against European colonialism.
- Tet (January–February 1968), a resounding military defeat for North Vietnam and the Viet Cong that led to a political victory for the Communists by fanning US antiwar sentiment.
- The Yom Kippur War (October 1973), in reality a battle that introduced advanced electronic technology to large-scale warfare and that ended the fighting between Egypt and Israel.

The author's sixteenth "battle"—destruction of the Paul Doumer and Thanh Hoi bridges of North Vietnam in May 1972—does not, in the reviewer's opinion, merit inclusion in this book. Middleton uses their destruction as a hook for his discussion of precision-guided munitions and their possible effect on warfare of the future. Approached in this manner, Hiroshima and Nagasaki would seem to be of greater importance, both militarily and politically.

Without diminishing their importance in modern warfare, Mr. Middleton treats tactical airpower and airlift as auxiliaries of surface forces rather than as elements of a coordinated force.

Some readers will be disappointed by the author's lack of attention to strategic airpower, doubtless because it bears more on the outcome of wars than on battles within a war. Nevertheless, *Crossroads of Modern Warfare* is one of the most interesting and instructive of the short military history books to come off the press in recent years.

—Reviewed by John L. Frisbee, former Editor, AIR FORCE *Magazine.*

Cloak-and-Dagger Chieftain

Wild Bill Donovan: The Last Hero, by Anthony Cave Brown. Time Books, New York, N. Y., 1982. 891 pages with charts, index, and photos. $24.95.

This book reviews the life of a truly remarkable man. William J. Donovan's crowning achievement was the World War II founding of the Office of Strategic Services (OSS), forerunner of the Central Intelligence Agency.

Author Brown was given exclusive access to all of "Wild Bill" Donovan's personal papers, and much of what he presents is not only detailed but, by all indications, newly made public.

Called the "last hero" by President Eisenhower, Donovan left his imprint on this century. Reflecting this, four of his lieutenants in the OSS subsequently have served as heads of the CIA, including current Director William J. Casey.

Donovan was raised in modest circumstances. Through hard work and athletic prowess, he graduated from Columbia University where he quarterbacked the 1905 football varsity. After practicing law and dabbling in politics, he and a group of friends formed a troop of cavalry in 1912 in the New York National Guard.

Donovan rose rapidly through the ranks to become head of the troop as captain. Thus began his military career, which would interact with his other public and private service throughout his lifetime.

In 1916, when the troop was mobilized to help track down Pancho Villa, he came to the notice of General Pershing. Subsequently, Donovan was given command of the 1st Battalion of the New York National Guard's 69th Infantry Regiment—an aggregation of Irish Catholics later immortalized as the Fighting Irish.

The book does a good job of detailing Donovan's early years, including how he won the Medal of Honor on the Western Front and how he came to the attention of such people as Douglas MacArthur, Theodore Roosevelt, and others who were to stand Donovan in good stead between the wars as he pursued a law career in Washington. There, among other things, he argued a number of landmark cases successfully before the Supreme Court.

Throughout all of this, Donovan maintained personal relationships at home and abroad that gave him a rare insight into the worsening world situation. He also found time to draft a report, based in large measure on British practice, that laid out a plan for an American intelligence service.

Thus, in June 1941, when President Franklin D. Roosevelt established the Office of Coordinator of Information—in fact a clandestine intelligence agency—he also asked then-Colonel Donovan to head it.

About two-thirds of this large book is devoted to the war years. It charts a course through what were admittedly some murky channels as the OSS worked with sometimes shadowy accomplices overseas.

The book examines the post-World War II formation of the CIA, Donovan's later service to his country as Ambassador to Thailand, and his death in 1959. But the most significant factor is the review of how the OSS became the CIA, a uniquely American intelligence service.

As former CIA Director William Colby put it in his book, *Honorable Men*, Donovan's "unique contribution to American intelligence was that scholarship was its primary discipline, that the acquisition of information was to serve it, and that its paramilitary adventures were an adjunct. . . . "

This perhaps best sums up the thrust of the book, must reading for anyone interested in the CIA and its origins.

—Reviewed by James A. McDonnell, Jr., AFA Director of Military Relations.

New Books in Brief

B-24 Liberator at War, by Roger Freeman. This nostalgic look at the Consolidated-built heavy bomber makes one wonder how the B-17 Flying Fortress eclipsed the B-24 as the symbol of American airpower in World War II. The versatile four-engine Lib was the most widely used bomber of that war, with a production run that stretched to almost 20,000 aircraft. Noted aviation historian Freeman concentrates in this book on the operational history of the Liberator, relying heavily on recollections by airmen and ground crew who flew and serviced her and excellent vintage photographs to tell her story. Published by Ian Allan Ltd., available from Motorbooks International, P. O. Box 2, 729 Prospect Ave., Osceola, Wis. 54020, 1983. 128 pages. $16.95.

The Schweinfurt-Regensburg Mission, by Martin Middlebrook. The bombing raids by the Eighth Air Force on the industrial-chokepoint towns of Schweinfurt and Regensburg on August 17, 1943, were to be the culminating demonstration and validation of American strategic air war theories. Instead, the raids were little short of disastrous. The air strategists learned that the self-defending bomber was not really a viable concept, as the formations suffered severe losses. The tacticians realized that they had an insufficient number of aircraft available at that time to press the attack successfully. At any rate, despite heavy damage to some plants, German industrial production continued. A hallmark of author Middlebrook's work has been a meticulous thoroughness and attention to fact, and this book bears that mark. He focuses here on the tactical aspects of the raids, and covers in unprecedented detail the bombings from the German perspective. His in-depth examination of this milestone operation is sure to become a classic among air war histories. With illustrations, appendices, bibliography, and index. Charles Scribner's Sons, New York, N. Y., 1983. 363 pages. $22.50.

The Soviet Control Structure: Capabilities for Wartime Survival, by Harriet Fast Scott and William F. Scott. An assessment of the Soviets' ability to manage and control their society under the stress of war, this scholarly work delineates comprehensively the mechanisms and organizations through which the Soviets will direct a war—including nuclear war. The authors, who are regular contributors to this magazine, point out that the Soviet Union is a "mobilized" society, and that a sort of "state of war" exists permanently for the Soviet people. The rigorous nature of Soviet society is predicated on a complex, centrally organized structure that pervades all aspects of public and private life. Under the stress of emergency or war, the fabric of control might unravel because of ethnic unrest and rebellion. However, the authors tend to believe that the Soviet control structure—which has been built up over sixty years and which has survived "external war and vast internal repression"—would be "effective throughout a nuclear war and in its aftermath." With notes, figures, and appendix. A National Strategy Information Center publication by Crane, Russak & Co., New York, N. Y., 1983. 150 pages. $7.95 (paper).

