JULY 1985/$2

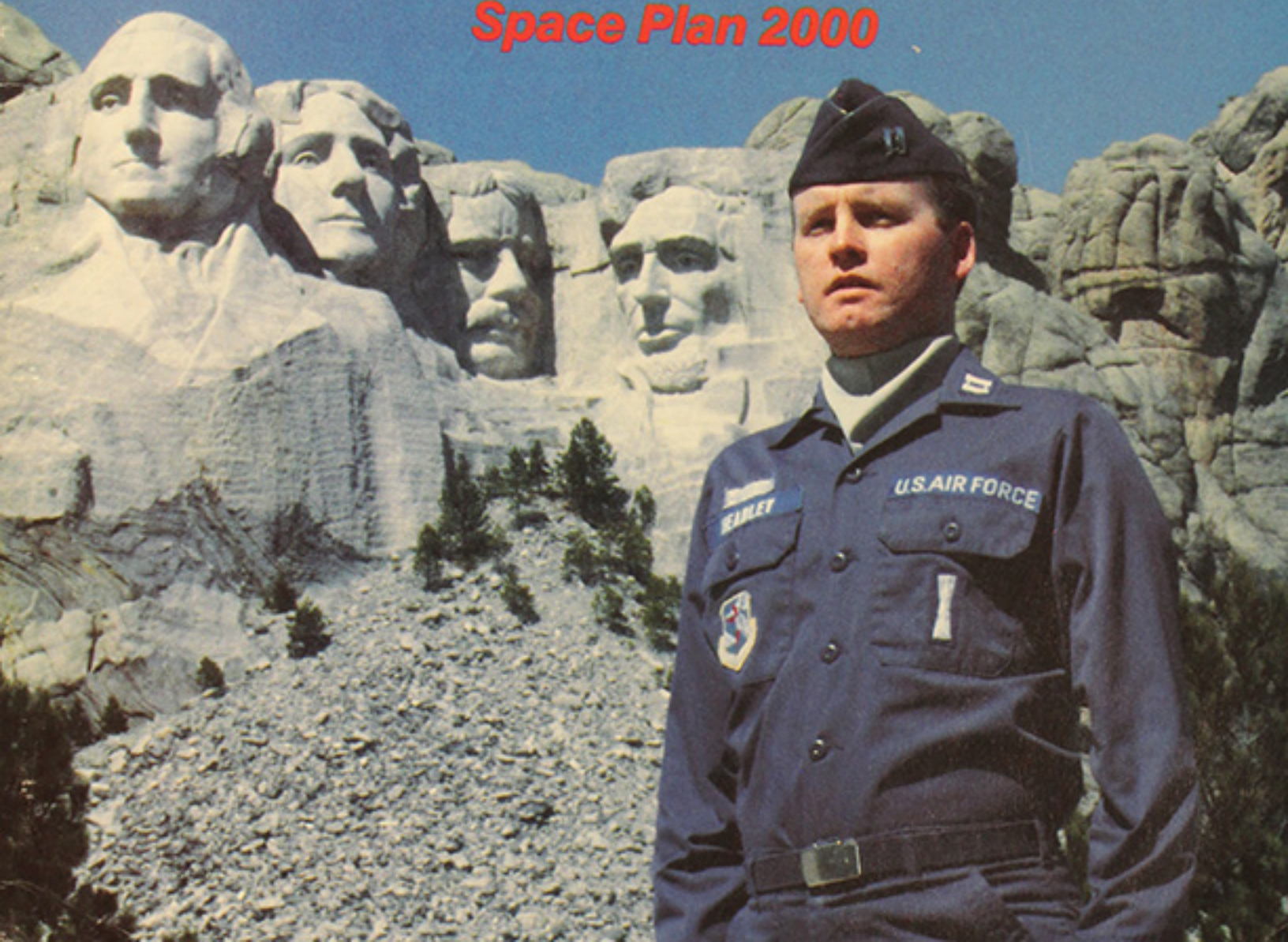
# AIR FORCE MAGAZINE

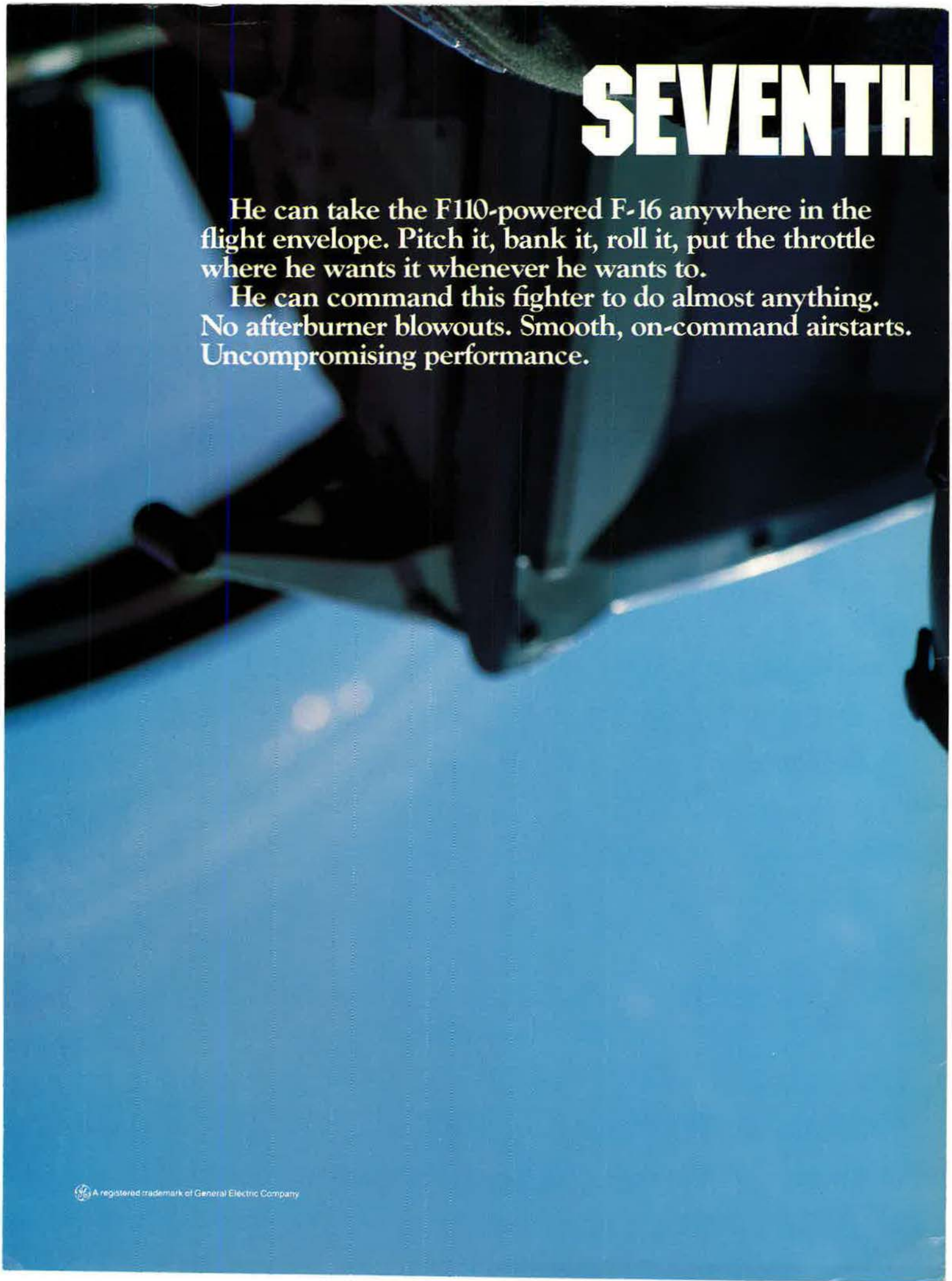
PUBLISHED BY THE AIR FORCE ASSOCIATION

## HOW WE STAND ON STRATEGIC FORCES

## High Space Heats Up

## Space Plan 2000




SEVENTH
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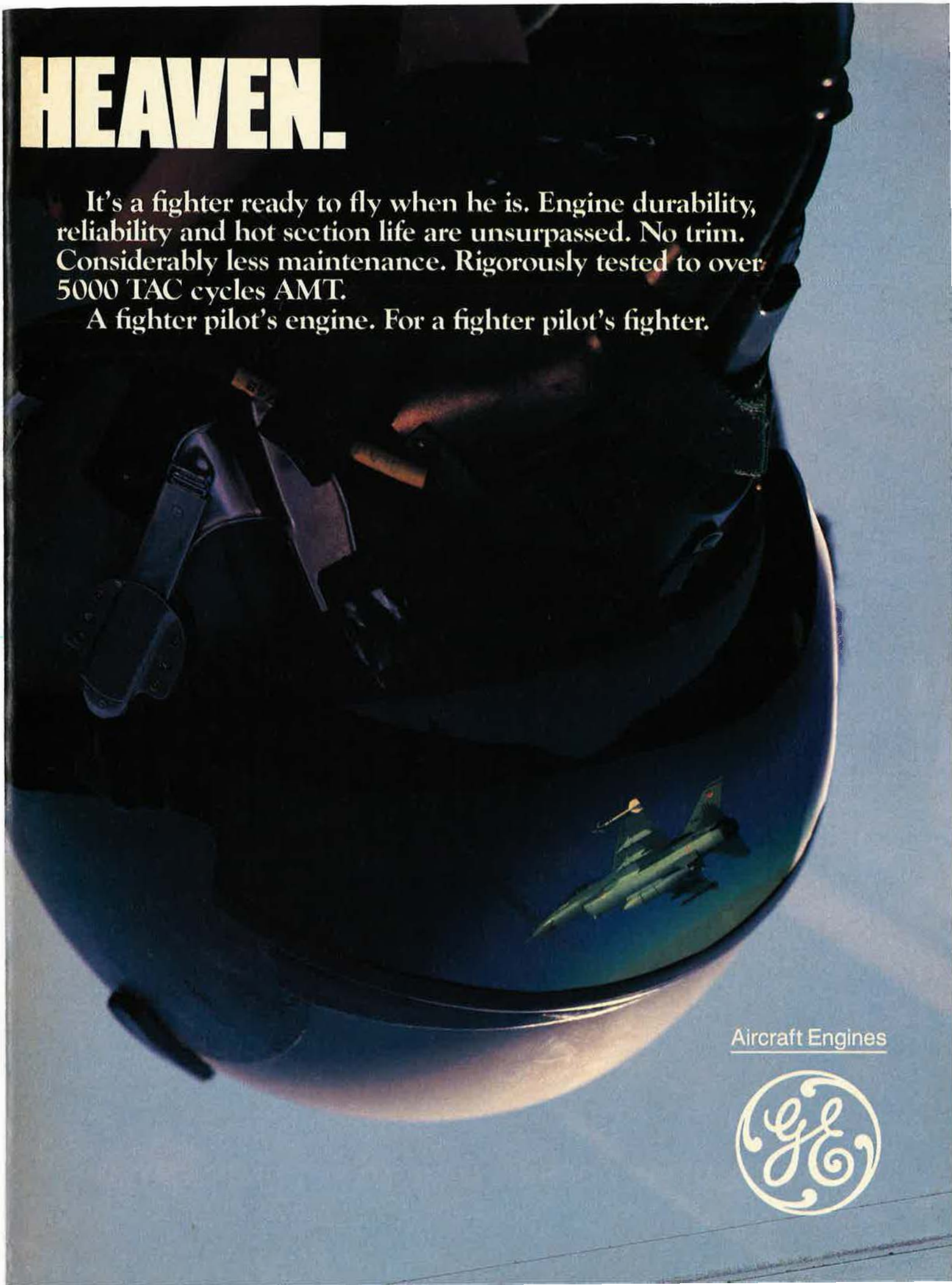
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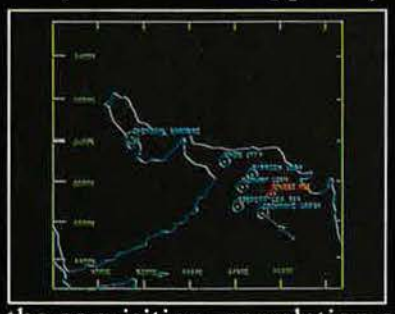

of the command chain, from real-time control systems to tactical and strategic planning tools. Whether the system requires the acquisition, correlation and presentation of real-time data streams, or the organization, retrieval and presentation of complex information, we can satisfy the most stringent $C^3I$ requirements.

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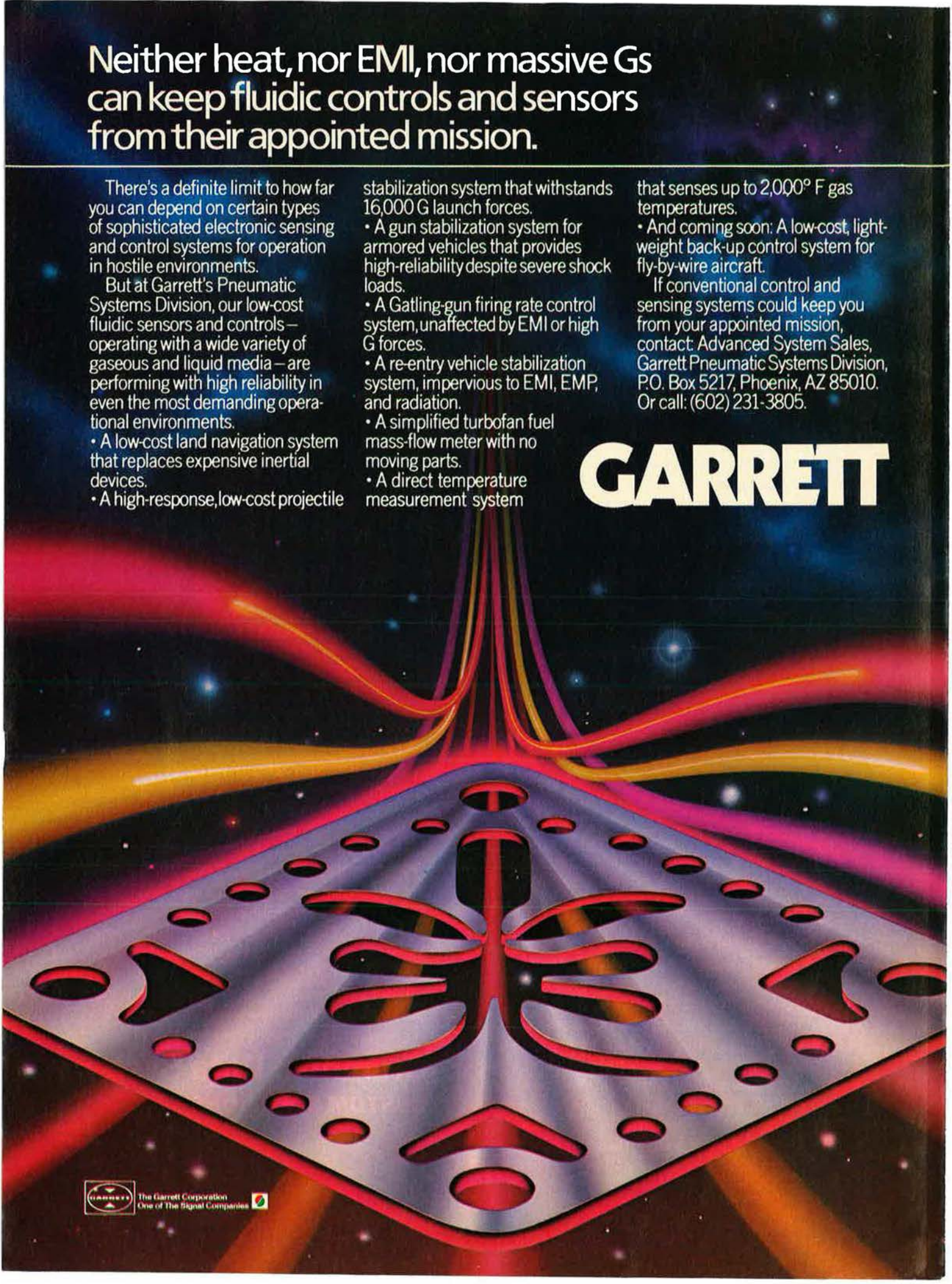

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JULY 1985
VOLUME 68, NUMBER 7

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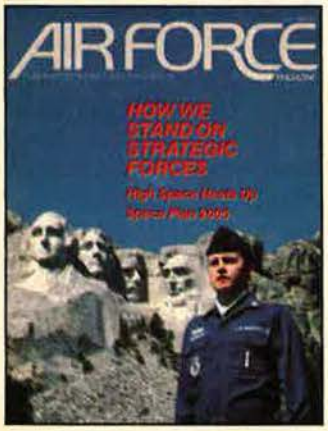


**About the cover:** Rising from South Dakota's Black Hills, Gutzon Borglum's sculptures on Mount Rushmore loom over SAC missileer Capt. Stephen A. Headley. A special section on "Strategic Forces and Space Activities" begins on page 52. (Cover photo by Thomas K. Arnold)

## Strategic Forces and Space Activities



## Features



## Departments



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Every year tornadoes, thunderstorms, flash floods, and other major weather disturbances in the U.S. take an average of 618 lives and cause $9 billion in property damage. These losses would be cut if the warning time, often less than 2 minutes for tornadoes, could be increased.

NEXRAD, the Next Generation Weather Radar, will increase tornado warning time up to a full 20 minutes. It will also provide the National Weather Service, the Federal Aviation Administration, and the U.S. Air Force with improved warning on the approach of other hazardous weather.

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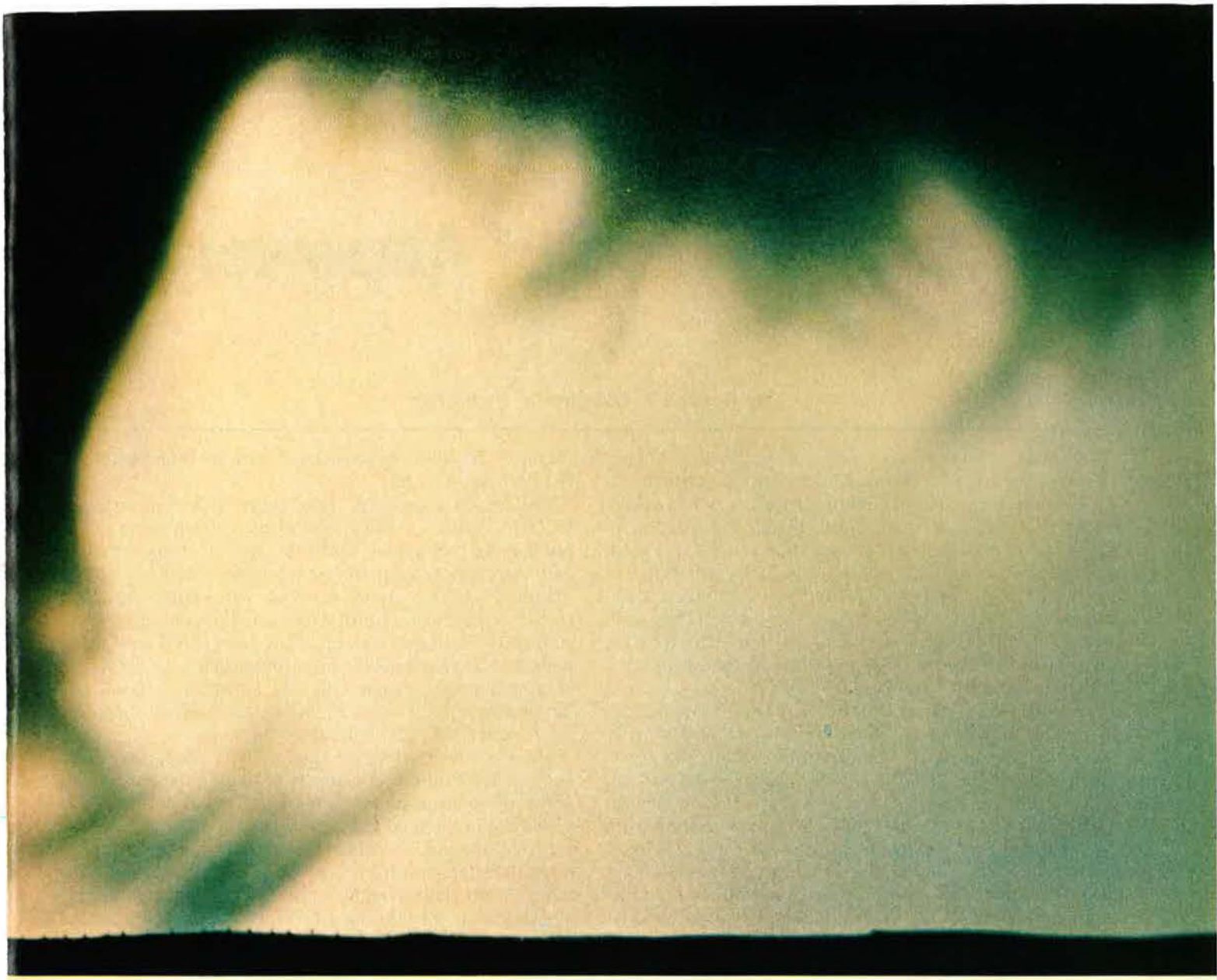

**minutes.**

and our pioneering applications of Doppler radar. It's a further demonstration that at Raytheon, quality starts with fundamentals.

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**Raytheon**

# AN EDITORIAL

# The Essence of Airpower

**By Russell E. Dougherty, PUBLISHER**

I AM very proud of every issue of AIR FORCE Magazine—proud of the people who produce it, write for it, and ensure its consistent quality. Therefore, when asked recently to pick the three most substantive articles in AIR FORCE Magazine over the past five years, I was hard put to select just three, but I did. My picks are "Why an Air Force?" an "end-of-tour" interview with Gen. Lew Allen, Jr., Chief of Staff, US Air Force, which appeared in the July 1982 issue; "The GHQ Air Force" by John L. Frisbee in September 1983; and "Indivisible Airpower" by Gen. Bennie L. Davis in March 1984.

Having made these selections, I was immediately struck by the attraction I have to articles that deal with the essence of airpower and aerospace technology; *i.e.*, the potential for *unlimited global access*—access for any purpose, in peace or war. These articles emphasize how important it is for the United States, as a nation with pervasive global responsibility, to exploit this aspect of aerospace technology. Also, they urge programs to ensure that the people of the United States understand the implications of having such global access and the hazards of *not* having it!

General Allen described AFA's future requirements as twofold. The first requirement is to make sure that the public is reliably informed and "doesn't slip back" into the fractured, piecemeal approach to our strategic aerospace capability that has marked our actions in prior years.

Secondly, he charged AFA to emphasize and explain to our nation *why* we have an Air Force, what is *unique* about an Air Force, and what its *role* is in modern combat—in short, how best to exploit the singular ability of airpower for global *access,* in keeping with our global responsibilities.

In writing about our "GHQ Air Force" in the mid-1930s, John Frisbee explains the purposes and actions (and the frustrations!) of Lt. Gen. Frank Andrews as he fought to develop and strengthen the inherent capability of our fledgling airpower—to centralize the control of long-range airpower and break the pattern of a fragmented, randomly trained organization, cast in the mold of a ground force auxiliary. Pointedly, those of us who are distressed by today's fiscally mandated "buy" of only 100 B-1Bs and fifty or fewer MX missiles for Strategic Air Command will find ironic similarity with the 1938 directives to the Air Corps (reflected in the FY 1940 budget) that disregarded General Andrews's operational requirement for 244 long-range B-17 bombers and required the Air Corps to ask for no more than the forty B-17s then on order!

Finally, the trenchant "Indivisible Airpower" article by Gen. Bennie L. Davis disabuses us from using such phrases as "strategic" and "tactical" to type aircraft and equipment, accurately explaining "strategic" and "tactical" as relating to *missions,* not equipment. He emphasizes the flexibility, responsiveness, and versatility of aerospace power, if properly developed and balanced. He explains the importance of *access* in terms of global power projection—the "strategic reach" of long-range missiles and multipurpose combat aircraft for a variety of complementary missions.

Having reviewed these selections, I recognize that some will brand my choices as reflecting the parochial views of an airpower crusader. Others will say that my views are prejudiced and colored by my tours in Strategic Air Command. Neither assessment is accurate, and I hope that this month's issue of AIR FORCE Magazine—which deals with current strategic concepts, offensive and defensive—bears me out. While it may be far from simple to meet, I see our future military challenge as being relatively straightforward: We *must* not fail to maintain an effective deterrent to nuclear war, and we *must* convince the Soviet Union that any potential military aggression will not succeed and cannot be expected to profit them.

Our task is to build and deploy sufficient reconnaissance systems, command and control facilities, and offensive and defensive weapon systems to ensure global access for our vital national purposes while denying an enemy such access for doing us grievous harm. Anything less is not enough. If the quantity and quality of our weapon systems prove inadequate to put at risk the primary military forces of a potential enemy, then we will be forced to achieve deterrence by an immoral strategy that threatens only noncombatant population and countervalue targets.

And in carrying out our task, we cannot afford to be too cute, clever, or analytically exact in our view of what it takes to achieve our objectives. If we do not succeed in this strategic imperative, nothing else we do will count for much. Professor Eugene Rostow quotes a great historian of the Roman Empire explaining why Rome fell: "They lost their nerve!"

On guard, America! Our long-range strategic posture and force structure are not fit subjects for incessant logrolling, penny-pinching, and political niggling. ■

# Now delivering... Singer-Rockwell TDMA JTIDS Terminals

JTIDS, the Joint Tactical Information Distribution System, is now a reality with integration in process in U.S. Air Force F-15 aircraft and the U.S. Army PLRS-JTIDS Hybrid.

Rockwell International's Collins Government Avionics Division and Singer's Kearfott Division are delivering AN/URC-107(V) Class 2 terminals which will make it possible for Air Force and Army elements to coordinate missions with reliable, real-time information.

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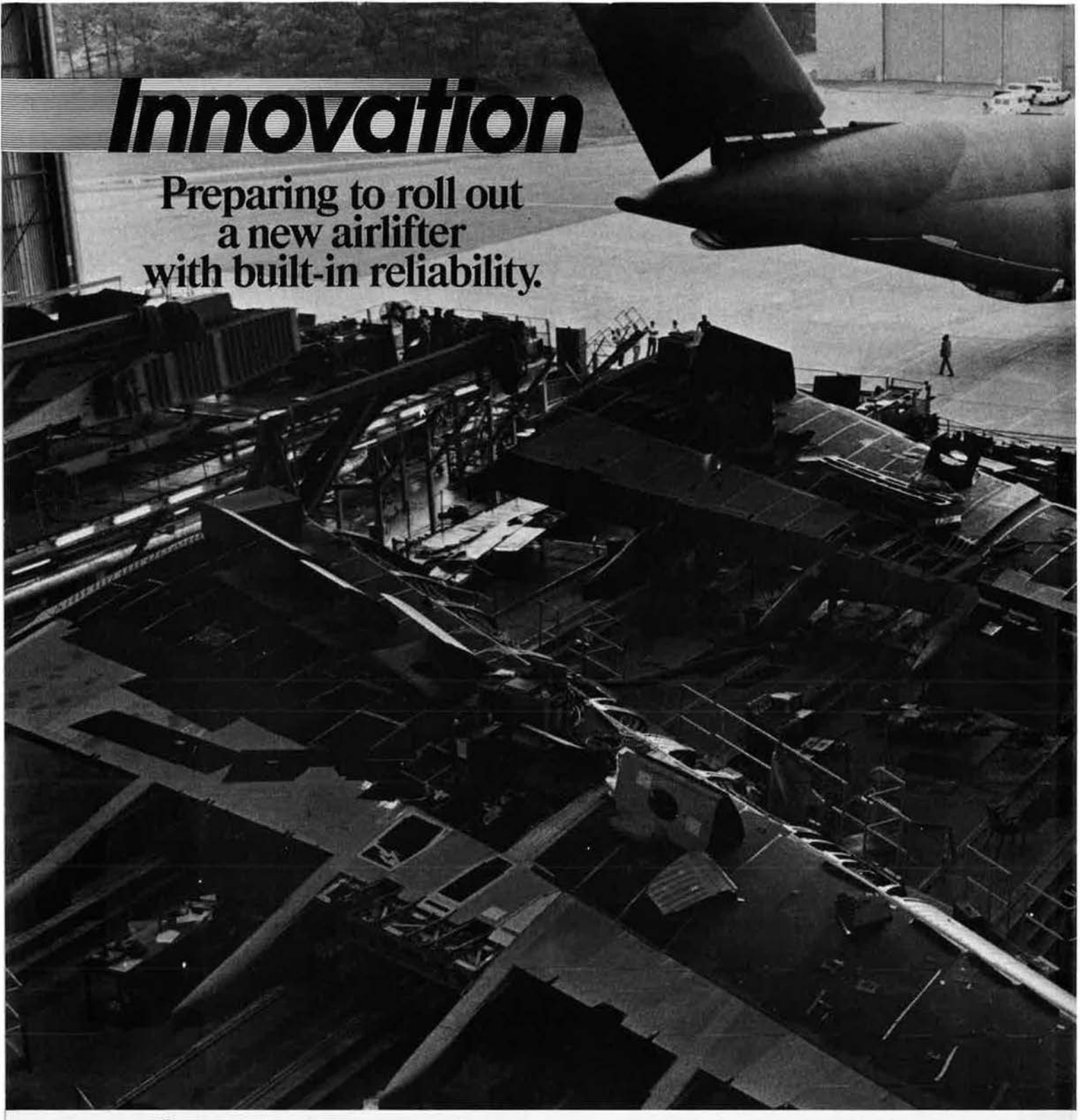


Lockheed-Georgia
Giving shape to imagination.

## Marietta, Georgia–June 1985

When the first new USAF C-5B rolls out of the factory this July, it will be ready to start functional preparation for test flights and delivery.

An innovative Lockheed approach to "doing it right the first time" has created an airlifter with built-in integrity.

A special Lockheed first article quality assurance tracking system has resulted in a 99% initial

acceptance rate of over 42,000 components of the first C-5B.

In addition, Lockheed's computerized real-time Assembly Status Tracking System (ASTS) links a powerful mainframe with 30 satellite terminals in manufacturing areas and managers' offices. This gives instant access to the status of all assembly operations in progress. ASTS is one of the tools Lockheed uses to keep production on schedule, use manpower efficiently, anticipate requirements and adjust to unforeseen circumstances. It is helping Lockheed management keep the first C-5B on schedule.

In May the aircraft received its wing. By late June the engines will be mounted and final assembly will be well advanced. Before year-end the first of the new C-5Bs will go directly into service with the 77 C-5As now flying operational missions with the Military Airlift Command. Each successive new C-5B also will go to work immediately.

This expanded C-5 force will dramatically increase America's capacity to carry everything from palletized cargo to trucks, helicopters, and massive M-1 tanks wherever they're needed. These aircraft will maintain unit integrity, as well, by delivering personnel together with their equipment.

Well into the next century they will give the United States the capability for rapid, reliable airlift of its men and equipment wherever they are needed around the globe.

# AIRMAIL

**Dominoes Again**

Dominoes, shmominoes. Here we go again. I am an old acquaintance and a longtime admirer of Gen. T. R. Milton, but I just can't stand still for another domino game. It's a phony. *(See "Dominoes Again," June '85 issue, p. 126.)*

In one breath General Milton avers that "no one in his right mind wants another Vietnam," but in his next he comes out with the same old war cry that mired us down in that swamp to begin with: Dominoes!

What dominoes, General? And who (besides you) says that "there was never a timetable attached to the domino theory"? That would seem to be a contradiction in terms, and it's also not the way I remember it. Those dominoes were going to fall *then,* because once one went down, there would be no stopping the rest, which included not only Thailand but also Indonesia, the Philippines, and, yes, Australia, as best I recall.

Well, Thailand still stands, as do the others, and it's been ten years now since they were supposed to topple. Some dominoes.

I served the Air Force faithfully and proudly for thirty years, so I hardly qualify as a "limousine liberal." But I do hate war, and I especially hate wars fought by the Marquis of Queensberry's rules.

In Central America, let's give Rep. Michael Barnes's plan a fair try, let's give Mexico and its partners something more than lip service, and, if that all fails, then yes, let's wait until all those millions start pouring across our southern border (any bets?). Only then should we do something about it, and let's do it right this time!

But, for heaven's sake, let's not get suckered into another game of dominoes.

Col. Alfred J. Hanlon, USAF (Ret.)
Alexandria, Va.

**Ignoring R&M?**

We have been active members and supporters of AFA for many years, but your article on Air Force R&D in the May '85 issue was a serious setback in our enthusiasm to continue that support *(see "R&D at the Razor's Edge," p. 50, May '85 issue).*

Whether intended or not, your article challenged the credibility of the Air Force Secretary and Chief of Staff in their efforts to make system supportability a coequal consideration with cost, schedule, and performance. Last year, you had several good articles on system support, especially the R&D summary that highlighted movement of the technical community toward better reliability and maintainability (R&M). However, this year's R&D article totally ignored recent gains by the logistician within both government and industry laboratories. This is especially damaging in light of the September 17, 1984, landmark policy memo by the Secretary and Chief on weapon system R&M.

How dare you ignore such major policy statements. Your magazine is widely read and considered a major authoritative source of intelligence to the aerospace community. You did the Air Force an injustice by ignoring the R&M issue in your coverage of the Air Force R&D program. It is bad enough that industry is pondering whether or not the Air Force is really serious about R&M this time. To have AIR FORCE Magazine totally ignore this landmark commitment to R&M is unthinkable and sends a message to the tech base that is just plain wrong.

Is it because the leadership of AFA is still mentally mired in the "performance" only mindset? Remember, "it don't break" is also a measure of operational performance. Please understand that this old mentality is exactly what has taken the Air Force to the brink of bankruptcy in terms of developing and fielding new weapon systems while operating and supporting fielded weapon systems.

Col. John C. Reynolds, USAF
Director, Air Force Coordinating Office of Logistics Research
Col. Gerald F. Saxton, USAF
Deputy for Advanced Technology and Logistics Strategy
Wright-Patterson AFB, Ohio

• *Colonels Reynolds and Saxton note correctly that the article "R&D at the Razor's Edge" did not deal with reliability and maintainability (R&M) issues. That article focused instead on DoD-wide responses to the advanced technology threat posed by the Soviets.*

*We cannot agree with their allegation, however, that* AIR FORCE *Magazine has ignored the R&M issue. For instance, in the March '85 issue, the article "Fourth Wheel on the Acquisition Wagon" dealt in depth with R&M. This article was subsequently inserted into the* Congressional Record. *In the April '85 issue, the article "Down-to-Earth Concerns About Tactical Air" highlighted the importance of R&M in considerable detail.*

AIR FORCE *Magazine has reported thoroughly on the reliability and maintainability story in the past and will continue to do so in the future.*—THE EDITORS

**Uniform Cover**

As always, I found your recent Air Force Almanac issue to be highly informative. I intend to keep it in my desk as a ready reference.

One of the most fascinating things about the issue was the uniform pictured on the cover. It appears to be made of a hopsack-type material not available at clothing sales. Is this an example of artistic license or a soon-to-be-released new uniform? Since I'm not too enthusiastic about either of the current uniforms—the issue wool-and-polyester or the optional double knit—the uniform on your

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


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# AIRMAIL

cover appears to be a much more attractive alternative.

Capt. Edward L. Mann, Jr., USAF
Wichita Falls, Tex.

• *The blouse pictured on the May '85 cover is part of a standard Air Force-issue polyester/wool uniform.*—THE EDITORS

**The Downing of Yamamoto**

I have just finished reviewing Terry Gwynn-Jones's story "In Search of Yamamoto" in the April '85 issue of your magazine. I think that it is a shame that someone had to reopen this subject for further discussion or debate.

At the time that Yamamoto was shot down, I was commander of the 12th Fighter Squadron at Guadalcanal. I was familiar with the premission planning. Four pilots from my squadron flew on the mission, and I was present at the briefing that took place just before the mission was launched. I was also present at the debriefing when the mission returned, and I was the last man to leave the briefing tent.

One thing is very clear in my memory regarding that debriefing. As a result of the stories given by all of the returning pilots, it was concluded and agreed that Lanphier and Barber should share equally in the destruction of a Betty bomber. Two such bombers had been shot down during the battle, but, at that time, the American forces had no way of knowing in which bomber the Admiral had been flying.

To my knowledge, no one ever personally claimed to have shot down the Admiral until a Detroit paper issued a story by Tom Lanphier. In that story, he claimed that he was the one who did it. I don't know any knowledgeable person from the Air Force who agrees with him, and I don't believe that the evidence presented in your article warrants the conclusions that the author comes out with or that it settles the so-called "forty-year-old controversy."

Again, I believe that it is unfortunate that the question of "who killed Yamamoto" ever had to become a controversy. I don't see that it mattered much then or proves anything now. Meanwhile, the true answer, if there really is one, may lie buried somewhere in a Japanese medical report.

Because of the success of the mission, all of the people involved were well recognized and rewarded for their efforts. Why can't we leave it that way?

Col. Paul S. Bechtel, USAF (Ret.)
Merritt Island, Fla.

I read Terry Gwynn-Jones's article "In Search of Yamamoto," which pretends to settle a forty-year-old controversy. Then, to make sure I wasn't crazy, I read it again. Please explain to me how that story settled anything.

From the reports quoted by author Gwynn-Jones, Barber blasted the Betty from dead astern at "less than a plane's length" away and last saw it on its back, at treetop level and smoking. Then Lanphier, who had been concerned with a Zero, returned and fired "a long steady burst" long before he thought he was in range—and the controversy is settled?

According to the official Japanese postmortem, "Yamamoto was killed by a burst of machine-gun fire through his head"—before the Betty's final plunge. Now which one of those pilots was most likely responsible for that?

I think that the article makes a very good case for Barber, the author's personal judgment notwithstanding. Tom Lanphier is a nice man and a good pilot, and I would hate to see him dispossessed from the accomplishment of his life.

In Europe, we shared victories under lesser circumstances. Why not continue to give Tom some credit?

Dr. Clayton K. Gross
Past President, American Fighters Aces Assn.
Portland, Ore.

The Terry Gwynn-Jones article "In Search of Yamamoto" was very interesting and enlightening.

I have read many stories about the mission on April 18, 1943, and the people who took part in that great American air victory. Your article was well written and included many details that answered all the questions that I had been seeking answers to for the past forty years.

Murray Juvelier
Flushing, N. Y.

• *In his forthcoming autobiography, Tom Lanphier takes a view different than that presented in the article "In Search of Yamamoto." He states: "No credit was assigned as to who killed Yamamoto because that afternoon we did not yet know whether he had been in the lead bomber, for which I already*

FAST, FURIOUS RESPONSE.

# "By the time everyone knew we were there, we were gone."

*"LANCE-14 AIRBORNE, HOSTAGES O.K. WE'RE COMIN' HOME" — What a satisfying message to send!*

*Without the* Osprey, *our mission would have required two days and refueling stops. With the CV-22A we only needed half a day. And we had enough range for the entire round trip.*

*We arrived fast and unannounced. After the strike team freed the hostages, we evacuated everybody from a rooftop in the compound and headed home — at 250 knots.*

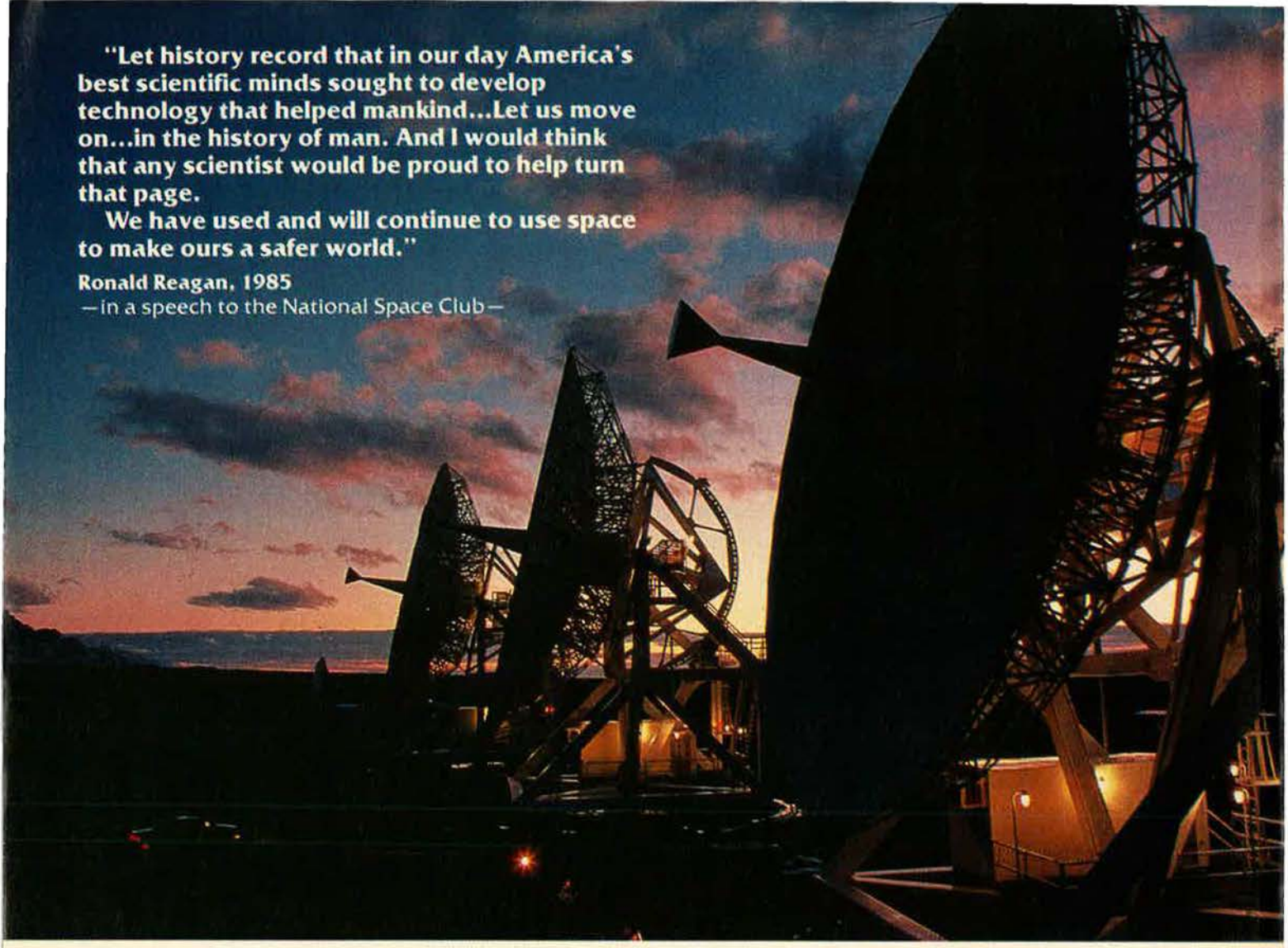
*That's a fast, furious response — which is the name of this game.*

Which is also the precise reason for the U.S. Air Force's CV-22A *Osprey.* They need the capabilities and mission responsiveness the V-22 offers. For the U.S. Air Force, previously impossible missions are about to be quite possible.

The concept is proven: an aircraft that can take off, land and maneuver like a helicopter, yet cruise at turboprop speeds. No other airplane works like it, or is as efficient. Payload and range are what you'd expect from a cargo plane. And it can reach up high or streak across the terrain at treetop level.

After two years of extensive predesign work, this Dept. of the Navy program is bringing the JVX into Full Scale Development (FSD) as the joint-service V-22 *Osprey.* The team of Bell Helicopter Textron Inc. and Boeing Vertol are leaders in this new era of combat aviation.

Bell • Boeing
THE TILTROTOR TEAM

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Spacecom is responsible for systems engineering, integration, testing, and development of the operations control center; the company is also prime contractor and program manager.

We're expanding our operations in Colorado Springs and developing other dynamic DoD markets.

We're making great progress in space and ground station communications technology, and the thrill of helping to make a safer world is still with us. Developing and using this technology to make ours a safer world is going to occupy us all for quite some time.

And we're seeking a few more of America's best minds to help us turn that page.

*The courage to lead*

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*had been given credit, or in the wing bomber. . . . Just after the war, the War Department announced that I had shot down the Betty bearing Yamamoto and Barber had shot down the staff Betty into the sea."*—THE EDITORS

**Who's First?**

In reference to your April '85 "Bulletin Board" item about the "First Woman Security Specialist."

The item in question makes an error in naming the *first* woman security specialist. The first woman in the field was Amn. Virginia L. Queen of the 160th Security Police Flight, 160th Air Refueling Group, Ohio Air National Guard, Rickenbacker ANG Base, Ohio. She graduated from 811X0 technical school on March 4, 1985. She resides in Columbus, Ohio.

During Airman Queen's graduation ceremony, she was honored by Karen Keesling, Deputy Assistant Secretary of the Air Force for Manpower, Reserve Affairs and Installations.

MSgt. Rose M. Beard, OhioANG
Rickenbacker ANGB, Ohio

The "Bulletin Board" item in the April '85 issue of AIR FORCE Magazine featured Amn. Carmen Y. Collins as the first woman recruit in the security specialist field. I think she is probably the first woman to serve in the field since it was reopened to women.

A test program begun in December 1976 saw 100 women start training as security specialists. Those who completed training were assigned to four test bases: Nellis AFB, Nev., Grand Forks AFB, N. D., Barksdale AFB, La., and Osan AB, Korea. These women performed all aspects of security duties, including air base ground defense, sometimes under field conditions (November and December 1977, Eglin AFB, Fla.).

Although the program ended in May 1979 with a decision to eliminate women from the field, many acquitted themselves honorably, in some instances surpassing the performance of their male counterparts. The women still in the career field when the test period ended were given the option of separating or retraining. Some separated, and some remained blue-suiters. . . .

W. J. Weaver
Minot AFB, N. D.

• *Reader Beard is right—and so is* AIR FORCE *Magazine, which is a nice win/win situation. The item reported correctly that Airman Collins was the first woman to* enlist *in the security specialist field since the field was opened to women. However, she didn't enter the required tech school until April. Meanwhile, Airman Queen, who had enlisted for no particular career field, was available for immediate school entry (in February) and is indeed the first woman to* serve *as a security specialist.*

*Reader Weaver is undoubtedly correct as well, though Air Force officials were unable to confirm the specific details of the test program. The Air Force security specialists we consulted did remember that some type of test had been conducted, but no one seems to know why the test ended with a decision to eliminate women from the field.*—THE EDITORS

# AIRMAIL

**Pound Foolish?**

Rep. Les Aspin, the chairman of the House Armed Services Committee, proposes to slash the military retirement fund by $4 billion in FY 1986. While we may be talking in terms of billions of dollars, this proposal may be a prime example of "penny wise and pound foolish."

During the late 1970s, the military services lost some 6,000 pilots. Many of these left the services because of lagging pay scales, uncertainties in the retirement system, and increased hiring by airlines, which offered lucrative pay and benefits. In FY 1979, the Air Force's cumulative continuation rate (CCR) for pilots completing their initial tour obligation (sixth year) dropped to twenty-six, reflecting the percentage who would complete their eleventh year if then-existing retention rates remained constant.

The taxpayers paid more than $1 million to train each of these pilots to combat-ready status. Replacement training costs, which do not reflect the loss of irreplaceable combat and overseas operational experience, exceeded $6 billion.

During the early 1980s, retention rates climbed to seventy-eight percent in response to improved pay and retirement benefits. The current CCR has since declined fourteen points, to sixty-four percent, reflecting a loss of more than one-third of those pilots completing their initial tour commitment. The airlines are seeking as many as 5,000 pilots this year. The average United Airlines pilot, including captains and first and second officers, is paid $91,200 a year for flying eighty-one hours per month, according to United Airlines officials.

Military pay freezes and adjustments to the retirement system (a key force management tool) are again popular causes in Congress. In the meantime, the commander in chief of Military Airlift Command, which provides DoD's strategic airlift capability, has felt compelled to send personal letters offering a return to active duty to selected pilots who separated earlier.

The indicators seem to reaffirm Georg Wilhelm Friedrich Hegel in his philosphy of history: "What experience and history teach is this—that people and governments never have learned anything from history or acted on principles deduced from it."

Mr. Aspin, let's not get "pound foolish" again.

Col. Charles D. Cooper,
USAF (Ret.)
Springfield, Va.

**The Military Pay Dollar**

Every year, the Congress of the United States goes through the throes of hammering out a budget acceptable to all the different facets of our society. Each year, there is a close look at all military spending, with a sharp eye to trim any excess—hopefully, without any decrease in our ability to provide for our country's defense. In this day and age when the deficit is reaching such high proportions that even the more liberal-minded among us are beginning to show concern, the budget-cutting knives are sharper than ever.

Usually, the cuts come in major weapon systems, like the B-1 bomber or the MX missile, and not in military pay. But we haven't received an increase in salary commensurate with the increase in the cost of living for years now. And to add to this, there is talk of changing the retirement criteria.

Maybe it's time that someone took a look at the value we are getting for our military pay dollar. I would like to see an estimate of the hourly wage received by the hard-working military member. Let's forget that he's considered to be on call twenty-four hours a day. Let's forget about the intangible cost to the member's child, who leaves behind his friends during the frequent PCS moves, and the stress on the family when Mom or Dad is TDY for months at a time. I would just like to know a figure for the actual pay for actual hours worked, by AFSC. Maybe this would let Congress know how much the country is receiving for the dollars spent.

This shouldn't be too difficult. We already have similar estimates in

other areas. Each year, the Finance Center at Denver sends out a letter giving each of us our estimated salary if all benefits were included. Likewise, estimates for cost of living in different geographical areas are made in order to determine the variable housing allowance. All that's needed here is an estimate of the hours worked. I know that would just be one more form to fill out, but it would be one that I wouldn't mind completing.