World Electronic Warfare Aircraft, by Martin Streetly. An alphabetical catalog of all electronic warfare aircraft in service since 1945, this book covers some seventy families of airframes and details such particulars as technical specifications, production, operations, and the nature and function of the on-board EW equipment. The entries are extensively cross-referenced, many feature line drawings of the aircraft, and several include cutaway drawings showing the locations of electronic pods and equipment. Also included are reference listings on such esoteric items and information as frequency/wavelength designations, US electronic warfare equipment nomenclature, antiradiation weapons, and Soviet radars. In all, this book should prove a useful guide for anyone trying to follow the arcane world of black box magic. With photographs and index. Published by Jane's, distributed by Van Nostrand Reinhold Co., Boston, Mass., 1983. 128 pages. $17.95.

You and the Armed Forces, by Texe W. Marrs. This handbook is a self-help guide for those who are considering a military career. Oriented toward people of high-school and college age, the guide describes service life, details what sort of training courses and jobs are to be found in the military, explains enlistment procedures, and so on. Also included are discussions of women in the military and pay and benefits and a list of active military installations in the States and overseas. The book is practical and action-oriented, and even features a short test to help the prospective enlistee to determine aptitude and fitness for military life. With photos, charts, and index. Arco Publishing Co., New York, N. Y., 1983. 172 pages. $12.95 cloth; $7.95 paper.

—Reviewed by Hugh Winkler, Assistant Managing Editor.

The Long Road to Freedom

Bud Day escaped from his captors in North Vietnam with nothing on his side but faith and boundless courage.

BY JOHN L. FRISBEE

On August 26, 1967, Maj. George E. Day punched out of his disabled F-100F some thirty-five miles north of the DMZ in Vietnam, opening a saga of unremitting valor that was to last for more than five years.

If any man could be prepared for the ordeal that lay ahead, it was Bud Day. He had served thirty months in the Pacific with the Marines in World War II. After the war, he earned a doctor's degree in law, joined the National Guard, was called to active duty in 1951, and completed pilot training that year. During the Korean War, he flew two tours in F-84s. Later, while based in England, he bailed out of a burning jet fighter at 300 feet, too low for his parachute to open, landed in trees, and survived. He arrived in Vietnam in early 1967 with a finely trained mind, a wealth of experience in fighters, devout faith in God, and an unshakable devotion to country.

After several weeks of combat flying, Major Day was picked to organize the F-100 "Misty" Forward Air Controllers, known as Commando Sabre. Their operations were in the hot areas north of the DMZ where slow-moving FAC aircraft couldn't survive. Bud Day was on his sixty-seventh mission in the North when Communist guns brought him down.

Day landed in enemy territory with his right arm broken in three places, a badly injured knee, and a damaged eye. He was captured immediately, interrogated under torture despite his injuries, and imprisoned in a bunker until the North Vietnamese could move him to a prison near Hanoi.

Realizing that if he were to escape, it had to be now, before he was behind bars, Bud Day tricked his youthful guards into believing he was unable to move. Shortly after nightfall, he worked free of his bonds, slipped out of the bunker, and began an incredible twelve-day journey toward freedom.

Twice in that nightmarish passage he was caught in the midst of B-52 attacks. On the second night an incoming artillery round threw him into the air, ruptured his eardrums, and left a deep gash in his right leg. Violent nausea and dizziness prevented his traveling for two days after that. It was not until the fifth day that he was able to catch his first meal—a frog, which he ate raw. After that, it was nothing but water, a few berries, and some fruit.

Despite frequent periods of delirium brought on by injuries and lack of food, he reached the Ben Hai River at the north edge of the DMZ and swam it with the help of a bamboo log. By that time, his bare feet were cut to ribbons and the wound in his leg had become infected. Then came the most agonizing moment of the escape. A US helicopter landed within half a mile of him, but before he could drag himself through the brush it was gone.

Col. Bud Day received the Medal of Honor for his heroism as a POW.

Still fighting his way south, Major Day was within two miles of the US Marine base at Con Thien when he was recaptured by two young enemy soldiers who shot him in the left leg and hand. The long, painful trek to Hanoi began for the only American POW to escape and make it south to the DMZ.

During the brutal punishment that followed his recapture, Bud Day's arm was broken again. He arrived at Little Vegas, one of the prisons near Hanoi, completely unable to care for himself, but denied medical treatment. Later he was transferred to The Zoo, "a bad treatment camp," where he was the senior officer. As the months dragged by, he was tortured many times for alleged transgressions by officers under his command. During frequent interrogations, he steadfastly refused to give information that would endanger American aircrews or could have been used by the North Vietnamese for propaganda purposes. Thirty-seven months of his five-and-a-half-year imprisonment was in solitary confinement.

For his long-sustained heroism, Col. George Day, who previously had earned more than sixty decorations, including the Air Force Cross, was awarded the nation's highest decoration, the Medal of Honor.

No words can recreate the horror of the long, calculated attack on mind and body suffered by Bud Day. That he survived with his honor intact and continued to serve his country until retirement from the Air Force in 1977 is testimony to the unconquerable spirit that dwells in the best of men. ■

AFA Intercom

Sen. Barry Goldwater (R-Ariz.), AEF Board Chairman, welcomes the First Family and General Doolittle to the Salute. (Photos by Ron Hall)

President Reagan, a charter AFA member, addressed the audience after his investiture as a Jimmy Doolittle Fellow.

Jimmy Doolittle Salute Features Appearance By President Reagan

"Ladies and gentlemen . . . the President of the United States and Mrs. Reagan."

With those words and the playing of "Hail to the Chief" by the USAF Ceremonial Band, AFA's Aerospace Education Foundation began its fourth annual Jimmy Doolittle Salute on December 6. The 1983 event honored President and Mrs. Ronald Reagan, who were on hand to accept their Jimmy Doolittle Fellowship plaques.

The Salute, which was held at the National Air and Space Museum as the previous three Salutes had been, has become an honored Washington tradition. The event salutes Medal of Honor recipient Lt. Gen. Jimmy Doolittle, USAF (Ret.), AFA's first National President, and each year honors a special guest. Earlier Salutes honored General Doolittle himself, Lt. Gen. Ira C. Eaker, USAF (Ret.), and Gen. Curtis E. LeMay, USAF (Ret.).

Sen. Barry Goldwater (R-Ariz.), Chairman of the Board of the Aerospace Education Foundation for the past eight years, again served as master of ceremonies. Among those introduced were congressional guests,

President Reagan holds his copy of Crusade for Airpower *as he and Mrs. Reagan are greeted by AFA President and Mrs. David L. Blankenship.*

From left, Mrs. Garrison, Mrs. Doolittle, General Doolittle, and AEF President Dr. Don C. Garrison pause during the Foundation's 1983 Jimmy Doolittle Salute. (Photo by Ron Hall)

high-ranking Air Force officials, and representatives of the Corporate Fellows of the Foundation, whose contributions help to support ongoing Foundation programs *(see accompanying box).*

AEF President Dr. Don C. Garrison noted that the Foundation has been called "the conscience of our parent organization, the Air Force Association." He emphasized that AEF works to spread the word about aerospace—a constitutional mandate of AFA—and also strives to build a foundation of respect for the history of aerospace advances, preserving for future generations the "rich and exciting heritage of those who follow the high road of aerospace achievement."

Referring to the National Air and Space Museum, Senator Goldwater welcomed President and Mrs. Reagan to this "hallowed place" where one could feel the "spirit of America." He noted that the Wright brothers had "changed the size of the world." Senator Goldwater cited the courage of the early airmen memorialized in the Museum and drew a parallel between their dedication and that of those who serve our country today—not only those in uniform but also civilians, such as the President.

Senator Goldwater, along with General Doolittle, then presented President and Mrs. Reagan with their Jimmy Doolittle Educational Fellowship plaques.

The President, in a moving response, gave a ringing tribute to Jimmy Doolittle, pointing out the tremendous lift that his 1942 mission over Tokyo gave to the American people. He praised the eighty-six-year-old airman "not only for the heroism of your thirty seconds over Tokyo, but for your service and devotion to country of a lifetime." Alluding to Doolittle's spirit and continuing inspiration to the American people, President Reagan concluded: "A dare for the sake of freedom is a dare well worth taking."

The 1984 Salute is scheduled for December 5.

—By James A. McDonnell, Jr.

SCAMP, AEF Benefit From 12th Annual West Coast AF Ball

"The Air Force Lights the Way" was the theme and Air Force-related charities were the beneficiaries as AFA staged its twelfth Annual Air Force Ball in Los Angeles, Calif., in late November.

Secretary of Defense Caspar W. Weinberger was the Honorary Chairman of the 1983 Ball. Although the Secretary was unable to attend, he sent a message to the more than 1,000 attendees.

"As the Secretary of Defense—and as a Californian—I take double plea-

Honor Roll of Aerospace Education Foundation Corporate Fellows

Corporate Jimmy Doolittle Fellows

(in order of affiliation)

Corporate Jimmy Doolittle Fellows support advancement of education through transfer to the nation's schools of US Air Force instructional systems which are based on applying aerospace technology to curriculum development, thereby enhancing the US Air Force public image.

John M. Olin Foundation
Northrop Corporation
General Dynamics Corporation
Mutual of Omaha Insurance Company
Vought Corporation
Martin Marietta Aerospace
Boeing Company
United Technologies Corporation
Garrett Corporation
Fairchild Industries
McDonnell Douglas Corporation
General Electric Foundation
Hughes Aircraft Company
Textron, Inc.
The Harry Frank Guggenheim Foundation
Lockheed Corporation
Ford Aerospace and Communications Corporation
Loral Corporation
American Telephone & Telegraph Company
Hughes Helicopter
MITRE Corporation
Reader's Digest Foundation
Avco Corporation
The Singer Company

Corporate Ira C. Eaker Fellows

(in order of affiliation)

Corporate Ira C. Eaker Fellows support perpetuating knowledge of the rich military and civilian aerospace heritage of our nation and ensuring national appreciation for the application of aerospace power to our nation's security needs.

Rockwell International Corporation
Pratt & Whitney Aircraft Group

Air Force and AFA dignitaries attending the twelfth Annual Air Force Ball in Los Angeles, Calif., in November included, from left, Air Force Under Secretary and Mrs. Edward C. Aldridge, Jr., AFA President and Mrs. David L. Blankenship, Air Force Secretary and Mrs. Verne Orr, and Air Force Chief of Staff Gen. and Mrs. Charles A. Gabriel. See item.

Actor Rory Calhoun (left) served as master of ceremonies; Constance Towers Gavin sang the national anthem. Others are Air Force Secretary Verne Orr and singer John Denver, who presented the SCAMP awards.

General Chairman of the Ball Maj. Gen. William Lyon, USAF (Ret.), center, along with Mrs. Lyon, at his left, chat with John Denver while military co-host Lt. Gen. Forrest S. McCartney and Mrs. McCartney look on.

sure in serving as the Honorary Chairman of the Air Force Association's 1983 Air Force Ball in Los Angeles. The Association, as sponsor, can take a justifiable pride in the knowledge that this splendid annual tribute to the men and women of the Air Force has emerged as a preeminent charitable event supporting two most worthwhile programs—Scholarships for Children of American Military Personnel [SCAMP] and the Aerospace Education Foundation of AFA.

"Those who attend and support these annual Balls can share this pride, knowing that their contributions have raised almost $1 million for these causes since their inception in 1972. This Ball honors an exceptional group of patriots—the airmen and officers of the United States Air Force. I am proud to be associated with them and with those of you who join me in this meaningful salute to their service."

Including contributions from this year's Ball, the total amount of money raised for SCAMP and AEF now exceeds $1 million.

The SCAMP Award goes to children of Americans who served in Southeast Asia and who were killed in action, were held prisoner of war, or are

A new force has been created to serve America's aerospace/ defense needs.

The LTV Corporation has announced the formation of all its aerospace and defense related activities into four divisions to better serve the needs of its customers in four major lines of business.

The divisions, to be operated under a new entity to be called LTV Aerospace and Defense Company, are: AM General Division, Sierra Research Division, Vought Aero Products Division and Vought Missiles and Advanced Programs Division.

Sierra Research and AM General were recently acquired by LTV, and the two Vought divisions were created from the former Vought Corporation, which has long been a part of the LTV family of companies.

Nearly 15,000 employees bring together broad experience, diverse technological capabilities and product lines ranging from major aerostructures to missile and rocket systems, from tactical wheeled vehicles to advanced electronics. Plus the ability to produce these superior products on time, within budget.

LTV Aerospace and Defense Company
P.O. Box 225907, Dallas, Tex. 75265
President and Chief Executive Officer:
Robert L. Kirk

AM General Division
14250 Plymouth Rd., Detroit, Mich. 48232
Capabilities: Tactical wheeled military vehicles
Number of Employees: 2,600
Locations: Detroit, Mich., South Bend, Indianapolis and Mishawaka, Ind.