And while we're at it, maybe someone could look at the actual expenses incurred beyond reimbursements during a PCS move. Most of us have to live off base, and that can mean buying or selling a house at a very inopportune time or having to spend several thousand dollars to put in grass, a fence, or blinds.

Who knows? Maybe Congress would be pleasantly surprised by how hourly military wages compare with those for similar civilian jobs.

Maj. Doyle Isaak, USAF
Oklahoma City, Okla.

**Computer Specialist Needed**

The Air Force Special Activities Center needs an E-8/E-9, AFSC 20600, who has a background in computers (IDHS) and requirements.

If you are qualified and are interested in an assignment to Fort Belvoir, just south of Washington, D. C., then please contact the address below.

CMSgt. Louis Vukich, USAF
HUMINT Enlisted Career Manager
Hq. AFSAC
Fort Belvoir, Va. 22060
Phone: (703) 664-2458
AUTOVON: 354-2458

**Airlift in Vietnam**

The Air University Center for Aerospace Doctrine, Research, and Education is sponsoring a book that I am working on entitled "Strategic Airlift in Vietnam—Personal Perspectives." I need your help to write the book.

Did you fly C-124s, C-133s, C-141s, or C-5s during US operations in Southeast Asia? Did you serve in transportation, maintenance, supply, or some other support activity related to airlift operations? Were you at a senior or intermediate airlift headquarters, and did you play a part in that part of the war? Were you in a leadership position? Staff? Command and control? Aerial port? En route support? Did you plan, support, or participate in Blue Light, Eagle Thrust, or Combat Fox? Did you work at a forward supply point or on the air-transportable dock? Were you involved in a strategic airlift "first" or "last" in Southeast Asia? Can you help to tell the Guard and Reserve story in SEA? Did you keep a diary or write home about the war? If so, you can make a major contribution to telling the airlift story.

I would like to hear from any readers who can tell me about their experiences. This can take the form of a short note, an outline, or a few pages in which you "tell it like it was." Or you can record your story on tape. . . .

If you don't want to write or record your story, would you be willing to "show" it? Slides, photos, cartoons, or any other sort of artwork could add immeasurably to the book. Any illustrations sent would be carefully reproduced and returned promptly.

The bottom line for this book is to let the airlifters tell their own story. I think I can help in this process if you contact me.

Lt. Col. Chuck Miller, USAF
5459 Broadmoor St.
Alexandria, Va. 22310
AUTOVON: 697-3601

# AIRMAIL

**Military Aircraft Photos**

I am an aviation historian and archivist. I have a collection of photographs of military aircraft from World War I to the present. People often loan me their photos, which I copy and return to the respective owners. Since I do all of the copying and photo processing myself, I can assure the safe handling and speedy return of all materials.

I have been involved in this project for fifteen years and have a considerable collection, but, in order to expand, I need the help of anyone who was involved with military aircraft and who may have photos that I could copy for my collection. . . . The types of photos, slides, negatives, etc., that I would like to borrow are of any American military aircraft, German aircraft, Japanese aircraft, fighters, bombers, cargo aircraft, transports, liaison aircraft, nose art, etc., etc. If you have any of this type of material, I would gratefully appreciate the loan of it so that I could copy it for my collection. I can also help to locate certain photos.

I am aware that many airmen did not carry cameras, but any photos of aircraft may prove helpful. Most of all, I want to stress that any material loaned to me will be well cared for and will be returned as promptly as possible.

I am looking forward to hearing from readers. Good luck with your reunions, and please pass the word about me to your comrades.

John M. Campbell
400 S. Ranchwood Blvd., #2
Yukon, Okla. 73099
Phone: (405) 354-7931

**USAF in Spain**

I am trying to find information on USAF units that served at Zaragoza, Spain.

I would like to contact anyone who has photos or slides of aircraft of the 401st Tactical Fighter Wing or who can help me learn about the unit's World War II history. I am also interested in learning about the activities of the 431st Fighter Interceptor Squadron, which flew F-102 Delta Daggers at Zaragoza in 1958–64. I would like to obtain photos of aircraft that served with this unit.

I would also like to learn more about the Reflex detachment of B-47 strategic bombers that operated from Zaragoza and other Spanish and North African bases at about the same time.

I have several hundred photos of Spanish Air Force planes and Spanish Army helicopters. I would be willing to exchange some of my collection for any photos concerning units cited above. Please contact me at the address below.

Angel M. Salcedo Oliver
C/Conde Aranda 79
50004 Zaragoza
Spain

**B-24 Crash**

I am currently researching details of a USAAF aircraft that crashed over here in Lancashire during World War II.

The aircraft in question is a B-24 Liberator, serial number 42-100322. It crashed on January 2, 1945, in the Trough of Bowland, between Clitheroe and Lancaster. I am advised that the aircraft belonged to the 715th Bomb Squadron, 448th Bomb Group.

It was apparently on a flight to BAD 2 at Warton, perhaps for maintenance, when it flew into a hillside covered by cloud. A number of personnel had hitched a lift on the flight, and a total of nineteen was on board. Four were killed and three were seriously injured, but I don't know what happened to the remainder on board. The three survivors were Bertram Chernow, Joseph B. Brown, and Richard C. Seymour.

I would be most grateful if any readers could be of assistance in helping me to gain further details on this inci-

Pilots of future aircraft may rely on artificial intelligence systems to help them assess combat situations and take appropriate offensive or defensive actions. Hughes Aircraft Company engineers are conducting studies for the U.S. Air Force on potential uses of artificial intelligence for fire control and battle management. One focus is how to identify targets automatically and present this information for a pilot's use. Another aspect involves tactical analysis, including decision-making that advises a pilot whether to attack, flee, apply electronic countermeasures, or fly low-altitude routes. New automation techniques may be necessary for pilots to cope with the fire control systems now being designed for the next generation of military aircraft.

Swedish JAS-39 pilots will have better views from their cockpits, thanks to a wide-field-of-view head-up display (HUD) that incorporates diffraction optics technology. The display saves pilots from looking down into the cockpit to read instruments by superimposing data on a clear plate mounted at the pilot's eye level. Compared with conventional displays, the new HUD is clearer and eliminates bulky support structures. Its wide field of view can be used with infrared or low-light-level TV imagery so pilots can fly high-speed low-altitude missions at night. Hughes produces the HUD using a proprietary process involving holographic techniques and lasers. Sweden is the first country to award a production contract for a HUD that uses diffraction optics.

A new target cueing system makes shoulder-fired missles more effective, allowing troops to fire at aircraft day or night or in bad weather. The prototype uses the Low Altitude Surveillance Radar (LASR), a recent Hughes development, and the Position Location Reporting System (PLRS), in production for the U.S. Army and Marine Corps. It enables a gunner to use the full capabilities of the missile and assists him in making the split-second decisions needed to engage fast, low-flying aircraft. LASR pinpoints incoming targets while PLRS provides the precise location of both the radar and the weapon. Small lights integrated into the missile launcher sight direct the gunner and tell him when the target is within launch range. Tests show that gunners can learn to operate the cueing portion of the system with only 20 seconds of practice.

A laser is used to weld certain components of the Amraam missile to lower costs and to provide improved performance where low heat distortion is required. The missile's precision RF (radio frequency) seeker antenna is made lightweight and low in cost by laser-welding aluminum foils together. The missile fins are made of laser-welded corrugations and skins to provide strong lightweight surfaces for steering. Hughes designed and developed the advanced medium-range air-to-air missile for the U.S. Air Force and Navy. This laser welding process was developed by Hughes on an Air Force Manufacturing Technology program. Amraam is manufactured in Tucson, Arizona.

Helicopters can now be equipped with a mast-mounted sight that permits their crews to fire TOW missiles from behind hills and trees, while exposing only the sight to possible enemy detection. The Hughes sight's stabilized optics compensate for helicopter movement and vibration of the rotor blades. Sighting and targeting is performed by using a video camera instead of direct-view optics as in the standard airborne TOW system. Helicopters qualified with the sight include: the Sikorsky H-76, HHI-500MD, and 530 MG Defender.

For more information write to: P.O. Box 45068, Dept. 71-3, Los Angeles, CA 90045-0068

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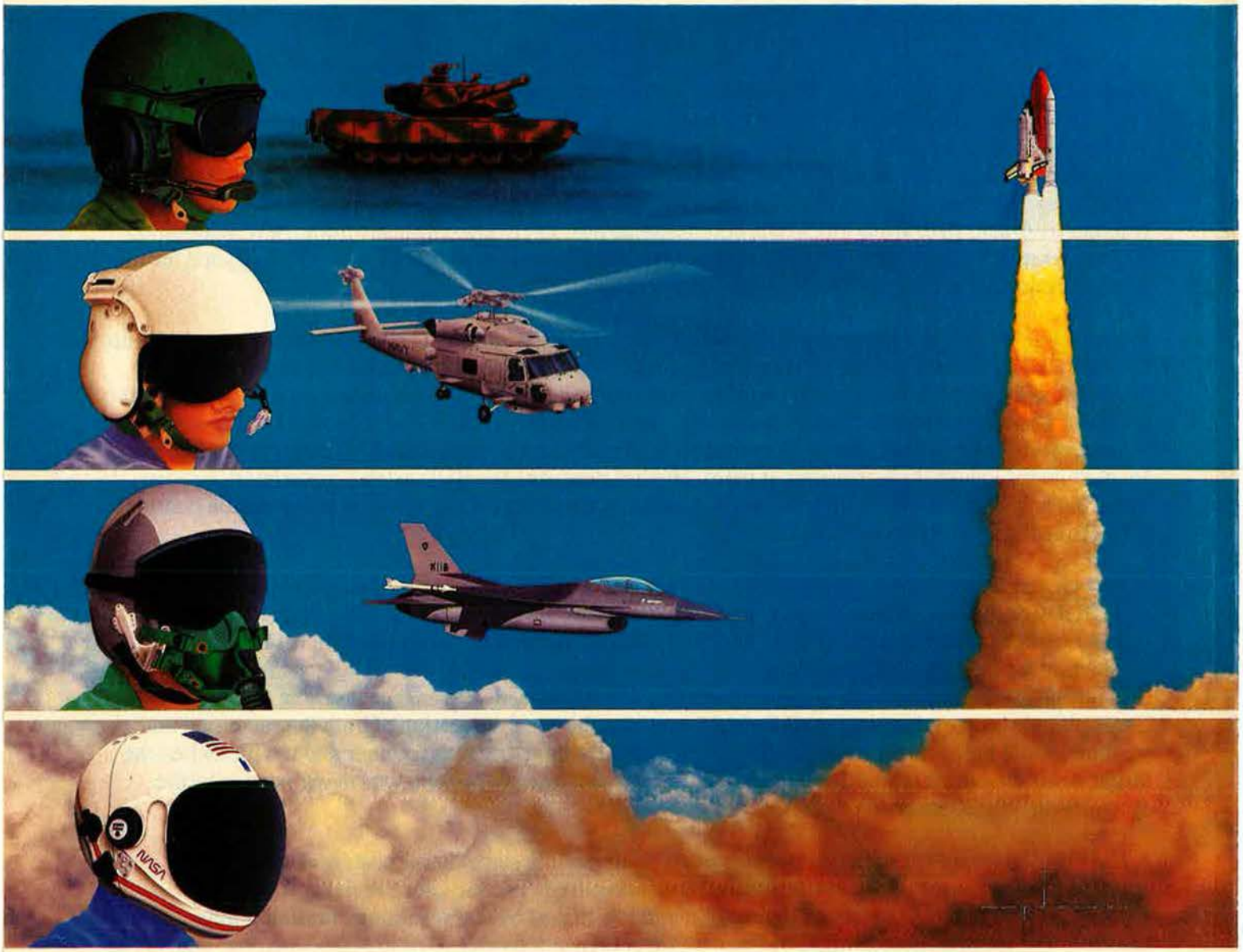
# First on land. First in the air. And first in space.




# GENTEX®

Since the dawn of the Jet Age, GENTEX has been the leader in high performance, high quality head protection. As a major supplier for the U.S. Armed Forces, GENTEX continues to be the innovative industry leader; engineering our products to exacting government specifications and using the finest materials available.

**ON LAND,** over a quarter century ago, GENTEX was the first to recognize that tank crews required a better head protection system. We responded by developing the Marine Corps MC-2. Then, a more advanced modular system, the DH-132®, was engineered offering superior head protection plus significant improvements in communications. Today, the expanded DH series remains the industry standard and is used by the U.S. Army, U.S. Marines, and Allied Armed Forces.

**IN THE AIR, GENTEX** combines high quality with high technology. The current USAF lightweight fighter pilot's helmet, the HGU-55/P, meets the most stringent requirements of the F-16's high G cockpit. Helicopter pilots rely on our lightweight SPH Series helmets, the latest in a long line of SPH helmets which have served the U.S. Navy, Coast Guard and Army for years.

**IN SPACE,** where there's no room for error, the first helmet NASA Shuttle astronauts reach for is the one GENTEX designed specifically for use during takeoff and re-entry.

Because we are a vertically integrated company, GENTEX is able to control the manufacture of our Life Support System components. We make our own lenses. We build our own respiratory and communications systems. We even weave the Kevlar® used in our most advanced designs. Our helmets are a composite of all our corporate skills, resulting in the production of the most advanced head protection systems in the world.

**GENTEX – First, in Life Support Systems.**

**GENTEX**
**Corporation**
P.O. Box 315
Carbondale, PA 18407

dent. Perhaps I will be able to contact a survivor.

David Stansfield
School House
Sharneyford, Bacup
Lancashire OL13 9UQ
England

**LeMay's 'Vette**

I am seeking information about and pictures of a particular 1963 Corvette that was shop-ordered by Gen. Curtis E. LeMay. The car can be described as follows:

Serial number 114, shop order number 10194, fuel-injected, four-speed transmission, power brakes, Positraction, special cold-weather solenoid installed at General Motors, split rear window, Hallibrand wheels, Sebring silver exterior, dark blue interior, specially made leather seat covers, wood-grain steering wheel, and carpet with scuff plates.

Anyone having any information on this automobile is asked to contact me at the address below.

Norma J. McClearn
345 N. Pitt St.
Mercer, Pa. 16137

**Vietnam Veterans**

As an active-duty personnel specialist, I have encountered many people. In my day-to-day dealing with people, I have met a very special group of gallant people. They are the Vietnam veterans. After hearing many stories of how life was for them in Vietnam, I was inspired to study and research the war.

Many of these people have stories to tell, but many of them do not want to relive that part of their lives for fear that no one will care or really listen. I have been studying the Vietnam War for two years now and would like to write a book about the Vietnam experience from the point of view of the vets and their families and loved ones. These very special people need to know that they are deeply respected and that there are people who do care about what they went through.

If you were connected with the Vietnam War in any way and would like the story told about what it was like then and what it's like now, please write to me at the address below. If you want to remain anonymous or would like to send things that you want returned, please indicate so in your letter.

SrA. Theresa M. Murphy, USAF
PSC #1, Box 3403
Grand Forks AFB, N. D.
58205-5370

**Atlantic Coast Patrol**

I am in the process of beginning research on the activities of the coastal patrol along the Atlantic during World War II. I am most interested in the two bases that were active in North Carolina during this period. One base was Coastal Patrol Unit #16 at Manteo, N. C., and the other was Coastal Patrol Unit #21 at Beaufort, N. C.

I am interested in obtaining any information about these two units and the people who were stationed with them. The men and women who staffed these posts were no less dedicated to the war effort than the many hundreds of thousands who went away over the oceans to fight. I hope to have a small part in telling their story.

Anyone having information on either of these two coastal patrol units is asked to contact me at the address below. Please be sure to include an accurate mailing address along with any information you have. A telephone number would also be helpful. Any and all assistance in this endeavor will be greatly appreciated.

Jim Belzer
3100 Tacoma St., Apt. 6
Charlotte, N. C. 28208

# AIRMAIL

**16th TCS/TATS**

I am researching the unit history of the 16th Transport Squadron, the 16th Troop Carrier Squadron, and the 16th Tactical Airlift Training Squadron from 1940 to the present.

I am interested in hearing from any aircrew member who flew in the 16th Troop Carrier/Tactical Airlift Training Squadron. I would also appreciate any slides, photographs, newspaper clippings, patches, or other personal memorabilia that could be given to the 16th TATS for a display case at the squadron.

Any assistance will be greatly appreciated. I can be contacted at the address below.

Capt. Kent Kysar, USAF
69 Spring Grove Dr.
North Little Rock, Ark.
72116-2642

**Axis POWs**

I am seeking names and current addresses of German or Italian prisoners of war who were interned at Wright Field, Dayton, Ohio, during World War II.

I am particularly interested in activities of the prisoners while at Wright and Patterson Fields, the locations where they were housed, and information regarding the wall paintings that still exist in Warehouse 281 at Wright-Patterson AFB.

Anyone having such information is invited to write to me at the address below.

Lois E. Walker
Wing Historian
2750th Air Base Wing/HO
Wright-Patterson AFB, Ohio
45433

**19th Fighter Squadron**

The 19th Fighter Squadron is planning to offer a limited-edition, hardbound book of the squadron's complete history, from its inception as the 19th Aero Squadron in 1917 through the summer of 1985. This will be the first ever published for the squadron and will include historical information, stories, action pictures, and photos of many of the past and present members of the squadron.

If you have any historical photos, information, maps, etc., that you feel should be included in the book to make it more informative, please send them to the address below. All items will be returned at the end of the project.

For more information, write the address below.

19th Fighter Squadron
History Book
31 Meeting House Rd.
Dalzell, S. C. 29040

**WW II Ranges in Michigan**

I am researching some of the many activities carried on in and around Eastern Michigan during World War II.

I would like to correspond with anyone familiar with the gunnery range operations conducted by the Army Air Forces on Lake Huron, just north of the city of Port Huron, Mich. I believe the fighter planes using this range were stationed at Selfridge Field, Mich.

Any help readers can give me would be greatly appreciated.

David A. Beulke
525 Kay St.
Hutchinson, Minn. 55350
Phone: (612) 587-8971

**Ardennes Air Ops**

I am carrying out research into the air operations during the Battle of the Bulge, particularly the bombing operations over the Belgian Ardennes in December 1944. The Eighth and Ninth Air Forces were involved in these missions.

I would like to ask for assistance from any former members of the 322d

# AIRMAIL

and 387th Bomb Groups, 9th Bombardment Division, Ninth Air Force. I would also like to hear from veterans of B-24 groups with the Eighth Air Force.

If you feel that you can assist me in documenting the activities of these units during this period, I would appreciate very much hearing from you.

J. Jacob
Fauconval 148A
B-5940 Huppaye
Belgium

**Missile Units**

I am seeking contact with anyone who was associated with SAC, TAC, ADC, USAFE, and PACAF missile units.

I especially need photographs depicting operational Matador, Mace, Snark, Rascal, Bomarc, Atlas, Titan, Minuteman, Jupiter, and Thor missiles and launch-support equipment. I also need any information pertaining to the Terracruzer launch vehicle.

I will pay for photocopying and postage. Please contact me at the address below.

Ronald Andrini
238 State St.
San Mateo, Calif. 94401

**Pacific Air Depots**

Air depots played an important part in the deployment of combat aircraft to operational units during World War II. The flow of many B-25 bombers to Pacific areas, especially to "Seventh Heaven," was through Oahu in the Hawaiian Islands. Deployment to this region was codenamed "Iron."

Oahu was also the site of the Hawaiian Air Depot, which refurbished B-25s for the 41st Bomb Group's deployment to Okinawa. The work was done in late 1944 and early 1945. At the end of hostilities, many of these planes were sent to Depot 7 at Clark Field in the Philippines. Most were condemned in November 1946 and salvaged in July 1949.

I am interested in making contact with anyone associated with the administration, physical preparation, and subsequent reclamation of these planes or with anyone otherwise familiar with the operations of these Pacific air depots. Please contact me at the address below.

Philip C. Marchese, Jr.
5753-32 Harwich Ct.
Alexandria, Va. 22311

**F-82 Twin Mustang**

I am researching the history of the F-82 Twin Mustang. I am looking for project engineers, pilots, crews, and radar technicians who can help me with the history of the development, deployment, and units of this aircraft. I am seeking answers to questions about engineering obstacles that had to be overcome, flight characteristics, aircraft maintenance, and radar maintenance.

On request, all photos and information sent will be copied and the originals returned. All letters will be answered immediately. Please send all correspondence to the address below.

Tom Massey
3051 S. 188th, #101
Seattle, Wash. 98188

**AFROTC Det. 905**

We are trying to establish a "Hall of Fame" of past graduates who received Air Force commissions through the ROTC program at the University of Idaho.

We would like to receive from alumni a biography and a recent, five-by-seven photograph. Please send this material to the address below.

AFROTC Det. 905
University of Idaho
Moscow, Idaho 83843

**Looking for . . .**

I am seeking information regarding the whereabouts of Edwin Benveniste.

Mr. Benveniste is a retired Air Force colonel and worked in Vietnam at Phan Rang City in 1968 and at Tra Noc in Can Tho City in 1971. In 1972, he left Vietnam for the Philippines, but returned to Vietnam a few times between 1972 and 1974. While he was in Vietnam from 1968 to 1972, he worked as a general manager for a company providing technical support and electronic services for A-37A and A-37B aircraft flown by the Vietnamese Air Force.

Mr. Benveniste has a legally adopted Vietnamese son who is still living in Vietnam. His son is trying to get in touch with his adopted father. Mr. Benveniste or anyone knowing his whereabouts is asked to contact me at the address below.

Chi M. Ha
3473 Goldendale Dr.
Dallas, Tex. 75234
Phone: (214) 620-0536

I hope that readers can aid me in reestablishing contact with some of my World War II friends who were stationed in India during 1942–46 at Reshra (near Diamond Harbor), Calcutta, India. I was a British receptionist working at Colonel Hamm's office.

I would like to hear from Colonel Hamm. In addition, I would like to learn the current addresses of Sgts. Ed Whittaker and Jack Goodlett, both of Austin, Tex., as well as those of Joe Kearney and William Harper, who were Douglas Aircraft Co. technical representatives. All of these people were mutual friends of my close friend, Edward Frederick Fries, who was the AAF Air Service Command disposal officer during the closing of the Bengal Air Depot at Calcutta. . . .

Is there an American reunion association for World War II AAF personnel and friends who worked during 1942–46 at this AAF base in Calcutta?

I would appreciate hearing from any of these people or from anyone who knew me when I was stationed at Calcutta. Please contact me at the address below.

Sheilagh Thornycroft
7 Wesley Ct., Bush St.
Pembroke Dock
S. W. Wales, SA72 6NE
England

I hope that readers can assist me in locating a World War II flyer who served in Europe.

Joseph I. Preston was an officer in the Army Air Forces when his plane was shot down over Germany in early 1945. He was helped to safety by a German citizen who, incidentally, exposed himself to great risk in doing so. This gentleman has since lost contact with Mr. Preston and wrote to me seeking help.

All the avenues that I've pursued with the military have been dead ends, but I hope that Joseph Preston or someone who knows the whereabouts of Mr. Preston will see this letter and come forward with useful information. Mr. Preston is known to have lived in the Los Angeles area as well as in Cedar Rapids, Iowa.

Anyone having any information should contact my office in Washington. I would be grateful for any assistance that readers might provide.

Rep. G. William Whitehurst
2469 Rayburn Building
Washington, D. C. 20515
Phone: (202) 225-4215

I am searching for any information about the military career of Cpl. Harry Super, a member of the 682d Air Materiel Squadron, 432d Air Service Group. Corporal Super was killed in early May 1945 while he was stationed in England. He was from Minneapolis, Minn.

## Air Force Association Balance Sheets

| Assets | December 31, 1984 General Fund | Life Membership Fund | Total | December 31, 1983 General Fund | Life Membership Fund | Total |
|---|---|---|---|---|---|---|
| *Current Assets* | | | | | | |
| Cash plus marketable securities at cost | $ 6,326,884 | $3,256,561 | $ 9,583,445 | $ 6,029,080 | $2,075,236 | $ 8,104,316 |
| Receivables, inventories, and prepaid expenses | 2,355,859 | 706,662 | 3,062,521 | 2,000,805 | 693,577 | 2,694,382 |
| *Other Assets* (including fixed assets, funds on deposit, etc.) | 7,357,413 | | 7,357,413 | 4,433,227 | | 4,433,227 |
| Total Assets | $16,040,156 | $3,963,223 | $20,003,379 | $12,463,112 | $2,768,813 | $15,231,925 |
| **Liabilities and Fund Balances** | | | | | | |
| *Current Liabilities* (including payables, accrued expenses, etc.) | $ 2,675,759 | | $ 2,675,759 | $ 2,667,394 | | $ 2,667,394 |
| *Deferred Revenue* (including advance membership dues and magazine subscriptions) | 1,241,098 | | 1,241,098 | 1,487,181 | | 1,487,181 |
| *Long-Term Debt* | 5,016,375 | | 5,016,375 | 2,007,000 | | 2,007,000 |
| *Fund Balance* | 7,106,924 | $3,963,223 | 11,070,147 | 6,301,537 | $2,768,813 | 9,070,350 |
| Total Liabilities and Fund Balance | $16,040,156 | $3,963,223 | $20,003,379 | $12,463,112 | $2,768,813 | $15,231,925 |

Any information about Corporal Super would be helpful. Please contact me at the address below.

David Super
5422 Brixham Ct.
Burke, Va. 22015

I would like to get in touch with CWO Joseph Bacon, Jr., USAF. He was an instructor at F. E. Warren AFB, Wyo., in 1952 and 1953.

It is important to me that I reach Mr. Bacon as soon as possible. Anyone having any information as to where I might find him is asked to contact me at the address below.

Walter D. Moorehead
7115 Aetna Rd.
Cleveland, Ohio 44105-1455
Phone: (216) 429-0822

### Collectors' Corner

I am in the process of accumulating variations of US wings and aviation officer collar devices from the early Aviation Section of the Signal Corps and Army Air Service to modern varieties. These would be for eventual display at the Air Force Academy.

I would like to make contact with collectors of US wings who would like to donate them to my collection or who could offer these items for sale. To complete the display, I specifically need a number of variations of the pre-1940 "prop and wings" and early Aviation Signal Corps collar devices.

Any help would be appreciated. Please include names and known histories. Any donations will be acknowledged.

Ken White
2309 Thorndale Ct.
Elkhart, Ind. 46517

## Air Force Association Statements of Revenues and Expenses

| General Fund | Year Ended December 31 1984 | 1983 |
|---|---|---|
| *Revenues* | | |
| Membership | $2,452,128 | $2,178,483 |
| Patronship | 216,793 | 182,579 |
| Magazine | 2,988,096 | 2,387,748 |
| Industrial Associates Program | 129,818 | 96,790 |
| Date Processing Services | 104,706 | 114,683 |
| Insurance Programs—Administration | 1,745,534 | 1,628,731 |
| Annual Convention | 375,095 | 346,147 |
| Aerospace Development Briefings | 803,873 | 848,050 |
| Other Income and Expenses—(Net) | (7,953) | 106,814 |
| Total Revenues | 8,808,090 | 7,890,025 |
| *Expenses* | | |
| Membership | 3,143,354 | 2,846,551 |
| Patronship | 224,348 | 206,241 |
| Magazine | 2,453,576 | 2,075,758 |
| Industrial Associates Program | 110,973 | 102,483 |
| Data Processing Services | 357,865 | 308,438 |
| Insurance Programs—Administration | 2,604,532 | 2,301,424 |
| Annual Convention | 482,665 | 399,597 |
| Aerospace Development Briefings | 418,819 | 421,769 |
| Total Expenses | 9,796,132 | 8,662,261 |
| Net (Loss) from Operations | (988,042) | (772,236) |
| *Non-Operating Revenues* | | |
| Investment Income | 916,186 | 727,903 |
| Insurance Programs—experience credits and interest on reserves | 873,493 | 933,394 |
| Net Income—General Fund | $ 801,637 | $ 889,061 |

Expenses include chapter commissions, state commissions, and other direct support for field units totaling $577,921 in 1984 and $522,223 in 1983.

| Life Membership Fund | | |
|---|---|---|
| Revenues from Investments | $279,274 | $148,225 |
| Less: Transfer to General Fund for annual dues | 222,432 | 126,864 |
| Net Income—Life Membership Fund | $ 56,842 | $ 21,361 |

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

# CAPITOL HILL

By Kathleen G. McAuliffe, AFA DIRECTOR OF LEGISLATIVE RESEARCH

Washington, D. C., May 28

## MX Cap

The Administration will have to suggest a different basing mode for MX if it wants more than fifty missiles deployed. The Senate voted overwhelmingly to cap MX deployment in existing Minuteman silos at half the 100 planned, approving only twelve of the forty-eight missiles requested in FY '86. The number of missiles procured the following year would be limited to between twelve and twenty-one, depending on the most efficient production rate, and these could be used only for spares and testing purposes.

The President, in agreeing to the MX compromise, committed himself to a reexamination of alternative basing options, to include elements of deception and mobility, according to Sen. Sam Nunn (D-Ga.), a sponsor of the proposal. The Senator and other supporters of the MX cap, however, also expect the Administration to review other strategic options, such as acceleration of the Trident and "Midgetman" programs. They believe that fifty MX missiles will provide sufficient prompt hard-target kill capability to give the Soviets incentive to negotiate reductions in Geneva, but that the Soviets won't perceive the fifty MXs as posing a first-strike threat. The Air Force, however, told Congress that deploying such a low number of missiles would not constitute a significant military capability.

## Defense Budget Freeze

The House cut deep into defense in its government-wide $56 billion deficit-reduction budget recommendation, freezing FY '86 defense budget authority at the current level of $292.6 billion. The cut amounts to forty-nine percent of all deficit-reduction savings for next year.

In earlier action, the Senate narrowly approved a defense budget for FY '86 that grows only enough to cover inflation. The Senate level would provide $302.5 billion next year. Both budget versions would allow three percent after-inflation increases in the following two years.

House proponents believe the freeze will still provide an adequate defense. But Sen. Barry Goldwater (R-Ariz.), chairman of the Senate Armed Services Committee, said that even the higher Senate level adds up to no more than a "stand-still" budget at a time when potential adversaries are not standing still.

The House action sets the stage for an even split in a House-Senate compromise, possibly resulting in a negative two percent growth for defense.

## SDI Funding Cut

The House and Senate Armed Services Committees strongly endorsed the President's Strategic Defense Initiative (SDI), recognizing its importance to arms-control negotiations and to keeping pace with Soviet efforts in strategic defense. However, the panels recommended significant cuts in the FY '86 request of $3.7 billion. SDI is the largest R&D program in the DoD budget.

The House panel expressed satisfaction that SDI was making significant technical progress, but cut the request by one-third, or $1.2 billion. The House allocated the reduction among five specific program elements, while the Senate recommended leaving allocation of its $750 million cut to the discretion of the program manager. Rep. James Courter (R-N. J.), a member of the House panel, criticized the House cuts, arguing that they were focused on areas that offer the greatest near-term potential. He claimed this action will delay a decision on strategic defense program development by two years.

The Senate wants SDI to put greater emphasis on near-term defense options. These include programs to defend US strategic offensive forces and to defend critical military facilities in Europe as a hedge against Soviet proliferation of missiles aimed at NATO.

## Defense Programs Terminated

The House Armed Services Committee terminated thirty weapons procurement programs totaling $2 billion as part of an $18.5 billion cut in the Administration's defense request. The committee protected the personnel and operations accounts, taking the bulk of its reductions from the investment areas of R&D and procurement.

The FY '86 DoD Authorization plan recommended by the committee provides no real growth overall and makes an actual cut of two percent in weapons procurement. Committee chairman Rep. Les Aspin (D-Wis.), who charged the Pentagon with receiving $18 billion in excess appropriations over the last four years because of lower than anticipated inflation, explained that the panel wanted more defense, not more production lines.

The Advanced Medium-Range Air-to-Air Missile (AMRAAM), the Sparrow follow-on, was among the program terminations. The program is running two years behind schedule and has risen from $6.7 billion to $8.4 billion in total program cost.

## F-20 Buy

The House Armed Services Committee wants the Northrop F-20 included in the USAF aircraft buy next year. The F-20, as proposed by the manufacturer, would be less costly to buy and operate than the more capable F-16.

The panel directed the buy of a minimum number of F-20s and F-16s and initiated a competition for the remaining tactical fighters required. All suitable aircraft, including the F-16 and F-20, will participate in the competition. Accordingly, the F-16 procurement was cut from 180 to 150 in FY '86. The committee believes competitive procurement for tactical fighters will yield long-term cost savings on a per unit basis.

The recommendation reflects the committee's view that DoD should rework procurement plans to accommodate increased budget austerity. In line with this, the panel suggested that USAF modify its tactical force modernization program in order to achieve the planned goal of growing from thirty-six to forty tactical fighter wings by 1991 by considering such options as increasing average fighter age and changing the force mix. ■

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In early April, for the 52nd time in as many consecutive weeks, the USAF Military Airlift Command (MAC) accepted a new Learjet C-21A. Since delivery of the first aircraft on April 6, 1984, the USAF C-21A fleet has achieved a mission capable rate in excess of 95 percent. Well above the required 85 percent rate.

In performing its missions of passenger airlift, medical evacuation, and high priority cargo transport, the C-21A fleet has accumulated over 18,900 flight hours and 20,000 landings. In the U.S., Europe and the Far East.

Its sophisticated, well-integrated and reliable systems and equipment provide a cost-effective platform to hone the skills of newly rated pilots and retain the high-level proficiency of veteran crew members.

By October, the Air Force will have taken delivery of 80 C-21As, and the remaining six bases will be operational. And Gates Learjet will continue staying close to all 80 aircraft, providing total logistics support. Our subsidiary, Gates Learjet Aircraft Services Corporation (GLASCO), will continue to ensure that C-21A maintenance manhours per flight hour and overall operating costs remain but a fraction of its USAF CT-39 predecessor.

The C-21A. A U.S. product proudly representing the high quality standards the U.S. Air Force demands of itself and its aircraft. At home and abroad. And ready to meet additional rigid requirements of future Air Force missions.

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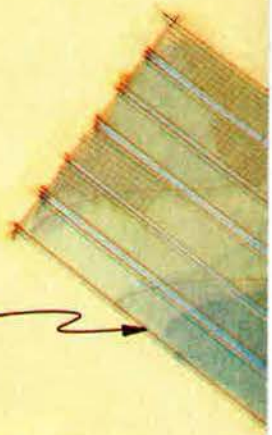
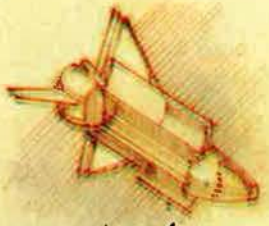
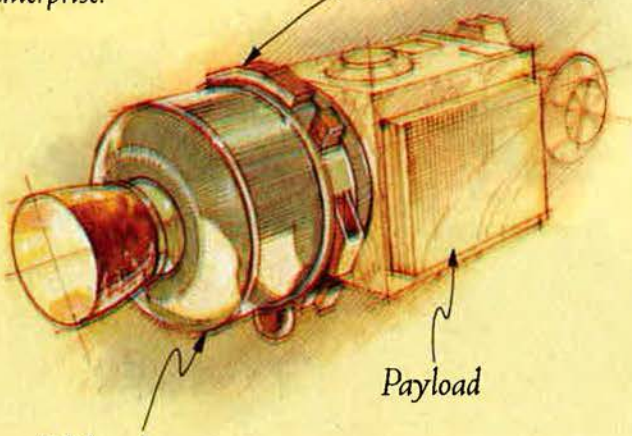
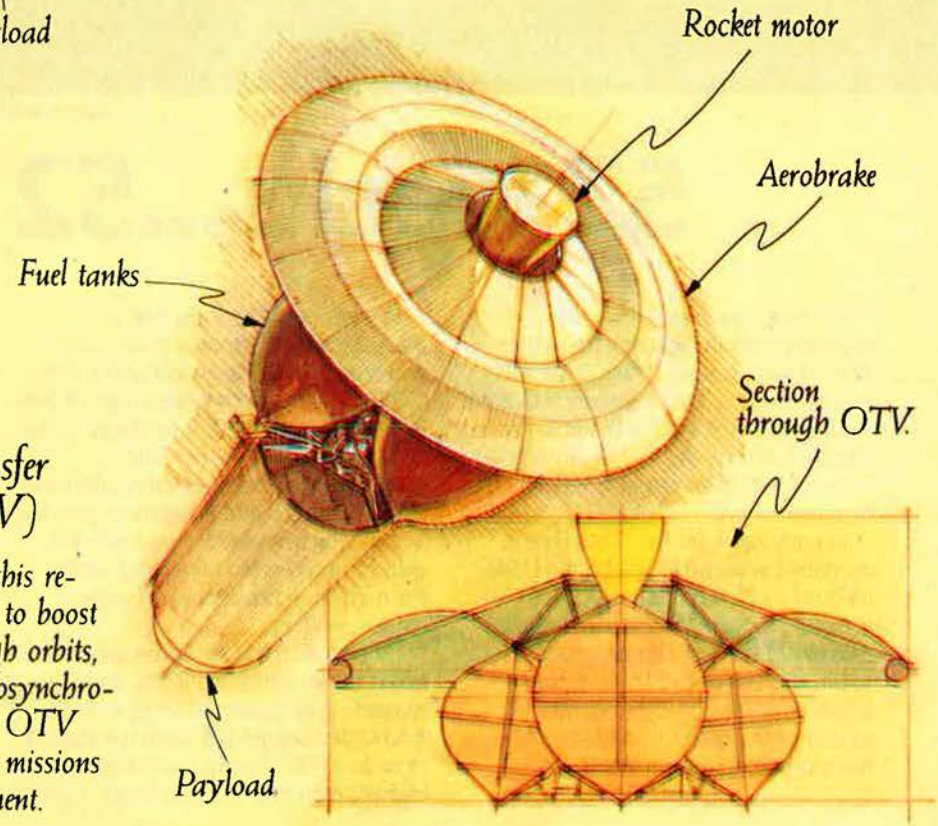



## Transfer Orbit Stage (TOS)

The TOS will boost spacecraft and payloads from the Shuttle's low Earth orbit to geosynchronous transfer orbit.




## Orbital Transfer Vehicle (OTV)

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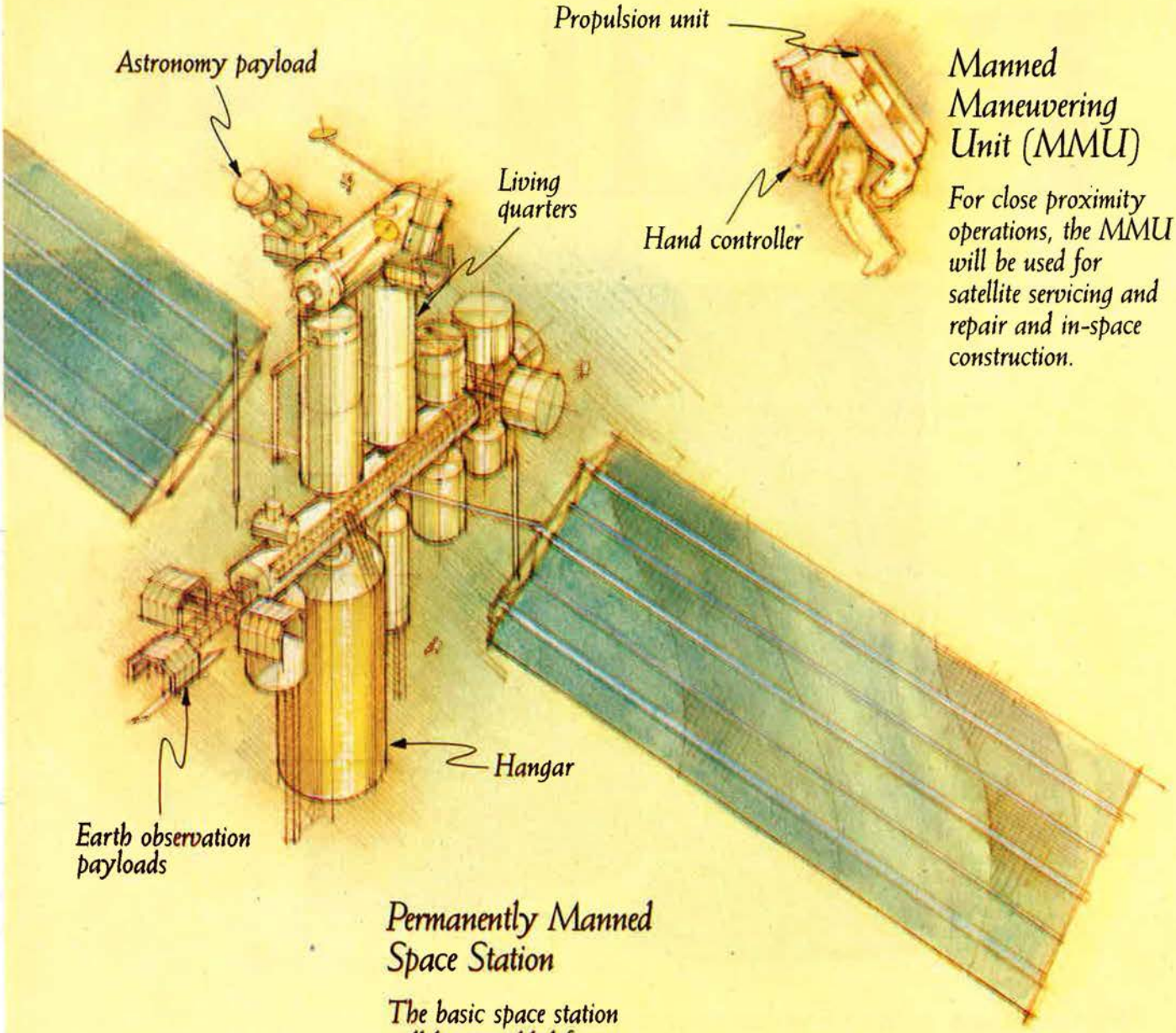


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# IN FOCUS...

# MX Halved—Again

**By Edgar Ulsamer,** SENIOR EDITOR (POLICY & TECHNOLOGY)

*The far-from-hawkish Carter Administration proposed 200 missiles. Deployment of fifty or fewer would be dangerously below the minimum number essential to preserve deterrence.*

Washington, D. C., June 3

The US Senate voted to hold deployment of the ten-warhead MX ICBM to fifty missiles rather than the 100 requested by the Administration and the Pentagon. The vote on May 23 approved an amendment to the FY '86 defense authorization bill that was offered by Sen. Sam Nunn (D-Ga.). This amendment cut production of the MX to twelve in FY '86. The Administration had asked for the authority to build forty-eight MX missiles next year. This Senate action leaves the door open for the eventual deployment of 100 missiles if the Air Force can come up with a basing mode that Congress deems less vulnerable to a Soviet first strike than the present scheme of placing these weapons in refurbished Minuteman silos.

The Administration accepted the amendment after lengthy negotiations with Senator Nunn that resulted in raising the number of missiles authorized for deployment from forty to fifty and that changed the nature of the ceiling from a permanent "cap" to, at least technically, a pause. "Damage limitation" appeared to be the motive behind the Administration's acceptance of this halving of this country's only force able to put hardened Soviet targets at risk in a reliable and rapid fashion.

The overwhelming nature of the vote—78 to 20—tends to confirm the Administration's wisdom in not trying to negate the effects of the amendment by a Presidential veto of the entire FY '86 defense authorization bill. The clear and present danger associated with accepting this compromise so early in the legislative cycle, however, is that it creates the incentive for the other chamber and the appropriations committees to reduce the number of deployed MX even further. Administration insiders reject this contention, claiming that the White House has not abandoned the requirement for 100 missiles capable of deploying 1,000 warheads but only agreed to a change in schedule.

The initial, visceral reaction in the Pentagon to acceptance of what might be considered a political inevitability was to "declare victory—because the MX program is still alive"—and to start work on a more survivable basing mode for the second fifty missiles. Some defense supporters on Capitol Hill suggested interim measures involving upgraded Minuteman ICBMs. There appears to be no Air Force support for such stopgap measures.

Whatever the eventual outcome, holding deployment of MX to fifty—or possibly even fewer—missiles makes little sense in terms of national security and plays into the hands of those forces in Congress bent on scuttling the MX weapon system.

The MX concept proposed in the waning days of the far-from-hawkish Carter Administration centered on the deployment of 200 MX ICBMs in at least 4,600 "multiple protective shelters" in shell-game fashion. This concept included the options of increasing the number of "aimpoints," or targets, that the Soviets would have to cover as well as eventually boosting the system's survivability by adding a dedicated ballistic missile defense.

Shortly after taking office, the Reagan Administration dropped the multiple-protective-shelter approach and put its imprimatur on the so-called closely spaced basing concept that capitalizes on the "fratricidal effects" of nuclear weapons detonating close to one another in time and place. By means of closely spaced, superhard silos, this basing mode was said to achieve comprehensive survivability for a period of several hours against even the most proliferated missile attacks imaginable.

The Air Force argued quite credibly that several hours in a strategic nuclear war constitutes an eternity, for it buys the time necessary to bring into play the slower bomber and cruise missile forces as well as the weapons of last resort, the submarine-launched SLBMs. Congress, however, turned thumbs down on the closely spaced basing mode, which had acquired the derisive sobriquet "Dense Pack."

Following that setback, the Reagan Administration settled for deployment of 100 MX ICBMs in a like number of existing Minuteman silos as the minimum essential hard-target kill capability necessary to back up the other elements of the strategic triad. The cut in deployed missiles was expected to win over even inveterate arms-control ideologues, since a force of 100 MX ICBMs is demonstrably well below any credible first-strike force level.

Halving what at best constitutes a minimum essential strategic capability is bound to erode both the US ability to deter and the prospects for equitable arms-control agreements. It also flies in the face of the Soviet threat and what it takes to counter it.

The just completed FY '86 Report of the House Armed Services Committee (HASC) defined that threat and the required countervailing measures brilliantly. Fundamental here is the conclusion that the Soviets come at deterrence—depending on whether it is the US or the USSR that is doing the deterring—in two different ways. This sophistry is hardly a new wrinkle in Marxist dialectics and results in the use of two different Russian words for the term deterrence, according to this analysis.

The US concept of deterrence is shrugged off with the Russian word *ustrashenie,* meaning to hold in fear. The Kremlin wants no part of this approach. What the Soviets reserve for themselves is *sderzhivanie,* meaning to hold in check (such as a wild animal) or to restrain the onslaught of an attacker.

Enduring, successful deterrence, the HASC report finds, "requires that the US be able to put at risk Soviet government and party control, shelters for the leadership, the strategic rocket forces, the Soviet Army, and their $C^3$ and support."

This country's strategic targeting philosophy has undergone several mutations, according to the report. In the earliest days of the nuclear age, the targets were mainly cities. Later, strategic forces and the means of economic recovery were emphasized. US strategic forces were structured accordingly. As the report points out, "The realization that [yet another] target set was needed is relatively new" and hinges mainly on the fact that many pivotal targets in the Soviet Union are being hardened and provided with dedicated defenses. The Soviets have "constructed a network of hundreds of underground shelters all over the [country] for nearly every level of Soviet national authorities, both military and civilian. Literally hundreds of thousands of Soviet authorities can be sheltered in this bunker archipelago. Further, the shelters around Moscow are defended by the ABM system."

Of special importance in terms of the rapid hard-target kill capability that only MX can furnish is the fact that the targets in the Soviet Union are now "more time-sensitive. The highest level of Soviet civilian and military command will be involved in the command and control of a strategic attack, presumably from fixed command posts. The command authorities will have to be able to disperse rapidly, as soon as the attack is under way. The command authorities and their communications facilities will only be vulnerable if they are hit almost immediately."

The same is true, the report points out, of mobile missiles and other military units: "They may be kept in garrison to avoid giving warning, but they will plan to disperse immediately."

By dint of hardening and dispersing, "the Soviets have effectively moved some targets out from under [threat by] our existing strategic forces. Minuteman, Poseidon, and the bombers are technically incapable of putting at risk the hardened, time-sensitive targets needed to enforce deterrence. We therefore need to provide some new capability to threaten this class of targets," according to this analysis.

The committee's report points out that although MX is vulnerable because of its basing mode, this weapon "is capable of very rapid response and great accuracy." As a result, "the Soviet ICBMs and command authorities are no longer safe in a sanctuary, but are at risk." The HASC report, of course, was framed before the Nunn amendment was passed by the Senate. That amendment greatly diminishes US ability to deny this sanctuary to the Soviets.

# IN FOCUS...

But cutting the MX deployment to fifty or fewer missiles does more than just impair the effectiveness of the US deterrent or diminish arms-control leverage; it also does violence to the economics of the MX program. The key reason for this is that the number of MX ICBMs needed for long-term testing is not determined by the size of the deployed force.

Several fundamental considerations peg the minimum number of missiles needed for operational test and evaluation (OT&E) as well as for "aging surveillance," based on an assumed fifteen-year lifespan of MX. The OT&E tests need to demonstrate on a continuous basis that the weapon will work well and reliably in an operational environment.

In specific terms, OT&E testing provides the only "end-to-end" operational demonstration of the weapon's effectiveness and reliability, from system availability and alerts through reentry vehicle impact. This takes in testing of command control and communications ($C^3$), logistics, connectivity, and missile crew proficiency. The bottom line, of course, is to demonstrate that the MX, with clockwork accuracy, can hit the targets specified by the Single Integrated Operational Plan (SIOP).

This need to reconfirm the effectiveness of MX over a fifteen-year period—in line with the standards set by the Joint Chiefs of Staff and Strategic Air Command—requires 108 OT&E test missiles. Aging surveillance requires an additional fifteen systems that randomly would be cut up to check on the condition of the propellants and related internal components. These 123 missiles will be needed regardless of the ultimate number of weapons deployed. In addition, if MX were to remain in the operational inventory for a period significantly longer than fifteen years, the number of test missiles required to maintain a continued high level of confidence in the system's reliability and effectiveness would obviously increase. The same is true if MX missiles were needed in connection with tests of the proposed Strategic Defense Initiative (SDI).

The MX's OT&E program, in accordance with guidance formulated by the Joint Chiefs, is divided into two phases. The numbers in these two phases are kept at levels significantly lower than for such comparable ballistic missile programs as Minuteman, C-4 (Trident I), and Pershing II.

Phase I involves twenty-four missiles and covers the first three years of the weapon's design life. This phase of the MX test schedule will provide basic empirical information—the "baseline" for SIOP reliability planning. The second phase will involve eighty-four missiles and cover the remaining twelve years of the MX's design life. By way of a comparison, the OT&E program of the three Minuteman versions combined involves 499 missiles; Trident I, 334 missiles; and Pershing II, 120 missiles.

The MX OT&E program obviously accepts risks for the sake of cost savings. It contains no contingency plans for system modification and extended service life, even though past experience in the ICBM field suggests a high likelihood that both eventualities might occur. Stretching an ICBM's life cycle beyond the original cutoff—and thus beyond the availability of test articles—makes it difficult to detect performance and reliability degradations. In the case of Minuteman II, for instance, only twenty-one OT&E missiles are left, and yet the system is expected to remain operational through 1999. The austere approach to testing associated with the liquid-fueled Titan II meant that the last OT&E launch occurred in 1969. But the last Titan ICBM won't be taken out of the operational inventory until September 1987.

Confining the operational deployment of MX to fifty weapons would cut in half this country's principal tool for holding at risk that which the Soviets deeply hold dearest—the state's political infrastructure and the means for surviving and eventually recovering from a nuclear war. It is ironic that these severe limits on this country's most unambiguous means for deterring nuclear war would cut the overall cost of the MX program only by thirteen percent, or about $2.8 billion. This equates to poor defense and poor economics.

## Congress Scrutinizes Strategic Requirements

In reporting on the National Defense Authorization Act for FY '86, the Armed Services Committees of both

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**Milton, Florida.** A night crew worked to get as many as 242 Navy T-34C trainers ready for an intensive training schedule. The Navy expects nothing less, and has scheduled more than 800 flight hours from Whiting Field for the day. BASI.

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TEXAS INSTRUMENTS

27-3455

chambers gave close scrutiny to USAF's strategic bomber programs as well as the new small ICBM (SICBM). In asking for comprehensive information concerning the nature and interaction of these weapons, both committees expressed support for the Air Force's two-bomber program—consisting of the B-1B and the "Stealth" advanced technology bomber (ATB)—but at the same time sought reassurance about the mix of the two weapon systems.

The Senate Armed Services Committee (SASC) complained, for instance, that it had not been shown any recent analyses that support the specific numerical mix of these two weapon systems and the resultant force structure proposed by the Air Force. In particular, the SASC expressed the belief that "such factors as bomber force requirements, relative cost, and relative effectiveness (including payload and probability of delivering weapons on target) of alternative delivery platforms, as well as the leverage associated with challenging Soviet defenses with very low observable and electronic countermeasures, should be incorporated in an updated analysis of the future strategic bomber force." Both the Senate and the House requested that the Department of Defense submit such a study to Congress by December 1, 1985.

Both committees questioned how the pending termination of B-1B production will affect cost trends for the ATB. Referring to the ATB as a "technical unknown," the House Armed Services Committee (HASC) pointedly cautioned that, "under current DoD plans, all competitive forces will be removed from the bomber acquisition area" after 1986, the end of the B-1B buy. Taking a more sanguine stance, the SASC noted that "Administration witnesses provided assurances that the competition, which has provided cost-control incentives in the two-bomber program to date, would be replaced in the follow-on bomber program, [the ATB], by internal cost-control mechanisms." The Senate report stressed that the "committee has been extremely pleased with the progress of the B-1B program in meeting cost and schedule objectives. The program is ahead of the original schedule, as indicated by the maiden sortie of the first production aircraft five months ahead of the contractual schedule, and the committee remains convinced that the program remains within budget."

Perhaps because of this high confidence in the B-1B program, such supporters of the ATB as Sen. Robert D. Byrd (D-W. Va.) and Sen. Sam Nunn (D-Ga.) put provisions into the Defense Authorization that, in ironclad fashion, rule out the possibility that funds allocated to the ATB and the Advanced Cruise Missile (ACM) programs could be shifted to the B-1B program, especially for the acquisition of more than 100 aircraft. These provisions—contained in an amendment offered by Senator Byrd and approved in plenary session—also designate ATB and ACM as "critical" to national security and mandate their expeditious development.

# IN FOCUS...

The two Armed Services Committees qualified their endorsement of the requirement for SICBM, colloquially referred to as "Midgetman," by raising some questions about its proposed basing mode and "baseline." The committees, in unison, emphasized the merits of mobile deployment for Midgetman and played down the benefits of housing this ICBM in superhard silos.

The House Armed Services Committee asserted that "mobile basing . . . is a more effective approach" and added "that eventual increases in Soviet accuracy will reduce the exchange ratio to unity, that is, one Soviet warhead for each superhard silo, no matter how hard."

The SASC expressed similar strong support for mobile basing but expressed doubts about the need to hold the design to 30,000 pounds. The panel was concerned about "the extent to which the existing weight constraint has resulted in tradeoffs affecting the payload or other features of the small ICBM that relate to its military effectiveness, survivability, or cost." Specific areas of concern cited by the SASC report include the absence of provisions for penetration aids, including evasive MaRVs (maneuvering RVs). The affordability and effectiveness of Midgetman as currently "baselined" were also questioned intensely by the committee: "For example, the current baseline guidance concept is very costly for a single-warhead missile and may restrict basing options."

The Senate Armed Services Committee also urged that a range of additional mobile basing options be considered, "including those that take advantage of the existing infrastructure of our Minuteman missile basing complex." The Air Force, therefore, was directed to report "on the payload, guidance, propulsion, and other tradeoffs that have been required by the existing schedule or by weight constraints and to provide information concerning additional tradeoffs between mobility, guidance, and payload options that exist in single-warhead missiles up to the Minuteman weight class." The committee asked further that these mobility analyses and comparisons "not be limited to launchers that afford thirty psi [pounds per square inch] hardness levels, but should include the consideration of lower hardness levels and more dispersed basing locations, such as would be available at existing Minuteman facilities."

The Air Force is to provide this report by September 1, 1985, to permit time for Congress to review it prior to initiation of full-scale development. In addition, Congress requested that "an independent review of the small missile and basing options be conducted by the Defense Science Board.

"The results of this review should be provided to the Committees on Armed Services of the House and Senate prior to submission of the FY '87 defense budget."

### Washington Observations

★ Two types of weapon systems could make difficult a credible, effective strategic defense, according to White House Science Advisor Dr. George A. Keyworth II: Depressed-trajectory SLBMs that might underfly most of the interceptors of the Strategic Defense Initiative, as currently envisaged, and the deployment of large numbers of low-observable, "nap-of-the-earth" cruise missiles.

For the time being, the Soviets do not appear to have either of these weapons in their inventory or near production.

★ While Congress is dillydallying over whether the Administration's request for deployment of 100 operational MX ICBMs should be "capped" at either forty or fifty weapon systems, US intelligence sources report that the Soviets are deploying new ICBMs at a rate of almost 100 per year. These new weapons parallel the MX's payload.

★ There are about 7,000 hard targets in the Soviet Union. These include at least 2,500 strategic nuclear delivery vehicles capable of firing more than 6,000 counterforce weapons against the US, Sen. Malcolm Wallop (R-Wyo.) disclosed recently. ■

# Litton introduces innovative, winning technology.



*LN-12 INS Family*



*LN-15 INS Family*



*LN-30 INS Family*



*LN-90 RLG Family*



## 1954---

With vision and courage Litton Industries invested heavily in adapting the then unwieldy inertial technology to navigation systems for manned aircraft.

Innovative all-attitude, no-gimbal-lock platforms combined with two-degree-of-freedom gyros and simple floated-pendulum accelerometers reduced dramatically the number and size of sensors used by single-degree-of-freedom gyro-based systems.

Using analog computers, these pioneering systems performed in the 2-3 nm/hr category as early as 1957 in operational military aircraft.

## 1964---

The key to next-generation navigation was the gas-spin bearing gyro which was less than half the weight of its predecessors. Litton's new gyro permitted longer life, better long term stability, and reduced mass shift problems. New digital computers replaced analog, pancake synchros were developed, and Kalman filter techniques were implemented within the inertial systems.

Aircraft-type navigators were introduced to the U.S. Navy and also to surface ship gyrocompasses to replace 1800 pound gyrocompass assemblies.

This platform operated in the 1 nm/hr category.

## 1974---

Our 3rd generation navigation system was designed for higher performance with low-life-cycle costs.

A cantilevered gimbal assembly resulted in reduced volume and assembly time permitting sensor element preassembly for later installation. Servo electronics mounted directly onto the gimbals permitted fewer slip rings. A 2-degree-of-freedom dry, tuned-rotor gyro reduced costs and improved performance. A low-cost dry flexure, supported, torque-to-balance accelerometer replaced the floated type.

Overall weight reductions brought the platform to under 8 pounds.

## 1984---

Litton's 4th generation navigation systems represent state-of-the-art advances in two important areas; computer evolution and ring laser technology.

New, small, high-powered computers permit the elimination of all gimbals from INS systems. Similarly, advances in Ring Laser science replace spinning wheel gyros, increasing both producibility *and* reliability simultaneously.

In designing its RLG, Litton avoided the early industry triangle mindset and selected the square laser "ring" because of its superior backscatter characteristic, reducing gyro volume.

## 1990---

Looking beyond ring laser technology, Litton is leading the way in fiber-optic sensor development by sponsoring significant research at leading universities and by making heavy internal R&D commitments in fiber-optic sensor technology.

Litton sponsored research has already demonstrated the capability of fiber-optic gyros to meet performances of a typical RLG. We anticipate that fiber-optic gyros will provide performance to meet the most demanding requirements of both accuracy and environment for earth-based and space-based inertial systems.

1,000,000 gallons of cooling water will flood into its three rocket exhaust ducts in twenty-three seconds (this creates the large "steam cloud" seen at all the launches at Cape Canaveral).

In addition to the launch facilities, Vandenberg now has a three-mile runway for Shuttle landings. Vandenberg and Kennedy Space Center are primary Shuttle landing sites, with Edwards AFB, Calif., as backup. After landing, each Shuttle will be towed to a new $46 million hangar, and preparations will start for its next mission.

★ A new sensor/tracker pod enabling an aircraft's fire-control computer to decide where the aircraft must be—and then to direct the flight-control system to get the aircraft there to deliver weapons against a specific target—has entered flight-testing. The Westinghouse forward-looking infrared (FLIR) sensor/tracker system is being tested at Edwards AFB, Calif., aboard the AFTI/F-16 (Advanced Fighter Technology Integration) aircraft.

The AFTI/F-16 program, managed by Aeronautical System Division's Flight Dynamics Laboratory, is a tri-service program that also includes participation by the National Aeronautics and Space Administration (NASA). Technologies tested aboard the AFTI/F-16 are designed to improve and help automate future fighters, reduce the pilot's work load, and allow him to concentrate on performing his primary mission, which is managing his weapon system.

The sensor/tracker pod is mounted conformally in the wing strake to reduce drag and to provide a "look-up" capability as well as the usual "look-down" and "look-back" capabilities. The sensor/tracker's FLIR provides directional information for use against either ground or airborne targets. A laser designator/ranger provides ranging information.

In the first flight test of the new system, the sensor/tracker pod successfully performed both air-to-surface and air-to-air target tracking functions. Further testing of the system, which will run through the summer of 1986, will include flight demonstration of automated head-on aerial gunnery and automated low-altitude delivery of conventional bombs. Bomb attacks will be performed at altitudes as low as 200 feet, with bomb release during a horizontal 5-G turn.

This summer, the FLIR laser system is being integrated with the AFTI/F-16 flight- and fire-control system by means of a software update. Flight verification of the total, integrated system will then begin. These tests are part of Phase II of the automated maneuvering and attack system (AMAS) portion of the AFTI/F-16 program that has been under way since July 31, 1984.

Flight test of the full AMAS system will include use of a helmet-mounted sight for cuing target sensors; an advanced, triplex digital control system; standard avionics integrated fuzing to enable the fire-control system to fuze weapons automatically just prior to release; a color, digital map with autonavigation features; a voice system for pilot control of subsystems and feedback responses; and additional advanced cockpit display technologies.

After Phase II testing is completed in mid-1986, the aircraft will be available for further modification and testing of emerging technologies. Phase I testing of the AFTI/F-16 in 1982 and 1983 evaluated the then brand-new digital flight-control system.

★ The new unified command for space (USSPACECOM) will be located at Colorado Springs, Colo., as recommended by the Joint Chiefs of Staff. The US Air Force is completing an environmental impact assessment, which is expected to result in a favorable recommendation. Locating the headquarters in the Colorado Springs area will reduce costs associated with establishment of the new command because the Department of Defense will be able to exploit the significant investment it has already made in facilities there.

USSPACECOM will centralize operational responsibilities for more effective use of communications, weather forecasting, navigation, and warning space systems, DoD says. The new command will improve utilization of our current systems and will enhance planning for future use of them as well as follow-on systems.

A unified command normally has at least two service components, according to Title 10, United States Code, and DoD directives. Although the JCS has not yet decided on the exact component composition of the new command, the existing Naval and Air Force Space Commands are logical components, with the Army playing a role as well. The JCS have established a new Joint Staff directorate, the Joint Planning Staff for Space, to develop the necessary transition plans.

***The USAF Advanced Fighter Technology Integration AFTI/F-16, equipped with a new forward-looking infrared (FLIR) tracking system, flies with a T-38 chase plane over Edwards AFB, Calif. The FLIR is attached at the wing root.***

★ The *Independence*, a ship designed to retrieve the costly solid-rocket boosters to be used in West Coast Space Shuttle operations, has been launched at the Halter Marine Inc. shipyard at Moss Point, Miss. It is similar to two other booster retrieval ships operated off the coast of Florida for Shuttle launches out of Cape Canaveral.

The giant boosters are jettisoned during each launch sequence after their propellant has been exhausted. The boosters are buoyant and float in the sea until located by the retrieval ships, which are specially equipped to hoist them on board and return them to the launch base for reuse. "A new set of solid-rocket boosters costs about $67 million," says Maj. Gen. Donald W. Henderson, Commander, Space and Missile Test Organization. "The retrieval and refurbishment cuts

the cost to about $20 million to $25 million. That's a net saving of more than $40 million per mission."

The 200-foot, 1,325-ton *Independence,* fully equipped, cost just under $1 million.

★ USAF is pressing ahead with evaluation of sites for the new small intercontinental ballistic missile (SICBM), which has an initial operational capability projected for the end of 1992. Decisions on how or where to base the first missiles will not be made until late 1986, after technical, operational, and environmental studies.

Current plans are for the SICBM to be based initially at Department of Defense or Department of Energy (DoE) installations. Since last fall, USAF has evaluated existing data on more than 4,200 locations across the country. All but forty-six installations in nine states have been eliminated as sites for initial deployment. They are now being studied in more detail to determine which installations will be included in environmental analyses.

Available data bases are being reviewed, and sites are being studied for information on topography, geology, population densities, growth projections, water resources, transportation capacities, public utilities, and government support facilities.

Here are the installations being studied, by state:

**Arizona:** Davis-Monthan AFB, Fort Huachuca, Gila Bend AF Auxiliary Field, Luke AFB, Luke Air Force Range, Navajo Army Depot, Williams AFB, Yuma MCAS, and Yuma Army Proving Ground. **California:** Barstow Marine Base, Camp Roberts, China Lake Naval Weapons Center, Chocolate Mountain Air-Ground Range, Edwards AFB, El Centro Complex, El Centro Naval Air Facility, Fort Irwin, George AFB, Lemoore NAS, March AFB, Twenty-nine Palms MCB, and Sierra Army Depot.

**Florida:** Eglin AFB and Whiting Field NAS. **New Mexico:** Cannon AFB, Fort Wingate Army Depot, Holloman AFB, Kirtland AFB, and White Sands Missile Range. **Nevada:** Fallon NAS, Hawthorne Army Depot, Indian Springs AF Auxiliary, Nellis AFB, Nellis AF Range, and Nevada Test Site. **Texas:** Reese AFB and Fort Bliss. **Utah:** Dugway Proving Ground, Hill AF Range, Tooele Army Depot North, Tooele Army Depot South, Wendover AF Range, and Camp Williams National Guard Facility. **Washington:** Washington Research Laboratory (DoE) and Yakima Firing Center. **Wyoming:** F. E. Warren AFB.

The Air Force is also continuing research into survivable basing methods for the SICBM, and if new methods are identified, additional areas and installations around the country may come under consideration.

# AEROSPACE WORLD

★ The Australian Army is replacing its US Redeye very low level air defense system missile with the RBS 70 ARMAD missile manufactured by the Swedish company Bofors. The RBS 70 is a crew-portable, laser-guided missile capable of engaging fighters and helicopters out to a range of 16,000 feet and as high as 9,500 feet. Redeye has been in service since the early 1970s.

Redeye is a heatseeker and has no Identification Friend or Foe (IFF) capability. The RBS 70 is equipped with a US-made IFF system. It is in service with the armed forces of Sweden, NATO, and several Southeast Asian countries.

The RBS 70 is also incorporated in a proposal submitted by Bofors and Canadian Marconi Co. for the new $600 million Canadian Forces Low-Level Air Defence (LLAD) project. The missile would be turret-mounted with a combination of an all-weather gun and an early-warning radar installed on an all-terrain armored vehicle. The contract definition phase of the project runs through 1985, with contract award expected in March 1986.

★ While the Fairchild Republic T-46 is being readied for its first flight later this summer at Edwards AFB, Calif., testing is under way on the aircrew escape system at the high-speed sled track at Holloman AFB, N. M.

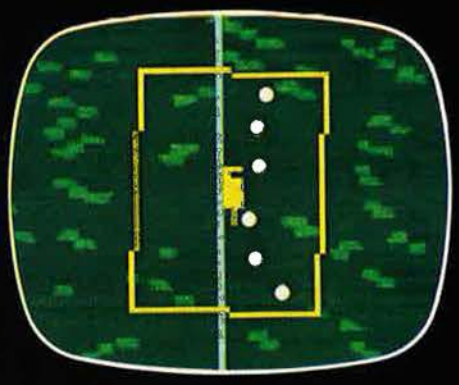
The new trainer is equipped with a modified version of the operational ACES II ejection system currently in the A-10, F-15, F-16, and B-1. Part of the reason for modifying it is that the pilots sit side by side in the T-46, and the seats must provide ejection separation time as well as lateral separation for safe parachute deployment.

Using the new seat, T-46 aircrews will be able to eject successfully from zero altitude and zero airspeed up to 400 knots airspeed at higher altitudes.

★ A new laboratory test facility, AGILE, for Aircraft Ground-Induced Loads Excitation, enables the Flight Dynamics Laboratory at Wright-Patterson AFB, Ohio, to carry out exact, low-cost tests revealing how well aircraft landing gear and structural components withstand rough, damaged, or newly repaired runways, as they would have to in a combat zone.

AGILE can carry loads up to 100,000 pounds and simulate aircraft hitting bumps at speeds of up to 200 knots. "A combat-configured aircraft, especially in takeoff mode, is a very complex system and therefore difficult to analyze," explains William P. Johnson, AGILE program manager. "In the past, before we had the AGILE facility, we had to test each possible aircraft configuration to gather the necessary data, but, at $1 million to $2

***A Bofors RBS 70 low-level air defense missile is fired from a proposed turret-mounted launcher being considered for purchase by Canada. The RBS 70, which is laser-guided and has a US-made IFF system, has replaced the US Redeye in the Australian Army.***



# JOINT-STARS

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In 1982, Grumman's Pave Mover radar successfully tracked moving tanks, and guided missiles and tactical aircraft to the targets, using technology required by Joint STARS. And we're ready to do it again.

Grumman's team members bring to the Joint STARS project outstanding, well-recognized credentials. Norden is one of the nation's foremost radar systems designers. Boeing has extensive large airframe and systems experience. And Grumman is a leading integrator of avionic systems.

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million per flight-test sequence, this was a very expensive method of gathering data."

Tests performed on AGILE cost only $30,000 to $50,000 per test, and they also take less time, are much less dangerous, and are easier to instrument, control, and repeat. AGILE uses three independent hydraulic shakers to duplicate the vertical input to tires and landing gear on an aircraft during rough runway operations. The first aircraft tested on AGILE was an A-7D Corsair II, which "taxied" over bumps three inches high at up to 123 knots.

★ Total potential savings of $18.7 million on the replacement of parts in the Air Force's GPU-5/A gun pod can be realized by extending the life expectancy of certain components, according to tests conducted by Armament Division of Air Force Systems Command. The General Electric GPU-5/A is a lightweight 30-mm gun pod built around the GAU-13 four-barrel Gatling gun capable of firing 2,400 rounds per minute.

It is similar to the GAU-9 Gatling gun, which is optimized for tank killing, in the A-10. The GPU-5/A provides an armor-penetrating capability for the A-7, F-4, and F-5.

Tests were conducted on several component parts. Tests on carrier belts, blast deflectors, and a baffle plate showed that scheduled replacement could be extended to 30,000 rounds, instead of the 15,000 rounds originally scheduled. The extension was accomplished by inspecting and lubricating the parts every 5,000 rounds of fire.

Gun-barrel replacement has been extended from 15,000 to 20,000 rounds. Other components normally changed at 30,000 rounds will now be changed at 45,000 rounds, and some that were scheduled for change at 45,000 rounds will now be changed at 60,000.

USAF has 200 GPU-5/A gun pods in the inventory and will have ninety-nine more by November. The pod's development program cost $29.7 million, and the 299 gun pods, along with support equipment and initial spare parts, will cost $140.9 million.

★ Using liquids produced from coal, a high-quality distillate—part of which can be refined into high-octane gasoline and the other part into high-performance jet fuel—has been developed at the Chevron Research Co. in Richmond, Calif. The company financed the effort using synthetic fuel research funds from the US Energy Department's Pittsburgh Energy Technology Center.

# AEROSPACE WORLD

Developing high-quality liquid fuels from synthetic crude liquids is not new—the Germans produced fuel for aircraft engines from coal in World War II. But their method, called the Bergius Process, required equipment able to withstand extremely high pressures and proved extremely dangerous and very expensive. The Germans were able to produce less than a barrel of fuel from a ton of coal; Chevron produces more than three barrels.

The new method was developed from a project begun in the mid-1970s, when oil prices skyrocketed. With prices lower today, the new method of producing fuel is too expensive, but if oil prices go back up, Chevron spokesmen say, it will provide a viable alternative to fuel derived from oil.

★ The British company that produces the head-up display (HUD) for USAF's F-16 multirole fighter has won The Queen's Award for Technological Achievement. GEC Avionics Limited, Britain's leading exporter of electronic systems for aircraft, won the award for a new "see-in-the-dark" HUD for the F-16C and F-16D.

The new equipment was developed and put into production in less than a year, with no slippage in the delivery

***Lt. Col. James Gress, right, uses a GPU-5/A gun pod blast deflector to explain extended life-cycle tests to Maj. Gen. William T. Twinting, left, Armament Division Commander, and Vice Commander Brig. Gen. John P. Schoeppner, Jr. See item.***

***Two new MBB Helicopter Corp. MBB BK 117 Space Ships have been purchased by the US Department of Energy (DoE) for surveillance and security response at DoE's huge Savannah River plant near Aiken, S. C. The plant, which produces nuclear materials, covers 192,000 acres, or 300 square miles.***

# AEROSPACE WORLD

schedule. The HUD will enable F-16 pilots to maneuver fast at low altitude and in total darkness. GEC Avionics produces more HUDs than the rest of the companies in the world combined, according to a company spokesman.

***The British firm GEC Avionics Ltd. has won The Queen's Award for Technological Achievement for developing and producing a new "see-in-the-dark" version of the F-16 head-up display (HUD) in less than a year. The HUD is incorporated in production versions of the F-16C and D and will be retrofitted on earlier models. Bob Eves, technical manager of the program, displays the new wide-angle HUD and its advanced digital computer.***

★ Twelve Israeli Kfir jet fighters are now being delivered to the US Navy to simulate Soviet fighters for the Navy's adversary training program. Designated the F-21A, the Kfirs are being acquired under a three-year, no-cost lease agreement.

Fighter Squadron 43 (VF-43) at Naval Air Station Oceana, near Norfolk, Va., is the first squadron to receive the fighters. VF-43 provides adversary training support for Navy and Marine Corps squadrons in the Virginia Capes operating area. VF-43 is the equivalent of USAF's 64th and 65th Aggressor Squadrons at Nellis AFB, Nev., the 26th Tactical Fighter Training Squadron at Clark AB, the Philippines, and the 527th Tactical Fighter Training Squadron at RAF Alconbury, in England, all of which fly the F-5.

The Kfir F-21A is a single-seat tactical fighter powered by a single J79 engine similar to that used in USAF and Navy F-4s. It has a top speed above Mach 2. The aircraft will be maintained for the Navy by Israel Aircraft Industries (IAI) under a three-year, $68 million maintenance contract.

★ Air Force plans to develop and deploy a new Short-Range Attack Missile (SRAM) were given impetus with the award by Aeronautical Systems Division at Wright-Patterson AFB, Ohio, of contracts worth $13,070,000 to three aerospace firms for the system definition phase of the new missile's development. The SRAM II will be an air-to-ground missile with a nuclear capability. Both rockets and ramjets are under consideration for propulsion.

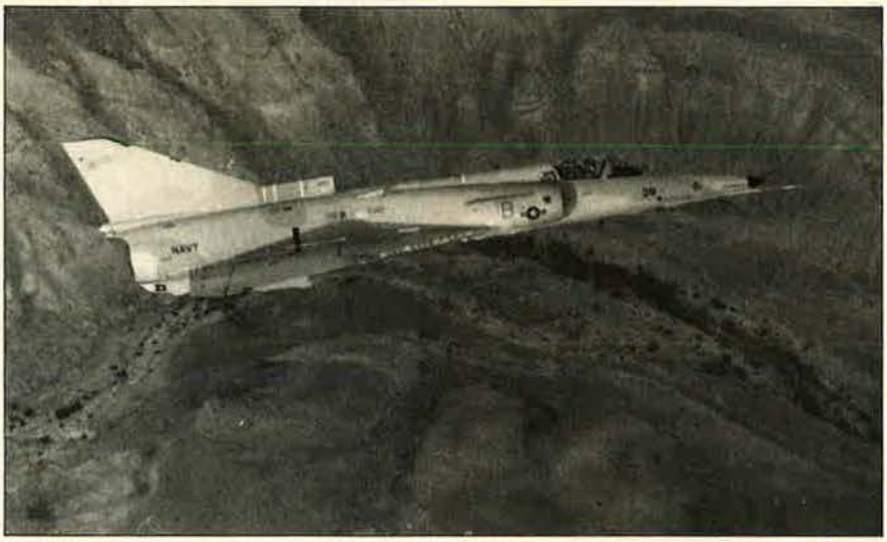
The fixed-price contracts went to Boeing Aerospace Co., Seattle, Wash., $4,230,000; Martin Marietta Aerospace, Orlando, Fla., $4,360,000; and McDonnell Douglas Astronautics, St. Louis, Mo., $4,480,000. Following system definition, one or two of the contractors will be selected for full-scale development of the new missile. Production will start in 1989, and the SRAM II will have an initial operating capability (IOC) with Strategic Air Command in the early 1990s.

★ The longest KC-10 unrefueled flight ever made, nonstop from Riyadh, Saudi Arabia, to March AFB, Calif., a distance of 7,800 nautical miles in 17.8 hours, has been announced. The USAF McDonnell Douglas tanker, flying from east to west, was scheduled to land at Barksdale AFB, La. But it became apparent that favorable winds would easily enable it to reach the west coast of the United States without stopping.

Flying a modified Great Circle route last February, the aircraft, after taking off from Riyadh, overflew the Red Sea; Cairo, Egypt; the Greek isles; Lyon, France; Belfast, Northern Ireland; eastern Canada; and Duluth, Minn. The KC-10, manned by two crews of the 9th Air Refueling Squadron, 22d Air Refueling Wing, stationed at March AFB, consumed 307,000 pounds of fuel (42,230 gallons) and landed with 33,000 pounds of fuel on board, enough for two additional flying hours.

The previous KC-10 nonstop record was set on a flight from Auckland, New Zealand, to Barksdale, some 7,000 nautical miles. On that flight, the KC-10 refueled a C-141 cargo aircraft. Thirty KC-10s are in service with USAF, and thirty more are scheduled for delivery through 1987.

★ Gator, the Air Force's first air-delivered mine system, is coming into the inventory, Air Force Systems Command announced. Gator provides the means for tactical and strategic air forces to sow a dense minefield



***One of twelve Israeli Kfir jet fighters provided to the US Navy for adversary training displays its Navy paint scheme. The Navy obtained the Kfirs under a no-cost lease, with maintenance to be performed under a $68 million contract with Israel Aircraft Industries (IAI). The official US designation is F-21A.***

# THREE OF THESE STARS HAVE EYES

They are General Electric observation satellites, scanning the Earth as you read this magazine.

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These include the NIMBUS weather observation satellites, which continued to perform long after their mission design life. Also the high-resolution, multi-spectral Landsat satellites — completed early and well under budget — which are providing data on crops, petroleum, and mineral resources.

In 1989, the next generation of observation satellite built by GE will be placed in orbit — the UARS (Upper Atmosphere Research Satellite).

GE, as it has for decades in civilian and Air Force space programs and their ground systems, stands ready to continue this tradition of successes to meet any future needs of the United States.

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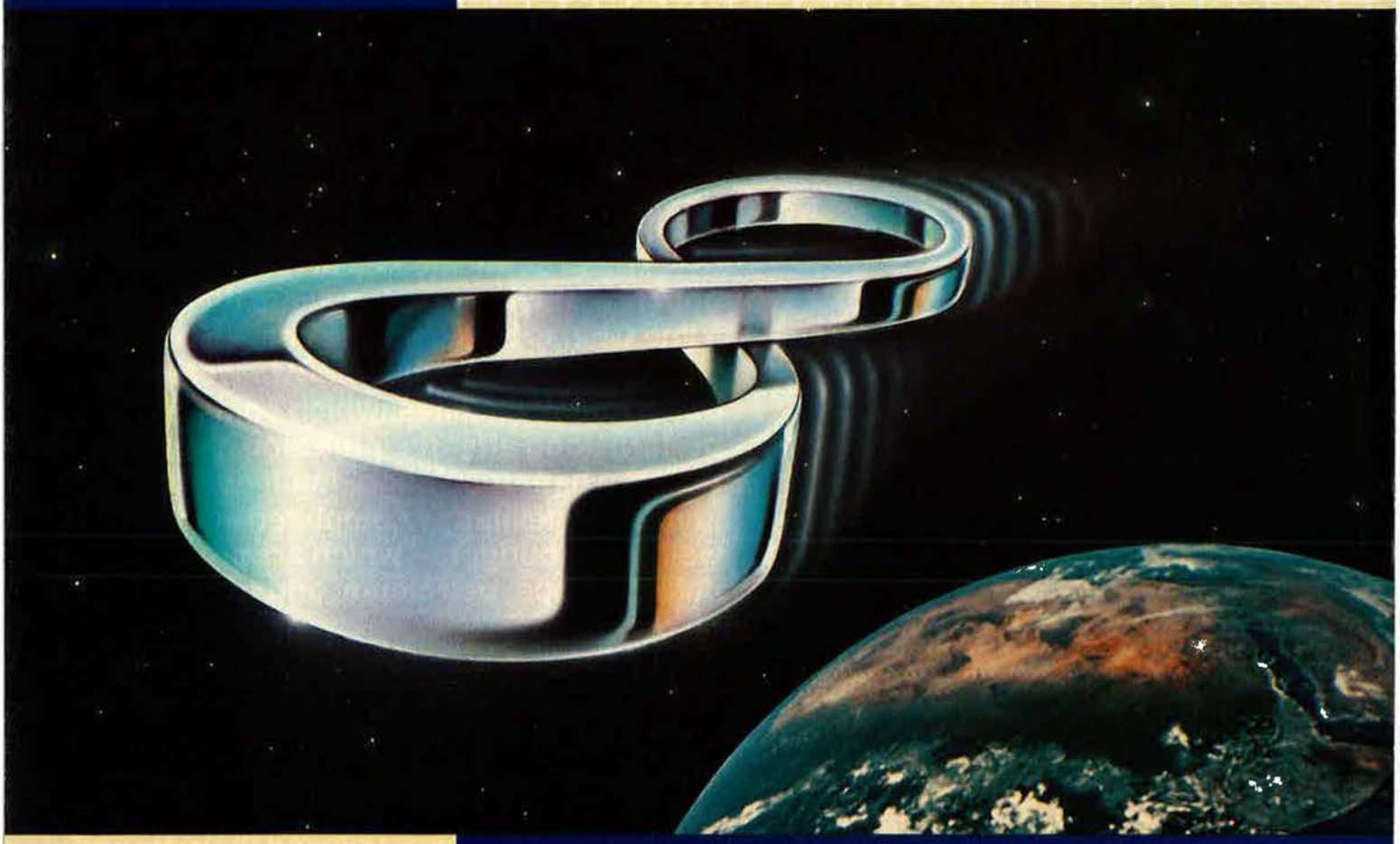

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rapidly and consists of antitank/antivehicle mines interspersed with antipersonnel mines. The antipersonnel mines prevent an enemy from clearing the minefield manually.

Gator can be delivered from high or low altitudes and at virtually any airspeed. Once released from the aircraft, the dispenser, depending on the minefield pattern desired, opens at the proper altitude, releasing the mines. They prepare to arm and set for a self-destruct time. Upon impact with the surface, the mines complete arming.

When used in the direct attack mode, Gator can immobilize ground forces by causing heavy casualties on wheeled and tracked vehicles. Because it is almost impossible to clear, the enemy will "button up" in the vehicles and stop, providing targets for close air support aircraft. In the interdiction mode, the system will be used as an area denial weapon to prevent attack by enemy second echelon forces. Gator can also be used in enemy rear areas to deny the enemy use of his own airfields.

Gator consists of the USAF Tactical Munitions Dispenser with a high-altitude proximity sensor, seventy-two antitank/antivehicle mines, twenty-two antipersonnel mines, and an adaptor kit. It can be employed from the A-7, A-10, F-4, F-15, F-16, F-111, and B-52.

This was a triservice program. AFSC's Armament Division managed the program and developed the Tactical Munitions Dispenser, the proximity sensor, and the shipping container. Naval Weapons Center, China Lake, Calif., designed the electrical system that interfaces the dispenser and mines. The Army's Picatinny Arsenal, Dover, N. J., developed the mines, which are members of the FASCAM, or Family of Scatterable Mines.

★ Two new records for unmanned aerial vehicles have been set by the Firebolt drone, a high-altitude supersonic recoverable target developed by Teledyne Ryan Aeronautical, San Diego, Calif. The drone achieved an altitude of 103,000 feet and a speed of Mach 4.1, or approximately 2,911 mph, over the Gulf of Mexico, the National Aeronautic Association announced.

Firebolt will be used to test newly developed air-to-air, ground-to-air, and sea-to-air missiles, such as AMRAAM, Phoenix, and the Aegis shipboard defense system.

The drone was launched from an F-4D Phantom flying at Mach 1.5 at 50,000 feet. The drone successfully

# AEROSPACE WORLD

climbed to 103,000 feet and cruised at Mach 4.1. At the conclusion of the flight, the drone was retrieved in midair by a helicopter at 8,100 feet.

Firebolt has a radar augmentation system that makes the seventeen-foot-long target look like a full-size aircraft on the radar screen of an intercepting fighter. When the interceptor fires a missile, the target drone can score its accuracy by determining how close the missile came to hitting it.

Meanwhile, the Air Force is busily incorporating new technology into the Firebolt and has just awarded full-scale development contracts for a unique Laser Vector Scoring System. The new system will not only provide date on the missile miss distance but will also transmit to ground observers the attacking missile's closest approach point, relative speed, flight path, fuzing point, and altitude. The LVSS will generate three fan-shaped beams as far as 200 feet from the drone. The laser beams (less than one inch wide) will reflect from special material in the nose of the attacking missile and then be picked up by sensors on the Firebolt drone.

★ Retired USAF Brig. Gen. Charles E. "Chuck" Yeager has demonstrated that he still has the "right stuff" by setting new altitude and speed records for business aircraft. At Hillsboro, Ore., on April 16, Yeager took off in a twin-engine Piper Cheyenne 400 LS powered by 1,000 shaft-horsepower Garrett TPE331-14 propjet engines.

He climbed to 3,000 meters (9,842.5 feet) in one minute, 47.7 seconds, smashing the previous record of two minutes, 12.85 seconds. Continuing the climb, he reached 6,000 meters (19,685 feet) in three minutes, 42.3 seconds, beating the old record by exactly one minute. He then leveled off at 9,000 meters (29,527.56 feet) in six minutes, 34.5 seconds, shattering the prior record of eight minutes, 8.5 seconds.

All records were for turboprop business aircraft weighing between 6,614 and 13,227 pounds. The records he broke were set in June 1981 with a Gulfstream Commander 980.

After his record time-to-height flights, Yeager set a new US record for transcontinental flights, flying from San Francisco to New York, a distance of 2,575.55 miles, in six hours, thirty-nine minutes, and twenty-eight seconds, averaging 387 mph.

★ Gunsmoke '85, the US Air Force Worldwide Fighter Gunnery Meet, will take place October 6–19 at Nellis AFB, Nev., Tactical Air Command has announced.

The meet will pit F-16, A-10, F-4, and A-7 teams against each other in various air-to-ground scenarios that test their combat skills. Gunsmoke demonstrates the capabilities of fighter and attack weapon systems, enhances *esprit de corps,* increases unit training efficiency, and recognizes the best air crews, maintenance teams, and munitions load teams in the US tactical air forces worldwide.

The USAF Tactical Fighter Weapons Center at Nellis organizes and hosts the competition and provides supporting services to competing teams. Teams participating will come from US Air Forces in Europe, Pacific Air Forces, Alaskan Air Command, Air National Guard, Air Force Reserve, and Tactical Air Command. Each team will have won a competition held within its own command.

Gunsmoke is held every other year.

★ The B-1B System Program Office of Aeronautical Systems Division, Wright-Patterson AFB, Ohio, has been selected to receive the 1984 Order of Daedalians Weapon System Award. This award is presented annually to individuals, groups, or organizations that contribute significantly to the development of the most outstanding weapon system for the armed services. The award is rotated among the services.

The B-1B office manages the acquisition of the $20.5 billion B-1B bomber, the largest development and procurement effort within the Department of Defense. The B-1B is now in production, aircraft delivery is currently five months ahead of schedule, and all cost objectives have been met.

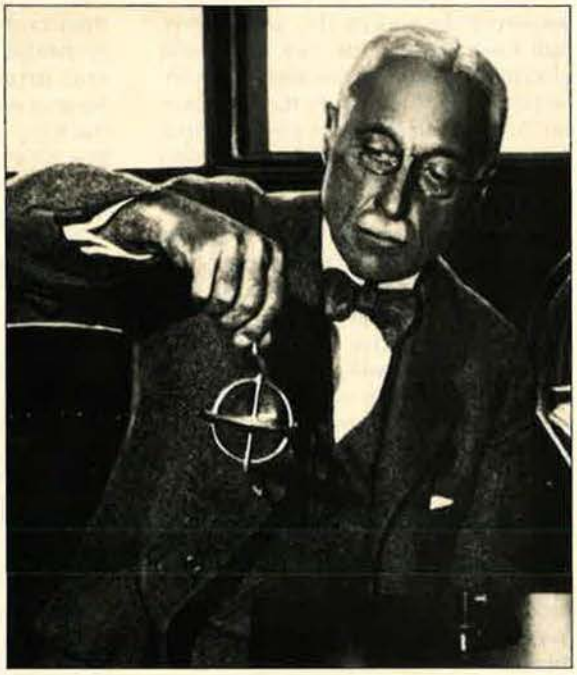
The Order of Daedalians was originally conceived as a military-fraternal organization of World War I commissioned military pilots of heavier-than-air powered aircraft. Since the order was comprised of men who first flew their country's airplanes in time of war, it took its name from Daedalus, who in legend was the first person ever to accomplish heavier-than-air flight.

★ Sperry Corp., Phoenix, Ariz., celebrates its seventy-fifth anniversary this summer, and, as part of the celebration, the company is commem-

orating the world's first flight by automatic pilot. That flight took place near Paris in 1914.

Born in 1860, Elmer Sperry was already a nationally known inventor when he founded the Sperry Gyroscope Co. in Brooklyn, N. Y., in 1910. After introducing the first shipboard gyrocompass, Sperry and his son, Lawrence, turned to the fledgling aviation industry.

In June 1914, Lawrence Sperry demonstrated the Sperry aeroplane stabilizer (the first "automatic pilot") by flying a Curtiss floatplane over the river Seine near Bezons, a village just outside Paris. While the twenty-one-year-old Sperry held his hands above his head to prove they were off the controls, his French mechanic stood on the lower wing to throw the aircraft off balance. The aircraft continued in straight and level flight, winning the Sperrys a 50,000-franc prize from the French War Department. The following year, they were awarded the Collier Trophy for outstanding contributions to aviation.



***The inventive genius Elmer Sperry, shown with a toy gyroscope, founded the Sperry Gyroscope Co. seventy-five years ago and revolutionized aviation with the inventions of the first gyrocompass in 1911 and the first aeroplane stabilizer ("automatic pilot") in 1914. Sperry was commemorated by his company at the Paris Air Show for establishing the foundation for today's sophisticated flight instruments and guidance and control systems.***

# AEROSPACE WORLD

Besides the automatic pilot, Sperry and his son invented the speed and direction indicator, stabilized bombsight, twin-propeller aircraft, parachute, aerial torpedo (which has been called the first guided missile), turn indicator, pitch indicator, and the variable pitch propeller. These pioneering efforts made possible the first instruments-only "blind" flight by Jimmy Doolittle in 1929.

★ The Defense Superior Management Award, presented to organizations and individuals whose management innovations for increasing competition and efficiency have been judged outstanding, has been presented to two USAF management organizations by Acting Under Secretary of Defense for Research and Engineering James P. Wade.

The F-16 System Program Office, led by Brig. Gen. Ronald W. Yates at Air Force Systems Command, Aeronautical Systems Division, Wright-

# INDEX TO ADVERTISERS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This unique level of experience, combined with the dedication of an effective systems oriented management has consistently ensured successful performance within assigned time frames and budgets on programs such as EA-6A, EA-6B Prowler, EF-111A Raven, P-3C Orion and the B-1B.

At Eaton, the critical importance of remaining at the cutting edge of this demanding technology continues to be well recognized. For when the stakes are very high, the Originator is still the Innovator.

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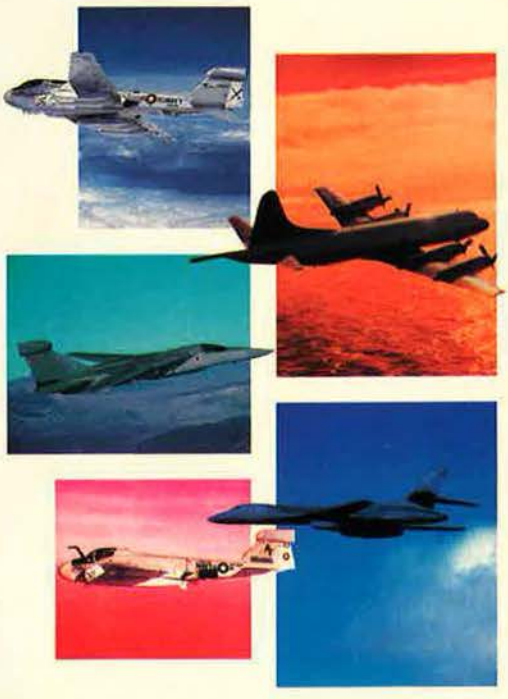

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Patterson AFB, Ohio, was recognized for developing and implementing modernization plans with General Dynamics that will reduce the cost of buying F-16s by more than $1.5 billion. The team negotiated a four-year production contract for 480 F-16s that will save $257 million over the normal single-year contracting period.

The F-15 System Program Management Team led by System Program Manager Col. Paul T. Goldman, Jr., Air Force Logistics Command, Robins AFB, Ga., was recognized for achieving a record high for mission readiness in 1984. The record was equivalent to having provided the tactical air forces an additional seventy-five aircraft, worth $1.7 billion, that operated at readiness levels of the previous year.

★ Dr. Smith J. De France, first director of NASA's Ames Research Center and long the country's leading designer of large wind tunnels for aeronautical research, died May 6 at his home in Los Altos, Calif. He was eighty-nine.

After winning a Silver Star flying Spads in World War I, he graduated from the University of Michigan in 1922 with a B.S. in aeronautical engineering. He immediately joined the National Advisory Committee for Aeronautics (NACA), the predecessor of NASA, at the Langley Aeronautical Lab, Langley Field, Va. This began a forty-three-year career with NACA and NASA, during which he became an international authority in wind-tunnel design, construction, and operation.

## AEROSPACE WORLD

★ More than thirty in-flight refueling aircraft from all over the world will be displayed at the 1985 International Air Tattoo to be held July 13–14 at RAF Fairford, Gloucestershire, in England. Theme for the Tattoo is "Skytanker 85," and it is being billed as the world's first In-flight Refueling Aircraft Meet.

Participating in the Tattoo will be aircraft from the Royal Danish Air Force, the West German Air Force and Navy, Canadian Forces, Royal New Zealand Air Force, Royal Navy, US Army, and US Air Force. USAF participation will include an SR-71 Blackbird and a TR-1.

This year is also the fiftieth anniversary of the first flight of the Douglas DC-3, which the British call the Dakota, and DC-3 or C-47 aircraft from Europe, Africa, and North America are expected to appear. With seven hours of flying demonstrations, the Tattoo is expected to be the largest exhibition of military and civil aircraft ever seen in the United Kingdom.

★ The National Aeronautic Association presented the prestigious Collier Trophy this year to key organizations and individuals involved in developing and proving the Manned Maneuvering Unit (MMU), which the astronauts use to walk in space. Recipients were the National Aeronautics and Space Administration (NASA), Martin Marietta Corp., Bethesda, Md., and the NASA team that rescued three disabled satellites from space, with special recognition to Astronaut Bruce McCandless II, first untethered man to walk in space, Astronaut Charles E. Whitsett, Jr., who was a key figure in development of space maneuvering devices, starting with the Gemini program in the 1960s, and Martin Marietta MMU project manager Walter W. Bollendonk, "for adding and demonstrating the significant new dimension to man's capabilities in space." ■

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# Anyone could have used these 4,178 words. In the hands of William Shakespeare, they became *King Lear.*

All the writers of his day had the same elements to work with — the same words, forming the same language. But Shakespeare's talent was his ability to choose from all these elements and combine them flawlessly — in a unique organization of words.

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Federal Systems Division

*At SAC headquarters eight miles south of Omaha, controllers in the underground command post intently monitor the status of operations.*

**Strategic forces are the heart of national security—and the heart of strategic forces is SAC.**

# The View From Omaha

**BY GEN. B. L. DAVIS, USAF**
**COMMANDER IN CHIEF, STRATEGIC AIR COMMAND**

IN March of this year, we reached two important milestones. On March 21, Strategic Air Command, having been established eighteen months before the Air Force, observed its thirty-ninth anniversary. On days bracketing that date—March 19, 20, 26, and 28—Congress voted to authorize and appropriate the Fiscal Year 1985 funds for the MX missile. The latter generated a great deal of publicity; the former received almost no attention outside the command itself.

The contrast, not unexpected, is symbolic of the often ambivalent way the nation's strategic nuclear forces are viewed. The MX Peacekeeper case is merely the most recent example of the controversy and debate that for years have surrounded every attempt to modernize our strategic inventory by introducing a specific new system. The B-1 bomber and the Trident ballistic missile submarine are others. The result has been a series of cancellations, delays, and stretch-outs that have had a major impact on our ability to maintain a strong and credible strategic deterrent posture.

Recent years have seen prudently paced but steady progress toward recovery from those years of vacillation. The MX votes provide both a degree of assurance that the recovery will continue and, based on the relatively small margins of victory in both Houses of Congress, ample evidence that the overall issue is not yet fully resolved. *(See also Edgar Ulsamer's column, "In Focus," which begins on p. 29.)*

And yet, despite disagreement over such specifics as the weapon systems and force size required, virtually no

one who has given the matter serious thought questions the requirement, in the current environment, for an effective nuclear deterrent. However much we may wish the environment were different, whatever efforts may be under way to alter it, we have no choice but to contend with the circumstances as they objectively exist. Strategic Air Command has been a central and generally accepted element in doing so since 1946—seven months after the bombings of Hiroshima and Nagasaki brought about the surrender of Japan. The command has pursued its goal of deterrence so professionally, proficiently, and unobtrusively over those thirty-nine years that the scant attention paid to its anniversary is no surprise.

### Capability and Will

The two Japanese cities have been restored, but, in a very real sense, the fallout from the weapons that destroyed them on August 6 and 9, 1945, is still with us today. Those two weapons altered not just the course of World War II, but the course of human history and the perception of armed conflict as a means of settling disputes among major powers. The most promising approach to ensuring national security rested on keeping the consequences of conflict between powers armed with nuclear weapons so clear and so calamitous that it was no longer a viable option.