Vought Aero Products Division
P.O. Box 225907, Dallas, Tex. 75265
Capabilities: Aerostructures technology and manufacturing of aircraft and aircraft components
Number of Employees: 7,000
Locations: Dallas, Grand Prairie, and Longview, Tex., and Palmdale, Calif.

Sierra Research Division
P.O. Box 222, Buffalo, N.Y. 14225
Capabilities: Avionics, Radar Systems and Advanced Electronics
Number of Employees: 1,400
Location: Buffalo, N.Y.

Vought Missiles and Advanced Programs Division
P.O. Box 225907, Dallas, Tex. 75265
Capabilities: Design, development and manufacturing of missiles and rocket systems, guidance systems and other advanced technology
Number of Employees: 3,500
Locations: Grand Prairie, Tex. and Camden, Ark.

LTV

Aerospace • Energy • Steel

Other LTV companies are Continental Emsco (Energy) and Jones & Laughlin (Steel). The LTV Corporation, Dallas, Texas.

CINCSAC Gen. Bennie L. Davis, left, greets this year's SCAMP winners. Recipients of the $3,000-a-year college scholarships are, from left, Joanne Marie Bonnarens, Karen Marie Hinckley, Barbara Jean Moore, and Edward N. Collins. See item.

listed as missing in action. Four young people were honored at this year's Ball. Each will receive a $3,000-a-year college scholarship. Other award winners who are still in school—ten at present—will each receive $2,500 per year.

Also honored during the event was the late Martin M. Ostrow, who died suddenly last October. A former AFA National President and Chairman of the Board, Marty was the driving force behind the establishment of SCAMP.

AFA STAFF PROFILES

Data Processing Keeps AFA on Line

By Capt. Patricia R. Rogers, USAF
CONTRIBUTING EDITOR

Data Processing helps all departments at AFA National Headquarters process their information efficiently.

"This department is a mainstay of AFA because every department has to come to us at some time," said Charles S. Tippett, Director of Data Processing at AFA.

The people in Data Processing have a large data base to use in providing that help. They maintain a list with up to 239,000 names and addresses of AFA members, both regular and life, and former members with recently lapsed memberships. There are an additional 50,000 entries dealing with the AFA insurance programs.

AFA's Data Processing team, from left: Charles S. Tippett, Jean E. Kund, James E. Brown, Ann W. Gray, Alan J. Johnson, Donald G. Whetstone, and Jeff Lohr.

This information is manipulated in a Central Processing Unit (CPU) capable of holding 756,000 bytes of data. The AFA computer room also functions with eight disc drives, four tape drives, two printers, and a card reader. Twenty remote terminals in AFA offices provide access to the data base.

AFA is currently in the process of upgrading to a new computer system that will have two million bytes of memory in the CPU and 2.3 billion bytes of storage capacity.

AFA personnel—primarily those in Membership Fulfillment, Insurance, and Accounting—key 50,000 transactions into the computer each month. These transactions include changes of address, name changes, renewals, and changes to chapter records. The Accounting Department stores records of monetary transactions in the computer and even has it write almost all checks, except the payroll. Of course, the computer doesn't sign them—at least not yet.

Certain monthly jobs require a large chunk of computer time. Printing out the address labels for more than 200,000 copies of AIR FORCE Magazine takes around twelve hours. The data base provides daily updates on renewals and membership lapses. End-of-the-month reports for Membership, Accounting, and Insurance can be a two-day job, often requiring Jeff Lohr, the Computer Operator, to work nights or weekends.

Data Processing personnel use available computer time to run programs for eight other organizations. According to Mr. Tippett, this added revenue helps keep AFA membership costs down.

The programmers are now working toward greater use of mailing label presorting. AFA will assume more of the sorting work load previously borne by the United States Postal Service. This should save postage money for AFA, and perhaps get the magazines to members faster.

Programmers for the department include: Donald G. Whetstone, Assistant Director of Data Processing and Senior Programmer; James E. Brown, Programmer; and Alan J. Johnson, Junior Programmer. Other members on the Data Processing team are Jean E. Kund and Ann W. Gray, Data Entry Operators.

Announcing a timely
AFA National Symposium...

ELECTRONICS AND THE AIR FORCE—C³I

Major Developments and Their Impact on Military Plans and Operations.

Because our past two National Electronics Symposia were so well received and useful to those government and industry decision-makers who attended, we have scheduled another meeting on this important subject for April 1984.

Who: AFA, in conjunction with the Air Force Systems Command, and its Electronic Systems Division, and major leaders of the Administration and the Air Force.

What: A probing look at the major thrusts in aerospace electronics and how they can be expected to affect national security, the Air Force, and industry in the years ahead.

When: April 26 and 27, 1984.

Where: In the center of America's electronic heartland, The Conference Center at "The Hilton at Colonial" in Wakefield, Mass. (on Interstate 95 and Route 128, near Hanscom AFB, Mass.).

Participation will include key officials from the Administration, DoD, and the Department of the Air Force.

Don't be left out. Past experience indicates available seats will go fast and will be filled for each session. Plan to attend—and mark your calendar now! For further information and registration call Jim McDonnell or Dottie Flanagan at (202) 637-3300.

AFA

In a ceremony held recently at the US Capitol, two of the giants from the Air Force's history were honored. Lt. Gen. Ira C. Eaker, USAF (Ret.), and Gen. Lauris Norstad, USAF (Ret.), accepted honorary doctoral degrees from Salem (W. Va.) College. Generals Eaker and Norstad are seated. Standing from left are Mrs. Eaker; Dr. Ronald E. Ohl, President of Salem College; Mrs. Ohl; Sen. Jennings Randolph (D-W. Va.), Salem College Trustee Emeritus whose father and grandfather founded the school in 1888; and Mrs. Norstad.

Richard H. Becker, Past President of Illinois State AFA (second from left), was awarded his 1983 AFA Man of the Year plaque at a recent Chicagoland-O'Hare Chapter meeting. At the ceremony were (from left): Chapter President Kevin Clary, Mr. Becker, ROA President Walter Vartan, and AFA President David L. Blankenship.

Maj. Gen. William Lyon, USAF (Ret.), General Chairman of the 1983 Ball, praised Marty's services, noting that "he was the personification of community involvement and a prime mover in numerous Air Force Association endeavors. His altruism and shining selflessness were never more evident than in his work as the founder of SCAMP."

Lt. Gen. Forrest S. McCartney, Space Division Commander, and Lt. Gen. James E. Light, Jr., Commander of Fifteenth Air Force, served as military co-hosts. March AFB in California provided an honor guard as well as the Fifteenth Air Force Band of the Golden West. An Air Force ROTC detachment from the University of Southern California provided the color guard.