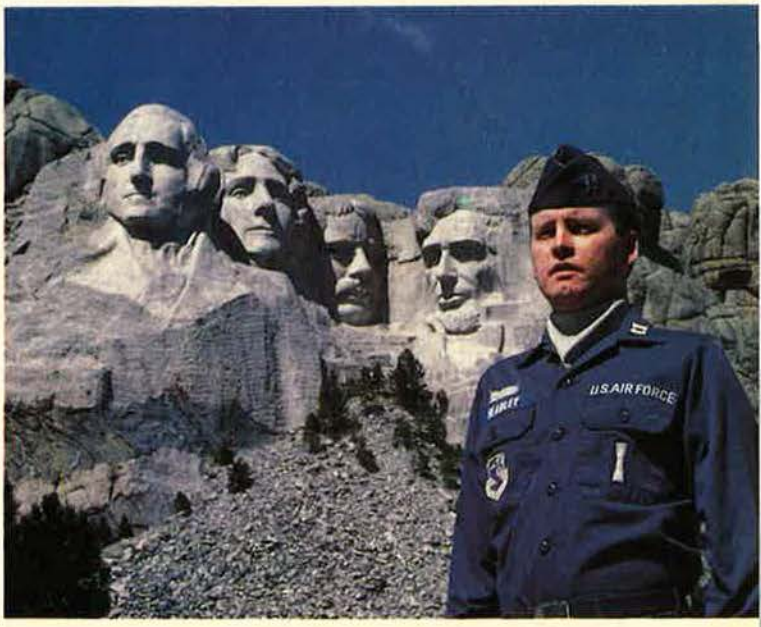
As Gen. Henry H. "Hap" Arnold put it in his final report to the Secretary of War in November 1945, "Real security against atomic weapons in the visible future will rest on our ability to take immediate offensive action with overwhelming force. It must be apparent to a potential aggressor that an attack on the United States would be immediately followed by an immensely devastating air-atomic attack on him. . . . The atomic weapon thus makes offensive and defensive airpower in a state of immediate readiness the primary requisite of national survival."

In the forty years since General Arnold's statement, nuclear strategy has evolved continuously, and the environment affecting that strategy has changed dramatically, particularly through the growth of Soviet strategic nuclear power. But the basic goal—credible deterrence—has not changed, nor has the formula for ensuring that the goal is achieved: a strong, capable nuclear retaliatory force that leaves no doubt in a potential aggressor's mind that he could not succeed by threatening or initiating aggressive acts against this nation.

In the final analysis, our ability to maintain credible deterrence is a function of two interdependent factors. First, we must have—and potential adversaries must understand that we have—the capability to deny them their goals at any level of conflict. Second, we must have—and adversaries must perceive that we have—the will as a nation to exercise that capability in defense of our national interests. The combination of these two factors has worked remarkably well over the last four decades. Not only have nuclear weapons never been used in anger since World War II, but the conventional conflicts among major powers that erupted with such distressing regularity and such terrible consequences during the first half of this century have, for all practical purposes, been eliminated.

Of course, the existence of nuclear weapons and Strategic Air Command does not account in full for this latter effect. A contributing factor is the recognition among all our allies that the common threat posed by the military power and aggressive policies of the Soviet Union far overshadows any intra-alliance differences, thus necessitating a united commitment to preserve Western ideals and freedom.

***Symbolizing the importance of people in carrying out the Strategic Air Command mission is Capt. Stephen A. Headley, a Missile Combat Crew Flight Commander, 66th Strategic Missile Squadron. (Photo by Thomas K. Arnold)***




Nevertheless, a convincing case can be made that nuclear weapons, despite their enormous destructive power—or, phrased in the obverse, because of that very power—have made the world a safer place. They have by no means ended warfare; thousands continue to die every year in conflicts that are by no means minor to the nations involved. But superpower involvement in such conflicts is carefully calculated to avoid direct confrontation due to the potential for escalation into a major conflagration—nuclear or conventional.

That kind of caution is worth preserving, particularly considering the dramatic increase in the destructive power of conventional weapons since World War II. It behooves us, then, to proceed carefully toward the universally accepted goal of reducing and eventually eliminating nuclear weapons. It would be imprudent in the extreme to abandon the current regime of deterrence through the threat of retaliation before another, at least as stable, form of deterrence has been firmly established. Indeed, it would be a Pyrrhic victory in the worst sense to erode the foundation of deterrence provided by nuclear weapons in such a way that we make the world "safe" for large-scale conventional conflict.

## A Prudent Approach

The Administration's three-pronged plan to bolster our deterrent posture is carefully designed to avoid pitfalls of that nature. First, it strengthens every aspect of our strategic capability to provide enhanced deterrence and stability both for the present and well into the future. These improvements also provide bargaining leverage that encourages the Soviets to talk seriously about significant reductions in nuclear arms—the second aspect of the plan. Finally, the plan calls for a vigorous examination of and research into available and potential technologies that might support a comprehensive defense against ballistic missiles—the Strategic Defense Initiative (SDI).

Strategic Air Command has an obvious interest in all three aspects of the plan, but the area of immediate concern to the command is the strengthening of our strategic offensive capability. For the foreseeable future, strong, fully modernized strategic offensive nuclear forces will remain the heart of our national security. While the promise of emerging technologies may someday provide new approaches to deterrence, even the most enlightened plan for the future may never be realized if we do not take the proper steps now to guard our national security.

## Strategic Modernization

That fundamental principle has not been overlooked. The strategic modernization program announced in October 1981 is the most comprehensive upgrade since the early 1960s. It addresses each leg of the strategic triad—manned bombers, intercontinental ballistic missiles (ICBMs), and submarine-launched ballistic missiles (SLBMs). In addition, it upgrades the command control and communications ($C^3$) network that links our forces to the National Command Authorities and assures its responsiveness and increases emphasis on our defenses against aircraft and missiles, an important and long neglected part of our overall strategic posture.

Clearly, strategic modernization is necessary if we are to maintain credible deterrence and preserve our national security. A brief look at two mainstays of our strategic deterrent posture—the B-52 bomber and the Minuteman ICBM—illustrates this point quite succinctly.

The last B-52H, the nation's newest heavy bomber, rolled off the production line in 1962, and the last Minuteman III ICBM was deployed in 1975 in a system whose primary supporting elements (launch facilities and control centers) were deployed a decade before that. In both cases, the systems have already exceeded their design life, but they represent the newest hardware within their respective triad elements.

Both the B-52s and the Minuteman have benefited from modification programs to sustain and improve performance, but their basic designs are of late 1950s and 1960s vintage. Put simply, an infusion of updated technology is needed now to revitalize our bomber and ICBM forces.

While the strategic modernization program is comprehensive, it is also modest—both in terms of earlier US strategic arms programs and, certainly, in comparison to the aggressive and extended Soviet strategic buildup. Even though the US effort will slow the adverse trends in the US-Soviet strategic balance, it will not reverse

*These SAC professionals carefully performing engine maintenance "by the book" typify the selflessness and dedication to duty that results in the command's perennially superb level of operational readiness.*

them. Despite its modest proportions, however, the modernization program now under way and planned will have a major and lasting impact on our ability to preserve peace and promote global stability.

At the heart of the US strategy for deterring nuclear war is the triad of nuclear delivery systems already mentioned. The key to a robust deterrent is the maintenance of two balances: a balance between the overall strategic capability of the US and the Soviet Union and an internal balance of capabilities among US strategic systems. Although there is a degree of obvious (and desirable) overlapping capability among our strategic systems, each has distinctive characteristics that allow for unique contributions to deterrence. A prudent balance optimizes overall force capability, promotes force-wide survivability, and raises attack and defense problems that the Soviets are a long way from resolving. Furthermore, a strong, fully modernized triad serves as a hedge against the possibility that a Soviet technological breakthrough could threaten our overall deterrent capability. By strengthening each leg, the modernization program assures that these synergistic benefits will endure well into the future.

## The ICBM Program

Our ICBMs have long been noted for their high alert rates and reliability—the best in the triad. They are easy to communicate with, and their combination of accuracy, yield, and responsiveness makes them the best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Telephone: 061-681 2071 Telex: 667857

Prime contractor for the JP233 Airfield Attack Weapon System, its dispensers and munitions, is Hunting Engineering Limited.
Other HB876 sub-contractors are The Royal Ordnance Factories, Irvin (GB) Limited and Venture Technology Limited.

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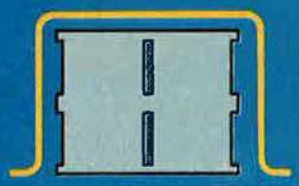
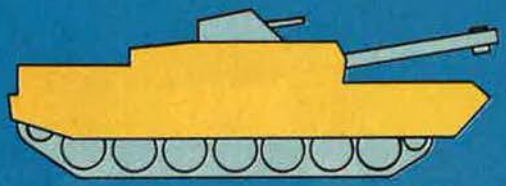


Protective blankets for ammunition.



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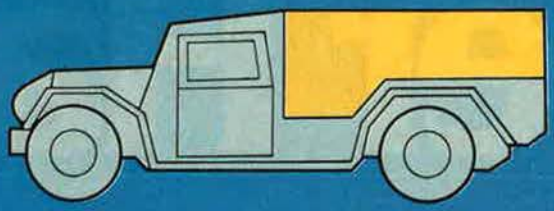
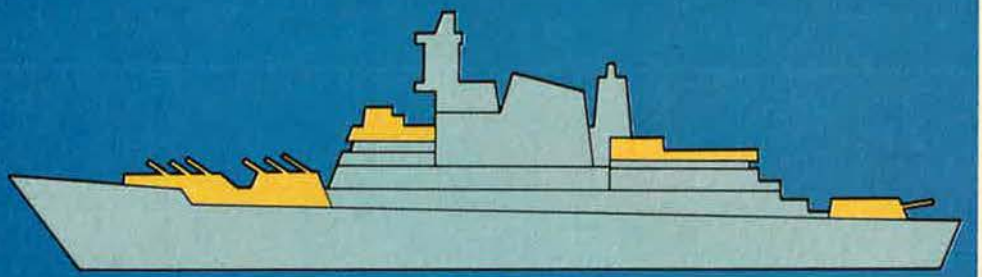


Structural armor for ambulance bodies.



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weapons to hold at risk valuable hardened Soviet targets that would need to be neutralized early in a conflict. Today, this land-based missile force consists of 550 Minuteman IIIs, 450 Minuteman IIs, and a declining number of Titan IIs that are being retired.

There are several important initiatives under way to improve our Minuteman force by extending its useful life and correcting problems caused by aging. These programs include motor washout and remanufacture, replacement of test and transport equipment, guidance improvements, and the Rivet MILE refurbishment of launch facilities and launch-control facilities.

Even with these initiatives, the disparity between US and Soviet ICBM forces continues to grow—particularly in view of Soviet progress in hardening such facilities as missile silos and command centers. Furthermore, the Soviets have a much more formidable hard-target-capable force in their SS-18 and SS-19 missiles. This excessive advantage undermines stability and threatens peace more than any other factor in the current strategic situation.

For several years, we attempted to improve both the effectiveness and survivability of our ICBM force with a single missile (Peacekeeper) in a single basing mode. Several proposed solutions would have been satisfactory from SAC's operational viewpoint; however, broad support could not be generated for any of the proposed basing modes. Today, in accordance with the recommendations of the President's Commission on Strategic Forces (the Scowcroft Commission), the command is following a two-track approach to ICBM modernization.

In the near term—beginning next year—MX missiles will be deployed in Minuteman silos at F. E. Warren AFB, Wyo. With its ten warheads and excellent accuracy, Peacekeeper is an urgent military requirement that represents the best near-term solution to redress the present imbalance in prompt, time-urgent capability against hardened targets. As such, Peacekeeper deployment is absolutely essential to return stability to the strategic equation.

Up to this point, the MX program has an excellent track record, the best record to date of any US ICBM development program. It is on schedule and within cost estimates, and all seven flight tests have been successful, with accuracy even better than expected.

In the second phase of our ICBM modernization program, we are pursuing research on a new, small, single-warhead missile that will be ready for deployment by late 1992. Its small size (around 30,000 pounds) makes it suitable for deployment in any of several basing modes that would make the missile much more difficult for the Soviets to detect and target. In addition, the fact that it carries only a single weapon makes it a less lucrative target for Soviet planners. The net effect is improved survivability and capability combined with greater stability. In conjunction with the Peacekeeper, the small missile will provide a strong incentive for the Soviets to move away from their very large ICBMs—a US national goal of long standing.

### The Bomber Program

Like ICBMs, bombers have attributes that make a potent contribution to deterrence. Their greatest asset is the flexibility provided by having a "man in the loop"

***Recognizing that retention of individuals like this flight-line specialist takes top priority, the command vigorously emphasizes improvement of quality-of-life "people programs."***

from launch to target area and back. The crew affords the capability for real-time damage assessment, reattack or withholding attack, depending on level of damage, and location and attack of relocatable targets. It is also the only system that can be recalled, regenerated for future strikes, or applied in conventional scenarios.

Those contributions are altogether too valuable to be allowed to atrophy. The flexibility and durability of our current bomber force, the B-52G and H models and the FB-111, have been remarkable.

Current deployment of the air-launched cruise missile (ALCM) system will enhance the B-52s' flexibility through a transition to a shoot-and-penetrate role. A typical profile would see multiple ALCM launches at high altitude, often followed by B-52 low-level descent to attack additional targets using gravity weapons or the short-range attack missile (SRAM). Using a combination of systems greatly complicates a defender's task and enhances the probability of successful attack. In the latter part of this decade, however, our aging B-52s will encounter increased difficulty penetrating Soviet defenses.

The ongoing program to add ALCM to most B-52s will prolong their value as a standoff attack platform, but to ensure continuity in the manned penetrator mission, new aircraft are needed. Again, Strategic Air Command has a two-track program designed to provide an effective bomber force well into the next century.

The first B-1B bomber rolled off the assembly line last

September and is now in flight-test. The 1986 initial operating capability and a rapid rise to the full complement of 100 aircraft make the B-1B one of our best options to counter the growing Soviet strategic threat and maintain a strong deterrent. Combined with its low, fast flight capability, the B-1B's small radar cross section and powerful electronic countermeasures will make it extremely difficult for Soviet defenses to detect and intercept. Like the B-52, the B-1B will have the inherent flexibility and growth potential to adapt to changing threats through changes in tactics, equipment, and payload.

Along the second track, technological advances in such key areas as propulsion, lightweight materials, and reduced radar observability are being investigated with an eye toward producing an advanced technology bomber some time in the 1990s. The combination of this bomber, the B-1B, and cruise missiles should confound well into the next century even the most aggressive Soviet attempts to deploy an effective air defense.

### SLBM and C³ Programs

SLBMs, too, have advantages, the premier one being the ability of the portion of the fleet at sea to avoid detection and thus survive and endure for extended periods. To preserve that capability, new Trident submarines are being deployed. In addition, a longer-range, more accurate Trident II missile is being developed to give the system a larger operating area and an improved capability against hard targets.

Within the strategic modernization program, the Administration has accorded top priority to strengthening the C³ links between all levels of command and the forces in the field. Modern, robust forces constitute a credible deterrent only if the C³ network can be relied on in all phases of a potential conflict. The programs being pursued to that end are too numerous to enumerate, but the command has made substantial progress in recent years and has a solid game plan to correct the remaining deficiencies.

### The Strategic Relationship

As was pointed out earlier, these programs, although relatively modest, will have a significant impact on the overall strategic relationship between the US and the Soviet Union.

The newer systems (B-1B, Peacekeeper, and Trident) are individually much more capable than the older ones they will supplement. Consequently, the gains in some important strategic measures are greater than can be deduced simply by examining the numbers of systems involved. The fact that measures are being taken to invigorate every leg of the triad means that the Soviets are not likely to relax their efforts in any area, and that has a significant effect on maintaining deterrence.

The modernization program is also oriented directly toward offsetting the value of some Soviet advantages that have accumulated over the years due to our own inactivity. As a result, each unit deployed makes greater than proportional progress in restoring some aspect of the balance.

Finally, the modernization program sends a very strong message to both the Soviets and our own allies that we are willing to compete and that any Soviet attempt to gain a usable strategic advantage will be resolutely denied. That message has already had two observable and beneficial results. First, it has brought the Soviets back to the negotiating table in Geneva. Second, by demonstrating our resolve not to permit the USSR to gain an advantage, it has been a material factor in clearing the way for deployments of modern intermediate-range nuclear forces—ground-launched cruise missiles and Pershing IIs—in Europe.

### SAC's Conventional Role

While Strategic Air Command's primary focus is on nuclear deterrence, a significant number of SAC assets are employed daily on a global basis in support of national objectives.

As the Air Force's single manager of aerial refueling assets, SAC owns a fleet of 615 KC-135 aircraft. Although the primary mission of these aircraft is to support execution of the nuclear bomber force, they are used on a day-to-day basis to extend the range of any US aircraft capable of aerial refueling—and that number grows constantly. In fact, aerial refueling needs are increasing to the extent that requirements now exceed capability, even though the Air Reserve Forces have assumed a portion of the overall work load, including day-to-day SIOP alert.

To reduce this growing shortfall, three programs are under way. The engines on more than 350 active tankers are being replaced with commercially proven CFM56 engines to increase fuel offload capability by fifty percent. Besides being more efficient than the current engine (fuel consumption is reduced by twenty-seven percent), the CFM56 is quieter, cleaner, and cheaper to operate. Additionally, all Air National Guard and Air Force Reserve KC-135 aircraft are being reengined with JT3D engines from retired Boeing 707 commercial aircraft. The gains are less spectacular than with the CFM56 (fuel use down twelve percent, offload up twenty percent), but are well worthwhile.

To enhance the effectiveness of the nation's mobility forces further, the command is procuring KC-10 tanker/cargo aircraft. These modern aircraft have a much greater range and offload capability than do the KC-135s, and they are tailor-made for dual-role support of our general-purpose tactical and airlift forces. The KC-10 weapon system is also a part of the Reserve Associate program. As such, fifty percent of the KC-10 crew force is made up of members of the Air Force Reserve. This combination of active and Reserve crews offers economies of operation under relatively low peacetime flying rates while permitting a vast increase in wartime capability. We are expanding further the scope of the program in the future to include maintenance personnel, thus increasing SAC's ability to sustain a higher wartime utilization rate.

Strategic Air Command also serves a variety of customers and users in its strategic and tactical reconnaissance missions by using the SR-71, U-2/TR-1, and RC-135 platforms. In peacetime or crisis, these highly capable assets can gather information worldwide to support decision-makers at all levels. We are modernizing our global reconnaissance forces by enhancing system flexibility, providing greater mobility, and incorporating advanced sensor technology. These are necessary im-

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*The F-16 Fighting Falcon is the first-line fighter for the United States Air Force as well as the air forces of 11 allied nations.*

*This high-performance, combat-proven fighter is now operational with South Carolina's 169th Tactical Fighter Group and will soon join Texas' 149th Tactical Fighter Group.*

*Enhancing their mission capabilities with the fighter that is setting the standard for readiness, reliability and maintainability worldwide is a significant milestone for the Air National Guard.*

**GENERAL DYNAMICS**

provements in light of the fact that our reconnaissance forces will likely be the first SAC forces employed in any conflict. They must have the capability to provide accurate, near real-time information to the National Command Authorities and theater commanders.

Today, the global responsiveness and inherent flexibility of long-range bombers are taking on increased importance as key elements in bolstering our deterrent capabilities at lower levels of conflict. The need for a rapid conventional power-projection capability has received increased emphasis in recent years, and the long-range bomber's characteristics make it ideal for that role. Its ability to deliver large conventional payloads anywhere, anytime, and in any kind of weather provides a national asset that cannot be duplicated by any other weapon system. That fact is clearly recognized, and theater operation plans calling for conventional B-52 support have more than quadrupled over the last four years. In the near future, support to theater commanders will be further enhanced when the sixty B-52Gs not scheduled for ALCM modification take on a dedicated conventional role.

In the area of maritime operations, SAC supports the Navy through mine-laying, ocean surveillance, sea lines of communication (SLOC) defense, and sea-lane interdiction. Concerning the latter role, we are currently equipping two full squadrons of B-52Gs—one in the Pacific and one in the Atlantic—with the Navy's Harpoon antiship missile. This will provide a much improved capability to project offensive firepower against enemy naval threats beyond the immediate range of other US forces.

SAC is also pursuing a new conventional standoff attack capability in support of ground operations. Available and emerging technologies hold the opportunity to develop precision standoff weapons that would allow highly effective attacks against important targets from beyond the range of lethal defenses. Such a weapon would be a significant addition to the B-52's already formidable capabilities.

### Top-Notch People

While fully capable weapon systems are certainly vital, SAC's top priority is its people. In recent years, the command has vigorously emphasized a quality-of-life environment that convinces top-notch people that SAC is a good place in which to live, work, and raise a family. Today, the recruiting and retention picture is very good, but a continued effort is required to prevent a return to the mass exodus of experienced personnel that occurred in the late 1970s. This will become especially true as the economy improves while, at the same time, the number of young people available for military service continues to decline.

As the new strategic programs essential to our deterrent posture are brought into the inventory, "people programs" will remain vital to assure that we continue to attract and retain the high-quality professionals needed to sustain our combat capability. Pay compensation comparable to the private sector, such realistic institutional benefits as an equitable retirement program, and adequate living and working facilities will be the keys to meeting this challenge.

A strong and capable America, willing and able to protect its worldwide interests and honor its global commitments, is of paramount importance to the continued security of both our nation and our allies. Military power is and will remain for the foreseeable future a central factor in our ability to meet our security needs; underwriting all our military strength is the capability of our strategic nuclear forces.

***Missile launch crew members meticulously follow procedures for sending an intercontinental ballistic missile on a practice flight to a splashdown point thousands of miles downrange.***

Overall, Strategic Air Command is well positioned to pass from this century to the next with strength and confidence. The challenges are great, but with the support of the Administration, Congress, and the American people, we have made real progress toward ensuring that our strategic forces will remain strong and capable enough to provide credible deterrence.

As we continue to sustain this progress, we can look to the future with confidence, secure in the knowledge that we are promoting a safer, more stable world—one in which the security of this great nation of ours will be preserved. ■

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*Gen. B. L. Davis has been serving since August 1981 as Commander in Chief, SAC, and Director of the Joint Strategic Target Planning Staff, Offutt AFB, Neb. A 1950 graduate of the US Military Academy, General Davis has spent most of his service career with SAC in operational staff posts, although he has also held key assignments in recruiting and personnel. A veteran of 142 combat missions in Southeast Asia, he headed Air Training Command from 1979 until 1981.*


*Space Shuttle Discovery booms from Pad 39A at Vandenberg AFB, Calif., on Mission 51-C—the first Shuttle launch dedicated to military space deployment. USAF's space activity is booming and is bound to intensify.*

**The question is not whether space will be "militarized." That happened a long time ago.**

# High Space Heats Up

BY JAMES W. CANAN
SENIOR EDITOR

PARALLELS between the historical development of combat missions for aircraft and the current development of such missions for spacecraft are becoming ever more exact.

In World War I, aircraft were first used for reconnaissance, then as the means of preventing it by shooting down the recce aircraft, then to provide air cover for them, and finally to deliver ordnance.

This pattern is now clearly evident in space systems as well.

US officials now openly regard space as "the fourth combat medium." This is the basic reason why space systems and space doctrine demand USAF's unflagging attention and will come to engross Air Force leaders in the years ahead.

The Reagan Administration set the pattern.

On July 4, 1982, President Reagan issued his National Space Policy, ordering up a comprehensive civil and national-security space program. From it, all things began to flow.

Shortly thereafter, USAF established its Space Command to centralize and give focus to its proliferating space activities. It also expanded its space doctrine to accommodate a wider range of missions, including "force application" in and from space.

Last November, the President authorized a new unified command, the US Space Command, to be made up of all four military services. And then, last April, he set in motion a new study by the National Aeronautics and Space Administration and the Department of Defense. It will size up the nation's urgent need for new space-launching capabilities and attendant, advanced launching technologies.

In all considerations of what is happening or of what will happen in space, USAF predominates. This is abundantly clear in the US military space budget.

According to figures supplied by Air Force Space Command, the $11 billion that USAF has budgeted for space programs and activities in Fiscal Year 1986, to begin next October 1, accounts for seventy-nine percent of the entire DoD space budget for that fiscal year. The Army accounts for six percent, the Navy for four percent, and defense agencies, such as the Defense Communications Agency and the Defense Nuclear Agency, for eleven percent altogether.

Moreover, USAF's space-budget total does not include its share of the $3.7 billion proposed for the DoD-wide Strategic Defense Initiative (SDI) program in Fiscal Year 1986. That share is very large. USAF is in charge of most SDI technology development programs, many of which are pertinent to the Air Force's rapidly evolving space systems and doctrine.

## USAF in Space

As reflected in the budget, Air Force activity in space is booming. It is summed up in this year's joint report to Congress by Dr. Thomas E. Cooper, Assistant Secretary of the Air Force for Research, Development and Logistics, and Gen. Robert D. Russ, who at the time of the report was USAF's Deputy Chief of Staff for Research, Development and Acquisition, as follows:

"Air Force objectives in space include pursuing a vigorous research and development program to give us future options in space, expanding to space those functions that can be better accomplished there, and developing an antisatellite system to assure our free access to space and to deter Soviet attacks against our satellites in orbit.

"Our plans include making our space systems—the satellites, the ground stations, and the communications links between them—more survivable from attack, improving the surveillance, communications, and navigation capabilities of our space systems, and increasing the robustness of our space system network by removing single [communications] nodes, procuring backup satellites, and reducing our dependency on overseas ground stations."

*This first launch of a Titan 34D/Inertial Upper Stage (IUS) booster system in 1982 took the first US DSCS III communications satellite and a DSCS II satellite into their orbits.*

Moreover, said the report, USAF is concentrating on "doing more with each launch by deploying satellites with the capability to perform multiple missions, and with much longer operational lives."

In keeping with this, President Reagan recently authorized the Air Force to develop a powerful new booster rocket for launching payloads too big and heavy to be sent into space by any means other than the Space Shuttle.

USAF plans to buy ten of these Titan 34D7 rockets, called Complementary Expendable Launch Vehicles (CELVs), and to launch a payload on the first of them into transpolar orbit from Vandenberg AFB, Calif., in October 1988.

Air Force launching of payloads on the Shuttle from Vandenberg will continue. However, in making use of the CELVs as well, the Air Force expects to cut its launching costs and its risk of overdependence on the Shuttle as its only means of boosting extra-hefty military payloads into orbit.

USAF has also asked the Administration for permission to modify thirteen deactivated Titan II ICBM boosters for space launches from Vandenberg. It wants those boosters, which are much less powerful than the Titan 34D7s will be, to launch relatively small military satellites into near-earth orbits.

Weather satellites, for example, are so small that they look lost in the Shuttle's cavernous cargo bay. USAF needs to be able to launch such small satellites one at a time—as needed and when ready—and cannot afford to wait for a programmed Shuttle launch to accommodate several of them. Launching them singly on the Shuttle is decidedly cost-ineffective.

## "Militarizing" Space

Given all such USAF stirrings on the space front, arguments that US production and deployment of antisatellite (ASAT) weapons would "militarize" space miss the point and have a hollow ring.

Space has been militarized, in effect, for nearly thirty years, ever since the first ICBM traversed it on a test flight and the first surveillance satellite was launched into it. Moreover, the Soviet Union has an ASAT weapon that former Secretary of Defense Dr. Harold Brown flatly described as operational in early 1978. First tested as far back as 1968, it is fully capable of destroying US surveillance satellites and others in low orbits. Land-based Soviet laser-weapon test installations seem capable of destroying—certainly, they threaten—US satellites in higher orbits.

This raises a very scary prospect, for, in one way or another, US strategic and tactical forces have come to depend very heavily on a widening array of US satellites for their very ability to deter or to wage nuclear or nonnuclear war. There are said to be more than 100 such satellites in space at any one time.

Dependence on them is deepening with every tick of the clock. It has got to the point that the satellites are no longer regarded as merely "force multipliers" or as tools for "force enhancement."

Instead, affirms Gen. Robert T. Herres, Commander of USAF's Space Command and of the Aerospace Defense Command, the satellites are "becoming absolutely integral" to US weapons and forces on land, at sea, and in the air.

"Our high-tech edge over the Soviets is more and more satellite-dependent," General Herres declares. "Anybody who thinks we can plan national security into the next century without military capabilities in space has a bankrupt idea. And if those capabilities are so important, shouldn't we expect that they will be attacked in a war? Of course."

## Data from Space

Surveillance satellites, ever more capable, routinely pass on streams of data that enable the National Command Authorities (NCA) and strategic and tactical commanders to stay in a heads-up mode. They are the main means of policing arms-control agreements and of keeping tabs on movements of military forces anywhere in the world. They also are said to have become so proficient—in their coverage and in their real-time responsiveness—that they can be used for actual selection of tactical targets.

Old-time navigation satellites like those in the Navy's Transit system can at best enable a warship skipper to fix his position within a radius of miles. The new US Navstar Global

Positioning System (GPS) constellation of navigational satellites will do a whole lot better than that.

In providing three-dimensional position and velocity data, GPS can fix the whereabouts of the ship captain and those of bomber, fighter, infantry, and armor commanders within sixteen meters. Thus, it is crucial to their disposition of firepower.

The GPS system will provide worldwide navigational coverage for US forces near the end of 1988, when all eighteen GPS satellites are expected to be operating in their orbits. Ten GPS developmental satellites have already been launched, and eight of them are being used in the GPS test program.

GPS will also be a prime means of precise navigational updating for future submarine-launched ballistic missiles.

Critical to everything military are the communications satellites, relay-station switchboards in the sky for the far-flung US military forces.

It is estimated that from one-half to three-fourths of all US overseas military communications are routed via space relays. The malfunctioning or destruction of communications satellite constellations could mean sudden disorder and death on battlefields, at sea, and in the air.

Airborne weapon systems that rely on digitalized maps in their guidance computers also owe a great deal to the geodetic, terrain-mapping satellites. Weather satellites are indispensable scouts for battle planning and battle management.

## Countervailing Strategy

Odd as it now may seem, the long-term wartime survivability of military satellites was not considered all that important until the beginning of this decade. It became important, direly so, when the US moved away from its premise that a nuclear war would be a bam-bam cataclysmic spasm of all-out attack and retaliation and began planning instead for the eventuality of a protracted nuclear war.

In 1980, having reviewed US strategic policy, President Carter issued Presidential Directive (PD) 59. It codified what was called the US "countervailing" nuclear strategy, actually a refinement of a strategy that had been evolving ever since Dr. James R. Schlesinger's strategically hard-nosed stewardship of the Department of Defense from 1973 to 1975.

*Navstar Global Positioning System (GPS) satellite as depicted by artist Erik Simonsen. The GPS constellation will provide worldwide, precise navigation for all US forces by 1988.*

The strategy was summarized by Dr. Brown, Carter's Secretary of Defense, in his final report to Congress in January 1981. The report made it clear to the Soviet Union that "no course of aggression by them that led to the use of nuclear weapons, on any scale of attack and at any stage of conflict, could lead to victory, however they might define that victory."

It went on to say: "Besides our power to devastate the full target system of the USSR, the United States would have the option for more selective, lesser retaliatory attacks that would exact a prohibitively high price from the things the Soviet leadership prizes most—political and military control, nuclear and conventional forces, and the economic base needed to sustain war."

Among the requirements for implementing this strategy, Dr. Brown enumerated "flexibility of weapons and targets" and "escalation control." His umbrella requirement was "survivability of nuclear forces and their supporting $C^3I$ capabilities."

Satellites had long since become the essence of such capabilities. Formerly, they had been deemed necessary only to give warning of a nuclear attack and then to play key roles in the launching and execution of an all-out retaliatory strike, after which their reason for existence would end.

## New Role for Satellites

Now, with the countervailing strategy, they would be called upon to keep on operating in support and management of US thrusts and parries in a drawn-out nuclear duel.

They were simply not up to that. They had no shielding against the electromagnetic effects of nuclear explosions or against the intense heat of lasers and the electronics-disrupting penetration of neutral particle beams. They could not maneuver out of the way of a Soviet ASAT weapon that might catch up with them via radar to kill them with the shrapnel from its remotely controlled self-destruction.

US communications and early-warning satellites range in faraway geosynchronous orbits above the equator, well beyond the reach of the low-flying, coorbital Soviet ASAT interceptors. But US surveillance satellites coursing through space on much lower transpolar orbits—so that the earth rotates roughly perpendicular to their flight paths and thus keeps passing under their lenses—are indeed vulnerable to the Soviet ASATs.

US officials estimate that those ASATs can reach targets up to 3,000 miles high, but are probably intended for top-priority US satellites at lower altitudes. Many US surveillance, weather, and navigation satellites are said to orbit, some of them quite eccentrically, at less than 600 miles about the planet. There may be a score of such satellites in space at any one time.

The Soviet "hunter-killer" ASATs, which have been derided as primitive by some opponents of the US ASAT program, are nonetheless clearly capable of nailing those US satellites, as one demonstrated against a Soviet target satellite in a test flight just three years ago. *(For more on the US and Soviet ASAT programs, see "A Dozen Anti-ASAT Fallacies" on p. 78 of this issue.)*

Thus, the Soviet ASATs are serving the same purpose vis-à-vis US spacecraft orbiting in low-to-medium orbits as the Soviet surface-to-air missiles are serving against US and allied fighter and ground-attack aircraft—closing off their operating regimes, eliminating what used to be their sanctuaries.

What's more, the Soviets now have two ground-based facilities for testing high-powered lasers that could be brought to bear against US satellites in much higher orbital planes, such as early-warning satellites and communications satellites operating in support of US strategic forces. And the Soviet Galosh ABM missiles around Moscow could play hob in high space with nuclear bursts.

The Soviets have been moving in other ways too—such as their long, hard work on space stations and on adapting their cosmonauts to protracted periods of existence in orbit—to make space a full-fledged military medium managed by men up there.

## Protecting Our Assets

All this adds up to the reason why the Reagan Administration immediately went to work at strengthening and protecting US space assets—an effort that undergirds each and every continuing, new, and future US space program.

Right from the start, the Administration went full bore on the US ASAT development program. Begun by President Ford, it had languished under President Carter, who was once described as not wanting to see "even so much as a peashooter in space"—an attitude that began changing once his Secretary of Defense demonstrated to him that the Russians had ASATs that worked.

The US ASAT weapon is a two-stage rocket with a drum-shaped, heat-seeking Miniature Vehicle (MV) nonexplosive warhead on its snout. It is taken aloft on an F-15. Once released by the aircraft, which was vectored to the launch point, the weapon's modified Short-Range Attack Missile (SRAM) first stage and its Altair rocket second stage boost it into and through space.

Closing on the target satellite via "direct ascent" (in contrast to the much slower coorbital catchup technique of the Soviet ASAT), the MV separates and is maneuvered to its target by small thrusters positioned around its circumference.

It homes on the target satellite's "black body radiation" by virtue of signals interplay between its heat-seeking sensor and its tiny on-board computer. It kills by striking the target at tremendous closing speed (satellites must orbit at speeds of at least 17,000 miles per hour, or they succumb to gravity).

F-15s assigned to carry ASAT weapons will be stationed at Langley AFB, Va., and McChord AFB, Wash. They will be under the command and control of the Space Command/Aerospace Defense Command Space Defense Operations Center (SPADOC) and will receive mission profiles from and be vectored by the ASAT Mission Control Center at Cheyenne Mountain, Colo., prior to takeoff.

USAF has conducted two tests of its ASAT weapon. The first was limited to a workout (successful) of the weapon's booster and booster-guidance systems and was directed against a point in space, not against a target satellite. The second test, a partial success, reaffirmed the results of the first and gathered limited data about MV performance.

## Tests and Arms Talks

A test against a target satellite will come soon. Congress forbade any such real-life testing until ASAT arms-control negotiations with the Russians got under way or President Reagan convinced the lawmakers that he is earnest about conducting such negotiations.

Given the good-faith evidence of the current Geneva arms-control talks between the US and the USSR, it is likely that USAF will be permitted to resume testing its ASATs this summer—and this time against an orbiting target.

The Air Force plans about ten more ASAT tests. It has set the ASAT IOC for the late 1980s. The exact date is classified.

As the Administration's national space policy directive of 1982 made clear, the Air Force is developing its ASAT not only to defend US satellites against attacking spacecraft but also—just as important—to take out Soviet satellites during wartime.

High on the list of such prospective Soviet target satellites are those constantly reconnoitering the oceans and providing targeting data for Soviet use against US carrier battle groups. Such information is vital to Soviet bombers overflying the oceans with long-range antiship cruise missiles and to Soviet attack submarines also thusly armed.

In fact, the Soviets have developed a comprehensive targeting system in space, and their satellites too are now regarded as integral parts of their air, land, and sea weapon systems and forces.

ASATs are often thought of in the context of a nuclear war. They would be just as important, however, in a nonnuclear war because surveillance satellites, their prime targets, are important to the prosecution of such a war.

The US SDI program has obvious antisatellite overtones. Clearly, any space-based defensive system capable of coping with welters of boosters and warheads would also be capable of picking off satellites, which would be "sitting ducks" by comparison.

*This image of Hawaii was formed last October 11 by the Shuttle Imaging Radar-B (SIR-B). The area covered is about sixteen by seventy miles.*

### SDI in Context

The SDI program is the defensive segment of a much broader strategic whole.

The Reagan Administration retained Mr. Carter's PD-59 as the basis of its own strategic policy, but swiftly set about giving it substance. The basis of this was the strategic modernization program that Mr. Reagan expounded in October 1981.

That program is probably best known for its emphasis on such "countervailing" weapons as the MX ICBM and the B-1B bomber. Its top priority, however, was—and is—to modernize the nation's $C^3I$ assets and make them more muscular and much less vulnerable.

$C^3I$ has become virtually synonymous with space.

Consequently, DoD, with the Air Force as its principal agent, is concentrating on hardening and dispersing satellites and their ground nodes against nuclear attack—against so-called "EMP coupling," wherein a nuclear burst generates an electromagnetic pulse that "couples" into electrical circuits and burns them out.

There are several ways to accomplish such hardening—by incorporating filters, surge arresters, Faraday cage contrivances, and the like. New generations of US satellites, such as the Milstar and the DSCS (Defense Satellite Communications System) III varieties, are designed with resistance to EMP in mind.

As one Air Force general puts it, however, "The real quantum steps in making satellites more survivable are yet to come." They will cost a bundle of money.

Among those steps will be the shielding of satellites (including, and notably, the SDI battle-station types) against attacks by lasers and particle-beams and providing some satellites with enough autonomous thrust to enable them to maneuver out of the way of orbital-interceptor ASATs (this would not work against a speed-of-light laser attack). These satellites will be equipped with sensors that will see those interceptors coming in plenty of time.

### The Weight Premium

The problem—a big one—with those methods is that they add weight to the satellites. Weight is at a premium on all spacecraft. As Air Force officials explain it, self-defensive additions to satellites almost always compromise their ability to execute their missions, given their stringent overall weight constraints.

This is why the SDI program puts great emphasis on cutting the cost of putting every pound of its prospective spacecraft into orbit.

The weight problem is compounded by the fact that new generations of "multipurpose" satellites are being built and designed to do more than one mission. This means great demands on their performance.

In spacecraft, as in aircraft, weight translates directly into cost. Moreover, it translates into bulk, and this, in years to come, will complicate the satellite-launching process.

Such a prospect explains why the US will probably have to resort to booster rockets much more powerful than those now used for depositing military satellites into space.

Satellites are loaded with electronic subsystems, which also add weight. Thus, one saving grace in the weight-performance tradeoff dilemma lies in the remarkable advancement of microelectronics technology—best exemplified by the very-high-speed integrated circuits (VHSICs) now entering production for USAF, the Army, and the Navy.

The VHSIC semiconductor chips are expected to be highly reliable and to process signals and data at dazzling speeds. If they live up to their billing (with even more proficient varieties in the offing), they promise not only to revolutionize the avionics of aircraft, such as USAF's Advanced Tactical Fighter, but also to provide satellites with extensive flight-control capability while actually *reducing* the weight of their electronic innards.

Just a few tiny VHSIC chips on a thin, lightweight circuit board can do signal-processing and data-processing jobs that now require many comparatively massive black boxes. Such compact circuit boards will also require far fewer wiring connections between the chips and the microcomputers they constitute, thus greatly reducing the chance of failures inherent in such connections.

Moreover, they can be installed in aircraft and spacecraft so copiously as to back up one another in case of failures (which they themselves will diagnose), and the microcomputers comprising them will be conducive to the incorporation of artificial-intelligence software.

All this will take satellites a long way toward fault-tolerance and autonomy. In turn, it is expected to lead to far less dependence on vulnerable and expensive ground stations that now must do the command-and-control data and signal processing for the satellites.

### C² for Space

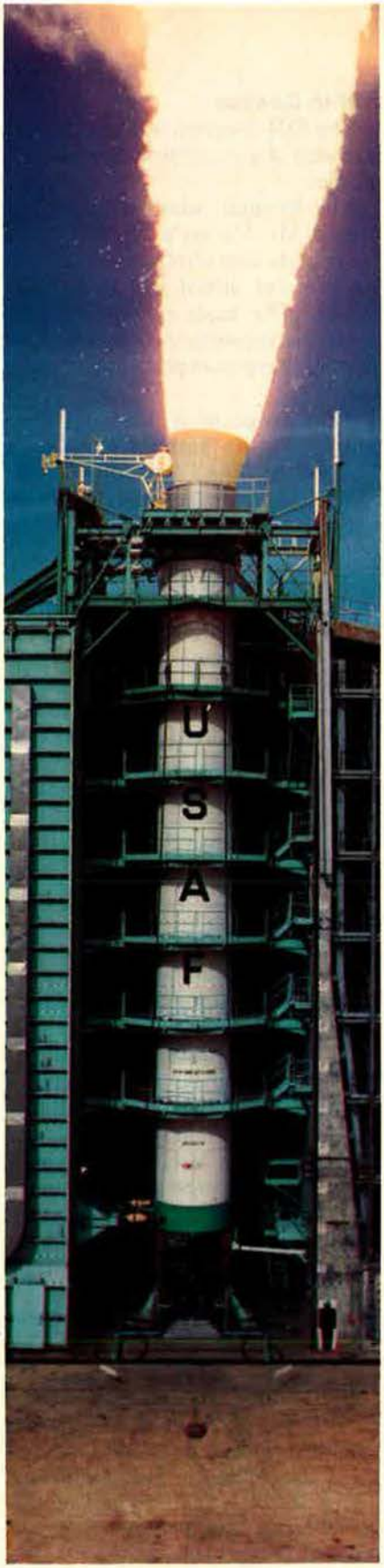
The Air Force now maintains command and control of spacecraft through its Satellite Control Facility (SCF), a network of seven remote tracking stations around the globe that are interconnected through USAF's Satellite Test Center (STC) at Sunnyvale AFS, Calif. It controls military missions of the Shuttle from facilities at NASA's Johnson Space Center, Houston, Tex.

Both are highly susceptible to sabotage and, in the case of the STC, to earthquakes, to say nothing of surprise attack by submarine-launched ballistic or cruise missiles from the Pacific. Moreover, the STC's computer facilities leave something to be desired.

To relieve STC's work load, USAF is moving as fast as possible to build its new Consolidated Space Operations Center (CSOC) near Colorado Springs, Colo., on the eastern side of the Rockies. Scheduled to begin operating next year, the CSOC will share the command and control of some critical military space missions with the STC, and each will control certain satellites independently, backing up one another as well.

In yet another major construction project pegged to assuring routine access to space, DoD is building a Shuttle launching and landing facility at Vandenberg. Its purpose is to launch Shuttle satellite payloads into transpolar orbits, something that cannot be done effectively from Cape Canaveral, Fla. Booster rockets for transpolar launches from Canaveral would fall on land, not into the ocean.

The coastal locations of Vandenberg and Canaveral are also worrisome to US space planners. Privately, some of them predict that the new NASA-DoD study of what the US needs to prepare to do in space will culminate in a recommendation for more secure, inland Space Transportation System bases.




*A seven-segment rocket motor ten feet in diameter is tested at UTC's Chemical Systems Division facility in California. Such space-boosting power is now in demand.*

### Sure Communications

Ensuring the security of space-oriented systems also means protecting the streams of data and signals that pass between the spacecraft and their air, land, and sea terminals as well.

It serves no purpose to have a fully functioning set of communications satellites transmitting messages to strategic or tactical forces if those messages are jammed—and it is almost certain that an enemy would try jamming before, or even as, he attacks satellites and terrestrial stations.

This is why the DSCS III communications satellites, now building up to their full orbiting complement, and the Milstar strategic and tactical communications satellites, scheduled for initial deployment later in this decade, are so important.

The DSCS III system, now augmenting but later to replace the DSCS II system, was developed to provide superhigh frequency (SHF) communications for secure-voice and high-data-rate transmissions.

USAF officials are satisfied that the system meets requirements as bearer of a wide range of traffic—military command and control, crisis management, early-warning detection-data relay, treaty monitoring, surveillance information, and diplomatic messages. The DSCS III satellites also have it over their forerunner DSCS II satellites in number of channels, flexibility, and counter-countermeasures capability.

The DSCS III system's flexibility has to do with its geographic range, meaning the satellites' scope of coverage and the mobility of their ground stations.

Each of the six satellites in the system, including "spares," has a "footprint" covering approximately one-third of the globe. A full-up DSCS III ground terminal can be carried by a C-5 airlifter and can be made available to US forces anywhere just as fast as the airlifter can reach them. Four DSCS III satel-

lites are expected to be on station in geosynchronous orbit by the end of next year.

The problem with those big broad footprints is that somewhere in nearly all of them lies a potential adversary who could try jamming them.

USAF officials are confident that it would be impossible to take all, or even much, of the DSCS III system off the air by means of jamming. But the Soviets are obviously working toward that end. So it's probably only a matter of time before they learn how to jam the DSCS III satellites, and this is why the Pentagon is already considering the development of a follow-on DSCS satellite system for possible deployment in the twenty-first century, or maybe a little before.

The concepts, techniques, and technologies of the Air Force's communications satellites capable of operating in intense jamming environments are developed in USAF's Advanced Space Communications program. It deals, for example, in laser communications and in satellite internetting.

### From Strats to Milstar

Out of that program several years ago came USAF's proposal for a Strategic Satellite System (SSS), made up of so-called "Stratsats," to replace the Air Force Satellite Communications (AFSATCOM) system.

AFSATCOM consists of transponders aboard the Navy's Fleet Satellite Communications (FLTSATCOM) satellites in geosynchronous orbits and is linked to USAF Satellite Data System (SDS) satellites in transpolar orbits. All serve strategic forces.

The idea was to have only a few Stratsats provide global coverage from their "parking" positions five times higher than geosynchronous orbit, in what is called hyper-geosynchronous orbit.

SSS funding was denied by Congress during the years of the Carter Administration, however, and so the Air Force turned to the Milstar system, instead.

Milstar is critical to the success of the Administration's strategic modernization program and was assigned the highest national priority—for very good reasons.

It represents DoD's most ambitious satellite communications program to date. Scheduled to be fully deployed around 1993, it will consist of a constellation of satellites circling the earth once a day at various inclinations relative to the equator. It is said that some will be "parked" in near-geosynchronous orbit as well.

All will be linked with a superabundance of air, land, and sea terminals of strategic and tactical forces. The Air Force is developing the Milstar system satellites, system control equipment, and airborne terminals. The Army and the Navy are developing ground and seaborne terminals, respectively.

For USAF, the Milstar linkups will be the assured means of bomber, fighter, tanker, airlifter, and radar aircraft units staying in touch with one another, and with commanders at all levels, at all times anywhere in the world.

The entire system is being built from scratch for robustness, survivability, and security of its communications. In this, it will feature crosslinks and such techniques as frequency hopping and time shuffling and will be hardened against nuclear and laser attack.

Its extremely-high-frequency (EHF) voice and data transmissions promise to be almost impossible to jam in the context of the current state of the art.

Testing of Milstar-capable EHF subsets was scheduled to begin aboard two new FLTSATCOM satellites next year. Once the Milstar system is fully operational, the AFSATCOM transponders on those satellites will be phased out.

The Milstar and DSCS communications constellations and the Navstar navigation constellation will contain a sufficient number of satellites so that some in each can orbit idly as "spares" and then be switched on if necessary.

### Reconstituting Assets

This begins to address a tough decision confronting the Air Force more and more—how best to "reconstitute" its fleets of satellites after too many take hits or are otherwise neutralized during war.

The "spares" method—also called "on-orbit storage"—seems to be the favorite. In its budget projections for future years, USAF is looking to provide increasing amounts of money for such storage in space.

But USAF would also like to have much greater capability for launching crucial "warfighting" (as contrasted with "deterring") satellites in short order as wars or crises demand.

This need is related to USAF's insistence on having the assurance of routine access to space independent of the Shuttle and is why the White House authorized its purchase of the ten CELVs.

But even those big boosters take a lot of time and involve much costly manpower in preparation for launching of satellites. All the while they are vulnerable on the ground.

There are several ways of confounding would-be attackers of satellites.

One is deception, which can take several forms. Another is proliferation—launching the varieties of smaller satellites, such as many surveillance, communications, and weather satellites, in bunches for dispersal in space, thus vastly complicating any attacker's target-selection process.

The Soviets are longtime users of this "salvo" technique, as they have demonstrated during such tense times as the Middle East and Falklands wars. They are said to have popped sixteen satellites into space in a big hurry to keep track of what was going on around the Falklands.

Some space experts in the Air Force, the Department of Defense, and the aerospace industry believe that manned spaceplanes capable of taking off from runways would be just the ticket in helping to solve the problem of reconstituting and maintaining sets or constellations of satellites on short notice.

Enter the Transatmospheric Vehicle (TAV) and all such horizontal-takeoff or single-stage-to-orbit spaceplanes.

Those concepts excite many officials. They have quite a way to go, however, before they are transformed into hardware, if ever.

Even so, several high-ranking Air Force officers have told this magazine that, as one put it, "we'll get a TAV sooner or later because we'll probably have to have it." ■

A national space strategy is coming, with options for manned spaceplanes and on-orbit repair of satellites.

# Space Plan 2000

BY JAMES W. CANAN
SENIOR EDITOR

*Artist's drawing shows Orbital Sciences Corp./ Martin Marietta Transfer Orbit Stage (TOS) with payload emerging from a Shuttle.*

THE science-fiction title *2001: A Space Odyssey* is shaping up as uncannily applicable to the United States. The turn of the century has been set as the benchmark of big plans now unfolding to establish US preeminence in space.

Those plans spring from the Reagan Administration's commitment to take all possible advantage of space for the sake of the nation's economic, scientific, and military well-being now and in the future, and they are founded in the National Space Policy that President Reagan set forth three years ago this month. They will culminate, according to Administration officials, in a new "National Space Strategy" to be formulated before the end of this decade.

Among basic questions being addressed by US military and civilian space planners are:

- Which technologies need to be developed to provide the nation with new space systems in the mid to late 1990s and beyond the year 2000?
- What civil and military space missions will be required in those two distinct time frames?
- Should the US anticipate assembling in space the very large military satellites to be required by and after 2000, or should it develop extremely powerful booster rockets to launch them fully assembled? Or both?
- What must be done to advance the fledgling state of the art of manned "military aerospace planes" like the Transatmospheric Vehicle (TAV)?

As a fundamental step in all this, President Reagan last April ordered the Department of Defense and the National Aeronautics and Space Administration to identify the space-launching capabilities that the US will need by the mid 1990s—and that we must soon begin to develop—and to pinpoint the technologies required for such capabilities. This study is expected to take about a year.

Technologies nurtured by NASA and DoD, with the Air Force in the lead, will be the means of fulfilling all aspects of the US drive toward primacy in space. Costs of advancing those technologies and of integrating them into systems will undoubtedly be very high. Coming to grips with them and establishing priorities to keep them within reason will be matters for tough decisions at the national political level in years to come.

The whole idea is to make sure that the US will enjoy routine, unchallenged, and unimpeded access to space for whatever purposes it deems necessary, consistent with arms-control agreements, for the deterrence of and, if need be, the waging of war.

### The Military Requirement

In the military sector, this means that the US must:

- Develop ever more capable communications, surveillance, warning, navigation, weather, and mapping satellites capable of carrying out their increasingly demanding missions.
- Launch them into space much more quickly than is now possible and build manned or unmanned launch vehicles, perhaps both, that will bear their heavier weights and boost them into optimal orbits.
- Be able to maintain and service those satellites in space.
- Make them robust and survivable and deploy the means of protecting them no matter how high they fly, clear up to geosynchronous orbit 22,300 miles away, or beyond.

NASA officials and DoD space planners have already pretty well agreed that the Space Shuttle will be the nation's main means of deploying satellites until the year 1995. By then, operations aboard NASA's Space Station, scheduled for deployment in 1991, should have taught astronauts many new techniques for assembling space platforms. Such knowledge will be of great benefit to Shuttle crews.

By the year 2000, on-orbit assembly techniques may well entail the routine deployment of so-called "orbital maneuvering vehicles" and "orbital transfer vehicles"—manned or unmanned spacecraft capable, for example, of retrieving satellites anywhere in earth orbit and then bringing them down to the Shuttle and its successor cargo spacecraft for refurbishment or repair.

Servicing satellites in geosynchronous orbit—the main domain of increasingly vital communications satellites, early-warning satellites, and some other types—is one of the top goals to be met at, or just before, the year 2000.

For USAF, this means that space logistics is coming into its own, demanding more and more attention all the time. Last May, for example, Air Force Systems Command undertook its first conceptual studies of orbital-transfer spacecraft and how best to use them.

### USAF Heavily Involved

The Air Force is a key player in all phases of the Administration's process for setting and meeting US military space goals for the late 1990s and the early years of the twenty-first century.

Those goals include the possible deployment of Strategic Defense Initiative (SDI) satellites, such as laser, particle-beam, and hypervelocity-gun platforms, and of reusable systems, such as a successor to the Shuttle, perhaps a military aerospace plane.

One thing already seems certain: Any spacecraft to succeed the Shuttle will dispense with the Shuttle's ceramic tiles and will instead be protected by a highly heat-resistant material not yet available but in early development. Administration and USAF officials also agree that a Shuttle follow-on spacecraft will need to be much more cost-effective per launch.

In the civilian sector, manned missions to geosynchronous orbit are being contemplated for the year 2000—and after that, manned missions to the moon and Mars.

The technologies for doing all this are being mustered in the US aerospace R&D community by NASA and DoD on a scale that is potentially far more encompassing than that of the Apollo moon-landing program of the 1960s and the Shuttle-centered Space Transportation System (STS) program of the late 1970s and early 1980s. The effort springs in large measure from the Administration's SDI program for the exploratory development of nonnuclear defensive weapons to be based in, or to pass through, space. There is a lot more to it than SDI, however.

It embraces myriad new systems that the US will require in order to satisfy its increasingly pressing needs for assured access to space

and for much greater survivability of a wide variety of satellites that have become downright indispensable to deterring or waging war. Such routine access and survivability will become increasingly important to the civilian sector, too, as plans for the industrialization of space ripen into actual operations.

### Synergism of Technologies

In many respects, the technologies that are vital to the accomplishment of US space goals are the same ones—those of microelectronics, propulsion, materials, aerodynamics, and the integration of all these and more—that gave rise to the Shuttle and to today's high-performance aircraft and that are now being advanced in such high-tech, nonspace military R&D programs as USAF's Advanced Tactical Fighter (ATF). The increasing synergism of aeronautical and astronautical technologies is an eye-catching element of US preparations to exploit space.

It comes through very clearly in concepts of a manned flying machine, usually called the Transatmospheric Vehicle (TAV), to operate interchangeably in air and space.

The synergism is underscored in a report, "National Aeronautical R&D Goals: Technology for America's Future," issued last April by the White House Office of Science and Technology Policy (OSTP). It said in part:

"US aeronautics and space endeavors share related constraints and unexploited opportunities in the transatmospheric regime.

"The capability to routinely cruise and maneuver into and out of the atmosphere, to gain rapid responsiveness for low earth missions [manned or unmanned], or to attain very rapid transport services between earth destinations from conventional runways must be viewed as aerospace options with global importance for the future.

"This convergence [of aeronautical and space technologies] makes it vital for the US to establish a long-range goal for understanding and better exploiting this important bridging regime."

### TAV Feasibility

For some time, the Air Force Scientific Advisory Board has been studying a spaceplane-airplane capable of operating in and up or down from the transatmosphere (the upper reaches of the atmosphere and the lower reaches of space). The board's report on the feasibility and desirability of such a machine was scheduled to be given to AFSC by USAF's Deputy Chief of Staff for Research, Development and Acquisition last May.

AFSC's Aeronautical Systems Division and Space Division have already explored TAV concepts. In fact, ASD's work on the TAV has progressed to the point of mission analysis.

With the results of all such TAV exploratory efforts in hand, AFSC is expected to decide next month if TAV-type spacecraft-aircraft are worth pursuing for military missions, just what those missions might be, and which technologies need to be taken in hand and advanced to make it happen. In this, AFSC is being guided by such potential TAV users as Strategic Air Command and Space Command. Of all USAF commands, they are said to have the keenest interest, at the moment, in the TAV.

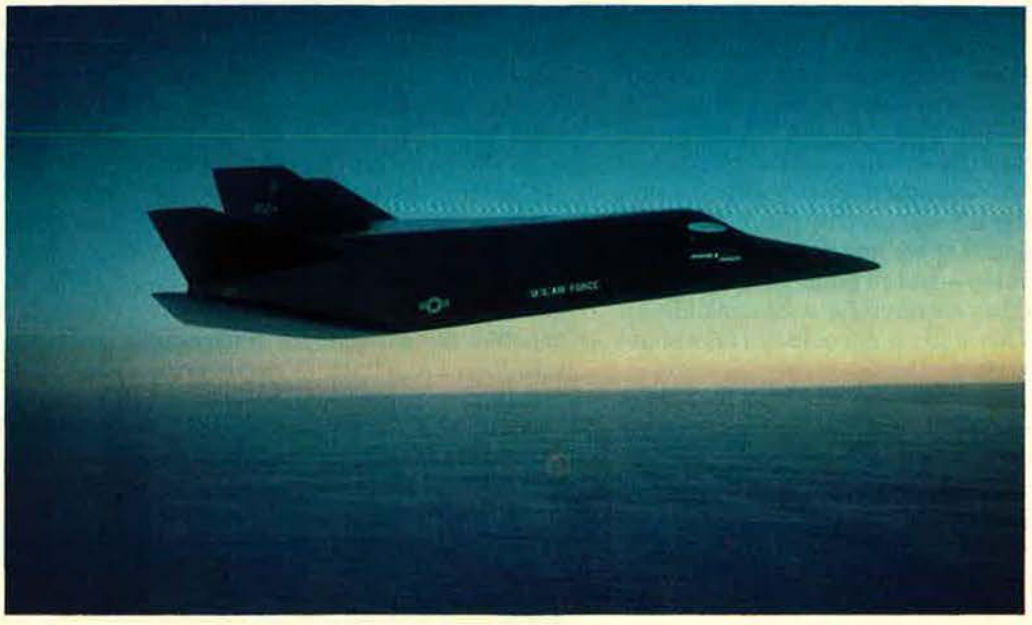
SAC, for example, sees promise in the TAV as a follow-on to the SR-71 Blackbird reconnaissance aircraft, or even as a strategic bomber for the twenty-first century.

Air Force leaders shy away from proclaiming the TAV's potential warfighting wonders, however. "We are most definitely *not* promoting the TAV as a strategic bomber," one official asserts.

### Too Early To Say

Lt. Gen. Bernard T. Randolph, speaking as Vice Commander of AFSC, prior to his appointment as USAF's Deputy Chief of Staff for RD&A, claimed it is far too early to pass judgment on the TAV. For one thing, General Randolph noted, "The Air Force has not yet decided that man in space will be useful militarily. I think the whole business of man in space [for military purposes] will have to be looked at a long time."

Some complicated and challenging questions surround the TAV. They are now being tackled by the



***A Transatmospheric Vehicle (TAV) aloft, as depicted by artist Erik Simonsen. TAV conceptual designs abound in the US aerospace industry, which awaits a go or no-go from USAF to begin developing such a manned aircraft-spacecraft. Air Force Systems Command is expected to report next month on the TAV's potential.***

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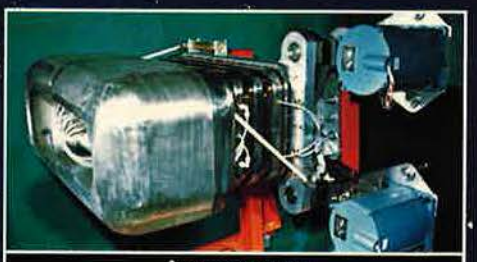

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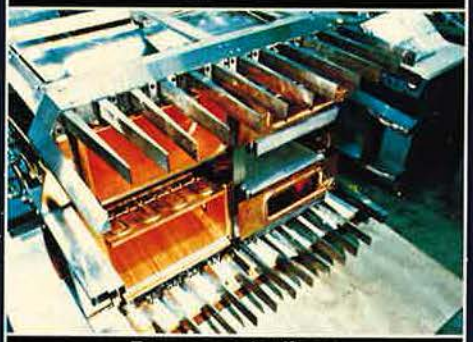

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Air Force and include the following:

What payload will it carry? Where will it take off and land? Will it be single-stage? Dual-stage? Will it be piggybacked on a conventional aircraft, such as the 747 jumbo jet, to carry it to launch? Would it take off from a runway? Would it be useful as a reconnaissance craft? As a bomber? As a cargo carrier? Since its thrust as a horizontal-takeoff aircraft-spacecraft would have to be vastly greater than that of any aircraft now in use, are the technologies available or in the offing to attain such thrust? Have the science and technology of lightweight materials that are highly resistant to heat progressed to the point where such materials can be foreseen for a TAV airframe?

AFSC will respond to all such questions next month. The betting is that even if AFSC decides for now against an all-out or even a modest TAV development program, it will almost certainly recommend pursuing TAV technologies, if for no other reason, to hedge against Soviet developments along the same lines.

"I worry a lot," says one USAF TAV enthusiast, "that we're going to look up some day, while we're dawdling, and see the TAV—with a red star on its fuselage."

### White House Push

The heaviest pressure to get on with the TAV, or at least to step up the development of its technologies, is coming from outside the Air Force—straight from the space-oriented White House.

The OSTP report of last April noted that "the extreme altitude and speed capabilities this technology makes possible could enhance military survivability in lethal environments and provide flexible basing for global-range weapons delivery, reconnaissance, or space-support missions."

Elaborating on the report at the time it was issued, Dr. George A. Keyworth II, the President's Science Advisor and director of OSTP, said the nation "must look to capturing the potential payoffs available from superhigh-speed flight—by this, I mean hypersonic speeds and transatmospheric vehicles."

Dr. Keyworth went on to say, "For the future, we can envision vehicles that could operate from conventional runways, maneuver at the fringe of the atmosphere, and, when required, ascend into space orbit with little additional effort.

"Vehicles of this type depend on further technological developments. As an example, hydrogen-fueled scramjets hold great promise for producing substantially improved propulsive efficiency over today's rocket technology."

Future applications for TAVs "range from regular access to space to rapid point-to-point global transportation," Dr. Keyworth declared.

Given President Reagan's proclivity for all things space, is he himself a TAV enthusiast? Administration officials say the President has not yet been briefed on the TAV's potential and thus has given no official indication.

"But it certainly would be in character for him to be attracted to—and supportive of—the TAV," one such official declares.

A year ago, Gen. Robert T. Marsh, just prior to his retirement from the Air Force as Commander of AFSC, wrote that "the development of a true aerospace vehicle" is "among the potential twenty-first century capabilities forecast by AFSC."

Such capabilities are inherent in "technologies already developed or predictable in the aeronautics world," General Marsh wrote. Among them, he mentioned "a space-capable airframe," advanced computers, and "a superenergetic fuel capable of providing the power required for exoatmospheric flight in a horizontal takeoff and landing vehicle."

*This sketch shows OSC's Apogee and Maneuvering Stage (AMS) with a Tracking and Data Relay Satellite payload, following separation from the TOS. Such future space-launching vehicles loom large in US space plans.*

### The Space Cruiser

Meanwhile, as TAV skeptics and advocates wrestle within the Air Force, yet another concept waits in the wings. It is called the "space cruiser"—a small, single-seat spaceplane that would be taken into space aboard, and launched from, the Shuttle or a much larger "space aircraft carrier."

The Defense Advanced Research Projects Agency (DARPA) funded a conceptual study of such a spacecraft. The study ended late last summer, apparently with inconclusive results.

Air Force officials are not exactly captivated by the space cruiser concept ("It sounds like a one-man sneaky Pete in a Battlestar Galactica," scoffs one Air Force general), but do not entirely dismiss it either.

A major reason for the Air Force's cautious approach to the TAV is congressional wariness of it up to now.

Last year, the House Armed Services Committee denied USAF's request for $2.8 million in the current fiscal year for its Advanced Military Spaceflight Technology program. That funding would have focused on TAV exploration.

The House panel wanted better answers than the Air Force was prepared to give at the time on just what the TAV would look like and what it would be capable of doing—the very answers that AFSC is working to come up with right now. ■

# USAF Space Division Checklist

## WHAT'S HAPPENING AT THE SPACE DIVISION OF AIR FORCE SYSTEMS COMMAND

(As of May 7, 1985)

| NAME AND MISSION | STATUS | CONTRACTOR |
|---|---|---|
| **Air Force Satellite Communications System**<br>The Air Force Satellite Communications System provides the capability of high-priority command and control communications for US strategic forces. The system is integrated with the Fleet Satellite Communications System and other DoD satellites, as it does not have its own dedicated spacecraft. | Operational | General Electric Co.; TRW; Hughes Electronics Dynamics Co.; Aerospace Corp. |
| **ASAT**<br>An F-15 aircraft specially configured to carry a modified SRAM will fly to a preplanned launch altitude, where the missile will be released to intercept a satellite in low earth orbit. The program remains in the test phase, with additional flight tests planned this year. | Development and Test | Hughes Aircraft Co. |
| **Consolidated Space Operations Center**<br>When operational, the Consolidated Space Operations Center (CSOC) at Falcon AFS near Colorado Springs, Colo., will provide in one location an enduring and secure facility to command and control DoD Space Shuttle and satellite missions. The Center will complement NASA space operations and integrate such military requirements as the need for increased security. Major construction of the Center is nearing completion, and work is beginning on installation of essential interior equipment. Control of some space operations is expected to begin in 1987, with full capability planned for the early 1990s. When completed, the Center will provide a capability to accomplish interactive and highly secure space and Shuttle operations through a dedicated DoD command structure. Control of satellite remote tracking, telemetry, and command stations will be shared by operators at the Center and those at the Satellite Test Center near Sunnyvale, Calif. Air Force Space Command will operate CSOC when it is completed. | Exterior Construction: Near Completion; Shuttle Operations: Full-Scale Development (1986) | TRW Defense Systems Group; Space Communications Co.; Ford Aerospace and Communications Corp.; IBM, Aerospace and Communications Co. |
| **Defense Meteorological Satellite Program**<br>Defense Meteorological Satellite Program (DMSP) spacecraft are designed to satisfy military requirements for worldwide weather information. Using data provided by these satellites, military weather forecasters can observe developing patterns of weather and can track existing weather systems over remote areas, including oceans. The data helps identify severe weather, such as thunderstorms, and other more violent atmospheric activity, such as hurricanes and typhoons. The satellite imagery is used to form three-dimensional cloud analyses that are the basis for computer simulations of various weather conditions. While the primary mission of DMSP is to gather weather data for military uses, the information is a national resource. It is frequently made available to the civilian community through the Commerce Department's National Oceanic and Atmospheric Administration. The satellites orbit at an altitude of approximately 450 nautical miles above the earth in near polar, sun-synchronous orbit. | Operational | RCA Government Systems Div.; Aerojet ElectroSystems Co.; Hughes Aircraft Co. |
| **Defense Satellite Communications Program**<br>The Defense Satellite Communications System (DSCS) is a worldwide satellite network that supports the Department of Defense, US State Department, and other US government agencies throughout the world by providing secure voice and high-data-rate communications service. DSCS II satellites provide current operational capability. DSCS III satellites will replace the older satellites in a phased deployment. The newer satellites are larger, have a longer design life and increased capability, and are more survivable. The first DSCS III satellite was launched in October 1982. Primary purpose of the DSCS program is to provide high-capacity communication channels by using selective narrow-coverage antennas. The system is designed to have antijam capabilities and to provide secure command and control communications. | Operational (DSCS II); Production (DSCS III) | Classified |
| **Expendable Launch Vehicles**<br>To meet the national security requirement of assured access to space for the most critical US payloads, the Air Force is buying ten complementary expendable launch vehicles. The contract calls for acquisition of all supplies and services necessary to procure and launch ten Titan 34D7s. Each Titan will be capable of placing a 10,000-pound payload into geosynchronous orbit. Plans call for the launch of two vehicles each year beginning in late 1988 to satisfy critical DoD satellite requirements. Selection of the upgraded Titan in March 1985 completed a source selection process begun a year earlier. It is an improved version of the Titan 34D launch vehicle, with stretched first and second stages, seven-segment solid-propellant rocket motors, and a Centaur upper stage. | Development and Production | Titan 34D7: Martin Marietta; Aerojet TechSystems Co. (liquid-propellant engines); United Technologies; Chemical Systems Div. (solid rocket motors); GMC, Delco Systems Operations (guidance components); General Dynamics (Centaur upper stage); McDonnell Douglas Astronautics Co. (payload fairing). Atlas E/F: General Dynamics, Convair Div. |
| **Fleet Satellite Communications System**<br>From its geosynchronous orbit above the earth's equator, the Fleet Satellite Communications System (FLTSATCOM) provides near global communications for high-priority requirements of the US Navy and Air Force. It also supports other Department of Defense communications needs. Each satellite has twenty-three channels in the ultrahigh and superhigh frequency bands. Ten of these channels are used by the Navy to communicate worldwide with its land, sea, and air forces. One channel on the satellite is allocated to the National Command Authorities. Three of the four operational satellites have exceeded their original five-year design life. One has been on orbit for more than seven years. In June 1983, a contract to produce three additional satellites was signed. This follow-on buy will serve to augment the established constellation in its UHF mission. An EHF addition, to be carried on satellites seven and eight and known as the FLTSATCOM EHF Package, will provide the Defense Department an early test-bed for the new Milstar EHF terminals. | Operational | TRW Space and Technology Group (development/test); Aerospace Corp. (engineering/integration) |
| **Inertial Upper Stage**<br>The Inertial Upper Stage (IUS) was developed to provide a highly reliable, two-stage, solid-fuel vehicle to boost selected payloads from the Shuttle's low earth orbit to a higher orbit in the 22,000-mile range. This vehicle is also designed for use with such expendable launch vehicles as the new Titan 34D7. In addition to use with military cargoes, the IUS is used by NASA to launch its tracking and data relay satellites. | Production | Boeing Aerospace Co.; United Technologies, Chemical Systems Div. (rocket motors); Rockwell International Corp. |

| NAME AND MISSION | STATUS | CONTRACTOR |
|---|---|---|
| **Milstar**<br>The next generation of military satellite communications is being developed to serve both US strategic and tactical forces. This new system, called Milstar, will provide a worldwide, highly jam-resistant, survivable communications capability for the National Command Authorities and US military forces well into the next century. Use of extremely-high-frequency and other advanced communications techniques will enable the system to achieve a high degree of survivability under conditions of both electronic warfare and physical attack. Extremely-high-frequency satellite communications recover very quickly from propagation degradation caused by high-altitude nuclear detonations. A joint service project, the Milstar system will be deployed in the late 1980s. The space segment of the system will include newly designed EHF and UHF satellites. An EHF package will be included in two of the US Navy's Fleet Satellite Communications System spacecraft. Milstar satellites will be compatible with launch requirements associated with the Space Transportation System. | Development | Lockheed Missiles and Space Co.; TRW |
| **NATO III Communications System**<br>To provide satellite communications capability for their military forces, NATO purchased four US-built satellites. The fourth was launched November 13, 1984, from Cape Canaveral, Fla. The system provides a network for ground, airborne, and shipborne communications that are interoperable with the DSCS. | Operational | Ford Aerospace and Communications Corp.; Aerospace Corp. |
| **Navstar GPS**<br>A constellation of eighteen satellites is being developed to provide precise navigation information for military and civilian users throughout the free world. Six developmental satellites are now in orbit, and the test phase for the space portion of the system is near completion. Production contracts for the satellites and for upper stage PAM-D IIs, which place the satellites into precise orbits, have been awarded. Recently, the contract was announced for development and integration of user equipment. This contract includes options to buy equipment for DoD air, sea, and land users. The space-based navigational system is expected to be operational by late 1988. | Production | Rockwell International Corp., Satellite Systems Div. (space segment); IBM, Federal Systems Div. (control segment) |
| **PAM-D II Upper-Stage Vehicles**<br>The PAM-D II upper stage will boost Navstar GPS satellites into 10,900-nautical-mile, twelve-hour orbits from the Space Shuttle's low earth orbit. These solid-fuel Payload Assist Modules are being purchased through a multiyear purchase agreement that saves approximately $40 million when compared with single-year contracts for twenty-eight upper stages. A spring-loaded mechanism ejects the spinning PAM-D II and Navstar GPS satellite from the Shuttle cargo bay. The spinning motion stabilizes the spacecraft from initial deployment to positioning in orbit. The delivery schedule for the PAM-D II extends from 1985 to 1990. | Production | McDonnell Douglas Astronautics Co. |
| **Space Launch Complex-6**<br>Construction of SLC-6 at Vandenberg AFB, Calif., is complete, and all systems required for Shuttle launch are nearing readiness. Pathfinder testing using the Orbiter *Enterprise* has demonstrated facility and handling capabilities. The three-month test, which began in January 1985, used the inert Shuttle *Enterprise* to verify compatibility of all support elements. The Shuttle was removed from the 747 carrier aircraft using the Orbiter lifting facility on the Vandenberg AFB flight line. From there, the Orbiter was towed to each location where the Shuttle will be worked on or stored. A spacecraft test vehicle was used successfully to demonstrate payload handling systems in each payload processing facility. Two support systems were demonstrated with the stacked verification Shuttle on the launch mount. The ice suppression system, which uses two TF33 jet engines, blew heated air over the external tank to prove system design. Water from the sound suppression unit also validated design of that system, with 500,000 gallons flowing into the Shuttle main engine and solid rocket booster exhaust ducts. Prior to the first launch, planned for no earlier than March 1986, NASA will conduct a Flight Readiness Firing. | Nearing Operational Capability | Classified |
| **Space Test Program**<br>The Space Test Program schedules spaceflights for DoD space experiments that either are not authorized their own means of flight or are Quick Response Payloads. These experiments have minimal impact on the primary mission. Each experiment must use standard hardware that can be operated by a Shuttle crew member during periods of reduced activity. The majority of those experiments flown on Shuttle missions have been crew-compartment "carry-on" payloads and cargo-bay Get-Away Special canisters. One example is the Radiation Monitoring Experiment that recorded the gamma-ray and neutron/proton background encountered by the Orbiter. This experiment was flown on STS missions 6, 8, 41B, 41C, 41D, 41G, and 51A. | Ongoing | Classified |
| **Strategic Defense Initiative Activities**<br>As a lead agency and integrator for the President's Strategic Defense Initiative program, Space Division is deeply involved in the following research areas: natural backgrounds, advanced cryocoolers, infrared focal plane, radiation hardening, focal mirror, space boosters, threat analysis, survivability analyses, large optics, atmospheric compositions, and space logistics. Research is being conducted at various government and contract laboratories. | Research and Test | Classified |

## Air Force Space Technology Center

As Space Division's technology arm, the Center is supporting the President's Strategic Defense Initiative program. Through its subordinate laboratories, STC is managing the development of SDI technologies for ballistic missile defense of the US and its allies.

**The Air Force Weapons Laboratory** is building a weapons-class cylindrical chemical laser that would be compact enough to base in space, if the President and Congress decide on space defense. Before that point is reached, acquisition pointing and tracking and optics technologies must be perfected.

**The Air Force Geophysics Laboratory** is investigating the nature of natural and man-made heat sources so that infrared sensors based in space can tell when a missile attack has begun and where the booster and warheads are located.

**The Air Force Rocket Propulsion Laboratory,** in addition to producing the rocket motors that will carry our systems among the planets, is developing propulsion for space-based rocket programs.

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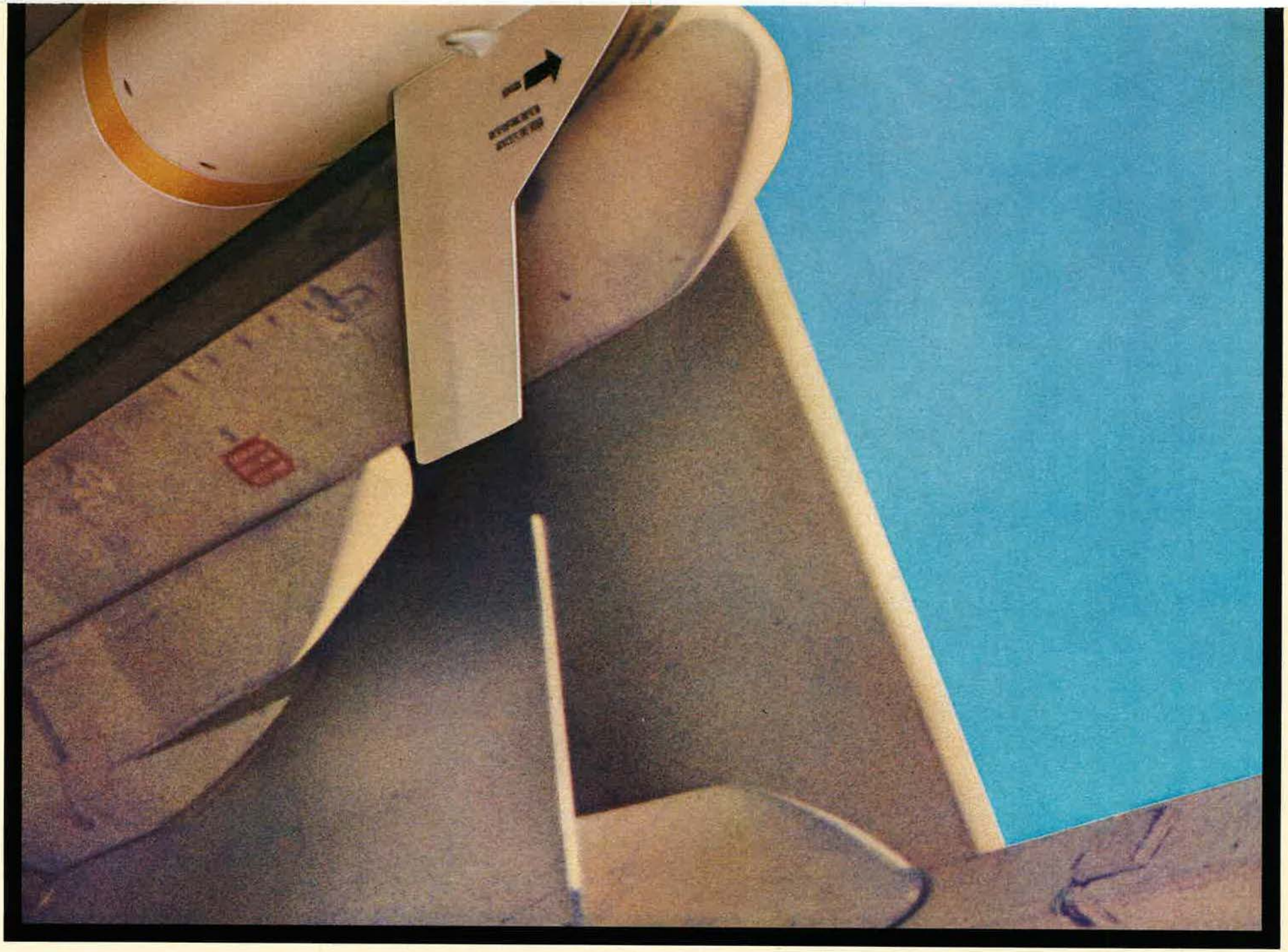


*A veteran analyst says that much of what you can hear about anti-satellite weapons is garbage.*

*A USAF F-15 takes an antisatellite (ASAT) weapon aloft. ASAT testing is scheduled to resume this summer against a target satellite. The author explodes the myth that it is a "first-strike" weapon. It cannot reach Soviet warning satellites. (Photo by Erik Simonsen)*

# A DOZEN ANTI-ASAT FALLACIES

BY JAMES E. OBERG

ONE aspect of the disarmament debate has been heating up lately because of a combination of recent weapons tests, international diplomatic efforts, White House reports, and a massive, Soviet-inspired propaganda push. It deals with the issue of antisatellite weapons, or ASATs.

On January 21, 1984, the US Air Force tested its air-launched ASAT missile without the actual warhead; a flight test of the full system occurred in November. Meanwhile, the Soviets have had an operational ASAT satellite for years. But in August 1983—in what turned out to be his last public appearance ever—Soviet Premier Yuri Andropov declared a "unilateral moratorium" and urged visiting American senators to block the American weapon.

Then, the following spring, the Reagan Administration released a special report on the prospects for negotiating a ban on such weapons with the USSR. The report had been required by Congress. In it, the President's experts concluded that the prospects for substantive negotiations and a verifiable treaty were very low.

This conclusion did not sit well with many vocal opponents of the Air Force's air-launched ASAT missile. Congressmen, lobbyists, commentators, and academics have been strenuously promoting the idea of a "freeze" on further space-weapons tests. The White House report directly opposed such a position.

While the debate rages, the facts of the issue have been confused to near-cosmic proportions. The technology itself can be elusive, and Soviet statements have been notable for their lack of candor.

Some have suggested an equivalent American "freeze" on ASAT testing as a prelude to negotiations to ban such weapons entirely. Many of these proponents are victims of gross misperceptions and errors of fact. Such errors appear in the news media and in Congress and are promulgated by direct-mail campaigns and during campus lectures. Serious public debate must be founded on reality, but some critics of the US ASAT are basing their case on fallacies. There are at least a dozen major ones.

*Fallacy One: The Soviet ASAT is "primitive, cumbersome, inept," or any number of pejorative terms.* This is false. Claims that the Soviet system works only half the time are based on juggled statistics that combine flight results of tests of the operational radar-guided system with test results of a newer infrared-guided system. The newer system has not performed well, but the operational two-orbit system has scored successfully in six out of the last seven shots over the past decade (the only failure was an unusual booster problem not associated with the ASAT itself). Since US low-orbit satellites, potential targets for the Soviet ASAT, lack countermeasures against the old system, the new Soviet ASAT is still unnecessary to ensure a very high "kill probability" for any single shot.

*Fallacy Two: The Soviet system, which uses a 150-foot booster rocket ("as big as two buses laid end to end"), is easily observed by American spy satellites. Thus, any negotiated ban could be easily verified.* This is false. The Soviet ASAT uses a booster called the SL-11 (or the "F"-class, based on the SS-9 ICBM), which is also used by a number of other military space programs. In 1982–84, there were thirty-one launchings of this booster, but only one carried an ASAT. The presence of such a booster on a launchpad (there are several pads in Central Asia and also north of Moscow) would not necessarily indicate a violation of a hypothetical ASAT ban. The Soviet orbital weapon is launched under an aerodynamic protective shroud indistinguishable from that used by the other programs, so the ASAT warhead would have to be spotted out in the open, during transport. It is even shorter than the American ASAT missile and is consequently far more difficult to spot.

*Fallacy Three: The US system is "far more sophisticated" and thus will provoke the Soviets to build a matching system.* This is false. While the guidance of the US ASAT missile is indeed more precise than that of the Soviet ASAT satellite (since the US system uses direct impact rather than a blunderbuss shrapnel charge as a kill mechanism), the weapons can only be compared fairly in terms of actual capability against real enemy military capabilities. In this regard, there is little difference in altitude range, reaction time, reload capability, or detectability. The major difference is that the Soviet system is operational now (and has been for a decade), while the US system will not be operational until 1987–88 at the earliest.

The notion that development of the American system will somehow "force" the Russians to "match" it is also false, since the Soviet system already possesses all the essential capabilities that the American system is supposed to have several years from now.

*Fallacy Four: The US ASAT is a "first-strike" system.* Opponents have conjured up visions of such missiles "blinding" Soviet warning satellites in the opening minutes of an attack scenario; other prestigious science journals and books have "by elimination" concluded authoritatively that such a weapon is clear-cut evidence that the US is preparing a BOOB ("bolt out of the blue") sneak attack on the USSR. The Soviets have trumpeted these claims widely, all the while stoking the fires of their own paranoia.

But the US ASAT cannot reach on-station Soviet warning satellites. It may not be able even to reach the ones at the low end of their orbit, six hours away from their apogees. Any such assault would be detected many hours before the Soviets' attack warning system was lost.

And besides, the scenario collapses under the simple Soviet expedient of moving their warning satellites into unreachable, 22,000-mile, geostationary orbits. Such a development is long overdue, simple to implement, and would counteract any presumptive American plans to attack the warning satellites.

*Fallacy Five: The Soviets have promised to stop testing their own ASAT satellite and to dismantle their system as part of a negotiated disarmament.* This is false. What Andropov really promised to the visiting US senators was that "the Soviet Union would never be the first to put any kind of antisatellite weapons into space." This solemn vow was brazenly at odds with the Soviet history of exactly such acts: putting antisatellite weapons into space. Soviet officials have steadfastly denied they have such a weapon, and consequently they are supposed to have nothing that could be dismantled. The Soviets have *never* explicitly stated that they possess any space weapon of any kind, and they have *never* promised to dismantle "their antisatellite weapon," under any circumstances.

*Fallacy Six: If the Soviets were to give up their "killer satellite," outer space would once again be "de-weaponized."* This is false. The Soviets would still retain an antisatellite capability based on their operational antimissile system around Moscow. Short of dismantling that whole system (an extremely unlikely prospect), the Soviets would still be able to threaten US satellites even under the most stringent verification requirements of any ASAT ban.

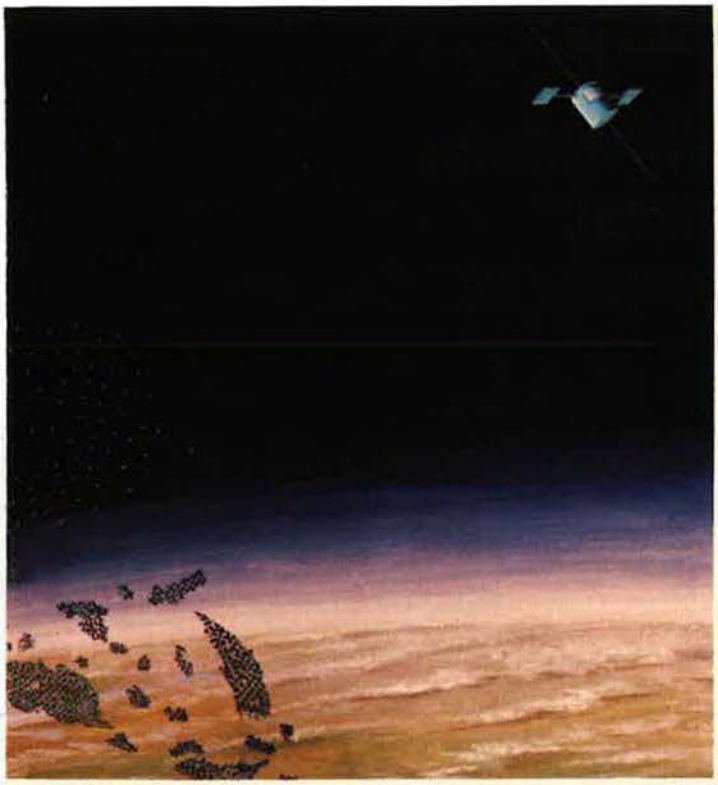
*Fallacy Seven: The air-launched nature of the American ASAT missile makes it extremely destabilizing because it can be based anywhere in the world and is thus much more flexible than the Soviet ASAT missile.* This is false. The American system needs an air-mobile launcher mainly to allow a head-on launch from directly in front of a target satellite, which otherwise could pass hundreds of miles to the east or west of the ASAT base. Worldwide basing has no obvious advantage, since any reasonable target's orbit will always carry it within range of the United States several times a day.

In contrast, the Soviet orbital system can use fixed launch sites because it has the speed and endurance to wait for the precise moment when the launchpad is carried by earth's rotation into the target satellite's orbital plane. At this point, the Soviet "killer satellite" is put into orbit and spends several hours hunting down its prey. The American direct-ascent system is much more severely limited in lifetime and speed.

***Artist's rendering shows Soviet ASAT weapons attacking a target satellite with exploding shrapnel. The Soviet ASAT system has been operational for a decade. Its technology differs from that of the US ASAT, but there is little difference between them in range, reaction time, reload capability, or detectability. The Soviet ASAT is launched under a protective shroud on an ICBM booster and thus is not easy to detect prior to launch.***

*Fallacy Eight: The US ASAT is dangerous because it can kill a Soviet satellite secretly, leading the Soviets to assume that any satellite failure might be the result of enemy action.* The American ASAT is supposed to be destabilizing because it can attack Soviet communications and missile-warning satellites and the Soviet ASAT cannot attack such US satellites. This is untrue. The Soviets have deployed a chain of nine infrared satellites that passes over North America and watches for missile launchings. The American ASAT booster rocket may be big enough to be detected by these satellites, providing confirmation of attack. And the loss of one or two of the nine missile-watchers does not degrade the Soviet warning capability. Such breakdowns occur all the time, and replacement satellites are launched routinely within a few weeks. Furthermore, while these Soviet satellites do dip to within 400 miles of the earth's surface, well within the presumed range of the ASAT missile, they do so over the far southern oceans, off the coast of Antarctica. The current carrier for the ASAT missile, the F-15, would need gross modifications and expensive Rube Goldberg arrangements to reach the necessary launch points.

*Fallacy Nine: The US system can easily be upgraded to attack higher-orbit satellites, while the Soviet system cannot.* This is untrue. The US system has a design flight time of only minutes and uses the target satellite's own high speed as a kill mechanism. The Soviet system has a flight time measured in hours and uses a high-explosive warhead as a kill mechanism. The US system would have to be modified much more than would the Soviet system in order to attack slow-moving targets many hours' flight time from earth. Perhaps a bigger American missile (Minuteman, Poseidon, etc.) could loft it to very great altitudes—but the Soviets have big-



ger boosters (*e.g.*, the "Proton") that can do exactly the same thing for their system, with much fewer modifications.

*Fallacy Ten: The United States opened the Pandora's box of space combat by being the first to test antisatellite weapons more than twenty years ago.* This is uncertain at best, since in this same period the USSR was testing its own antimissile rockets and Khrushchev was boasting publicly of the Soviet ability to destroy space targets. The Soviet Troops of Air Defense had organized special antimissile and antispace commands by the mid-1960s, suggesting some sort of capability in these arenas of combat.

*Fallacy Eleven: There is no military need for the Air Force's air-launched ASAT missile; in a nuclear war, all satellites will be useless anyway.* These arguments are misleading. The Soviets have been diligently developing and deploying nuclear-powered active radar ocean reconnaissance satellites (RORSATs) that scan the oceans for Western naval forces. Since they carry 100-kilowatt nuclear reactors, these satellites give off enormous amounts of waste heat and present excellent infrared targets.

Under conventional warfare conditions, these systems would be able to pinpoint US fleets and direct long-range strike forces against them. This Soviet capability was a deciding factor in the US decision to develop the ASAT as an active counter (passive countermeasures can be stopgaps only, vulnerable to advances in Soviet space-based radar technology). The military need is real. Defensive counteractions by US ASATs in nonnuclear scenarios are certainly within the realm of the possible.

*Fallacy Twelve: An air-launched antisatellite missile is not needed because the United States already possesses sufficient antisatellite combat capability—the Army's HOE (Homing Overlay Experiment) system and the Space Shuttle provide all the antisatellite capability we'll ever need.* This is false. The HOE system, impressive as it is for point defense against missile attack, has limited antisatellite capability because it must track on a nearly head-on intercept trajectory (satellites can pass hundreds of miles to the right or left of the launch site). Further, critics betray a double standard when they dismiss the Soviet ASAT because of its alleged less-than-fifty-percent success rate. Using those same score-keeping standards, the HOE has only a twenty-five percent reliability (only on its fourth test did it score a successful intercept)!

And the Space Shuttle, despite Soviet propaganda claims, is useless as a combat weapon since it takes months—even under the most urgent of conditions—to prepare it for launch. Besides, the simple expedient of arming target satellites with proximity fuzes and explosive charges would dissuade any Shuttle antisatellite plans. There are only four multibillion-dollar Shuttle vehicles, and no conceivable benefit would be worth risking such a large national investment.

Another conceptual fallacy being promulgated widely makes a baker's dozen: "We can determine if the Soviets are serious about negotiating to keep space free of weapons only by sitting down with them at formal negotiations." This is stupid. A much easier measure of Soviet sincerity in this matter would be any sign that they are willing to stop lying about their own space weapons—ASATs, ABMs, FOBS (Fractional Orbiting Bombardment System), RORSATs, and so forth. They can stop lying at any moment, in any forum. As soon as they do, we can then start to listen seriously to what they then have to say.

The facts in this subject area—near-term space "weaponization"—need not depend on "appeals to authority" of blue-ribbon panels of experts. They can be determined by a diligent examination of the public record, including material published by the Library of Congress's Congressional Research Service, the British Interplanetary Society, the Foreign Broadcast Information Service (for firsthand accounts of Soviet statements), the Stockholm International Peace Research Institute (SIPRI), *Scientific American,* as well as many charts and tables published by the anti-ASAT groups themselves (particularly those released by the Federation of American Scientists).

But until those facts enter the debate, there is no realistic basis for either national policy debate or international disarmament negotiations. Discussions of potential far-future systems (such as space-based missile defense) remain a waste of time, an arena of only ideologically motivated charges and countercharges. Debaters who ignore the facts on this subject—as the loudest of them seem to do—only sabotage their own professed points of view, along with any possibility of substantive international agreement. ■

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*James E. Oberg is a professional space engineer working on the Space Shuttle project in Houston, Tex. He is the author of many works on space topics, with 200 articles and six books (including the widely respected* Red Star in Orbit) *to his name. A retired Air Force captain, he is generally considered one of the West's leading experts on the Soviet space program.*

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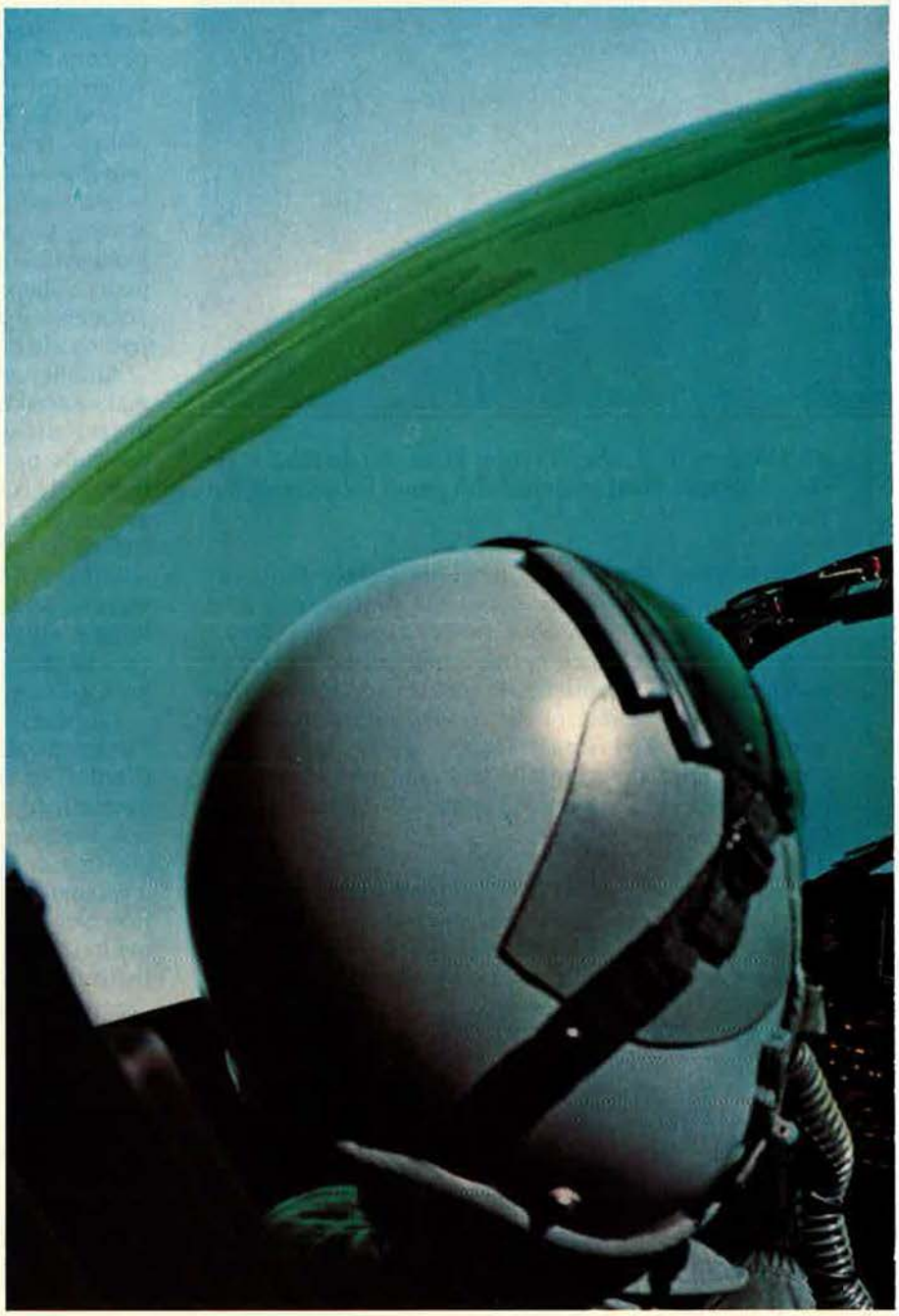

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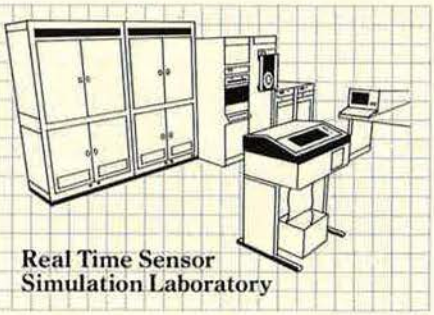

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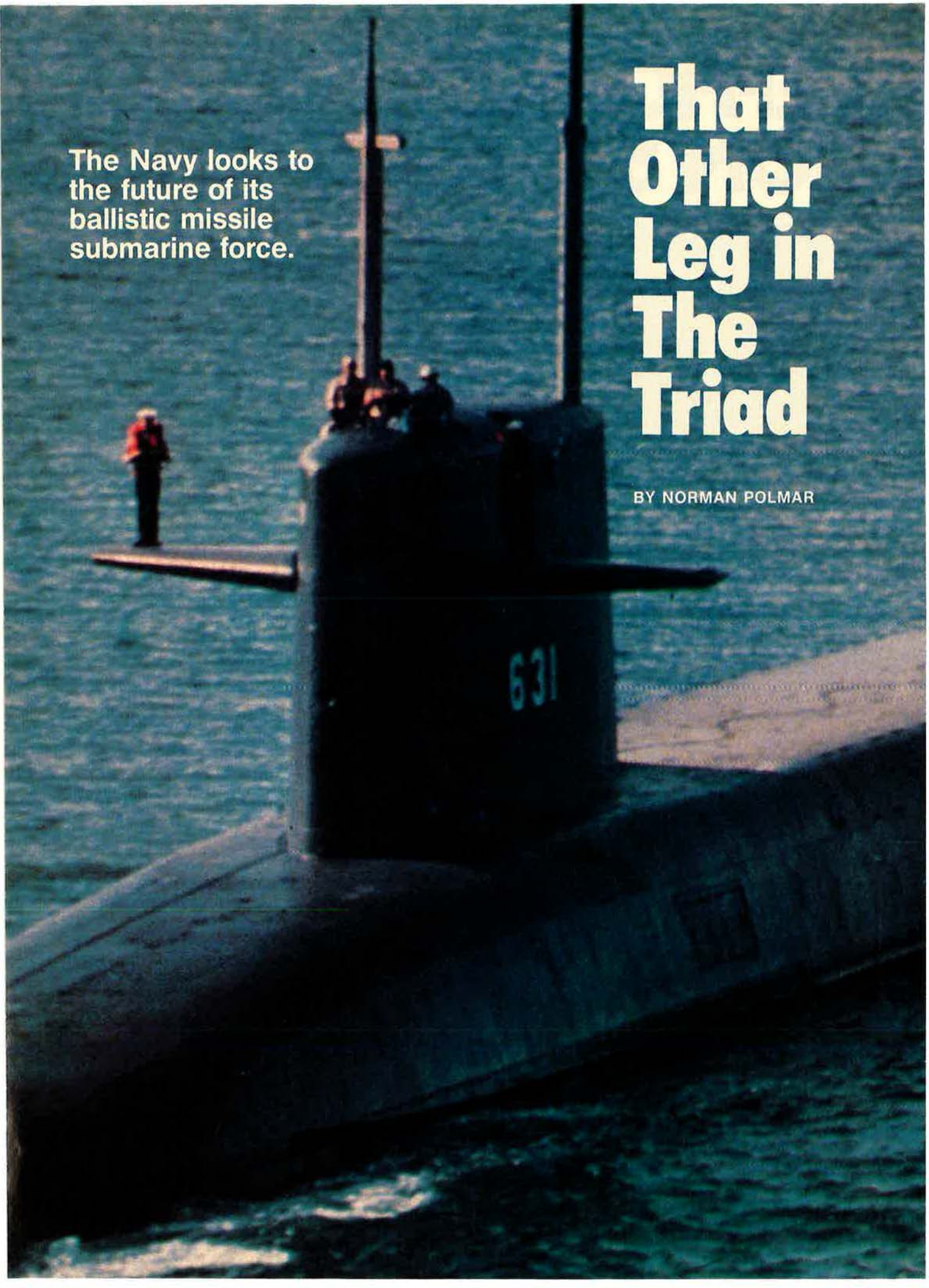



# That Other Leg in The Triad

The Navy looks to the future of its ballistic missile submarine force.