The 1984 Ball will be held Friday, November 30.

—By James A. McDonnell, Jr.

AFAers Take Part In Observations of Veterans Day 1983

Veterans Day 1983 was a special day for many people throughout the country. AFA leaders, including Donald W. Steele Memorial Chapter President Charles B. Durazo and AFA's 1982 Man of the Year Thomas W.

Official Air Force Association Watch

A Seiko Quartz timepiece available for a limited time only.
Featuring a richly detailed three dimensional re-creation of the United States Air Force Coat of Arms.
Electronic quartz movement guaranteed accurate to within fifteen seconds per month.
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For faster service, credit card orders may be placed weekdays from 9 a.m. to 9 p.m. (eastern time) by telephoning toll free 1-800-523-0124; Pennsylvania residents only should call 1-215-687-5277 collect. Please then request to speak to operator number 1123.

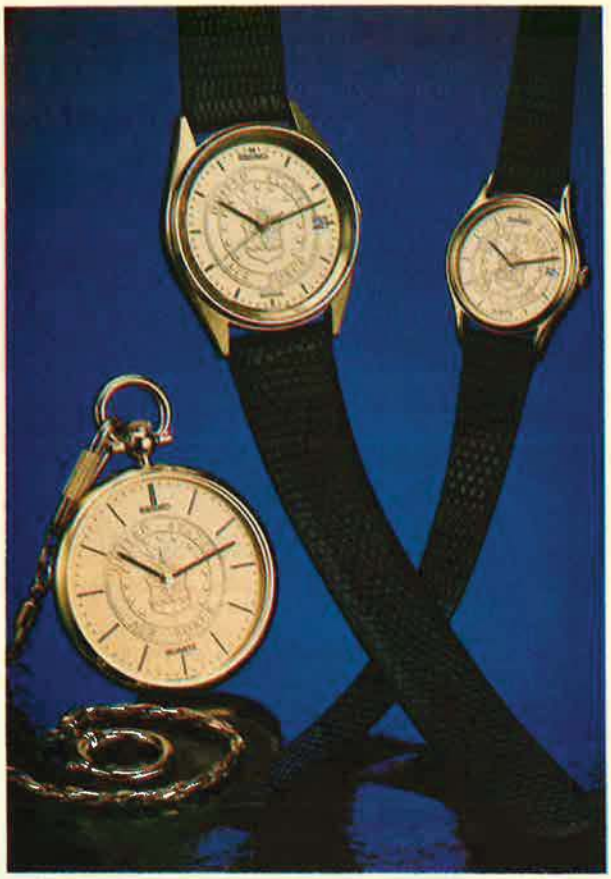

Illustration reduced. Actual diameters of watches are as follows; pocket watch 1-1/2", men's wrist 1-3/8", and ladies wrist 15/16".

Clip order form below. Mail orders should be sent to Air Force Association, c/o P.O. Box 511, Wayne, PA 19087.

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QUANTITY

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_____ Seiko Quartz Pocket Watch (#1123-SP)@ **$195*** each.
QUANTITY

**Pennsylvania residents only, add 6% sales tax.*

I wish to pay for my watch(es) as follows:

☐ By a single remittance of $_____ made payable to "Official AFA" Watch, which I enclose.

☐ By charging the amount of $_____ to my credit card indicated below: ☐ American Express Card ☐ VISA ☐ master charge

Full Account Number: Expiration:

																Mo.		Year	

SIGNATURE: _____

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c/o Post Office Box 511
Wayne, Pennsylvania 19087

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AFA Intercom

Each year AFA's Nation's Capital Chapter sponsors a reception for Air Force general officers recently assigned to duty in the Washington, D. C., area. Gen. Lawrence A. Skantze, recently appointed Air Force Vice Chief of Staff, received a special tribute at this year's reception. Pictured, from left, are General Skantze, Mrs. Jackie Smith, Mrs. Pat Skantze, Chapter President Dave Smith, and AFA Board Chairman John G. Brosky. (Photo by G. Hughes)

During registration for AFA's National Symposium in Los Angeles in November, AFA staff member Dottie Flanagan, second from left, was toasted by fellow AFA staffers in recognition of her completion of twenty-five years of service with AFA.

"Tony" Anthony, participated in the annual Veterans Day observance at Arlington National Cemetery in Virginia. A full day of activities, many of which were held at the recently renovated amphitheater at the cemetery, commenced with the Presidential wreath-laying ceremony at the Tomb of the Unknown Soldier.

Coming Events

March 16–17, **South Central/Southeast Regional Meeting,** New Orleans, La. . . . April 13–14, **South Carolina State Convention,** Clemson . . . April 28, **Massachusetts State Convention,** Wakefield . . . June 1–2, **North Dakota State Convention,** Grand Forks . . . August 17–18, **New York State Convention,** Mitchel Field . . . August 24–26, **Oregon State Convention,** Portland . . . September 16–20, **AFA National Convention and Aerospace Development Briefings and Displays,** Washington, D. C.

In Knoxville, Tenn., State President Jack Westbrook presided at a First Annual Veterans Day luncheon sponsored by the Knoxville Chapter and supported by such local civic organizations as Kiwanis, Rotary, Lions, and the Chamber of Commerce. Nearly 400 business, political, and community leaders heard a presentation by Lt. Gen. John Flynn, USAF (Ret.), who serves as AFA's national advisor for POW/MIA matters.

In St. Louis, numerous veterans and military organizations, including AFA's Spirit of St. Louis and Scott Memorial Chapters, participated in one of the largest Veterans Day observances in the country.

Following the day of activities, which included a parade through downtown St. Louis, the two chapters held a joint dinner meeting. Community and Air Force leaders joined local AFAers at the event. Recently retired Maj. Gen. James L. Gardner, Jr., then MAC Chief of Staff, delivered the keynote address. Entertainment was provided by the Air Force Band of Mid-America, Scott AFB, Ill. ■

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2) All eligible dependents of AFA members on active duty. Eligible dependents are spouses under age 65 and unmarried dependent children under age 21 (or age 23 if in college).

EXCEPTIONAL BENEFIT PLAN

(See chart at right)

FOUR YEAR BASIC BENEFIT. Benefits for most injuries or illnesses may be paid for up to a four-year period.

PLUS THESE SPECIAL BENEFITS . . .