BY NORMAN POLMAR

US STRATEGIC weapon programs suffered greatly during the 1970s in the aftermath of the Vietnam War and in the naïveté of the Carter Administration. Air Force efforts to produce the B-1 manned strategic bomber and the MX land-based strategic missile were retarded. While there was some progress in the 1970s toward developing an air-launched cruise missile, not until the Reagan Administration entered the White House in January 1981 were the B-1 and MX programs approved for production, albeit in far fewer numbers than originally planned.

In marked contrast, the Navy's Trident submarine missile program was approved for production in the 1970s—a new class of large nuclear-propelled submarines and a new submarine-launched ballistic missile (SLBM). There was little opposition to the program, with construction of the submarines continuing at a rate of one per year. Further, while defense critics have strongly opposed increases in accuracy for the MX missile, with little fanfare Secretary of the Navy John Lehman has directed production of the D-5 version of the Trident SLBM, which is reputed to have the same or possibly greater accuracy than the MX.

At this writing, the US Navy has thirty-six strategic missile submarines in active service carrying a total of 616 missiles, all with multiple warheads *(see accompanying table).* While comparisons of different types of weapon systems are tenuous at best, SLBMs account for some thirty-five percent of the weapons of the US strategic missile forces (ICBM/SLBM). Assuming eight reentry vehicles per missile, the submarines provide seventy percent of the warheads and perhaps twenty percent of the deliverable megatonnage.

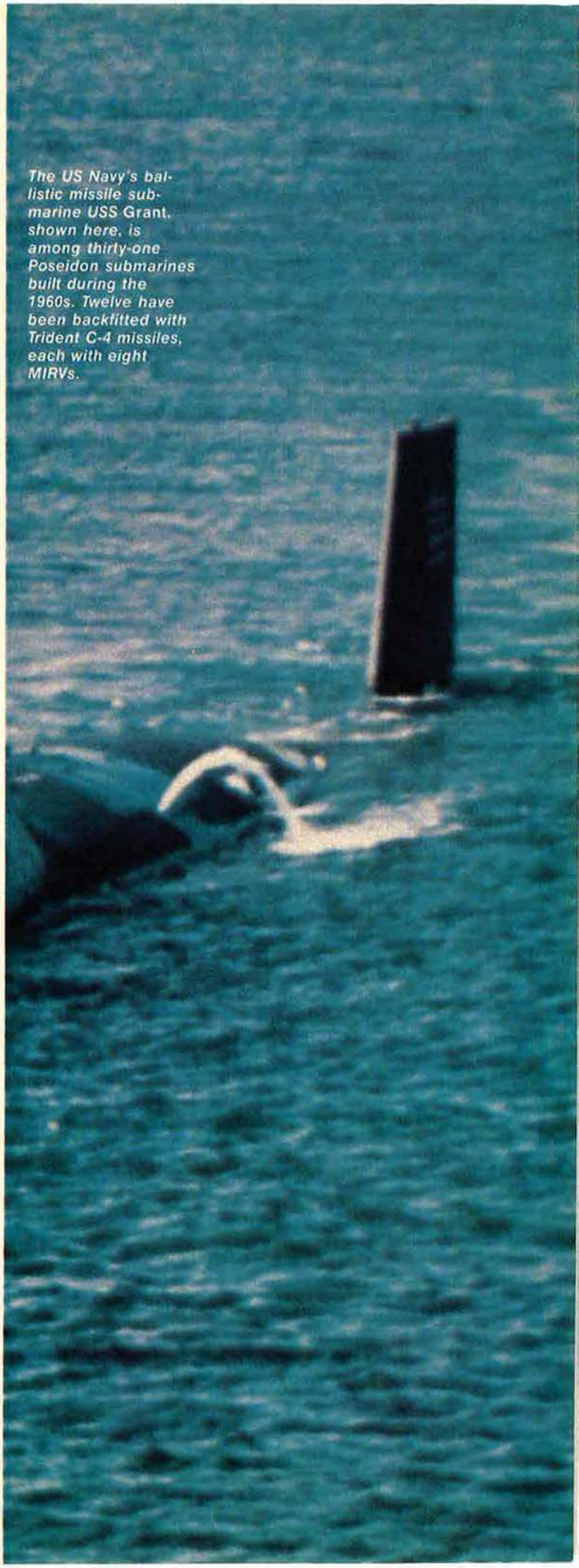
Of the thirty-six missile submarines now in service, all but five are from the forty-one SLBMs built during the early 1960s as part of the massive buildup of US strategic missile forces under the Kennedy Administration. Those forty-one submarines—each with sixteen Polaris missiles—provided the United States with a highly effective and survivable sea-based deterrent force of 656 missiles. Some sixty percent or more of those submarines were generally at sea; they were capable of striking targets some 2,500 nautical miles away with the Polaris A-3 MRV missile, available from 1964, or at somewhat lesser ranges with the subsequent MIRV-warhead Poseidon C-3 missile.

There was some modernization of the existing US strategic forces during the 1970s. However, the only new strategic program start was the Trident SLBM program.

### The Trident Program

In 1966–67, the Department of Defense conducted a technical study of future ballistic missiles. Known as the STRAT-X study, it recommended—from numerous candidate weapons—the development of four advanced strategic systems, a "political balance" of two sea-based and two land-based missiles. Only the submarine system, which was initially known as ULMS (for underwater long-range missile system), was approved for development.

The ULMS concept called for a submarine of about the same size as the later Polaris/Poseidon boats, some 9,000 tons submerged displacement, carrying a multiwarhead missile with a range of some 6,000 nautical



*The US Navy's ballistic missile submarine USS Grant, shown here, is among thirty-one Poseidon submarines built during the 1960s. Twelve have been backfitted with Trident C-4 missiles, each with eight MIRVs.*

miles. This range could permit a missile submarine on patrol in the Pacific or South Atlantic to target Moscow with its missiles, greatly complicating Soviet ASW efforts.

In approving the Trident program, Secretary of Defense Melvin Laird stated, "The expanded operating area permitted by the long range of an ULMS missile could offset possible antisubmarine threats which might develop during the late 1970s or beyond. Since continued development work on ULMS preserves our flexibility to respond to a possible future degradation in effectiveness of *any of our strategic systems,* it is an important factor in our future strategic force planning." (Emphasis added.)

Once the ULMS—renamed Trident—entered the development phase, there was a major restructuring of the program. Adm. H. G. Rickover, then head of the Navy's nuclear-propulsion program, sought a higher speed than that proposed in the STRAT-X study, resulting in a larger nuclear propulsion plant and hence a much larger submarine. Further, the Navy's conservative approach to design of the craft led to retaining the missiles in a vertical position within the pressure hull, another factor affecting submarine size. (ULMS had a more efficient scheme of carrying the missiles in a horizontal position, external to the hull.)

A strange alliance of Admiral Rickover, Adm. Elmo R. Zumwalt—the Chief of Naval Operations who found himself in opposition to Rickover on most issues—and Secretary of the Navy John Warner led an effective drive to gain Administration and congressional approval of Trident. The keel for the lead Trident submarine, the USS *Ohio,* was laid down in April 1976. Construction of the early submarines was delayed because of problems at the building yard—the Electric Boat Division of General Dynamics Corp. at Groton, Conn.—and Navy management problems.

The *Ohio* is the largest submarine yet constructed in the West, displacing 18,750 tons submerged and measuring 560 feet—five feet longer than the Washington Monument is tall. Each submarine carries twenty-four SLBMs (compared to sixteen in the previous Polaris/Poseidon submarines).

Subsequently, Trident submarines have been approved and started at the rate of one per year. The *Ohio* was commissioned in November 1981 and began her first missile patrol in October 1982. She has been followed into service by the USS *Michigan, Florida, Georgia,* and *Henry M. Jackson.* Eight more Trident submarines are under construction or authorized through the Fiscal 1985 budget.

These submarines are being armed with the Trident C-4 missile. While ULMS was to have had a 6,000-mile weapon, here too the Navy sought a more conservative approach and developed an extended-range Poseidon (EXPO) missile with a range of some 4,000 nautical miles and eight MIRVs. This weapon, available before a longer-range missile could be available, was also backfitted into twelve of the Polaris/Poseidon submarines beginning in 1979.

The Trident submarines on patrol have demonstrated that the "boats," despite their size, are quieter and in other respects more effective than planned. Further, the major delays in building the early units have been overcome, and the program is now on schedule with costs apparently under control, due in large part to the management policies instituted by Secretary Lehman. (Such policies have also been facilitated by the departure of Admiral Rickover from the scene.)

Congressional support for the Trident program has been high, with some of the critics being far less vocal in their opposition to Trident than to either the B-1 or MX. Rather, the most vocal and photogenic opponents of Trident have been the "peaceniks" who oppose all nuclear weapons and who enjoy sailing the Thames River with signs and taunts when a Trident submarine is being launched or commissioned in ceremonies at Groton. But such protests have little—if any—impact on decision-makers in Congress or the Administration.

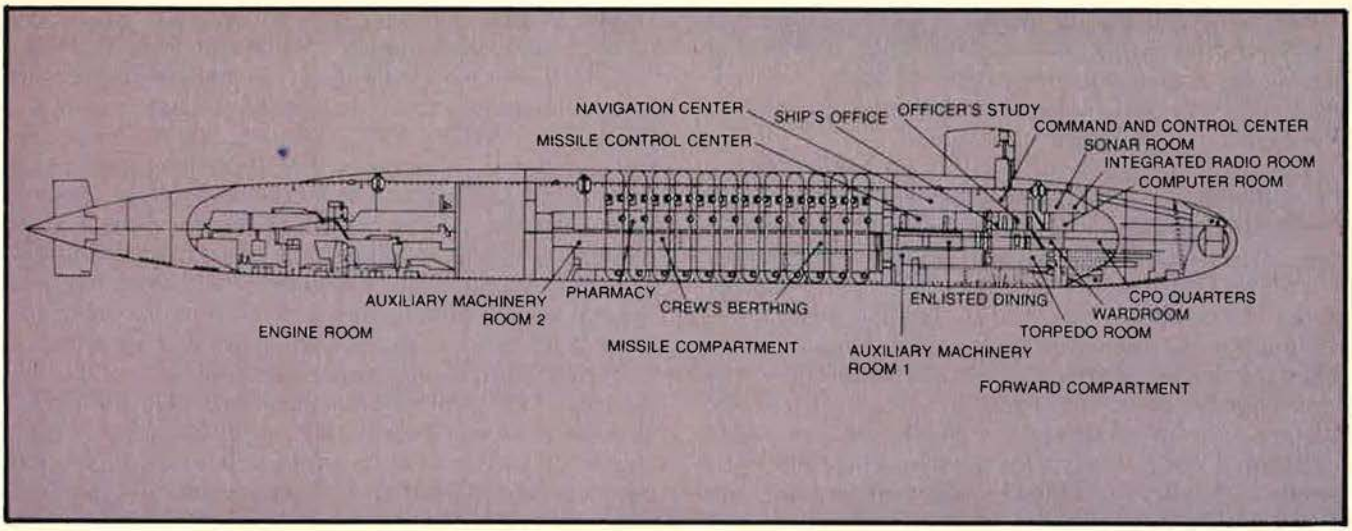
Similarly, Secretary of the Navy Lehman in 1981 approved full development and production of the Trident D-5 missile. While having a greater range than the C-4, when the D-5 goes to sea in 1989 it will have increased accuracy, providing a hard-target kill (HTK) capability. Secretary Lehman's action has encountered little opposition.

Part of the reason for acceptance of this HTK in submarines could be that submarines, with their essen-

## US Navy Strategic Missile Submarines

| CLASS | NUMBER | YEAR COMPLETED | MISSILES (EACH) | WARHEAD |
|---|---|---|---|---|
| *Lafayette* | 19 | 1963–67 | 16 Poseidon C-3 | * MIRV (8–14 RVs) W68 |
| *Lafayette* | 12 | 1964–66 | 16 Trident C-4 | MIRV (8 RVs) W76 |
| *Ohio* | 5 | 1981–84 | 24 Trident C-4 | MIRV (8 RVs) W87 |
| TOTALS | 36 | | 616 missiles (more than 4,928 RVs) | |

* Up to 14 RVs can be carried by the Poseidon "bus." However, 8–10 RVs are believed to be the normal missile payload.




***Tridents (one shown here in cutaway) are the largest subs built in the West, though dwarfed by the Soviet* Typhoon-*class SSBNs. The drawing is from the author's* The Ships and Aircraft of the U.S. Fleet, *reproduced by permission.***

tially one-way communications procedures, cannot be employed effectively in a first-strike attack. Several methods are used for submarines to *receive* communications while submerged. Floating buoy and trailing wire antennas permit the submarines to receive low and very low frequency transmissions while at shallow depths.

The Navy is seeking to build an extremely low frequency (ELF) transmission capability that could enable submarines to receive low-data-rate signals while operating at greater depths. This program has suffered from poor Navy sales efforts and has encountered massive opposition from ecologists and from critics who fear that ELF could provide a first-strike capability. Both types of opposition have been countered with factual responses, but emotions have had a major role in the opposition.

With respect to the fear of ELF permitting Trident to have a first-strike capability, the number of warheads carried in the force at sea would probably be too small to attack all Soviet hard targets (missile silos, command and control facilities, etc.) effectively. At any rate, a national leader would wish effective two-way communications with his weapons before planning to use them in a first-strike attack—a feature that is not feasible with existing or planned US submarine communication systems and procedures.

### Survivability—Real and Perceived

The most important characteristic of the SLBM force is its high survivability. Secretary of Defense Caspar Weinberger noted in his 1985 Posture Statement: "When at sea, [the SLBM submarines] are the most survivable element of the strategic triad."

This high survivability provides a number of advantages over the other portions of the strategic triad: SLBMs can be withheld from commitment by the National Command Authorities for longer than can ICBMs or manned bombers. Their mobility permits them to target locations from different azimuths than ICBMs or bombers based in the United States. And the cost of countering missile submarines is comparatively higher than for other strategic systems. The systems necessary for a preemptive strike against ICBMs or manned bombers and for defending against them exist or are at least

***The USS* Ohio, *first of the Trident ballistic missile submarines, goes to sea. Six Trident boats are in service, with eight more under construction or authorized. Now armed with C-4 missiles, the Trident boats are destined to receive the longer-range, more accurate D-5 missiles now in development.***

known; an antisubmarine warfare (ASW) system that would be effective against modern nuclear-propelled submarines armed with long-range SLBMs does not now exist, nor does the technology exist that could be deployed in the near future.

The submarine's survivability is derived from the great difficulty in penetrating water with energy. Light waves (such as blue or green lasers) cannot penetrate very deep, while active (pulsing) acoustic detection is also short-ranged. At this time, the most effective means of submarine detection is passive detection—listening for the sounds made by the submarine's machinery and other internal noises and the flow noises as the submarine moves through the water. Considerable effort is expended to reduce these self-generated sounds, and while on patrol the missile submarines operate at slow speeds, less than ten knots. The other submarine signatures, such as magnetic, thermal, and wake, can only be detected at very short distances.

The Navy's public attitude has been that strategic missile submarines are absolutely invulnerable. Senior Navy officials have stated that no submarine has ever been trailed by a Soviet "killer" submarine or surface ship while on patrol. Such statements, questioned by some US submarine officers, bring to mind the photograph of the battleship *Arizona* in the program for the Army-Navy football game of November 29, 1941, which had the caption, "It is significant that despite the claims of the air enthusiasts no battleship has yet been sunk by bombs." Eight days later, a single Japanese bomb reduced the *Arizona* to a smoking hulk resting on the floor of Pearl Harbor.

Privately, there is concern over the *potential* vulnerability of missile submarines, as evidenced by the Navy's SLBM submarine security program. According to Secretary Weinberger, "This comprehensive research effort is reviewing all current antisubmarine warfare techniques, as well as possible breakthroughs for the future." While ASW "breakthroughs" have long been predicted, there is today no available evidence that such a breakthrough is in the offing. Rather, several knowledgeable persons have predicted that Soviet ASW effectiveness will continue to increase in an evolutionary manner; the ASW "revolution" will come because the Soviets are able to employ known technologies (or even systems) in a way not understood or expected.

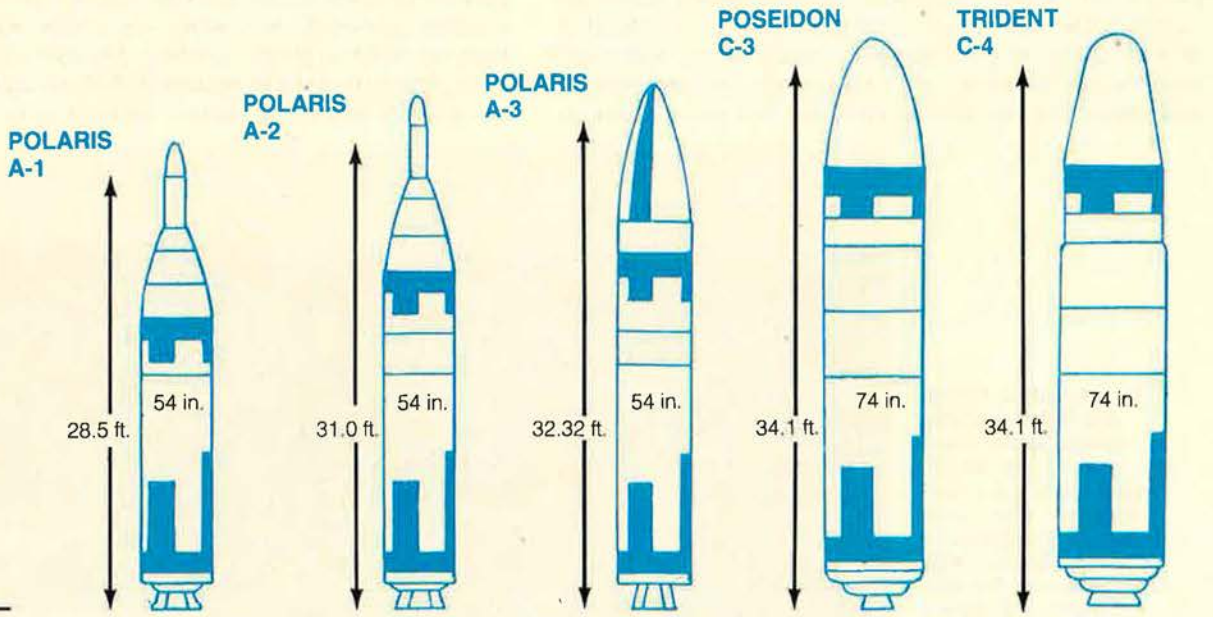
*If* an effective submarine detection system can be developed and deployed at some future date, the strategic missile submarine will undoubtedly continue to have an effective role. On a comparative basis, manned bombers and ICBMs are already vulnerable, yet we continue to produce them and use active and passive methods to protect them. The same will undoubtedly be true for submarines. Because they are at sea and mobile for long periods (months, contrasted to hours for a bomber), they should remain highly survivable.

### Force Level Trends

However, a factor that could impact ASW effectiveness against strategic missile submarines is the decline in submarine numbers. Obviously, the most effective form of strategic counterforce against submarines is to detect and kill the submarine rather than to intercept the missile or the incoming reentry vehicles.

From 1967 until 1980, the Navy had forty-one Polaris/Poseidon submarines in commission. The ten oldest submarines, which had not been updated to fire the Poseidon missile, were retired from the strategic missile

## Fleet Ballistic Missiles




| | | | | | |
|---|---|---|---|---|---|
| YEAR | 1960 | 1962 | 1964 | 1971 | 1978 |
| RANGE | 1,200 n.m. | 1,500 n.m. | 2,500 n.m. | about 2,500 n.m. | more than 2,500 n.m. |
| WEIGHT | 28,800 lb. | 30,000 lb. | 35,000 lb. | | more than 65,000 lb. |

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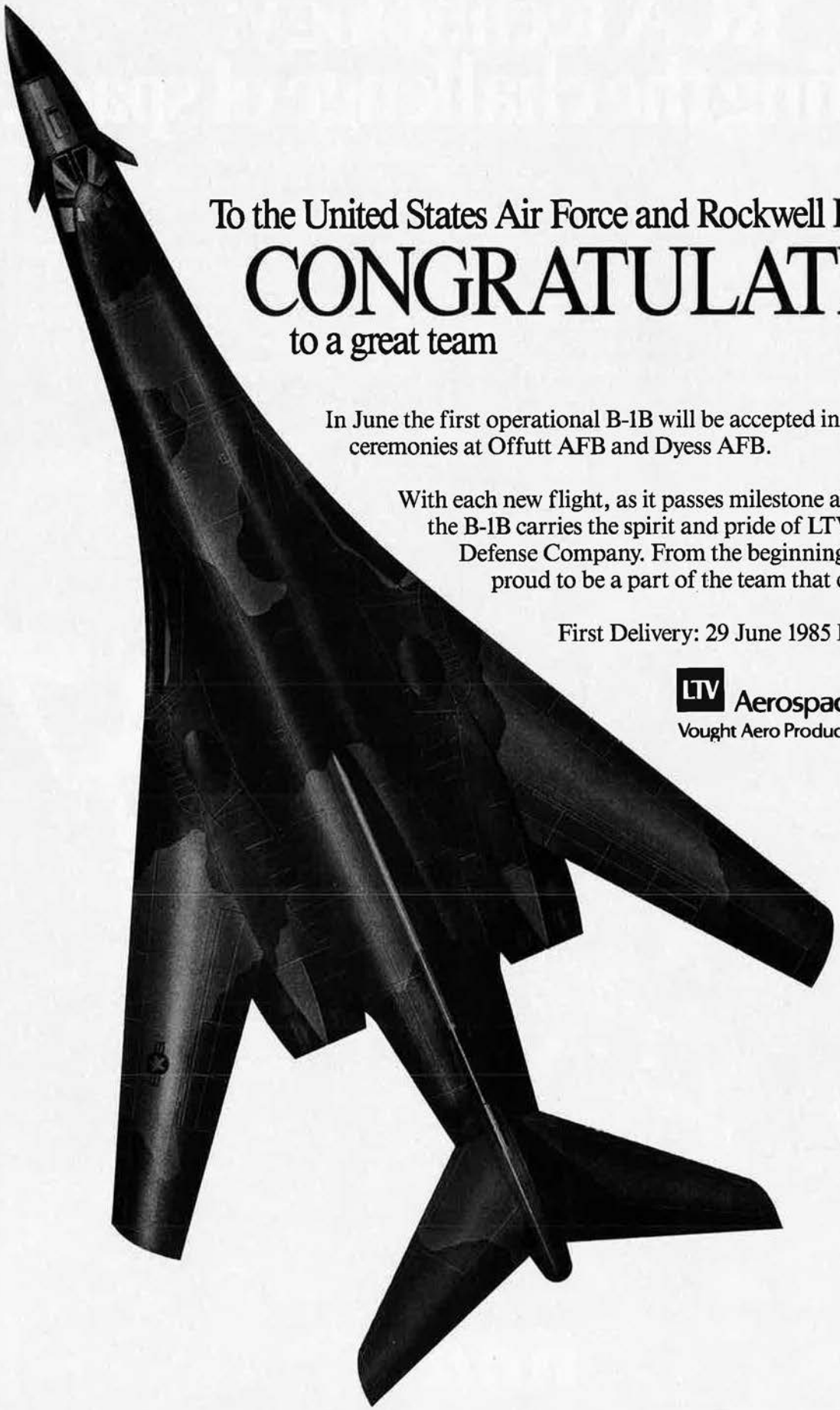

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*In the eerie setting of a magnetic silencing facility at the US Navy's Bangor, Wash., submarine base, the USS Ohio is purged of the telltale "signature" acquired from the earth's magnetic field while at sea. Trident boats have demonstrated greater effectiveness than Poseidon subs and are even quieter than anticipated. The Trident program enjoys solid congressional support.*

role in 1980–82. The first of the new Trident missile submarines, the *Ohio,* joined the fleet in late 1981 and is being followed at approximately one-year intervals by other submarines of the class. Five Trident submarines are in commission today.

When the seventh Trident submarine, the *Alaska,* begins her sea trials late this year, the United States will have 664 sea-based launch tubes for multiple warhead missiles. This will exceed the SALT limitation. By then, the United States must begin decommissioning Poseidon-armed submarines, resulting in a decrease in the submarine force level. Even placing SALT considerations aside, the submarines have an expected maximum service life of thirty years. Thus, the last of the thirty-one *Lafayette*-class submarines would be decommissioned in 1996. By that time the Navy would have perhaps sixteen Trident submarines in commission with 384 missiles. Ten or eleven of those submarines (240–264 missiles) would normally be at sea.

That number is a matter of concern to some defense planners and members of Congress. By the year 2000, the now-planned twenty Trident submarines could be in service (480 missiles). While the number of reentry vehicles will be large, the number of "launch platforms"—submarines—could become a significant factor in view of the increasing Soviet ASW capabilities.

### The Future SLBM Force

The submarine numbers factor is intertwined with the issue of submarine size. For a given cost, the same number of missile tubes could be put to sea in a larger number of smaller submarines. The extreme of this possibility was the small undersea missile (SUM) concept put forward a few years ago. SUM called for a fleet of small, two-missile submarines that could be operated in US coastal waters. The cost per tube, of course, would be high; although the submarines would be diesel-electric and not nuclear-propelled, the costs of command and control facilities in the submarines and other equipment would have been great. Also, submarines in coastal waters are highly vulnerable to interference from commercial shipping and collisions.

The Scowcroft Commission convened by President Reagan to examine future strategic force alternatives strongly recommended a smaller strategic missile submarine:

"To reduce the value of individual targets, the Commission recommends that research begin now on smaller ballistic-missile carrying submarines, each carrying fewer missiles than the Trident, as a potential follow-on to the Trident submarine force. The objective of such research should be to design a submarine and missile system that would, as much as possible, reduce the value of each platform and also present radically different problems to a Soviet attacker than does the Trident submarine force. This work should proceed in such a way that a decision to construct and deploy such a submarine force could be rapidly implemented should Soviet progress in antisubmarine warfare so dictate."

The Navy has steadfastly opposed research or even study efforts in this area. There is apparently a fear that any acknowledgment of the value of a smaller or alternative missile submarine of any size would undercut the existing Trident program.

At the same time, the cost of the Trident submarine—$1.6 *billion* per submarine, without missiles, in the Fiscal 1985 budget—makes it unlikely that more than one per year would be funded except under the most unusual conditions.

This is an unfortunate situation, for while a triad of strategic forces should be maintained by the United States, the composition and balance of the triad should be sufficiently flexible to reflect technological opportunities and threat developments. At this time—and for the foreseeable future—the ballistic missile submarine offers the United States the most survivable and in some respects its most flexible strategic weapon. But in view of the long development time for modern weapons, more effort is needed now if the submarine-launched ballistic missile is to remain the central component of the US strategic triad. ■

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*Norman Polmar is an analyst and author specializing in US and Soviet naval and aviation subjects. He has directed or participated in several major studies in these areas for the Navy, various Defense Department agencies, and US and foreign aerospace and shipbuilding firms. He is currently a member of the Secretary of the Navy's Research Advisory Committee (NRAC). His many books include the reference works* Guide to the Soviet Navy *and* The Ships and Aircraft of the U. S. Fleet, *both published at three-year intervals, and the historic volume* The American Submarines.


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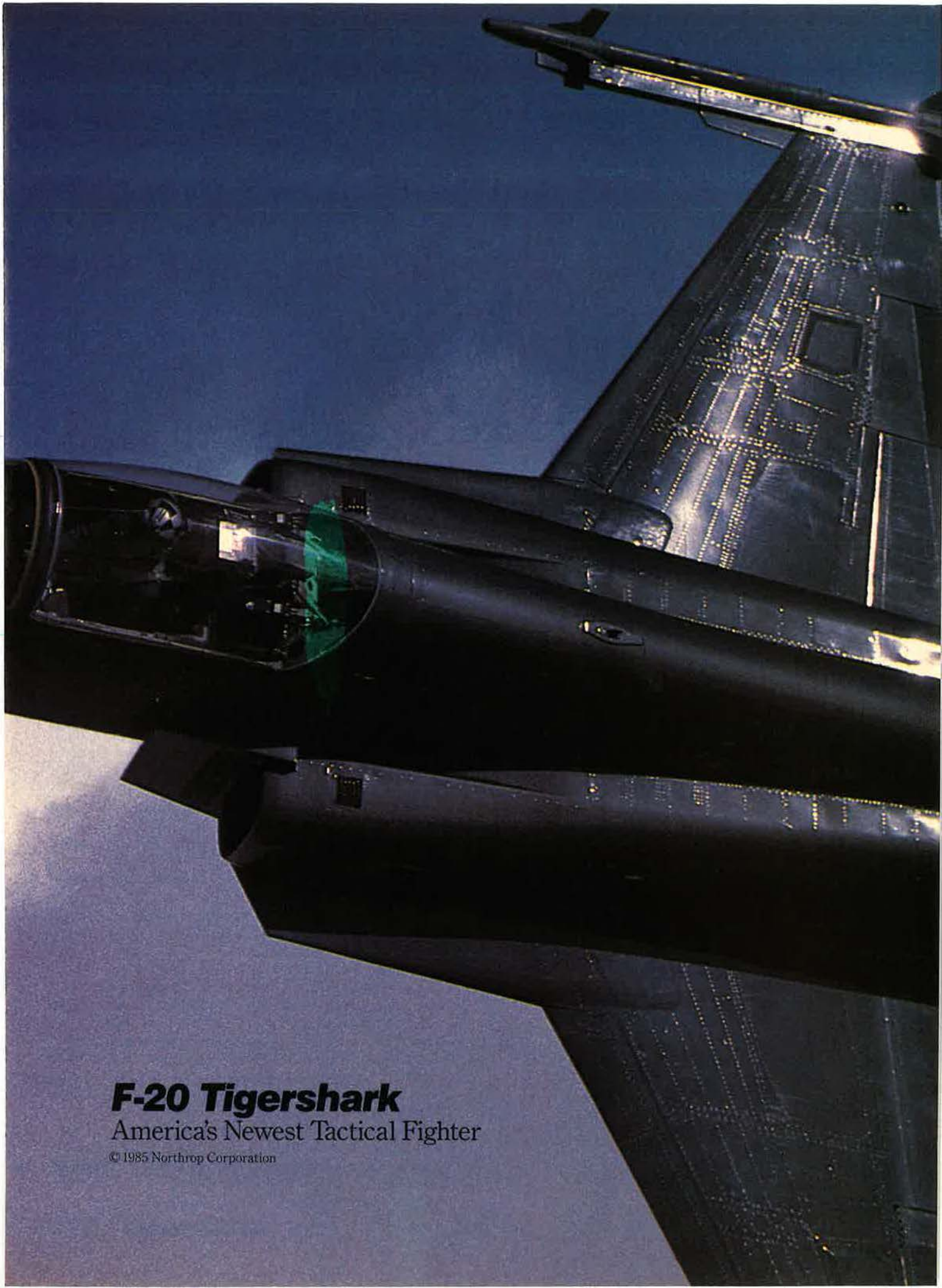

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# What Ails the Acquisition Process?

**BY DR. JACQUES S. GANSLER**

HAVING worked in both parts of the military-industrial complex, I find it interesting and worthwhile to compare and contrast these two quite different worlds. Far too frequently the cultural differences between the two are ignored. You will often hear an industry executive say, "If only DoD would operate like General Motors, it would cure all of DoD's problems." It just can't—and probably shouldn't.

Industry's objectives are measurable (*e.g.*, fifteen percent per year growth in profits), and measurable objectives are achieved by maximizing *efficiency*. Management's responsibility is to develop long-term plans for attaining corporate objectives and to fit operations to these plans.

By contrast, the objectives for government are not nearly so measurable; for example, how do you know when you have enough defense or if the overall budget allocations for guns and butter are "fair"? The methodology used by the government is the democratic process, and objectives are achieved through *consensus*. In the political world, management focuses on avoiding day-to-day problems. Consensus management, especially when using other people's money, does not lead naturally to efficiency. In fact, to paraphrase Winston Churchill, democracy is probably the worst system—except for all the alternatives.

Nonetheless, the public expects DoD to be managed with some semblance of efficiency, and I believe that our nation's security requires us to move further in the direction of getting more defense for the dollar. If the public, and therefore Congress, can be convinced that DoD is

managing its resources better, it will be far easier to get the needed defense dollars.

Why is there a need to improve the way defense does business? What lessons can we learn from industry's planning and control approach, and how can we adapt them to the different and unique DoD environment? These questions are addressed below. The overall conclusion, I believe, is that specific changes need to be made immediately. These changes will amount to a "broad cultural change" within the DoD acquisition process and should, in time, yield both improved management and enhanced national security.

### Negative Trends in Weapons Acquisition

One very important fact, frequently overlooked by defense critics, deserves mention here—namely, that DoD has repeatedly been shown to be the best managed of all government agencies when measured by such criteria as cost overruns, performance achievements, etc. Nevertheless, there is clearly room for improvement. Let me briefly highlight four important long-term acquisition trends that must be reversed.

First, there is *growing concern that we are not emphasizing cost-effectiveness enough in selecting weapon systems.* The issue is not, for example, whether or not it's desirable to spend $20 billion for 100 MX missiles, or for 100 B-1B bombers, or for a few more nuclear aircraft carrier task forces. Rather, the issue is whether or not these are the best investments compared to other potential defense uses of limited dollars. Even more significant, do the organizational and institutional structures even exist to address these questions, make the decisions, and implement them?

The second undesirable long-term trend is that of *rising equipment costs.* Perhaps equally significant to the well-known cost overruns on individual programs is the "performance cost growth" of equipment from generation to generation. For example, the fact that the M1 tank costs three times more than the M60, though undoubtedly providing much more performance, means that, with a constant set of resources, we would be able to buy only one-third as many.

In the defense world, technology is used primarily to increase performance, while in the commercial world it is used to reduce costs and improve performance simultaneously. The result in defense is that we buy fewer and fewer numbers of each system each year. For example, during the 1950s, we used to buy around 3,000 fighter aircraft a year; during the 1960s, 1,000 a year; during the 1970s, 300 a year. Former DoD official and longtime defense industry executive Norman Augustine has pointed out that, projecting current trends, we will buy only one aircraft in the year 2054. It'll be a very good aircraft, but it will clearly not win a war.

The third and worsening undesirable trend is that it *takes far too long to develop and procure new weapon systems,* frequently as long as twelve to fifteen years. Then, because of high unit cost, we produce the system at very low and inefficient production rates. The net effect is not only that it costs much more than it should, but we modernize our forces extremely slowly and often deploy new systems that have already become obsolescent. Thus, this trend has both economic and military adverse effects.

The fourth undesirable trend is the *declining efficiency and responsiveness of the defense industrial base.* Numerous studies over the last few years by Congress, DoD, the defense industry itself, and independent researchers have all indicated the ailing state of the defense industry. Lack of competitiveness and the inability to surge production rapidly—when that is required in periods of military crisis—plague defense industry. Particularly disturbing is the almost total absence of government insight into the health of the industrial base and the seeming inability of the government to take actions to promote efficiency and responsiveness in the defense industry.

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**Technology can do more than increase performance. It can also reduce costs.**

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These long-term negative trends—given the increasing quantity and quality of Soviet weapon systems—clearly must be reversed. By looking at some of the ways in which US industry does its planning and control, we should be able to gather some lessons from industry that can be translated into the DoD cultural environment. Some of these key characteristics contrast dramatically with current DoD practices and indicate where potential corrective action should be taken.

### Lessons From Industry Planning and Control

The first key characteristic of any corporation's planning and control system is *a coherent, integrated, resource-constrained, long-range plan tied to corporate objectives.* While that's a mouthful, each word is critically important, and we need to address them one by one.

First, a "coherent" plan is one that makes sense—one that is credible, consistent, and understandable. (Does DoD theater nuclear force planning meet this test?) Second, an "integrated" plan means coordinating all the various divisions' plans. (Current military resource planning is done by each service *independently,* with no coordination by the JCS or the CINCs, only an attempt by OSD to tie these service plans together.) Third, a plan must be "resource-constrained." Why plan an "ideal" strategy if you can't afford it? (But isn't that exactly what the current JCS force planning documents do?)

Formulating a "long-range" plan may be the most important consideration of all. Industry recognizes that capital, plants, equipment, trained people, or products

are not created overnight. Rather, each business makes its plans over a number of years sufficient to match its products' life-cycles. If you're in the durable capital goods business, this may be a very long period; if you're in the "fad" business, it might be only a few years. However, no business has a plan that it *assumes* is valid for only one year—none, that is, except the Department of Defense, wherein both Congress and DoD basically have a one-year budget, with the outyears treated simply as "targets" that everyone knows will be violated and totally reprogrammed next year.

Finally, the plan must be "tied to corporate objectives." Some corporations relate this to market share, others to profit growth, but some criteria for making trade-off decisions within the constrained-resource plan need to be established. By contrast, one of the greatest concerns about our current national security posture has been the absence of a rational relationship between strategy and resources.

**Why plan an ideal strategy if you can't afford to implement it?**

The second key characteristic of planning and control is *stability,* without which there could be neither coherence nor efficiency. Stability applies to people, organizations, programs, resource commitments, objectives, etc. Former Deputy Secretary of Defense Frank Carlucci and many others have pointed out that the single most critical characteristic *missing* from defense operations is stability. Contrast the typical eight- to fifteen-year acquisition cycle of a weapon system with the rotation rate of DoD people and the frequent changes in "requirements," program budgets, congressional line item "adjustments," and so on, and the underlying instability of the defense acquisition process becomes obvious. Many within DoD argue that they are striving for budget and program "flexibility," but frequent and rapid changes yield mostly back and forth motion, with little forward progress.

The third key characteristic of corporate planning and control is *execution—and monitoring—to match the plan.* This requires allocating resources according to the plan while keeping broad objectives in mind when working the details. It also requires decentralized implementation, with a feedback system that provides senior management with good data on progress toward the planned objectives.

Contrast this with the defense Planning-Programming-Budgeting System (PPBS), which lacks any "evaluation" system to gauge feedback on the plan. Even the accounting systems that measure actual resource allocations differ from those used in the planning process, so it is impossible to relate the two. Similarly, contrast the decentralized approach of most large corporations, where a small corporate headquarters office grants a great deal of autonomy to each division for executing and monitoring its plans, with the layering that exists within each military service's acquisition world. In the latter case, the program manager responsible for executing a plan and the service chief of staff are separated by an incredible number of staff layers that "help" the program manager and frequently prevent him from implementing the plan by removing his authority over both what he has to do and how he will use his resources to do it.

Finally, the fourth key planning and control characteristic is *incentives that are tied to actual performance.* Industry works hard to figure out ways to create natural incentives that are consistent with the plan and its execution. They discourage and eliminate incentives that run counter to the plan and that have to be overcome through extensive regulation.

For example, in industry, managers who achieve the stated objectives are generally promoted. In DoD, this is not always the case. Acquisition management has historically not been considered a desirable career path for advancement to flag officer rank, regardless of performance. The Air Force recognized this fact and began to rectify the situation a few years ago, and the Navy has just recently begun to address the issue.

**DoD gets into situations where the incentives are against lowering of costs.**

As another example, consider how a typical US firm would create an incentive for a supplier to reduce costs. Do you think General Motors would ever become dependent on a single supplier of tires? Or IBM on a single supplier of semiconductors? By contrast, DoD almost always gets itself in a position of dependence on a single supplier who has little incentive to lower his costs or improve his performance. In fact, many suppliers are rewarded for higher costs by increased sales and profits.

Overall, there are two dominant considerations in corporate planning and control: first, a focus on *cen-*

*tralized decision-making and decentralized implementation* and, second, on *tying planning and execution together* by holding line managers responsible for both creating *and* implementing the plan, rather than separating planning and execution.

By contrast, within the defense establishment, we find almost the reverse of these two principles. First, the emphasis, even in the current Administration, is on decentralized decision-making and highly centralized control over the details of implementation. It's not only backwards, but it's wrong from both the decision-making and the implementation perspectives. Second, planning is almost totally divorced from implementation. Those who are responsible and who have the authority to implement a plan have no hand in its creation.

Given this situation, dramatic changes will be required to make significant improvements in the way defense does business. These changes will be neither fast nor easy, since they represent basic "cultural changes." Nonetheless, they can be achieved, and they can be achieved within the existing institutions.

By contrast, some of the more extreme current proposals to improve defense planning and control might be more difficult to achieve and would perhaps even be damaging. These include proposals to shift to a single civilian buying agency for all services—as recommended by Sen. William V. Roth, Jr. (R-Del.), and the Grace Commission—and to organize as a single military service, as Canada has done. These proposals are an "Option C," with the current situation being "Option A." An intermediate position—"Option B"—would not require a change in all of the existing institutions, but could nonetheless make a dramatic difference. The changes that are needed can be made within the existing framework and should focus essentially on the four industrial planning and control characteristics noted above.

### Improving Weapons Acquisition

• *Structural Changes*. As noted previously, there is a growing perception that the system does not select and procure the most cost-effective weapons. The requirements and budgeting processes are presently dominated by the individual military services, with each acting independently and only the Office of the Secretary of Defense having an integrating role.

We need to shift to a system where weapons and equipment are selected to complement one another and to maximize the combined capability of the armed forces. The most important structural change needed in the requirements and planning process is *to strengthen the role of the Chairman of the Joint Chiefs of Staff and the commanders of the unified and specified commands (CINCs).* These are the military leaders responsible for planning how wars will be fought. None of them is now significantly involved in the development of weapons requirements, the selection of weapon systems, or in establishing priorities for expenditures among competing demands.

Basically, this change has been categorized as "reform of the JCS." It was advocated by President Eisenhower in 1958 and more recently by such people as Gen. David Jones, USAF (Ret.), former Chairman of the JCS, and Gen. E. C. Meyer, former Chief of Staff of the Army—none of whom could be categorized as defense radicals. The proposal would strengthen the Chairman by giving him an independent staff and requiring him to put together the integrated decisions on the types and numbers of systems to be developed and procured. Thus, the military would devise a long-term plan that would take account of resource constraints and that would use more realistic cost estimates, since they would have to live with those estimates. To maintain civilian control, the military would develop these plans together with the Office of the Under Secretary of Defense for Policy and according to detailed guidance from the Office of the Secretary of Defense. Additionally, OSD would be responsible for monitoring the progress of the military against these plans.

**It's working backwards: Decision-making is decentralized and control is centralized.**

A complementary change (to the JCS structuring) to improve resource planning and the associated weapon selection process is to strengthen the Office of the Secretary of Defense in the policy and resource planning areas. Here, as noted above, the weapon selection and resource allocation questions need to be harmonized in an integrated, long-range, national security strategy and resource plan—by major mission areas, *i.e.*, strategic, NATO, and regional. The JCS and OSD changes would focus on reconciling strategy and resources in terms of both where the dollars are going and which systems are selected to fit within the plan.

• *Programming and Budgeting Changes*. The second of the broad objectives requiring institutional change is that of *achieving stability in the defense programming and budgeting process*. The United States is one of the few, if not the only, nations with a one-year defense budget. You just can't do business in an efficient or effective manner this way, given the long development and procurement times for sophisticated weapon systems.

A critical step is to shift defense budgeting to a multi-year process. This requires congressional action, and fortunately there are many in Congress today who are pushing for at least a biennial budgeting system. The two-year cycle is suggested as a compromise for both political and constitutional reasons. It is a step in the right direction, since it would force longer-term perspectives into the process.

Besides this needed congressional action, DoD itself must discipline its own programming and budgeting sys-

tem. A major step in that direction came with the introduction of the concept of "baselining." The Air Force has recently taken the lead in this direction. The $20 billion program for 100 B-1B aircraft is an example.

In baselining, the senior service management agrees to a detailed set of program plans—from requirements through annual budgets, quantities, etc. When realistic dollars are used for these long-term program budgets, it becomes obvious that only a few programs will be affordable; others will have to be canceled or abandoned. This would avoid the current continuous process of starting too many programs with too few dollars and then stretching out all of them, with the associated inefficiencies. An Air Force study showed that, in recent years, continuous budget stretch-outs have reduced the number of systems procured by around thirty percent.

• *Procedural Changes*. The third area requiring change in the way DoD does business is in the execution area. Here, DoD must shift to a decentralized approach if it is to achieve greater efficiency. This means *giving the services full responsibility for carrying out acquisition plans* after centralized decisions have been made on each of the programs and enough dollars have been allocated. The services themselves must decentralize further and eliminate the extensive layering that exists, for example, in the Air Staff, within AFSC, and within each of the product divisions. These layers often only hamper and weigh down the program manager who is actually running the multibillion-dollar program.

**Baselining is a major step toward achieving stability.**

Additionally, within the execution arena again, the concept of "evaluation" must be added to the PPBS system. DoD needs to determine whether or not it was successful in running a program by comparing what it set out to do in any given year with what it actually did. Amazingly, such evaluation does not exist within the PPBS system today. This comparison of plans and execution should show not only where the resources went, but also what force levels and force readiness were achieved, how programs performed in relation to their budgets in terms of both expenditures and achievements, and how the defense industry structure moved toward objectives desired by DoD. This should give a better assessment of the competitiveness, innovativeness, and responsiveness of the defense industrial base.

• *Performance-Related Incentives*. Finally, the fourth of the broad set of desirable changes is *to create, for both sides of the military-industrial complex, incentives that are based on performance*. The objective here is to shift from a system that totally regulates—and that creates disincentives to lower cost—toward one in which natural market forces can be used to achieve better performance and lower costs. For example, on the military side, if it becomes clear that the services are promoting people to flag rank who do a good job in the acquisition world, people will work harder, and many will want to develop career paths in this area. Since experience is so important in managing complex, multibillion-dollar programs, any system that discourages good people from careers in acquisition is wrong.

**The incentives, for both sides of the military-industrial complex, must be based on performance.**

Another example of how the military could lower costs by incentive is to follow the commercial practice of price elasticity; *i.e.*, if the price of an item falls, you buy more of it. In the defense world, the quantities to be bought are essentially fixed, and the incentive is therefore to put maximum performance into every item, regardless of how much it costs or how many years it takes to afford them all. If it were common practice to allow the services to reinvest in higher performance or greater numbers of systems any money saved by a cost-effective program, then there would at least be some incentive for more careful, cost-effective management—and hence for savings. Today, any funds saved are returned to the general fund.

A number of years ago, then Secretary of Defense James Schlesinger tried an "experiment" in price elasticity when he offered the Air Force the choice of buying the high-cost F-15 aircraft or the lower-cost F-16 and having three more wings of the latter. Confronted by this nontraditional choice, the Air Force decided to buy what was then considered a less desirable (lower performance, lower cost) system because it recognized the cost-effectiveness of buying greater quantities.