1) Up to 45 consecutive days of in-hospital care for mental, nervous, or emotional disorders. Outpatient care may include up to 20 visits of a physician or $500 per insured person each year.
2) Up to 30 days care per insured per year in a Skilled Nursing Facility.
3) Up to 30 days care per insured per year and up to 60 days lifetime in a CHAMPUS-approved Residential Treatment Center.
4) Up to 30 days care per insured per year and up to 60 days lifetime in a CHAMPUS-approved Special Treatment Facility.
5) Up to 5 visits per insured per year to Marriage and Family Counselors under conditions defined by CHAMPUS.

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As long as you are a member of the Force Association, pay your premiums time, and the master contract remains force, your insurance cannot be ca celled.

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AFA CHAMPLUS® insurance is adm istered by trained insurance professior on your Association staff. You get prom reliable, courteous service from peo who know your needs and know ev detail of your coverage. Your insuranc underwritten by Mutual of Omaha, t largest individual and family health ins ance company in the world.

AFA OFFERS YOU HOSPITAL BENEFITS AFTER AGE 65

Once you reach Age 65 and are cove under Medicare, AFA offers you prot tion against hospital expenses not c ered by Medicare through the *Senior A Benefit Plan* of AFA Hospital Indemn Insurance. Members enrolled in A CHAMPLUS® will automatically rece full information about AFA's Medicare su plement program upon attainment of A 65 so there will be no lapse in covera

AFA CHAMPLUS® BENEFIT SCHEDULE

Care	*CHAMPUS Pays*	*AFA CHAMPLUS® Pays*
	For Military Retirees Under Age 65 and Their Dependents	
Inpatient civilian hospital care	CHAMPUS pays 75% of allowable charges.	CHAMPLUS® pays the 25% of allowable charges not covered by CHAMPUS.
Inpatient military hospital care	The only charge normally made is a $6.55 per day subsistence fee, not covered by CHAMPUS.	CHAMPLUS® pays the $6.55 per day subsistence fee.
Outpatient care	CHAMPUS COVERS 75% of outpatient care fees after an annual deductible of $50 per person ($100 maximum per family) is satisfied.	CHAMPLUS® pays the 25% of allowable charges not covered by CHAMPUS after the deductible has been satisfied.
	For Dependents of Active-Duty Military Personnel	
Inpatient civilian hospital care	CHAMPUS pays all covered services and supplies furnished by a hospital less $25 or $6.55 per day, whichever is greater.	CHAMPLUS® pays the greater of $6.55 per day or $25 of the reasonable hospital charges not covered by CHAMPUS.
Inpatient military hospital care	The only charge normally made is a $6.55 per day fee, not covered by CHAMPUS.	CHAMPLUS® pays the $6.55 per day subsistence fee.
Outpatient care	CHAMPUS covers 80% of outpatient care fees after an annual deductible of $50 per person ($100 maximum per family) is satisfied.	CHAMPLUS® pays the 20% of allowable charges not covered by CHAMPUS after the deductible has been satisfied.

NOTE: Outpatient benefits cover emergency room treatment, doctor bills, pharmaceuticals and other professional services.

There are some reasonable limitations and exclusions for both inpatient and out patient coverage. Please note these elsewhere in the plan description.

Against Costs CHAMPUS Doesn't Cover

APPLY TODAY!
JST FOLLOW THESE STEPS

oose either AFA CHAMPLUS® Inpatient verage or combined Inpatient and Outtient coverage for yourself. Determine e coverage you want for dependent mbers of your family. Complete the en-osed application form in full. Total the emium for the coverage you select from e premium tables on this page. Mail the plication with your check or money der for your initial premium payment, yable to AFA.

AFA's CHAMPLUS®

MITATIONS

verage will not be provided for condi-ns for which treatment has been re-ived during the 12-month period prior the effective date of insurance until the piration of 12 consecutive months of urance coverage without further treat-nt. *After coverage has been in force for consecutive months, pre-existing* con-ons will be covered regardless of prior atment.

CLUSIONS

s plan does not cover and no payment all be made for:

- routine physical examinations or immu-zations
- domiciliary or custodial care
- dental care (except as required as a cessary adjunct to medical or surgical atment)
- routine care of the newborn or well-by care
- injuries or sickness resulting from clared or undeclared war or any act reof
- njuries or sickness due to acts of inten-nal self-destruction or attempted sui-de, while sane or insane
- treatment for prevention or cure of al-holism or drug addiction
- eye refraction examinations
- Prosthetic devices (other than artificial bs and artificial eyes), hearing aids, hopedic footwear, eyeglasses and con-t lenses
- xpenses for which benefits are or may payable under Public Law 89-614 HAMPUS)

PREMIUM SCHEDULE

Plan 1—For military retirees and dependents (Quarterly Premiums)

Inpatient Benefits

Member's Attained Age	Member	Spouse	Each Child
Under 50	$19.03	$23.30	$14.85
50–54	$26.16	$32.01	$14.85
55–59	$36.16	$44.28	$14.85
60–64	$43.62	$53.41	$14.85

Inpatient and Outpatient Benefits

Under 50	$26.80	$31.05	$37.13
50–54	$36.83	$42.68	$37.13
55–59	$50.92	$59.02	$37.13
60–64	$61.41	$71.20	$37.13

Plan 2—For dependents of active-duty personnel (Annual Premiums)

Inpatient Only	None	$ 9.68	$ 5.94
Inpatient and Outpatient	None	$38.72	$29.70

APPLICATION FOR AFA CHAMPLUS®

Group Policy GMG-FC70
Mutual of Omaha Insurance Company
Home Office: Omaha, Nebraska

Full name of Member _____
Rank Last First Middle

Address _____
Number and Street City State ZIP Code

Date of Birth _____ Current Age _____ Height _____ Weight _____ Soc. Sec. No. _____
Month/Day/Year

This insurance coverage may only be issued to AFA members. Please check the appropriate box below:

☐ I am currently an AFA Member. ☐ I enclose $15 for annual AFA membership dues (includes subscription ($14) to AIR FORCE Magazine).

PLAN & TYPE OF COVERAGE REQUESTED

Plan Requested (Check One)
☐ AFA CHAMPLUS® PLAN I (for military retirees & dependents)
☐ AFA CHAMPLUS® PLAN II (for dependents of active-duty personnel)

Coverage Requested (Check One)
☐ Inpatient Benefits Only
☐ Inpatient and Outpatient Benefits

Person(s) to be insured (Check One)
☐ Member Only ☐ Member & Children
☐ Spouse Only ☐ Spouse & Children
☐ Member & Spouse ☐ Member, Spouse & Children

PREMIUM CALCULATION

All premiums are based on the attained age of the AFA member applying for this coverage. Plan I premium payments are normally paid on a quarterly basis but, if desired, they may be made on either a semi-annual (multiply by 2), or annual (multiply by 4) basis.

Quarterly (annual) premium for member (age ____) $_____

Quarterly (annual) premium for spouse (based on member's age) $_____

Quarterly (annual) premium for ____ children @ $ $_____

Total premium enclosed $_____

If this application requests coverage for your spouse and/or eligible children, please complete the following information for each person for whom you are requesting coverage.

Names of Dependents to be Insured	Relationship to Member	Date of Birth (Month/Day/Year)

(To list additional dependents, please use a separate sheet.)

In applying for this coverage, I understand and agree that (a) coverage shall become effective on the last day of the calendar month during which my application together with the proper amount is mailed to AFA, (b) only hospital confinements (both inpatient and outpatient) or other CHAMPUS-approved services commencing after the effective date of insurance are covered and (c) any conditions for which I or my eligible dependents received medical treatment or advice or have taken prescribed drugs or medicine within 12 months prior to the effective date of this insurance coverage will not be covered until the expiration of 12 consecutive months of insurance coverage without medical treatment or advice or having taken prescribed drugs or medicine for such conditions. I also understand and agree that all such pre-existing conditions will be covered after this insurance has been in effect for 24 consecutive months.

Date _____, 19 ____ _____
Member's Signature

2/84

NOTE: Application must be accompanied by check or money order.
Send remittance to:
Insurance Division, AFA, 1750 Pennsylvania Ave., NW, Washington, D.C. 20006.

Form 6173GH App.

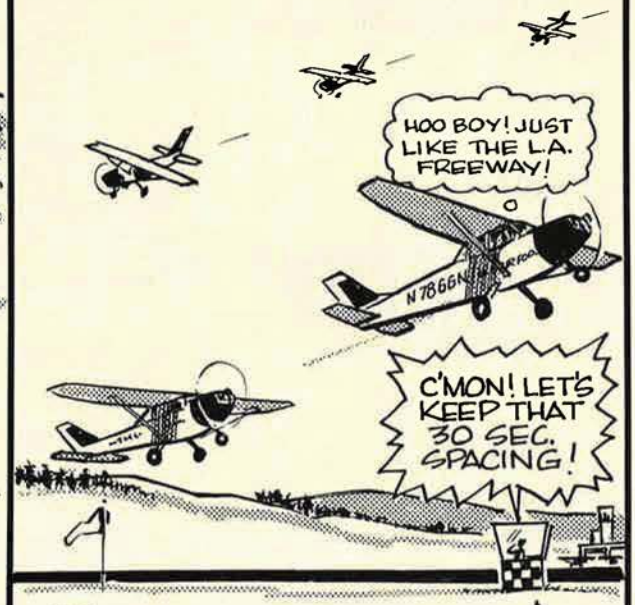
Bob Stevens'

"There I was..."

...AT THE SECOND BUSIEST YET SECOND SMALLEST AIRFIELD IN THE AIR FORCE! THOUSANDS OF CADETS SOLO HERE EACH YEAR. FIFTY PERCENT OF THE GRADUATES ARE STILL ON ACTIVE DUTY!
KNOW WHERE?
THE U.S. AIR FORCE ACADEMY AIRFIELD

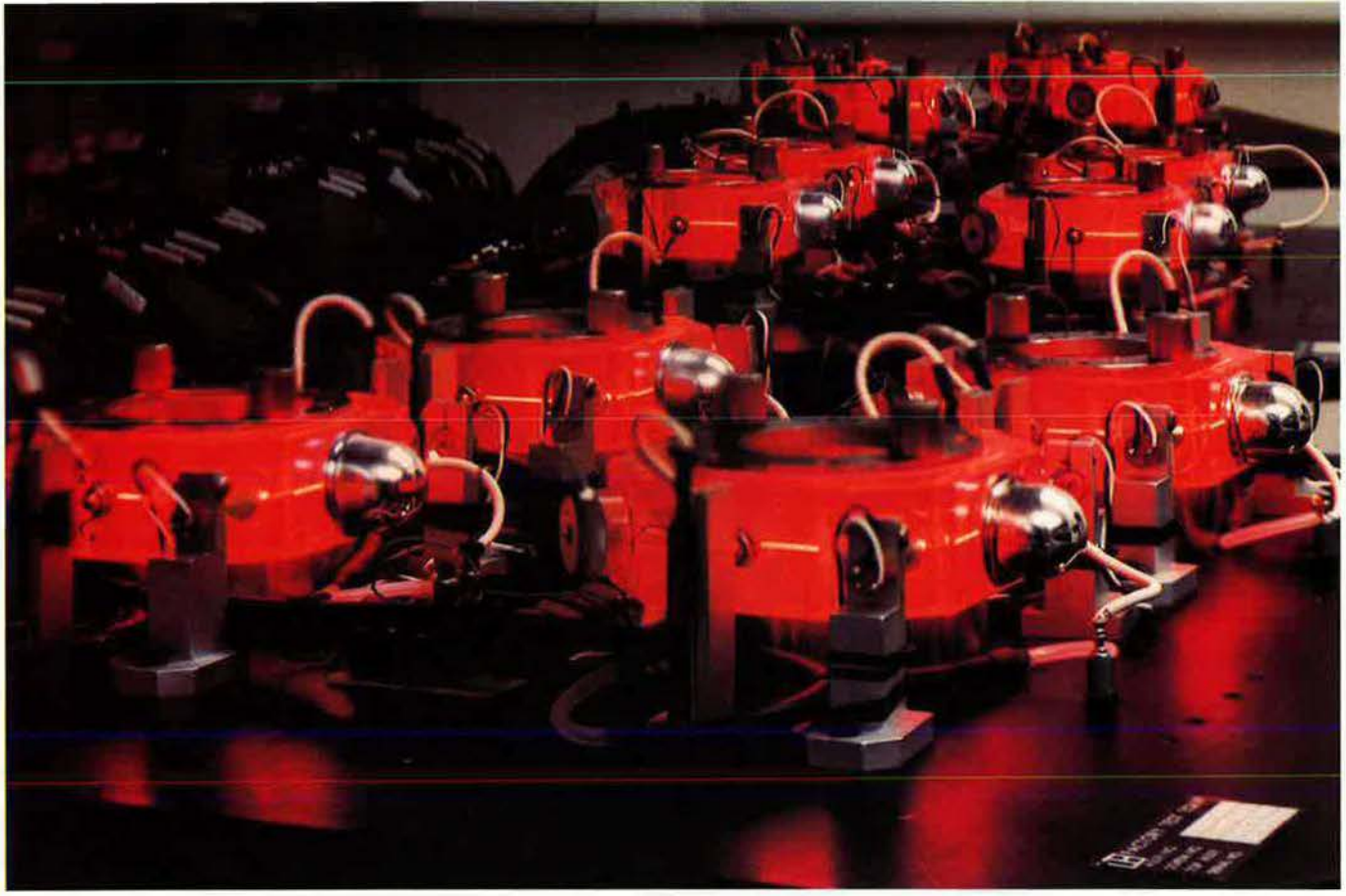
THE PLACE IS HIGH - FIELD ELEV 7,200' (ON A HOT DAY, THE DENSITY ALTITUDE CAN REACH ALMOST 10,000 FT.!)