Industrial incentives for increased efficiency can be created in other ways. For example, the most common incentive in the "real world" is some form of continuous alternative—competition. If General Motors decides to double the price of its cars, people will simply buy from another manufacturer. There always is a choice.

By contrast, the normal DoD practice is to have an initial competition for development of a weapon system and, from that point on, to have a sole supplier for the remainder of that weapon system's life. Should the cost rise significantly, the government essentially has no choice but to continue to pay the sole producer's price.

The obvious corrective is to figure out ways of creating continuous alternatives. For example, the Air Force recently went to dual-sourcing of its jet engines so that there will be continuous competition between Pratt & Whitney and General Electric for an annual share of the buy. Other forms of continuous alternatives are, of course, possible. Creating such alternatives—both at the prime contractor level and at the critical subsystem level—usually produces an initial cost increase to set up the second source. But data indicate that, over time, the Department of Defense will benefit from both increased performance and dramatically lower unit costs. Net savings of twenty-five to thirty percent have been estimated.

Consider also the possibility of a revised DoD profit policy for industry. Today, if a defense contractor's costs go up, the following year his profit also will rise, since the profit percentage tends to stay about the same and is added to the likely cost of the system for the coming year. (This is the case for a sole-source supplier—as is usually the case in defense.) An alternative profit policy would be to tie the percentage of profit offered the contractor to the current cost of his weapon system vs. the originally planned cost. In that case, if he drove down the unit cost of his systems, the percent profit that he would be allowed would go up each year (or down dramatically, if his costs rose). Thus, he would have a significant incentive to lower the cost of the system in order to increase his profit. The total cost to the government would eventually decline.

**An alternate approach would be to index profit to actual cost vs. planned cost.**

### Prescription for a Healthier DoD

I believe that these four broad corrective actions can be achieved:

- Institutional changes, including JCS and OSD restructuring, so that a coherent, integrated, resource-constrained, long-range plan tied to national security objectives can be developed and maintained.
- Institutional changes yielding far greater program and budget stability through multiyear budgeting and service baselining.
- Decentralized execution of the plan, down to the program manager level in the services, with monitoring to assure that plans are executed as intended and that resources and strategies are compatible. (The latter will require strengthened and more clearly defined service responsibilities for training, equipping, and supporting the forces. Performance evaluation should be added as a last step in the PPBS system and should apply to areas that range from force size and readiness through industrial base visibility.)

**If DoD doesn't act, the heat is going to get hotter.**

- Creation and implementation of incentives for improved performance and lower costs within both DoD and industry through such devices as career path enhancement, increased use of competition, improved profit policies, and reinvestment by the services of any money they have saved.

None of these changes can be implemented easily or quickly, but all four are required for any dramatic improvement in the way defense business is done. If DoD doesn't move in this direction, far more revolutionary changes will be forced upon it by Congress, since the public, stimulated by the press, is becoming increasingly disenchanted. The perception is that defense is not being managed well and that the taxpayers are not getting their money's worth for the increased—and badly needed—defense dollars.

I do not believe that the current position of DoD—"give us more dollars and things will be fine"—is going to be accepted. Rather, all parts of the military-industrial complex—Congress, civilian leadership of DoD, the services, and defense industry—should begin now to support and implement these changes. In this way, we will strengthen our national security posture, and the taxpayers will get their money's worth. ■

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***Electronic capabilities are increasing rapidly—but so are requirements and cost, and that's a real problem.***

# $C^3I$ Keeps Climbing

**BY EDGAR ULSAMER**
**SENIOR EDITOR (POLICY & TECHNOLOGY)**

COMMAND control communications and intelligence ($C^3I$), a vast and diverse array of electronic systems, subsystems, and components without which the signals of war would retrograde to bugles and semaphores, is in its heyday. Over the past five years, defense spending on $C^3$ has shot up by 150 percent in *real,* inflation-adjusted dollars, according to Assistant Secretary of Defense for $C^3I$ Donald C. Latham. The publicly disclosed portion of the $C^3I$ funding request tallies $22.1 billion in FY '86, compared with $9.9 billion in FY '81, Secretary Latham told the AFA national military electronics symposium held on April 25–26 in the Greater Boston area.

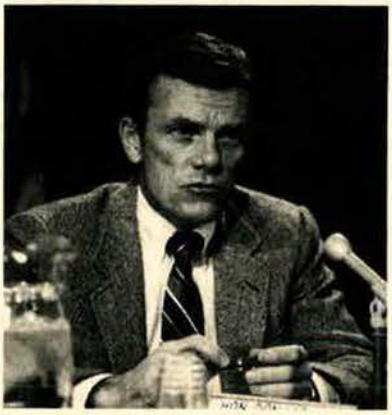
The "dark" portion of the investments in $C^3I$, mainly in the intelligence area, has undergone similar rates of growth, with spending on tactical intelligence systems, for instance, scoring a nineteen percent gain over last year's level, he said. AFSC Commander Gen. Lawrence A. Skantze told the AFA meeting that the Air Force's share of the Pentagon's FY '86 $C^3$ spending is pegged at about $10 billion—or forty-six percent of the total Department of Defense request—up from slightly less than $9 billion in FY '85.

The "stars" of the current cast of $C^3I$ products are what Secretary Latham termed the "incredible sensors" that are now coming out of the pipeline. Key here are the advanced synthetic aperture radar (SAR) of the TR-1 (a derivative of the high-flying U-2) and the SAR I version of the SR-71—eventually to be followed by a growth version, the SAR II—that "allows you to take pictures of the battlefield at night and in any weather from a hundred miles away and to present [such pictorial information] to [our] commanders." The upshot is that "we can fight continuous combat [by dint] of seeing in the dark with $C^3I$."

Another hallmark of the Defense Department's $C^3I$ program is the emphasis on integrating $C^3I$ with the weapon systems themselves. Great strides are being taken in this area in the tactical area, but some "disconnects remain on the strategic side," according to the Pentagon's top $C^3I$ executive.

### Soviet Progress in $C^3I$

While the US $C^3I$ business clearly is on a roll, Secretary Latham pointed out that Soviet progress in $C^3I$ systems is more comprehensive and hence alarming. The Soviets, he suggested, deliberately propagate the canard that, in the context of $C^3I$, they are technologically inferior in such areas as the strategic, tactical, and SDI (this country's strategic defense initiative, or "Star Wars") missions. "They are not," he stressed. "They may have less capacity in their computers and, maybe, less speed, but they are very good in applying technology to their systems—much sooner and better than we are in both lethal and nonlethal systems."



***Donald C. Latham is Assistant Secretary of Defense for Command Control Communications and Intelligence ($C^3I$).***

By way of an example, he pointed out that they "are ahead in the application of digital technology. [Also], they are ahead in applying IR [infrared sensor] systems to their fighters." At least three of the last Soviet fighters are equipped with IR systems, compared to "zero" on the US side, even though "the F-106 had an IR search track years ago."

In the area of air-to-air missiles, the Soviets are clearly in the lead, he added, saying: "We are trying to field AMRAAM [the advanced medium-range air-to-air missile] at an incredible cost while they already have a missile on [some of their] aircraft that is even better than AMRAAM."

Another area where the Soviets best US capabilities by a wide margin is in the largely classified "design for war" field, according to Secretary Latham. Stressing that he could only touch on this security-sensitive area in general terms, he disclosed that the Soviets build "a lot of wartime surprises into their equipment." This ability to deceive and conceal stems from the Soviet tendency to design "wartime reserve modes" into their systems—not just in terms of electronics but across the board.

Juxtaposing central features of the F-15 and the MiG-31, he pointed out that the F-15's gross takeoff weight (GTOW), when carrying maximum fuel, is about

68,000 pounds; the comparable figure for the MiG-31 is 85,000 pounds. The MiG-31's GTOW exceeds that of a B-17 World War II strategic bomber, he added. Even the new two-seat F-15E, with a GTOW of 81,000 pounds, lags behind the MiG-31. He assessed this Soviet fighter as superior to any existing US aircraft because the MiG-31 "has better avionics, a better $C^3$ system to work into, a better air-to-air missile, is faster, has greater combat range, and [the Soviets] are producing it like gangbusters."

### Concern Over the Acquisition Process

The Defense Department's fundamental concerns about the state of the research, development, and acquisition process involve military systems in general but $C^3I$ technology in particular, Secretary Latham told the AFA symposium. The four principal areas, he said, are that "we are not keeping up with the threat; that the cost of doing business is staggering; that [there are deficiencies] in how we specify equipment; and that [there is cause for concern] about contractor performance."

*Commander of Air Force Systems Command, headquartered at Andrews AFB, Md., is Gen. Lawrence A. Skantze.*

Under the rubric of staggering costs, he cited the fact that the R&D costs associated with the airborne terminals of the Defense Department's new jam-resistant, global Milstar satellite communications system have escalated to about a half a billion dollars. "That's R&D only, without recurring costs," he complained. Assuming optimistically that the weight of the B-1's Milstar terminal can be held to 500 pounds or less, he predicted that the total installed cost of such a terminal will "come to several million dollars per aircraft." On an installed basis, each pound of avionics aboard the B-1 costs about $4,000, while the comparable cost per pound of Milstar avionics—allowing for launch costs—has reached a staggering level of between $35,000 and $40,000, according to Secretary Latham.

He warned presciently that the costs of the Joint Surveillance and Target Attack Radar System (JSTARS)—a moving-target-indicating SAR installed on a modified Boeing 707 designated the C-18—might cause Congress to balk. (The House Armed Services Committee subsequently zeroed the FY '86 JSTARS funding request of $260 million on grounds that the "committee believes there are less costly alternatives for this mission." The committee further claimed that the Defense Department "failed to comply with congressional guidance to develop a plan for a more survivable JSTARS platform than the Boeing 707," reflecting presumably a preference for the much smaller TR-1. Some or all of this HASC cut is likely to be restored in conference with the Senate, but the warning about growing costs is real and clear.)

Stressing the "great and versatile capability" that ensues from JSTARS's ability to locate, track, and target moving targets from the forward line of troops (FLOT) to deep into the enemy's rear echelon, Secretary Latham nevertheless expressed concern that "it's going to cost $1.4 billion for the first four aircraft." He asked rhetorically and with obvious resignation, "How much more of this can we stand?"

Several other speakers stressed the fundamental importance of JSTARS, including General Skantze, who termed it a "fall-on-your-sword" priority. Lt. Gen. Clarence E. McKnight, Jr., USA, the Joint Staff's Director for $C^3I$, and Maj. Gen. Jacob W. Moore, USMC, the US Central Command's Chief of Staff, both underscored the essentiality of this system in operational terms. Lt. Gen. Melvin F. Chubb, Jr., Commander of AFSC's Electronic Systems Division and keynote speaker of the meeting, termed JSTARS pivotal to second echelon interdiction and standoff capabilities required in Europe and elsewhere. He strongly defended the Air Force's choice of the C-18 as the JSTARS platform, but acknowledged that the C-17, USAF's new airlift aircraft, might also be suitable for the JSTARS mission.

*Lt. Gen. Melvin F. Chubb, Jr., is Commander of AFSC's Electronic Systems Division, Hanscom AFB, Mass.*

### Problems With JTIDS

Another $C^3I$ program that Secretary Latham warned was becoming vulnerable to congressional budget slashing because of cost is the Joint Tactical Information Distribution System, or JTIDS. (The House Armed Services Committee did precisely that when it zeroed key elements of this program.) The R&D costs of JTIDS, Secretary Latham predicted, "ultimately will reach about $2.3 billion." The system will allow large numbers of users to share essential data securely and in the face of sophisticated jamming. Although he acknowledged the operational requirement for JTIDS, Secretary Latham expressed dismay over its high cost, driven in part by the fact that "it is an eleven-year-old program, with some relevant work dating back even further. The system won't get into production before 1987 or 1988. Why should it take so long for a fancy radio?"

A fundamental reason why JTIDS's research and development costs keep rising is that the individual needs of the various users seemingly can't be accommodated in one common design. This leads to major, special modifications. Deputy Assistant Secretary of the Navy for $C^3I$ Harold Kitson explained that his service "has a

unique requirement to have multiple, simultaneous nets to provide command and control capability for the anti-air warfare, antisubmarine warfare, antisurface ship warfare, electronic warfare, and battle force commanders." Stressing that the Navy's requirements differ from those of the Air Force, he added that the Navy has historically emphasized data over voice in its communications. The Navy, he said, encountered schedule problems during full-scale engineering development of its JTIDS system—especially in terms of the F-18—but is now at the point "where we are integrating software with our brassboard system. By the end of this calendar year, we will have our first full-scale engineering development terminal delivered."

He told the AFA meeting that the Navy plans to procure approximately 2,000 JTIDS terminals. Although the Navy uses an approach to JTIDS that differs basically from that of the Air Force—distributed time division multiple access (DTDMA) vs. time division multiple access (TDMA)—the Navy's terminals will be "backward compatible" with those of the Air Force. This means that Navy terminals that need to talk to Air Force terminals can be equipped to do so, according to Secretary Kitson.

*Harold Kitson is Deputy Assistant Secretary of the Navy for Command Control Communications and Intelligence.*

Another factor affecting the JTIDS program is the Air Force's requirement over the long term to replace its Have Quick I and II voice communications systems, which provide electronic counter-countermeasures for primary air-to-air and air-to-ground radio links, with a more robust capability known as the enhanced JTIDS, or EJS. Although the need for EJS is not immediate, General Chubb said this upgraded system is imperative in order to keep the Soviets from getting "a jump on us."

General Skantze cited EJS as an example of how adding new requirements in the design stage can entail delays and cost increases: "Since the program started—under the name Seek Talk—EJS has grown from a jam-resistant voice radio in the UHF band to include interoperability with JTIDS in the L-band, addition of a TACAN capability, operation in an alternate band, and the capability to pass a limited quantity of data in both the L-band and alternate band." As a result, the initial operating capability for this secure communications radio has slipped seven years, the AFSC Commander told the AFA symposium.

Secretary Latham, while acknowledging that successful enemy jamming can "shut down the Air Force," warned that EJS will probably cost well over thirteen times more than Have Quick II. As a result, he expressed doubts about the affordability of EJS. General Skantze suggested that the experience with EJS and with other instances of "requirements creep" cement the case for declaring a "moratorium on new requirements early in the development process." He cautioned that no moratorium should be absolute, but stressed that "when a program manager declares the need for a moratorium, having the entire defense community support him would do more to improve the C³I acquisition process, contain cost, and get delivery dates met than would any other management initiative." He added that the short life-cycle of emerging technologies in the electronics realm strengthens the case for imposing moratoria.

### Fixed-Price Mania?

Over the past year, several significant Pentagon programs experienced schedule slippage that, in turn, caused the government to "cap" some of them, according to Secretary Latham. "We in effect told the contractor, 'This is the final money we are going to give you, and you will have to complete [the program at this funding level] or you will have to pay the overage.' " He said JTIDS and the Airborne Self-Protection Jammer (ASPJ) are in this category.

The result on the part of the Pentagon has been overemphasis on fixed-price contracts: "You are seeing fixed price becoming the norm in programs that carry a fair amount of risk." Expressing skepticism about categoric application of fixed-price contracting to R&D in the C³I field, Secretary Latham pointed out that software, rather than hardware, is often the Achilles' heel of such programs. On average, about eighty percent of the cost of C³I programs is in the software, "yet often we can't get the software to work." At least three NATO-related programs managed by the US are bogged down in software problems and, as a result, are between three and four years late, he said.

General Skantze agreed that fixed-price contracting should not be applied in a procrustean manner: "From a contracting point of view, we are in the risk-management business. The higher the risk, the more the government should share that risk; the lower the risk, the more industry should share that risk." Stressing that the Air Force will not resort to fixed fee plus (FFP) contracting "just because it's popular," the AFSC Commander averred that "if we want industry to build something that isn't invented yet, then we are clearly in the 'cost-plus' area." He told the audience of industry executives from around the country that, "in general," the Air Force will continue to "link the R&D contractor to building the first pieces of equipment" in the case of programs involving competitive procurement. "If we want to bring in a second manufacturer, we will make allowance for the first contractor's investment in the program." The government as well as industry find themselves in a "hardball defense procurement arena" and need to recognize that "Congress is in no mood to tolerate cost growth of significant amounts for defense programs," General Skantze warned.

"This year, for the first time in recent history, a major Air Force program, a munitions system, was canceled due to a breach of the Nunn-McCurdy Act [covering cost overruns in excess of fifteen percent]," General

Skantze pointed out. Rejecting the contention that the Air Force has been excessively harsh in dealing with contractors, he noted that "we have put people who failed to meet the required standards on due notice. We didn't run to the media to [tell them about] these difficulties, but these sorts of things do get out. I agree in a broader sense there has been too much criticism [in the media], but that is pretty well out of our control, if not completely so." Recent sanctions by the Defense Department against top executives of a major aerospace company do not represent a deliberate attempt by the Pentagon to revamp the management of that company. But General Skantze speculated that enough pressure has been applied on that company so that "I would be very surprised if the corporate board [of that organization] had not been thinking along those same lines."

Secretary Latham made clear that not all cost growth is the fault of industry. By way of an example, he cited the case of the Roland air defense weapon system that is deployed with the New Mexico National Guard: "This is a disaster story. We took a perfectly good European system . . . and redid the whole design to Americanize the system from the metric [standard]. It turns out that we want to send [these weapons] here and there and thus need to re-Europeanize them again. The Germans [who co-designed Roland originally] came over and said it's going to cost $10 million to do that. This is ridiculous."

### Divergent Views on JRMB

With about sixty-five percent of all C³I programs predicated on cross-service or multinational use, the importance of a joint oversight mechanism is obvious. The service Vice Chiefs and the Director of the Joint Staff are now meeting on a regular basis as the Joint Requirements and Management Board, or JRMB, which was formed last year, to examine potential joint military requirements; to identify, evaluate, and select systems for joint development and acquisition; to provide oversight of cross-service requirements and management issues; and to resolve service issues that arise after a joint program has been initiated.

Proponents of the JRMB claim that its actions in its first year of existence have led to potential life-cycle savings of about $3 billion. Major issues currently being examined by the Board include remotely piloted vehicles (RPVs), electronic warfare commonality, worldwide military command and control systems, and wide-area surveillance, including space-based radars. The uniformed side of the Pentagon in general sees the JRMB as proof that the services can and will work together at the highest levels to achieve maximum combat capability by the most economical means. In addition, the meetings of this body of "four-stars" helps to establish closer working relationships and promotes consideration of the impact of individual service decisions on the other elements of the Defense Department.

Secretary Latham told the AFA meeting that he "opposed" formation of this Board when it was first proposed by the Defense Science Board. He alleged that "these 'four-stars' . . . meet all the time; [they] meet without staff and without understanding these complex issues. We need to come up with a better mechanism."

General Skantze countered that he was "not at all surprised that [Secretary Latham] is concerned about the JRMB, because [its views] might not coincide with what he sees as needed." This structure was created because the Secretary of Defense and the Defense Science Board agreed that "the responsibility for setting military requirements for meeting military threats belongs to the military services. The four Vice Chiefs and the Director of the Joint Staff make up the JRMB and are the means for getting the joint view into the requirements process. They look at the issues and don't just let them gestate in the civilian community in OSD," according to General Skantze.

### Further Delays for Space-Based Radar?

As requested by OSD, the Defense Science Board last summer completed a study of the space-based radar requirement and, according to Secretary Kitson, "ended up with a recommendation that a 'Block Zero' approach, with relatively low cost and limited operational capability, should proceed immediately." The Department of the Navy, he claimed, came up with a concept that dovetails with the DSB's recommendation. OSD, at the same time, "is supporting an effort to get critical technology efforts for the space-based radar initiated in FY '85. Once again, however, the Navy and Air Force have not resolved their differences in management, and until they do, the program will really not get started," according to Secretary Kitson. He suggested that the high costs of space-based radar rule out the possibility of either individual service funding the project independently. The current impasse, General McKnight told the AFA meeting, prompted the JRMB to review the program in an attempt to resurrect it.

A space-based radar is of vital importance to the Navy, according to Secretary Kitson. Such an all-seeing, global sensor would enhance the survivability of the battle groups by its ability "to pick up Bears and Backfires in time for our fighters to go after them, in the right direction." Pointing out that the exchange ratio in a local combat area boils down to a function of the square of the force ratio, he suggested that a space-based radar would "allow us to put twice as many fighter aircraft in a local area to confront an incoming Backfire raid on a battle group." This would improve the exchange ratio fourfold and thus would sharply reduce the probability of the Soviet bombers getting through.

Another incipient space program of major long-term importance to the Navy is the blue-green laser communications system, which shows great potential for maintaining reliable command links with the ballistic-missile-launching submarines (SSBNs). This type of laser energy can penetrate clouds and seawater to reach submerged submarines operating at full speed. Tests of major components of this submarine laser communications research program off the coast of California by the Defense Advanced Research Projects Agency (DARPA) and the Navy have shown highly promising results, according to Secretary Kitson.

A space-qualifiable prototype transmitter is to be fabricated and readied for test in FY '86. At the same time, a submarine-qualified atomic resonance filter receiver is being built. Testing of these pivotal components will set the stage for formulation of a specific configuration and full-scale engineering development. The laser communications system—in addition to its primary strategic mis-

sion—is expected to enable battle group commanders to maintain communications with submerged attack submarines that support them.

A third space-based system that was singled out for special emphasis at the AFA symposium is the Boost Surveillance and Tracking System (BSTS), a follow-on to the Defense Support Program's early warning satellites. Now a part of the SDI program, the BSTS not only detects the launch of ICBMs and SLBMs on a global basis but calculates their trajectory within tens of seconds to permit intercepts before the missiles can release their individual warheads. The new defense budget request seeks $130 million in the coming year for development of this system. BSTS is to achieve operational status in the early 1990s, according to Secretary Latham. The system's contract definition, including selection of a prime contractor, is about "to start in earnest," he added.

*Maj. Gen. Thomas S. Swalm is Commander of TAC's Tactical Air Warfare Center at Eglin AFB, Fla.*

## Electronic Warfare Issues

Congressional experts have expressed concern about the Air Force's decision to cancel the Pave Tiger RPV program. Maj. Gen. Thomas S. Swalm, Commander of the Tactical Air Warfare Center, said the primary reason behind this decision was that Pave Tiger—envisioned originally as a low-cost RPV—had become a "very expensive program. The costs just went up and up." As a result, it lost out to some other programs the Air Staff "felt stronger about." General Swalm said that Pave Tiger, designed to shut down or kill enemy radar defenses and jammers, "would have been very useful against Soviet UHF jammers, especially in cases where we don't have Have Quick" available.

General Swalm underscored the importance of upgrading—or replacing with follow-on systems—the EF-111A Raven, or "Electronic Fox" as pilots call it, and F-4G Wild Weasel. Predicting a pronounced requirement for standoff and penetration jammer platforms in years to come, he suggested that the forty-two EF-111As will eventually have to be replaced. In the case of the F-4G, he said, the Air Force is looking at electronics upgrades and reengining because "the engines simply are getting too old."

While he was sanguine about the Air Force's ability to cope with Soviet "Radio Electronic Combat," General Swalm expressed some concern about Soviet radio-frequency weapons. This new technology appears capable of disabling both avionics and personnel on a broad basis. While he declined to give specific details because of tight security classification, he acknowledged that "we watch Radio Frequency [technology] very closely and are working this in both a tactical and a technical sense. This is a hot and heavy issue, and we certainly don't have it on the backburner."

In discussing another hush-hush element of electronic warfare, command and control countermeasures ($C^2CM$), General Chubb acknowledged that "we are working the devil out of" this area and have a number of "black programs" in progress. A key reason behind the intensity of the Air Force effort in $C^2CM$ is that the Soviets "are so potent" in that area.

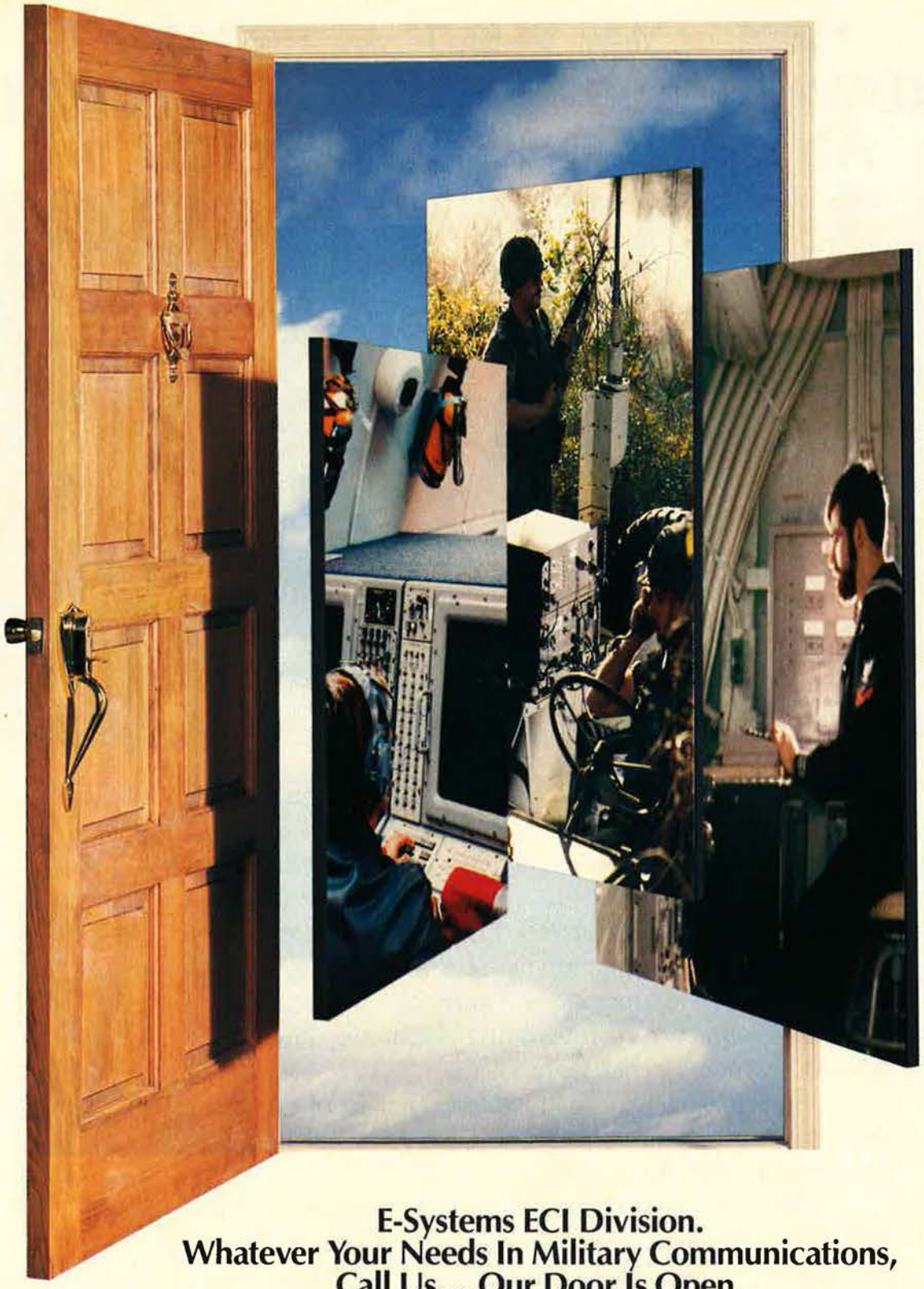
## DoE's Nuclear Weapons Programs

The US doesn't know "a great deal [about] what really goes on" in the design of Soviet nuclear weapons, the Department of Energy's Assistant Secretary for Defense Programs, William W. Hoover, told the AFA symposium. When both the US and the USSR began in the early 1960s to test nuclear devices underground because of their agreement not to detonate nuclear devices in the atmosphere, "we lost most of our intelligence [on] what the internal design of their weapons is actually about," he disclosed. On the other hand, "we can see the magnitude of their effort" in terms of such yardsticks as laboratory floor space and size and quality of work force. The Soviet level of effort in nuclear warhead programs tops that of the US by "between fifty and a hundred percent." Secretary Hoover warned that "while we don't know what they are doing in weapons [design], there is legitimate concern about the magnitude of their effort." On balance, he said, "they certainly seem to be as good as we are" in nuclear warhead and nucleonics technology.

DoE's defense programs are being carried out by three national laboratories—Lawrence Livermore, Los Alamos, and Sandia—and seven production plants managed by commercial contractors. DoE's weapons design complex, Secretary Hoover said, "is probably the world's leading user of supercomputers. The evolution of nuclear weapons is directly tied to the power of supercomputers. That is why we are anxiously awaiting the next generation" of supercomputers that will make possible advanced computer-designed warheads. In the D-5 program, which is also known as the Trident II SLBM warhead program, DoE expects to be "converted to full use of computer-aided design and computer-aided manufacturing and production," he told the AFA symposium.

While SDI "is meant to put nuclear weapons on the endangered species list," he pointed out that a comprehensive ballistic missile defense system is out in the future, and "until then, we will need strong deterrent capabilities." Nuclear weapons and their warheads are the underpinning of this country's deterrence strategy. As long as that remains the case, "we need to test to make sure that [our nuclear weapons] remain viable." As a result, "it would not be useful to proceed with a Comprehensive Nuclear Test Ban [CTB]." He added that if arms-control considerations were to drive the US to a point "where we are unsure whether our [nuclear] weapons remain viable, this would be quite destabilizing."

In spite of the increasing complexity of nuclear weapons, this country's nuclear materials stockpile is down



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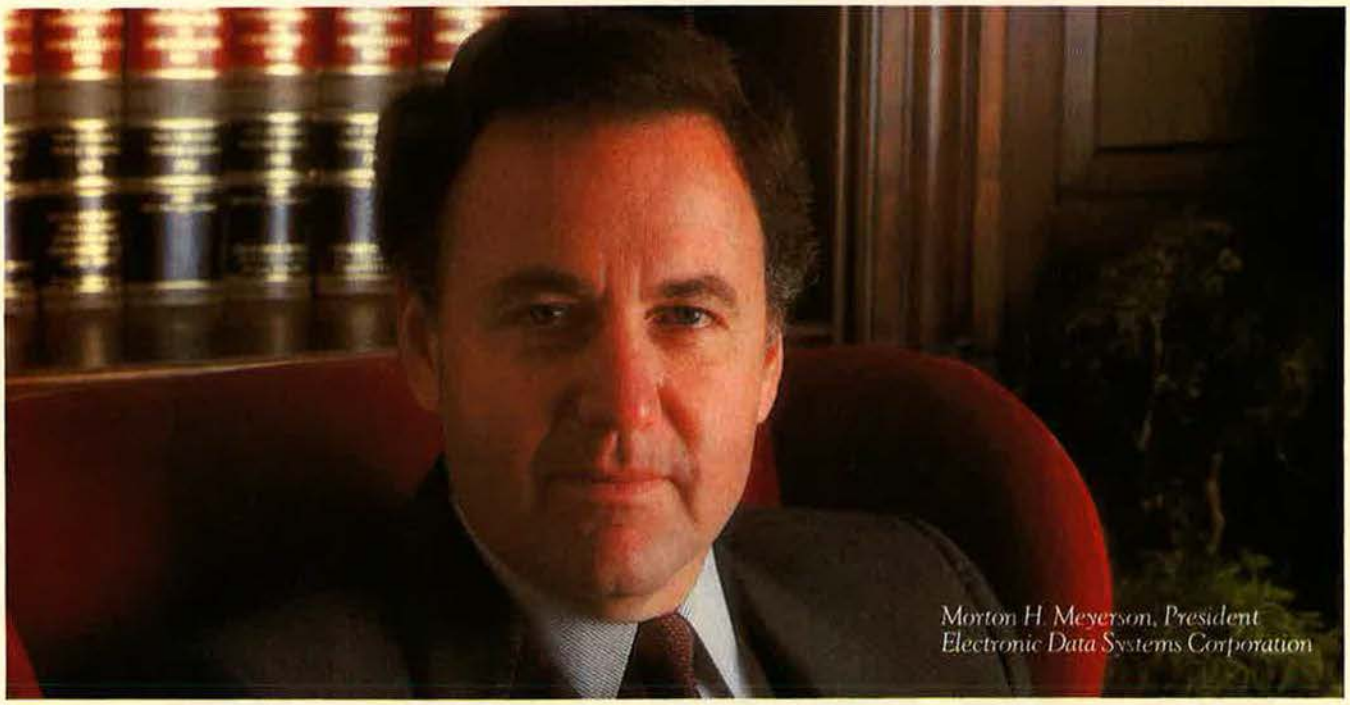


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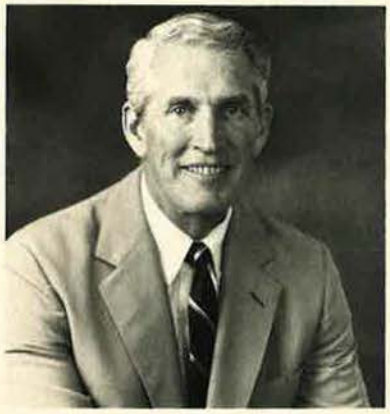
by about twenty percent from what it was a few years ago, according to Secretary Hoover. The largest percentage of special nuclear materials (SNM)—the key component of nuclear weapons—"comes from dismantling old weapons." Secretary Hoover added that "we retire almost the same number of weapons as we produce in any one year." DoE plans to continue this policy, but "we don't want this to get out of balance so that, in fact, we can't meet requirements." Over the past few years that balance has been "right at the margin." Needed are various improvements, such as having "our reactors produce at a higher rate" and eventually replacing reactors as they wear out: "By the turn of the century, these reactors will be fifty years old—so there is cause for phasing in newer reactors as we phase out older ones."

DoE is also exploring such technologies as "special isotope separation that will allow us to process some material that is currently in an unusable form." He added that, at present, "there is virtually no redundancy in the system." Also, the system is vulnerable not just in terms of terrorism but also with regard to natural disasters and strikes by a laser force. He stressed that it is essential to develop a backup capability for the production of tritium, a nuclear material of central importance. At the moment, he said, the only place where "we load tritium is at the Savannah River facility." The Department of Energy has produced excess quantities of some critical components to build up a reserve that, in case of a shutdown, can sustain the production process "for about one year," Secretary Hoover explained.



*William W. Hoover is the Department of Energy's Assistant Secretary for Defense Programs.*

Over the past few years, DoE has quadrupled the number of security systems at its nuclear facilities. Still, the prevention of terrorism remains a tough job: "We use things like perimeter intrusion and detection systems [and] sensors that detect nuclear material that is being taken out of our facilities," according to the DoE official. Lastly, there is a "sort of volunteer nuclear fire department—the Nuclear Materials Search Team—[whose top-flight experts] search for, diagnose, and know how to disarm" nuclear weapons that might have fallen into the wrong hands. "We have deployed this team several times, but only under hoax conditions," he disclosed.

An area of major concern, according to Secretary Hoover, is the hardening of warheads—especially their electronic arming and fuzing devices—against the nuclear effects of other weapons, hostile or friendly, such as X-rays and gamma rays. "We are putting a lot of effort into hardening our weapons, primarily at the Sandia [facility]. We are confident that [the warheads] can survive to [a] degree so that there is no fratricide, [wherein detonation by one weapon disables another]."

### Status of the SDI Program

Dr. George A. Keyworth II, the White House Science Advisor, told the AFA meeting that the first—and central—goal of the Strategic Defense Initiative (SDI) is the elimination of "the ICBM, the most destabilizing element of the nuclear arsenal, as an effective military weapon." If SDI were eventually to succeed in convincing the Soviets of the "loss of utility of their ICBMs as a preemptive force, they will have to admit that the age of the ICBM as the dominant weapon is passing. They, and we, will no doubt begin to replace ICBMs with other weapons, but in so doing we'll be phasing out the most feared and most destabilizing of the nuclear weapons."

*White House Science Advisor in the Reagan Administration is Dr. George A. Keyworth II.*

SDI's basic leverage against ICBMs stands or falls with the ability to intercept those weapons in the boost phase, before the individual warheads and penetration aids can be offloaded by the "bus." Recent major advances in directed-energy weapons technology, he suggested, point the way toward successful boost-phase intercept capability. By the way of an example, he cited "high-power, pulsed lasers—with as much as a hundred megajoules packed into a 100-microsecond shock—[that] could cycle so fast that we might only need a handful of them to defend against the whole Soviet ICBM fleet launched simultaneously."

He added that recent advances in basic research in astronomy "have shown us how we can use adaptive optics for atmospheric compensation. That means we [could put] large lasers on the ground, where they can be easily maintained and protected, [and] relatively simple mirrors in space to reflect the rapid laser pulses and direct them to their targets far away." He predicted that such a weapon would be both survivable and "almost impossible to overwhelm by proliferation. A single laser could send out more than 500, maybe up to 1,200, missile-destroying pulses per minute." He added it appears likely that "we can develop a technology in which pulses are going to be far cheaper than missiles—though I hasten to add that it's up to us to show that we can do that." ■

*(AFA's next symposium on military electronics is scheduled for June 26–27, 1986, again in the Greater Boston area.)*

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# Getting Together on Air Defense

**BY CAPT. NAPOLEON B. BYARS, USAF**
**CONTRIBUTING EDITOR**

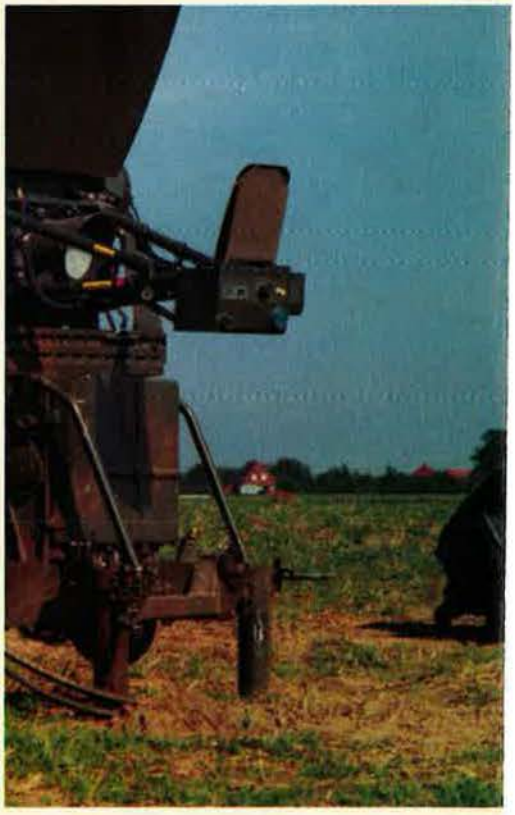
AIR defense is absolutely vital to the security of Western Europe. There has never been any argument about that. Until recently, though, the arrangements to provide for that air defense were not as integrated as they needed to be.

Last year, joint studies of the requirement led to a major Memorandum of Agreement (MOA) that was signed by the Chiefs of Staff of the US Army and the US Air Force. That MOA, now being implemented, is one of the reasons why real progress is being made in modernization and integration of ground-based air defense capabilities in Europe.

The air arm of NATO air defense includes American F-15s that will meet intruders and seek to establish control of the air. Swing-role air-superiority and attack aircraft, such as the F-16, will also be employed alongside a number of fighters dedicated to air defense. They will employ beyond-visual-range (BVR) air-to-air weapons behind enemy lines.

With the development of better systems to distinguish friend from foe *(see "Telling Ours From Theirs," June '85 issue)*, this capability will be greatly enhanced and will permit BVR weapons to be employed closer to the battle area. An

***Such highly regarded air defense systems as Chaparral provide protection against low-flying aggressors.***



especially effective area of air defense will be the interdiction of enemy airdromes by USAF and other NATO aircraft to stop the cycle of follow-on air raids.

Another big chunk of the problem—ground-based defense of installations and other critical assets—was addressed in the Army-Air Force MOA.

### Combined Priority List

In the past, the Air Force developed its own list of requirements that sought to elevate air base defense to the number-one priority for ground-based air defense. As a result of the MOA, the Unified Commands are now tasked to submit a combined prioritized list of vital assets requiring air defense. And though the Air Force is still concerned primarily with air base defense, commanders in the theater must now come up with a combined priority list of assets to be protected. These include such things as munitions storage sites, bridges, and power-generating facilities.

As one DoD official put it, "What we are trying to do is size the air defense requirement. The priority listing should show us where our deficiencies are and point the direction where air defense forces need to grow."

Presently, ground-based firepower for these purposes is achieved by an interlocking array of forward air defenses and point air defenses. NATO's forward air defense consists of surface-to-air missiles (SAMs), antiaircraft guns, and fighter-interceptors. Its point air defense comprises a mix of long-, medium-, and short-range air defense systems. Radars and major sensors that provide early warning of intruders are also essential elements of the air defense network.

"The object of our air defense system in Europe is to engage the enemy as far forward as possible and to continue to engage him all the way to his target area," says a defense official. "We can't afford to give him a free shot at anything during any point of his ingress."

But air defense includes more than just making the skies unfriendly to enemy air forces. It also includes such passive measures as camouflaging high-value assets to make them more difficult to find from the air. Rapid runway repair is yet another facet of air defense.

A major provision worked out in the MOA put the ground-based air defense mission—excepting arrangements involving air bases in Britain, Germany, and Turkey—squarely in the Army's hands. However, the Air Force will continue to track Army developments in order to pursue air defense improvements.

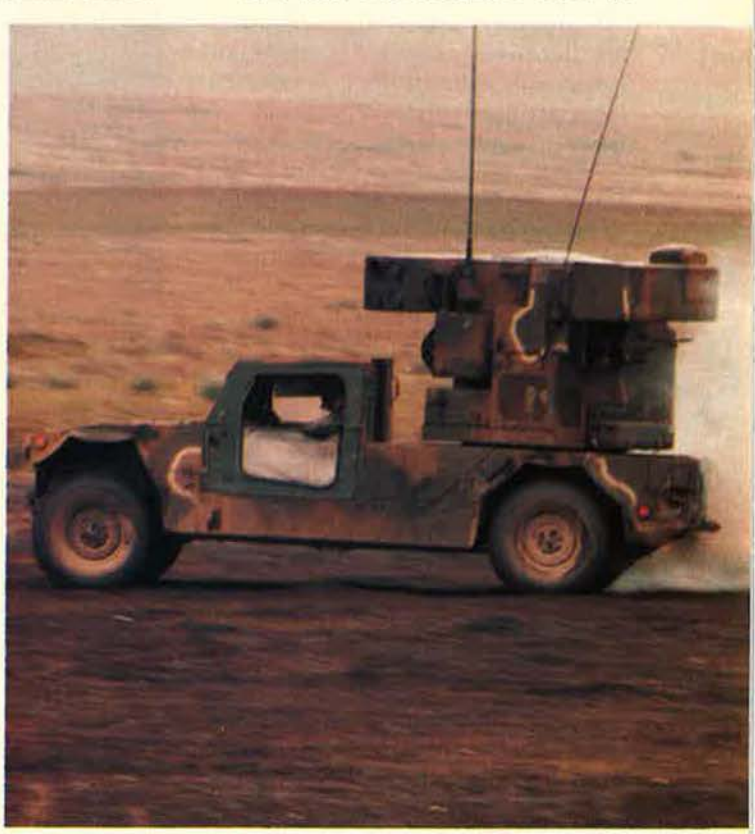
The Air Force will be responsible for defenses inside the base perimeter only. Beyond the fence, it's up to the Army. To help accomplish this, the Air Force will transfer Reserve component manpower spaces to the Army if air base ground defense requirements exceed Army capabilities.

The Army will also procure whatever weapon systems are needed for the mission. Consequently, the Air Force canceled a program that duplicated Army efforts to develop a mobile firepower system to be used mainly against light ground forces and slow-moving airborne threats. The Air Force will still participate in determining requirements.

### Beefing Up European Defenses

To beef up air defenses in Europe, the US has negotiated placement of a number of new SAMs at bases in Germany, the Netherlands, Turkey, and the United Kingdom. Patriot and Euromissile Roland have been designated for bases in Germany. Patriot will also be deployed in the Netherlands. Rapier will be used for bases in Turkey and the UK.

The first Patriots have been in



***LEFT: Rapier SAM systems became operational at RAF Lakenheath, UK, in November 1984. Rapier will help beef up air defenses around main operating bases in the UK and at air bases in Turkey. RIGHT: The Avenger air defense system, mounted on a High Mobility Multipurpose Wheeled Vehicle (HMMWV), prior to testing at the Army's Yakima Firing Center in Washington state.***

place in Germany for almost a year. They are the part of a bilateral agreement that calls for the deployment of twenty-eight such units to Germany. Patriot is a mobile SAM system that is jam-resistant and capable of engaging several targets simultaneously.

The Euromissile Roland, also scheduled for deployment in Germany, is an advanced, all-weather, short-range air defense system. Roland is presently in production in France and Germany. It has a command guidance system and is highly mobile. The Bonn government has agreed to operate twenty-seven Roland fire units for ten years at three US air bases in that country. Germany will also purchase and man sixty-eight Roland units for deployment at its own bases.

American-bought but British-manned Rapiers became operational at RAF Lakenheath in November 1984. All told, thirty-two Rapier units will be acquired and deployed at seven main operating bases in the UK. Rapier has an optical guidance system supplemented by radar or laser tracking. It is extremely effective during daylight or at night against low-flying, fast-moving targets. Rapier's effectiveness has been proven in combat during the Falklands war.

In another move to shore up point air defenses, the US signed an agreement with the Turkish government to locate Rapier units at air bases in that country.

DoD's purchase of Roland and Rapier SAMs is, in part, a response to urging by NATO allies for the US to field more European-built systems. The pattern that prevailed for years—the Europeans buying US systems but the reverse seldom happening—has been a matter of considerable contention.

In addition to new systems, a variety of highly regarded SAMs, such as the Improved HAWK (I-HAWK), Chaparral, Redeye, and shoulder-mounted Stinger, continues in use. The last of the Army's thirty-year-old Nike-Hercules SAMs, which could engage only one target at a time and had a low rate of fire, were retired last summer.

## The Search Goes On

The Army is still searching for a lightweight air defense system (LADS) to replace its outdated Vulcans. Vulcan is a fair-weather short-range system that uses a 20-mm Gatling gun. Future procurement of the Division Air Defense (DIVAD) gun, which will replace Vulcan, remains on hold. DIVAD made headlines after the Secretary of Defense decided to delay further procurement until additional operational tests were completed. Also known as Sergeant York, DIVAD is an all-weather antiaircraft system using twin 40-mm Bofors guns mounted on a modified M48A5 tank chassis. The additional operational tests began in April of this year. The results from this testing could well determine the fate of the gun.

Even if DIVAD is canceled, the requirement will still exist for a similar system to defend against ground attack aircraft and missile-firing Soviet helicopters. DIVAD or some alternative system that is mobile, multipurpose, and quick-reacting is critical if the Army is to provide effective firepower for future point air defense.

The Army is exploring several air defense artillery (ADA) systems to deploy with its light divisions and to provide mobile firepower for point air defense. One such system is the Avenger, which can launch Stinger missiles from a high-mobility, multipurpose wheeled vehicle (HMMWV—also known as Humvee). It has a forward-looking infrared sight that enables it to operate at night and in adverse weather. Another ADA system in development, named Setter, can fire multiple Stinger or hypervelocity rockets.

The Army is also considering a new system to augment Patriot and to extend low-altitude coverage well beyond the forward line of troops (FLOT). Presently in the concept stage, the system will provide around-the-clock, low- to medium-altitude coverage. It will require minimal manning and be highly mobile. Whatever shape the system eventually takes, it will be a product of joint Army-Air Force efforts.

"One message of the MOA," says an Air Force official, "is that even though the Army is responsible for doing the air defense mission—including providing the manpower and hardware—the Air Force has a vested interest in how air base defense is done. So the systems that are being developed need to meet our needs as well as theirs." ■

***The highly mobile, air-transportable Chaparral allows for maximum flexibility of ground-based air defenses. The self-propelled version of Chaparral pictured in the foreground carries four modified Sidewinder missiles on launch rails and eight additional missiles in internal storage compartments.***

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## Classified and unclassified National Security related contractor telecommunications shall be brought into current compliance with National Policy...effective immediately...

...This National Communications Security Instruction allows government contractors to charge communications security or protection costs back to the government in the same manner as other contract security costs. National COMSEC Instruction 6002, June 1984.