SEVENTY PERCENT OF THE 4,000 CADETS SOLO OUT IN SOUPED-UP CESSNA T-41'S.



BESIDES FLYIN' THE '41s, THE 557 FTS HANDLES SOARING and MOTOR-GLIDER TRAINING—

THE "WINGS OF BLUE" TEAM and PARACHUTE COURSES SHARE THE SAME FIELD (SOARING & CHUTING ARE ELECTIVE; 60-70% OF THE CADETS SIGN UP).



LITTON "PRODUCTIONIZES" HIGH TECHNOLOGY.

We've moved our ring laser fabrication from the laboratory into two completely modern factories with current production capacity of 250 ring laser gyros per month. "Productionizing" high-tech products is high technology, too. And no one knows how to do it better than Litton.

The unique and extensive knowledge gained as world leader in the high-volume production of more than twenty thousand sophisticated inertial navigation systems enables us to transition highly complex technology into full production with minimal problems.

Again leading the industry we pioneered, our ring laser gyros will be onboard the first operational military aircraft to use ring laser technology, the E-6A. In addition to the E-6A program, our assembly lines are producing ring laser gyros for such activities as: LTN-90 ARINC System Production for the Falcon 50, Gulfstream IIB, and A310 Airbus; Inertial Sensor Assembly Development for MRASM; CAINS II Development and Flight Test; USAF RLG Standard INU Development and Flight Test Program; NWC Cost Reduction Gyro Development Program; and NADC multiple redundant Integrated Inertial Sensor Assembly (ISSA) Program.

Our diversity of product line is appropriate to tactical and strategic missiles, aircraft, ship, and submarine navigation.

LITTON
NAVIGATION, GUIDANCE AND CONTROL SYSTEMS

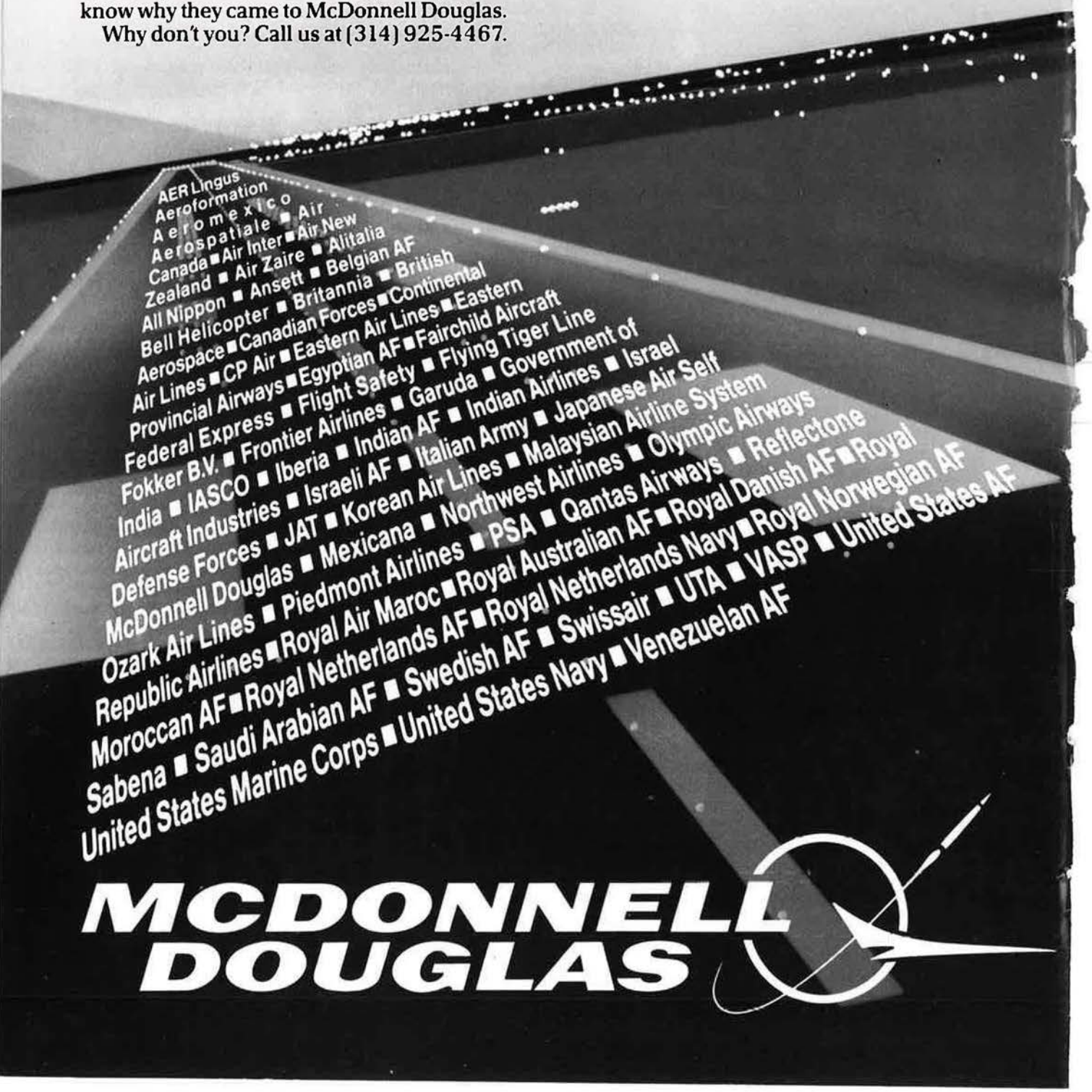
67 WHO SAW THE LIGHT.

We build visual systems. Vital™ Visual Simulation systems.

Which means that if you like the looks of our visuals, you can combine the reliability, low cost, and visual imagery of Vital with any simulator you choose.

That's exactly what 67 commercial and military customers did at more than 200 installations around the world. And when you see the realism of our day, twilight, and night imagery–when you're aware of the versatility we've built into the system–you'll know why they came to McDonnell Douglas.

Why don't you? Call us at (314) 925-4467.



MCDONNELL DOUGLAS