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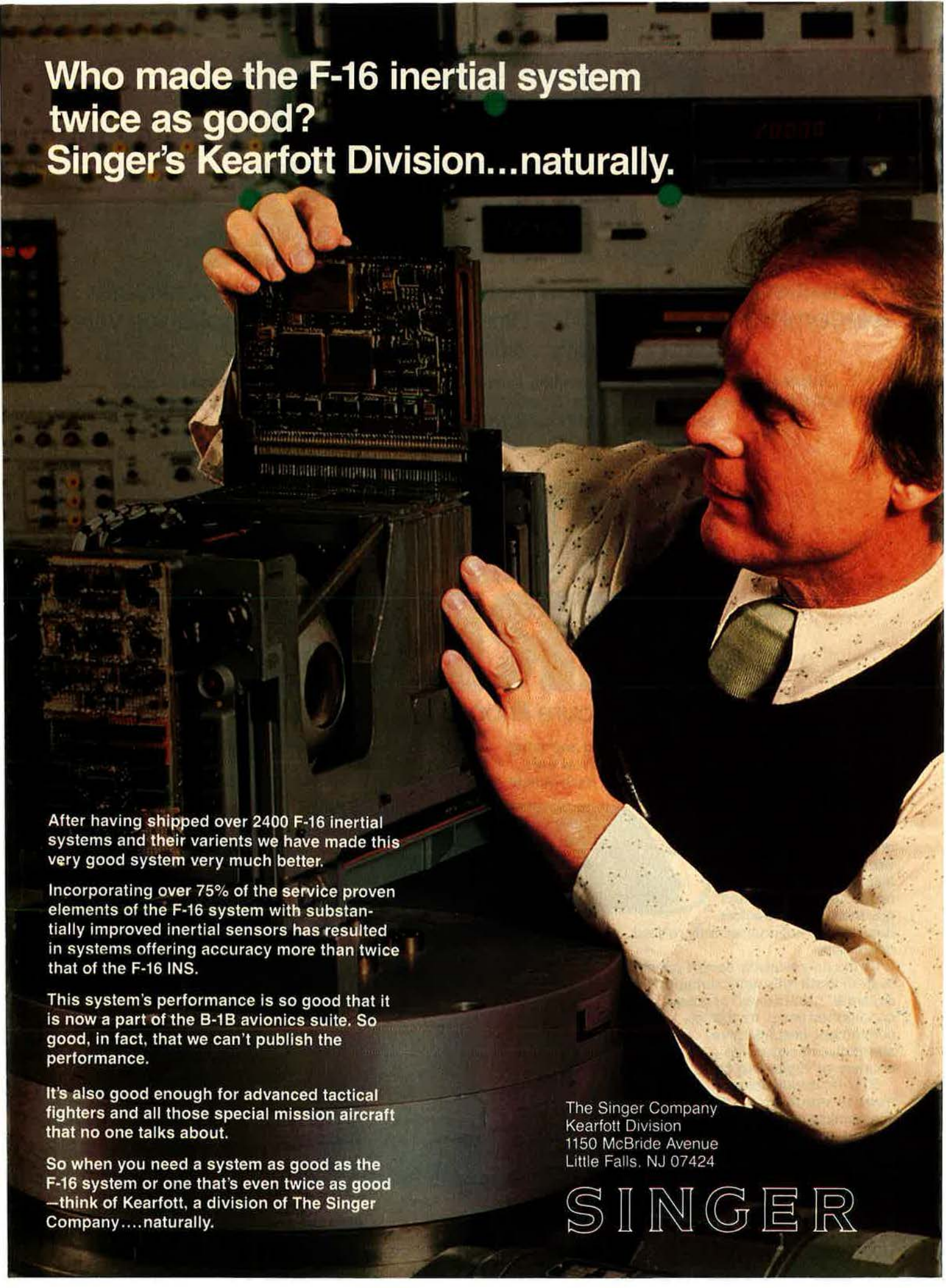
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# AEROSPACE WORLD
## News, Views & Comments

**By James P. Coyne, SENIOR EDITOR**

Washington, D. C., June 3

★ The Air Force has revised its combat-exclusion policy and will now open to women about 800 active-duty jobs previously closed to them. The revision resulted from a force composition study that Congress asked for last year.

For the first time, the USAF policy that restricts women because of combat involvement now specifies types of units, aircraft, and skills.

Under the new policy, women will now be eligible to serve with forward air control posts and munitions storage sites, fly and crew with some EC-130E, EC-130H Compass Call, and C-23 Sherpa aircraft, and serve with C-130s assigned to the 16th Tactical Airlift Squadron, Little Rock AFB, Ark.

These positions are now filled by men. In opening the jobs to women, the service will consider individual merit and will provide the same job opportunities for equally qualified men and women. The Air Force will not recruit to a fixed percentage, officials said.

"Women continue to make substantial contributions to today's high-quality Air Force," said Air Force Secretary Verne Orr. "As their numbers continue to increase, the Air Force is committed to providing full career opportunities." Combined with the opening of the security specialty and Minuteman and Peacekeeper launch crew positions, about half the jobs closed to women a year ago have been opened.

About 26,400 jobs remain closed because of combat exclusions. These jobs include four enlisted career specialties: combat patrol, tactical air control, aerial gunner, and parachute-recovery. There are no officer career fields closed to women; however, some positions in the open fields are closed due to the combat nature of their missions.

The Air Force already has a higher percentage of women in the work force than the other services. With the new job openings since last year, officials expect this percentage to rise from eleven percent to sixteen to twenty percent in the next few years.

★ Major construction work is almost completed at the West Coast Shuttle launch facility at Vandenberg AFB, Calif., and NASA and Air Force officials look forward to a first launch in March 1986.

The US Army Corps of Engineers faced different challenges in managing construction of the $500 million project at Vandenberg than were experienced at the East Coast launch site at Kennedy Space Center, Cape Canaveral, Fla. The most important difference is that, at Kennedy, the Space Shuttle is moved to the launchpad after having been completely assembled, while the opposite is true at Vandenberg, where the giant buildings move around the stationary Shuttle.

Before each launch, three huge mobile buildings move along railroad tracks to the launching point. Two of them are taller than a twenty-three-story skyscraper. First, the service tower, using a 200-ton capacity crane, stacks the solid-rocket boosters on the launch mount. Then the Shuttle Assembly Building, weighing 4,000 tons, moves in with the Shuttle from the opposite direction to mate with the service tower and enclose the Shuttle vehicle for assembly.

Using a 125-ton capacity crane in the roof of the Shuttle Assembly Building, the Space Shuttle is lifted into position and attached to the solid-rocket boosters. Once the Shuttle and its boosters are mated, the third moving building—an eighteen-story Payload Changeout Room—moves through the Shuttle Assembly Building and transfers satellites and other payloads to the Shuttle. These payloads have been readied in another, stationary, building, the Payload Preparation Room.

Once this has been accomplished and the spacecraft has been fueled, the buildings move back on their railroad tracks, leaving the Shuttle and its boosters attached to the stationary launch mount. The steel launch mount will withstand more than 6,900,000 pounds of rocket thrust as the Shuttle lifts off, while almost


*Giant, movable buildings will prepare the Space Shuttle for its first launch from Vandenberg AFB, Calif. From left are the payload and changeout facilities, the Shuttle assembly building, and the service tower. The* Enterprise *is at rear.*

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**Fifty years ago this month, the B-17 rolled out of the factory and into history.**

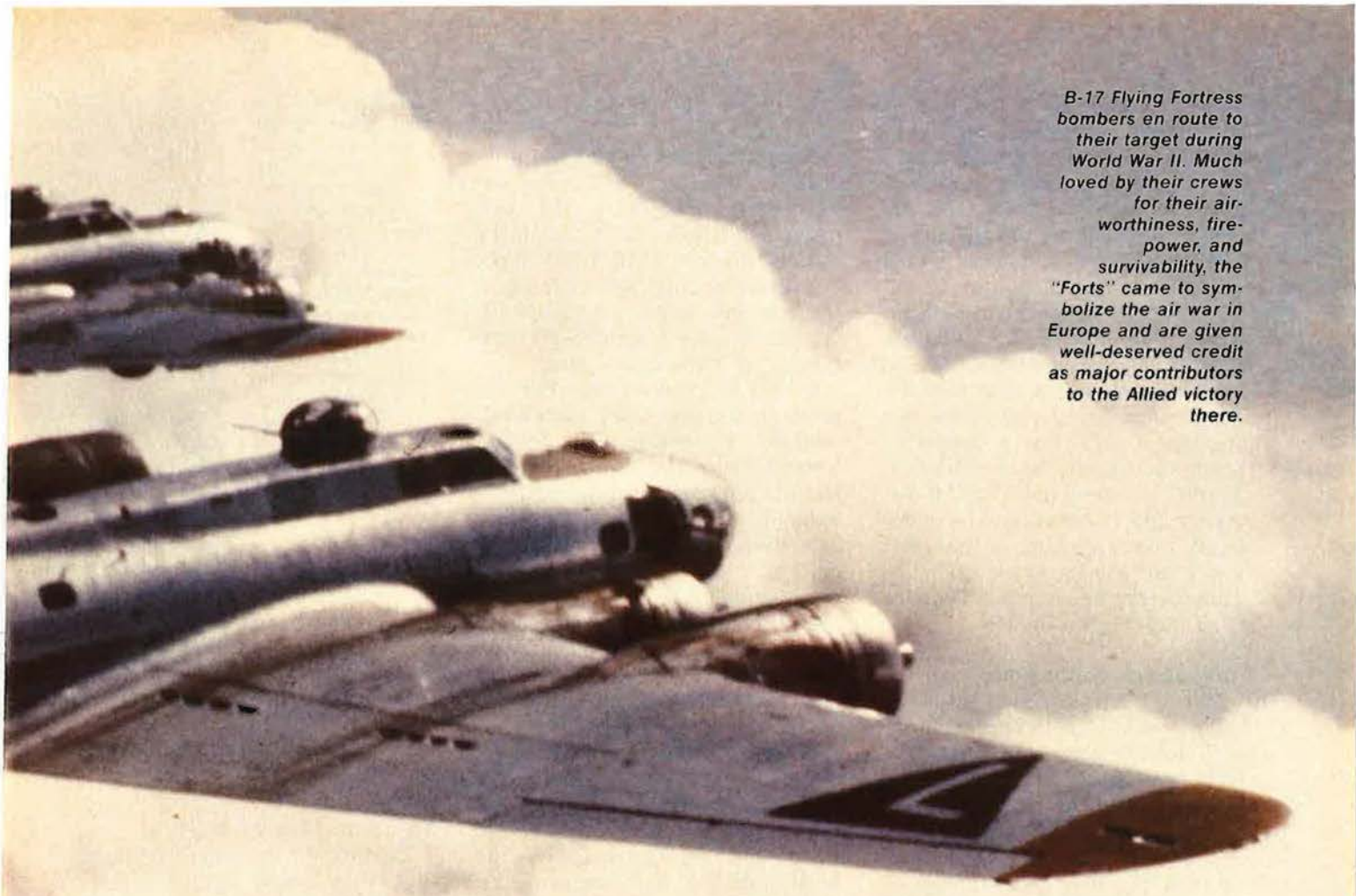
# The Fabulous Fortress

BY C. V. GLINES

MAJESTIC. Regal. Stately. "That's just exactly what you felt about her," one former pilot said. "She gave you confidence sitting there in quiet repose. You were sure she would get you there and bring you back. That's why we called her 'Queen of the Skies.'"

"She" was the Boeing B-17, the World War II bomber that many say forged victory for the Allies over the Luftwaffe in Europe's skies. Its fame is deserved, according to the late Gen. Carl A. "Tooey" Spaatz, who commanded all the Army Air Forces in the European theater. When hostilities were over, he said, "Without the B-17, we might have lost the war."

That statement will probably be disputed, but not by many who flew the Flying Fortress, a name given to it originally by a newsman who saw a photo of the first one being rolled out of the Boeing hangar in 1935. The Fort became a symbol of the air war in Europe—and a symbol of victory as well.



*B-17 Flying Fortress bombers en route to their target during World War II. Much loved by their crews for their airworthiness, firepower, and survivability, the "Forts" came to symbolize the air war in Europe and are given well-deserved credit as major contributors to the Allied victory there.*

Crew members who flew Forts give them a special place in their hearts. Capt. Rowan T. Thomas, a pilot in the 513th Bomb Squadron, said in his book *Born in Battle*, "There is a strong belief in the minds of pilots and crews that their ships are living personalities, and they love them for having brought them safely through many dangers. Each crew believes its ship is the best in the world.

"I've known a crew to treat their ship as if it were a faithful dog with whom they never want to part," he wrote. "When it growls, they know something is wrong with it; they think it doesn't like the gas they are feeding it or that the oil is irritating it.

"Some pilots think of their ship as a 'home.' They had lived on it, worked over it, house-cleaned it, and kept it as spic-and-span as a family keeps its house. It's hard to make a man change ships in which he has lived the most exciting days of his life."

It's ironic that an airplane that contributed so valiantly to victory and that changed the concept of aerial warfare and war itself nearly died in its infancy. The decision to produce the B-17 was a gamble for its maker. But that gamble later paid off handsomely in bigger and better planes for peace and war.

The B-17 started life as Boeing Project 299, which was designed to meet an original US Army specification for "a multiengined four to six place land type airplane" that had a "high speed" at 10,000 feet of 250 mph, an endurance time of ten hours, and a service ceiling of 29,000 feet. Furthermore, it was to be "capable of maintaining level flight with the design useful load at a minimum of 7,000 feet altitude with one engine out."

### The Bombardment Concept

Behind this specification were years of work on a concept for bombardment by such forward-thinkers of the early 1930s as Henry H. "Hap" Arnold, Carl A. "Tooey" Spaatz, George C. Kenney, Hugh J. Knerr, and Frank M. Andrews. Their theory was a simple one: If an enemy ground force can, by aerial bombardment, be denied access to such vital fighting needs as ammunition, fuel, and weapons, that ground force cannot function as a fighting unit. This doctrine of strategic bombardment envisioned a force of long-range, heavy bombers that could protect themselves from enemy fighters.

This concept began to become reality in 1934, when a budget for the development of a long-range bomber was approved and negotiations were begun with Martin, Douglas, and Boeing. The latter was awarded a contract for a one-of-a-kind bomber designated XBLR-1 (Experimental Bomber, Long-Range, Model 1). It was later redesignated XB-15.

The XB-15, the largest aircraft ever built in the US at that time, would prove too big and heavy for the engines then available. Concur-

rently, however, a second bomber specification was issued for a production multiengine aircraft capable of carrying more than a ton of bombs at speeds greater than 200 mph over a distance of 2,000 miles. The winner of this contract would get an order for 220 planes.

At the Boeing plant in Seattle, Wash., this challenge became Project 299. The designers saw it as a four-engine plane, smaller than the XB-15 then being assembled but one that would bear a family resemblance to it. If accepted, it would be designated Y1B-17. Meanwhile, Douglas and Martin designers were looking at the same specs and came up with twin-engine designs that became the Douglas DB-1 and the Martin 146.

### Rollout and Setbacks

Boeing's answer rolled out of the factory on July 28, 1935, and on August 20 made a nonstop, 2,100-mile flight from Seattle to Dayton, Ohio, at a speed of 233 mph, breaking all previous records for that distance.

A contract seemed assured until October 30, when 299 crashed on takeoff from Wright Field, killing two pilots and badly injuring three other occupants. At first, it was thought that the crash had killed Project 299 along with the project pilots. Later, it was found that the tail surface control locks had not been disengaged in the cockpit before the takeoff roll. "Pilot error" had caused the accident; the plane itself was structurally and aerodynamically sound.

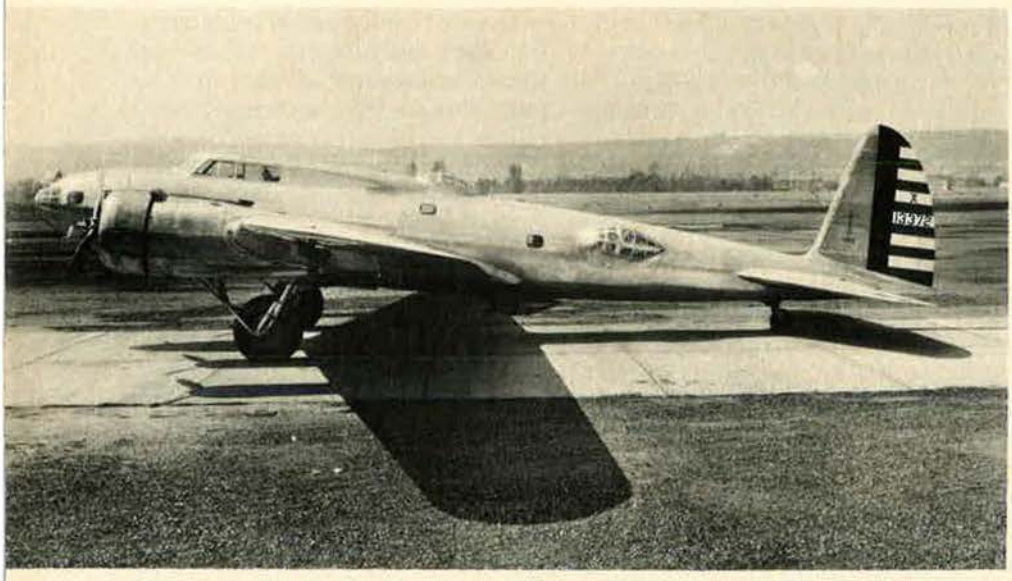
A contract was subsequently issued for thirteen Y1B-17s for service tests. But more bad luck plagued the program. On December 7, 1936, the first Y1B-17 had an accident on landing, and once again the program seemed threatened. Was the airplane too big for pilots to handle, as some critics said?

Cooler heads prevailed. The test program was eventually successful, with the "Y" versions being sent on a number of record-setting flights to test the advisability of the decision to build the aircraft and the viability of the strategic bombardment concept.

Setbacks still dogged the B-17 follow-on contracts, however, mainly because of cost. Boeing had used its own funds to develop the aircraft and was losing money. The program almost foundered again.

Hitler's invasion of Poland on September 1, 1939, however, turned around the program. The Royal Air Force requested B-17s, and the Air Corps sent the first twenty of its initial order of thirty-eight to the British.

Once again, bad luck intervened. The RAF put the B-17s on daylight missions against German targets, but suffered many aborts and accidents. Only about half of the sorties scheduled resulted in bombs on primary targets. The British began to call the Forts "Flying Targets"; Joseph Goebbels referred to them in his propaganda as "Flying Coffins."



*Forerunner of the B-17, this Boeing 299 aircraft was introduced in 1934 as the largest landplane in the US and the fastest bomber ever. The prototype rolled out on July 28, 1935, and was dubbed the Flying Fortress right away.*

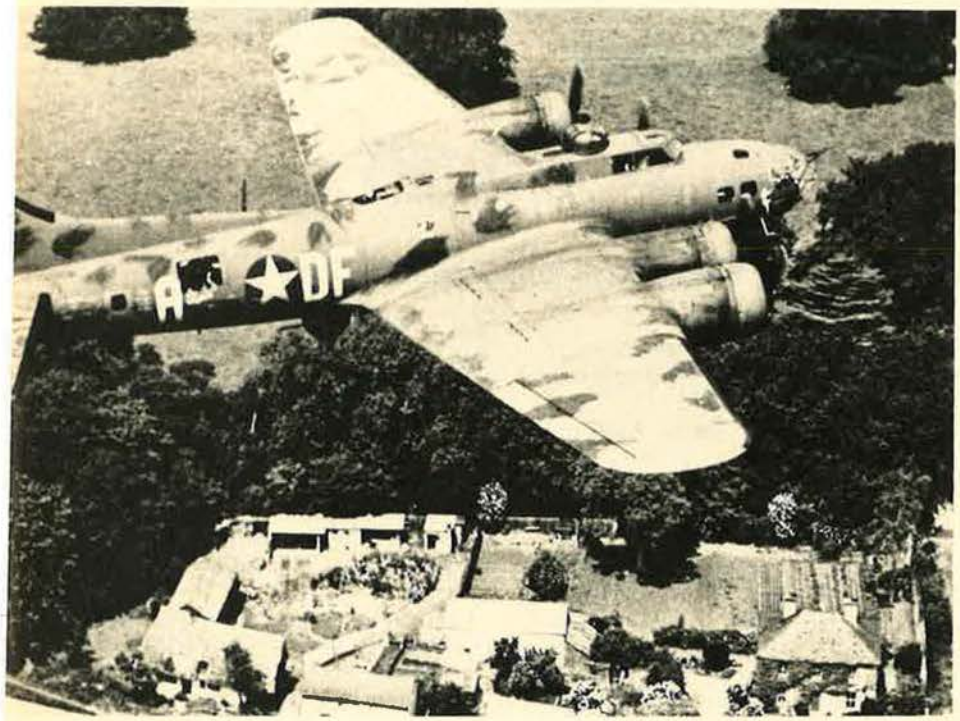
***The Memphis Belle won a place in military history as the first B-17 to complete twenty-five missions. The bomber and its ten-man crew were returned to the US in June 1943 for a nationwide war-bond tour. Memphis Belle is on permanent display in its namesake city as perhaps the most famous Fort of World War II.***

### The Believers Vindicated

Despite the seeming shortcomings, Hap Arnold and his strategic bombardment advocates would not give up. Because of prewar political pressures, the first B-17 models were built primarily to defend the United States from the coastline to 100 miles offshore. Arnold asked for improvements to make the B-17 an offensive weapon. These included more armor protection for the crew, increased firepower, self-sealing gas tanks, deicing boots, and improved engine cooling through the use of cowl flaps.

These improvements resulted in the B-17E, which sported a new profile because its empennage section had been enlarged to accommodate a tail gunner position and a ball turret underneath the belly. Heavier but faster, the E models were sent to the Pacific and to the Eighth Air Force in England after the US entered the war. The subsequent F and G models featured further improvements, the most noticeable being the chin turret in the nose.

As the Eighth Air Force grew in size and began inflicting heavy damage on German targets, the image of the B-17 as an effective offensive weapon began to grow. In addition, it proved that it could absorb tremendous punishment. Crew mem-



bers developed an understandable attachment to it when they learned how much damage it could sustain in flight and still survive.

The Germans also developed a healthy respect for the Forts that increased as each new model appeared with improved firepower and as better defensive formation tactics were devised. One B-17, struggling alone over Holland and having sustained considerable battle damage, was attacked by a flight of Me-109s. The Fort's gunners shot down two and damaged others; the Fort survived to fight another day. A German POW later confided to American intelligence interrogators that the Luftwaffe cautioned its fighter pilots to be wary of "those *verdammten* Forts!"

### Famous Forts

Stories about the "Queen of the Skies," as newsmen liked to call it, were legion. A mythology developed that still abounds.

Some planes received unusual news coverage. There was *Alexander the Swoose,* a B-17D assigned to the 19th Bomb Group and the lone survivor of the B-17s at Clark Field when the Japanese invaded the Philippines. One of its pilots, Weldon H. Smith, named it after a popular song of the time about the legendary Swoose, which was "half swan and half goose." Smith's B-17 had been patched up repeatedly with parts from other B-17s, so it could no longer claim its original structure and equipment. Lt. Gen. George H. Brett, head of the US Army forces in Australia, later used it as his personal plane and VIP transport.

Another celebrity B-17 was the *Suzy Q,* an E model also assigned to the 19th Bomb Group. Newsmen called it "the fightingest Fortress of the war" after it served a year attacking Japanese targets. *Yank* correspondent Howard Maier reported: "The *Suzy Q* has been hit a countless number of times, engines have been knocked out and replaced; she has slugged it out with Zero fighters in superior numbers and made forced landings. But always she comes up off the ground to fight back again and again. . . . She has become something of a legend." Still another "name" plane was the *Bataan,* used as Gen. Douglas MacArthur's flying headquarters.

The European and North African theaters, with far more B-17s assigned, naturally spawned more stories to perpetuate the lore of the Flying Forts. One of the most published photos from the air war was that of *All American,* a B-17 of the 97th Bomb Group that had collided with a German Messerschmitt Bf-109 fighter. The fighter had knifed through the aft fuselage, almost severing it from the rest of the plane and clipping off the left stabilizer and elevator. The Fort landed at Biskra in North Africa one and a half hours after the collision, defying all odds that it would crash.

Perhaps the most famous Fort to survive the war was the *Memphis Belle*—the first B-17, along with its crew, to complete twenty-five missions. It and the ten-man crew were returned to the States in June 1943 and sent on a nationwide war-bond tour. The *Belle* is on permanent display in its namesake city.

### Thirty-six Survive

When the last B-17 rolled out, statisticians figured that nearly 13,000 Forts had been built by Boeing, Douglas, and Vega (Lockheed) during the decade from 1935–45. About 4,750 were lost in combat. According to Boeing, thirty-six still survive today. Only seven of these are in flyable condition.

A three-day celebration on July 26–28 at the Museum of Flight in Seattle will commemorate the B-17's golden anniversary. The event is expected to attract several thousand World War II air and ground crewmen and their families and will feature a number of Medal of Honor winners who received the award for their heroism while flying on B-17 missions.

In his excellent book *Flying Fortress,* Edward Jablonski pays a tribute to this "hardy, beloved, and destructive" plane. He writes:

"It had served, unlike any other heavy bomber, through all of the Second World War. It had become a legend in its time, a tribute to the men who had conceived, designed, and built it—and a monument to the remarkable young men, most of them boys, who flew it. These men, and this plane, accomplished one of the most frightening missions ever demanded of men and aircraft. Together they helped to end history's last 'Glorious War.' " ■

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*C. V. Glines is a free-lance writer, a magazine editor, and the author of numerous books. His by-line appeared among the pages of this magazine many times during the 1960s. A retired Air Force colonel, he flew the B-17 while stationed in Panama. His most recent book,* Round-the-World Flights, *was reviewed in the December 1983 issue of* Air Force *Magazine.*

# VIEWPOINT

# The Thirtieth Class

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

*The Air Force Academy has proved the foresight shown by its founders and has been strengthened by the problems it has encountered. It continues setting high standards as it continues producing USAF's future leaders.*

Andrew Jackson, Old Hickory, was a rough-hewn character who made it to the White House on military credentials. Since these credentials did not include much in the way of formal education, West Point became a favorite target for the hero of New Orleans. He insisted that the cold process of mathematical and scientific studies was harmful to the martial spirit. As a matter of fact, during my own cadet days, I held to the same opinion—but never mind, for that is a chapter best left unread.

In the years following World War II, some of the leaders of the new and slightly self-conscious Air Force had similar misgivings about the relevancy of formal education to armed combat. Time out for service schooling was widely viewed as a waste of time by senior officers who had come up on a fast track during the war. Many, in fact, their education interrupted by the war, were indifferent even to the need for the college experience. Results were what counted. A reincarnated President Jackson would have found soul mates in this Air Force.

Mixed in with these rough-and-ready types, however, were military intellectuals of a very high caliber. Gen. Carl "Tooey" Spaatz, a man who listened far more than he talked, was not only a brilliant warrior but a moralist who harbored deep apprehensions about the misuse of airpower and a visionary who saw, ten years before Sputnik, the threat to this country that one day would be posed by ballistic missiles. There were others—Arnold, Eaker, Doolittle, White, to name a few—who could look far down the road to an Air Force that would require a high degree of scholarship and scientific knowledge.

This year, thanks to the foresight and perseverance of those men and a great many others, the thirtieth class graduated from the Air Force Academy. Nine hundred cadets, one hundred of them women, had sweated through four years of a curriculum heavily loaded with Jackson's detested mathematics and scientific studies. Most of these graduates will not only fulfill their minimum obligatory service, but will make a career of the Air Force. Seventy-nine percent of the Class of 1976, for example, is still on active duty, as is seventy percent of all graduates—reassuring statistics for those who might otherwise have second thoughts about the cost of a service academy education.

The number of Rhodes scholarships a school has been able to secure is one measure of its excellence. The Air Force Academy has done exceedingly well in this area, with twenty-seven Rhodes scholars thus far in its brief history. What is more, most of these scholars have remained in the Air Force, despite the lure of lucrative civilian offers.

Rhodes scholarships, however, are only for the few, and the Academy has the larger job of graduating career officers who will be the Spaatzes, Arnolds, and Eakers of the future. Toward that end, much emphasis is placed on self-reliance, a basic ingredient of leadership. This past year, 1,200 third classmen soloed in sailplanes, a foretoken of future success in pilot training. The best of these will become soaring instructors. Most of the 1,200 earned their jump badges as well. The airmanship program, like the greater part of Academy activities, is largely in the hands of the cadets. By the time of graduation, they will have met responsibilities and faced dangers far beyond the expectation of the normal undergraduate. They are learning to lead.

Attrition during the cadet years has been a disquieting problem for the Academy since its inception, but it is beginning to drop toward an acceptable figure in the mid-twenty percentile. This figure will never go much lower, for the rigid life of a cadet is not for everyone. Those who can't handle the Academy's discipline and pressures are not the ones to set the standards for the Air Force officer corps. And that, after all, is the primary justification for the Academy: to turn out graduates who will set a high standard.

Last year's episode of honor code violations, in which a few cheated on an exam and many more looked the other way, was a disturbing incident, but it has served a useful purpose. The easy path around the scandal would have been to have kept it small: to have booted out the cheaters, lectured the rest on the meaning of the toleration clause, and moved on. Instead, the Superintendent instituted a searching review of the system as a whole. During that review, it became clear that the vast majority of cadets not only supports the honor code but is fiercely defensive of it.

On discovering that four of this year's Thunderbird pilots are Air Force Academy graduates, even Old Hickory might forgive the fact that they also know a bit of mathematics and scientific matters. Our own World War II Old Hickorys would doubtless also admit that the only thing in common among F-15s, B-1s, P-51s, and B-17s is that they are all airplanes. Nowadays, an airman must know a little more to get by.

And in a world where moral values are increasingly confused, it is important that the military keep its standards high. As General Sir John Winthrop Hackett has so aptly put it:

"A man can be selfish, cowardly, disloyal, false, fleeting, perjured, and morally corrupt in a wide variety of other ways and still be outstandingly good in pursuits in which other imperatives bear than those upon the fighting man. He can be a superb creative artist, for example, or a scientist in the very top flight and still be a very bad man. What the bad man cannot be is a good sailor, or soldier, or airman. Military institutions thus form a repository of moral resource which should always be a source of strength within the state." ■

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THE fundamental fact of NATO is that it is primarily a political alliance rather than a military one. It is based on voluntary participation by nations who did not surrender their sovereignty to join.

This has been its greatest strength, enabling it to endure for thirty-six years. It has also been the source of its often-cited disarray as independent-minded members quarrel with each other on points of both major and minor consequence.

Leading off an April 23 Aerospace Education Center Roundtable on NATO, Joseph J. Wolf, director of the Atlantic Council, compared the Alliance to the Kon-Tiki raft: "It wallows partly under water most of the time, but it doesn't sink." Despite the tensions, the Roundtable panelists said, NATO still has the strong support of member governments and a majority of the citizens in Europe and in the United States.

Even political pronouncements by leftist factions may be less significant than they sound. "There has been a pattern of opposition parties being more extremist while they are in opposition than they are when they are in power," said Wolfgang Pordzik of the Washington office of the Konrad Adenauer Siftung.

A great many of NATO's real problems have to do with the diverse interests, the intentions, and the commitments of the member states.

"In NATO, the perception is the reality," said Russell E. Dougherty, AFA Executive Director. To deter an adversary from aggression, "you have to deny any perception of success if the other side uses its forces. In order to do that, you have to prepare a fighting force." Consensus to field that deterrent force depends on convincing people that it is necessary to do so—another perception.

The biggest perception issue of the lot, however, is the credibility of the US guarantee to use its strategic nuclear weapons, if need be, to protect Western Europe. Doubts about the continued validity of that guarantee stem from an "irreducible difference" in strategic interests, said Dr. Jeffrey Record of the Institute for Foreign Policy Analysis.

In the beginning, the NATO nations pledged themselves to regard an attack upon one as an attack upon all. Over time, confidence in this principle has diminished.

"As the nuclear balance shifted from one of substantial [US] nuclear superiority over the Soviet Union to one of parity, it became less and less credible to believe that an American President would risk the homeland of the United States on behalf of any other entity than the United States," Dr. Record said. As close as US and European interests may be, they are not identical. "It is in our strategic interest to confine any war in Europe to the European theater," Dr. Record said. "Understandably, the Europeans take a different view."

"If there is war in Europe, conventional or nuclear, the Europeans are not sure who will win—but they are certain who will lose," said Gen. William Y. Smith, USAF (Ret.), former Deputy CINCEUR and rapporteur for the Roundtable.

The best evidence of US commitment to defend Europe is the presence of US troops on European soil. "It is extremely important for reasons of deterrence and European confidence in the American guarantee that Americans get killed in the first hours of an attack on Western Europe," Dr. Record said. "It might also be important for some Europeans to be in the Persian Gulf so that when the first battalion of Marines is wiped out defending European oil, a few Europeans will get shot in the process."

A recurring question about European defense is what the French—who pulled their forces out of NATO in 1966—would do in the event of conflict. "I would suspect that, in time of crisis, their territory and their forces would be made available to the Alliance," said Lt. Gen. George M. Seignious, USA (Ret.), president of the Atlantic Council. He expressed concern that France, as a free agent operating outside of the NATO structure, "could preempt the use of nuclear weapons."

"The French may be a little difficult at times, but they're even more difficult for the Russians, aren't they?" said Air Vice Marshal Ronald Dick, the British Defense Attaché in Washington. "There's no question in my mind that the French would use [their strategic forces], and I'm sure the Russians understand that, too. The presence of this volatile, unpredictable, separate nuclear entity on the end of the Continent seems to me to be more beneficial than too difficult for us to deal with." A key element is perception.

Perception also figures in more NATO problems, particularly the testy question of its financial support. Many Americans feel that the Europeans do not bear their full share of the expense. Europeans point out that they increased their defense spending by twenty-three percent in the 1970s while the US was cutting back on its own. The end of the argument is nowhere in sight.

Despite some of the perceptions—and because of others—NATO is still getting the job done after thirty-six years. And it is still demonstrating its ability to muster up cohesiveness and determination when it has to have them. ■

# AIRMAN'S BOOKSHELF

## Space Commerce 101

*Astrobusiness: A Guide to the Commerce and Law of Outer Space,* by Edward Ridley Finch, Jr., and Amanda Lee Moore. Praeger Publishers, New York, N. Y., 1985. 172 pages with notes, appendices, and index. $29.95.

When Geraldine Ferraro lost her bid for the Vice Presidency, the first thing she did was to write a book about how it all happened. As a rule, politicos waste no time in capitalizing on news, whether good or bad.

American industry generally follows a similar course, promoting and advertising new products and technologies with astonishing speed. Aerospace, however, has been slow to exploit its literary potential. While decades of research and development have led to a myriad of space-related products and services, only now do we see the emergence of the first books addressing commercial space.

Edward Ridley Finch's *Astrobusiness,* released in January of this year, is one of these. Finch, teamed with Amanda Lee Moore, a fellow Unispace delegate, has amassed an impressive volume of information about the more prominent space ventures of the day and laid it out in an organized and cohesive fashion. Beginning with an overview of the commercial uses of space—as it happens, the best part of the book—Finch and Moore enumerate the pros and cons of space structures, transportation, finances, law, and utilization by the military.

*Astrobusiness* is billed as "A Guide to the Commerce and Law of Outer Space." Commerce perhaps, but I would seriously challenge the legal value of this text. The book *is* suited perfectly for Aerospace 101, where students will acquire an expansive vocabulary of high-tech buzz words, acronyms, trends, and issues. For those already involved in space, however, this 100-page overview would probably serve best as crib notes for the course that we have all been following now for a good number of years.

One of the challenges of writing a comprehensive but popular guide to the space business is how to educate the uninitiated without simultaneously preaching to the choir. Apparently recognizing that space is a fascinating yet sometimes intimidating topic, Finch and Moore have thoughtfully prefaced the book with an excellent list of abbreviations and acronyms and closed with numerous footnotes and three appendices. But they forgot the definitions.

In Chapter One, commercial uses of space are named, as are the principal players. But if one has never heard of a multispectral scanner, I question the value of devoting almost three pages to remote sensing.

This fundamental shortcoming is exemplified by the description of the relay satellite business: "A 1983 study on the processing, products, and profits of space for 1983 to 1990" stated that "the relay satellite business is estimated at world sales of $2 billion for space and ground hardware and that a $10 billion market is estimated for communication services by satellite." Now, class, what can you tell us about relay satellites?

While this synopsis is both well documented and accurate, one would be loath to label *Astrobusiness* engrossing, exciting, profound, or insightful. This is a pity. For most of us who work in the field, space business is characterized by just these traits.

The nucleus of *Astrobusiness* centers on thirty-two pages devoted to actual space business products and services, commercial uses of space, space structures, and space transportation. This concise presentation highlights the salient features of space technology, from communications to transportation. In this section, each description whets the appetite and encourages the reader to consult the informative footnotes at the back of the book.

I wish that the authors had said more about products and services presently on the market. Instead, this hard nucleus gives way to sixty-some pages of what amounts to reference material on insurance and finance, national and international space "law," and military space. While the whats and wheres are all there, the whys are unfortunately left by the wayside. The reader is left to ponder the logic of it all.

*Astrobusiness* does, nonetheless, constitute a crucial step toward the commercial success of space. Its general appeal and useful facts and figures will help to support the increasing numbers of space buffs who recognize the real commercial potential of aerospace ventures. The authors' preference for the simply factual over the analytical, while disappointing at times, does open the door to heightened interest in a topic that has just begun to emerge in the popular mind.

Space is here to stay, and *Astrobusiness* is a welcome manifestation of the importance that space business is taking on in world commerce.

*—Reviewed by Nadine Binger. Ms. Binger is Manager of Market Development for the SPOT Image Corp. in Washington, D. C.*

## SAC Central

*SAC: A Primer of Modern Strategic Air Power,* by Bill Yenne. Foreword by Gen. Russell E. Dougherty, USAF (Ret.). Presidio Press, Novato, Calif., 1985. 138 pages with photos, notes, charts, and glossary. $10.95.

A B-52 is poised on flight-line alert. Beneath the plains of the American Midwest, a Minuteman missile stands ready to vault skyward. A sinister-looking SR-71 Blackbird, flying faster than any operational plane ever before, records the details of the most secret places. These are forces of the Strategic Air Command, and here is a firsthand, inside look at the creation and evolution of one of the Air Force's most dynamic major command organizations.

But *SAC: A Primer of Modern Strategic Air Power* goes beyond the technical descriptions of SAC's past and

present major weapon systems. Author Bill Yenne takes a close look at the role of SAC in an uncertain world by focusing on important strategic issues—including arms control. Yenne sketches the history of arms control from early agreements between the US and England limiting naval forces on the Great Lakes to President Reagan's Strategic Arms Reduction Talks that emphasized reducing, rather than capping, the arsenals of the superpowers.

When SAC was created, the command's role was to prepare for strategic air warfare. Today, the command's primary role is to maintain a deterrent long-range strategic strike force—a force of strategic bombers and ballistic missiles that is capable of reacting immediately in time of nuclear war.

The manned bomber is the oldest element not only of strategic airpower, but also of SAC, which was formed in 1946. Yenne describes how SAC's bomber fleet and other supporting aircraft serve as the manned member of the triad. Strategic bomber weapon systems—short-range attack missiles (SRAM) and air-launched cruise missiles (ALCM)—are also detailed by the author.

The reader can expect an excellent description of SAC's missile forces. Intercontinental ballistic missiles, which SAC began to deploy in September 1959, added a fearsome new dimension to strategic warfare. Throughout the 1960s, successive administrations in Washington—building on the cornerstone laid in 1961 by Defense Secretary Robert McNamara—propounded the idea that the huge ICBMs had eclipsed not only the manned bomber but conventional weaponry across the spectrum as well. While that eclipse is perhaps not total, SAC's custodianship of the ICBM is awesome nonetheless.

SAC maintains two fleets of aircraft to support its strategic forces. KC-135 Stratotankers and KC-10 Extenders serve the aerial refueling needs not only of SAC's bombers but also of aircraft throughout the US military and in allied air forces around the world. Also, SAC operates a fleet of high-performance reconnaissance aircraft, led by the SR-71 Blackbird. Author Yenne discusses the role of this unique aircraft and provides accounts by aircrews of what it's like to fly this remarkable plane.

In researching the book, Yenne visited many of SAC's bases and interviewed people of all ranks and specialties. In Part One, he takes the reader on a tour of the underground complex at "SAC Central"—Building 500, Offutt AFB, Neb.—by sketching a "doomsday" scenario to demonstrate how SAC people there would react in case of nuclear attack.

"Mr. Yenne has gone well beyond the mere assimilation of events over dates and places. He has given us valuable perspectives on the relationship of emerging aerospace thought and technology as they relate to shaping events or responding to them," writes Gen. Russell E. Dougherty, USAF (Ret.), in the Foreword. General Dougherty served as SAC Commander in Chief from 1974 to 1977 and is currently AFA Executive Director.

Those interested in the history of strategic airpower will especially want to read the section on strategic airpower before SAC and a subsequent section examining SAC's formative years. Both sections of the book help to establish Yenne's central theme—that the superpowers' nuclear arsenals exist to convince one another that to launch a nuclear attack is to invite destruction. Until further nuclear disarmament becomes a reality, SAC stands ready for war, Yenne stresses.

SAC's role in Korea and Southeast Asia is also examined, with special attention being given to Linebacker II operations in SEA. The Linebacker strikes constituted the most intensive strategic air offensive since World War II. These B-52 raids in December 1972 destroyed nearly all of North Vietnam's capacity to generate electricity and a quarter of its petroleum reserves. Rail lines were cut in 500 places, with several hundred engines and railcars put out of business. The enemy fired somewhere between 884 and 1,242 SAMs, but only fifteen B-52s were shot down. Yenne relives the bombing campaign through first-hand accounts by planners and aircrews.

SAC is not the only strategic air force in the world. Strategic air commands, as the author points out, serve also in the military forces of the Soviet Union, France, the People's Republic of China, and, until recently, Britain. France, for example, was the fourth nation to acquire nuclear weapons (1960) and is the only nation other than the two superpowers—and possibly China—to have developed an operational triad. Chinese strategic airpower rests in three regiments totaling ninety Hong-6 medium bombers (a Chinese version of the Tupolev Tu-16). Britain terminated the Royal Air Force's long-range strategic air capability in 1983.

The Soviet Union's triad is under the operational control of the Soviet Navy and not one but two strategic air commands. The first serious Soviet venture into the realm of strategic airpower took the form of several American B-29 Superfortress strategic bombers that had made forced landings at Vladivostok after raiding Japan in the waning days of World War II. The Russians interned the bombers instead of returning them to the Americans. The confiscated Superforts were sent to the Tupolev design bureau, which disassembled them and duplicated their every detail. This bureau subsequently produced several hundred Russian "B-29s," which were designated Tu-4. Since then, the Tupolev bureau has been responsible for nearly all Soviet strategic bombers.

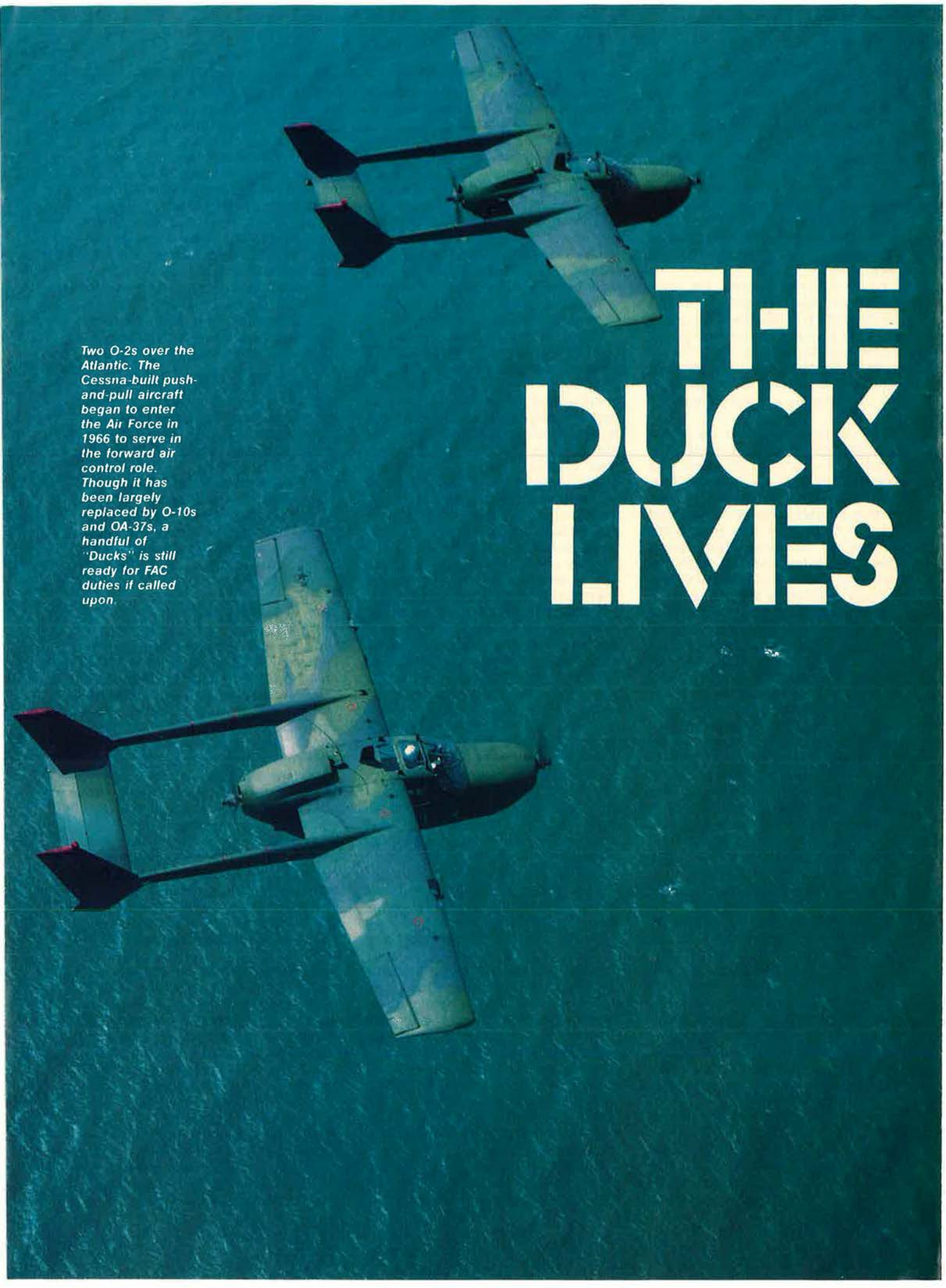
Author Yenne has told the SAC story in an interesting as well as comprehensive fashion. This book deserves a place on any airman's bookshelf and in the stacks of serious professional military libraries.

*—Reviewed by Maj. Michael B. Perini, USAF. Major Perini is Deputy Chief, Operational Forces Branch, Media Relations Division, Secretary of the Air Force Office of Public Affairs.*

## New Book in Brief

*Command Structure for Theater Warfare: The Quest for Unity of Command,* by Col. Thomas A. Cardwell III, USAF. How should the individual US military services organize to prosecute war jointly in a theater of operations? That fundamental question is answered in this monograph written under the auspices of the Airpower Research Institute. From a historical overview, the author moves to an examination of current service thinking on joint and combined doctrine and theater warfare. He notes discrepancies among the services' interpretations of what shape a joint command structure should take, though all stress the principle of unity of command. Colonel Cardwell concludes by spelling out his prescription for how best to achieve such unity in a theater command structure. As he notes appositely, "We can ill afford the luxury of duplication of effort, inefficient and ineffective command structure, and parochial positions when developing a theater command structure for winning wars." With photos, appendices, notes, bibliography, and index. Published by Air University Press, available from Superintendent of Documents, GPO, Washington, D. C. 20402, 1984. 186 pages.

*—Reviewed by Hugh Winkler, Assistant Managing Editor.*



# THE DUCK LIVES

*Two O-2s over the Atlantic. The Cessna-built push-and-pull aircraft began to enter the Air Force in 1966 to serve in the forward air control role. Though it has been largely replaced by O-10s and OA-37s, a handful of "Ducks" is still ready for FAC duties if called upon.*

## The little O-2 is still training FACs—and is still ready for action in medium-intensity combat.

BY LT. COL. ROBERT W. NICHOLSON, JR., USAF

THE caller from Washington was incredulous.

"The O-2?" he said. "Are we still flying *those* things?"

The O-2—affectionately known as "the Duck"—is still very much part of the Air Force inventory. Intended only as an interim replacement for the O-1 Bird Dog until OV-10 Broncos could assume the forward air control mission, the O-2's economy and dependability earned it a much longer-lasting spot on the active ramp.

Militarized versions of the Cessna 337 Skymaster (distinguished by push-pull propellers), the O-2s at Patrick AFB, Fla., are vintage 1966 and 1967 and have flown more than 4,000 hours each. Using the O-2 and the newer OV-10 Bronco, Patrick AFB's 549th Tactical Air Support Training Group trains all Air Force forward air controllers.

Both new UPT graduates and experienced fighter pilots are enrolled in ten-week courses that annually produce some 140 new FACs. Since the basic skills are the same no matter where the FAC is located, a FAC learns to work from a fixed-wing aircraft, helicopter, jeep, or the battlefield—anywhere he can talk on a radio.

Through academics and training flights, the pilots learn to direct friendly fighters against battlefield targets. When the shooting starts, FACs work their fighters in close proximity to friendly ground troops. A thorough knowledge of the tactical situation is required to avoid friendly casualties while using airpower to the best advantage.

The O-2 curriculum features twenty-six training flights, including familiarization and navigation sorties. After three flights in which the student is taught to fire target-marking rockets, the future FAC gets to work with fighters and controls air strikes on the nearby Avon Park gunnery range. Each student flies nine or ten air strike control rides. USAF, Navy, and Marine Corps fighters deploy to Patrick for two-week periods to help with FAC training and also to sharpen their own skills.

The FAC at the battlefront is expected to have the big picture. Among other things, he must keep track of friendly and enemy troop positions, aircraft, and antiaircraft artillery and missiles while simultaneously worrying about fuel reserves and bomb loads of the fighters he controls.

To be effective, the FAC operates at medium altitude (between 4,500 and 9,000 feet AGL) and at low airspeeds. Yet modern tactical warfare dictates that "speed is life," and the closer to the surface the FAC flies, the better. How survivable, then, is the O-2 over today's battlefield? The answer is "not very" if you're talking about Central Europe. There, FACs expect to work from helicopters or on the ground. In low- or medium-intensity engagements elsewhere in the world, however, the consensus is that the O-2 can still do the job and survive.

The handful of FACs still flying who fought in Vietnam includes Maj. Doug Jones and Maj. Don Julian of the 549th. Between them, they logged more than 400 sorties in I Corps, Laos, and Cambodia. Their training before combat consisted of a half day of academics, a few aircraft familiarization flights, and firing rockets "to see if we could hit the ground." Neither had worked with fighters before going into combat. FAC training has come a long way since then.

"The basics are covered much better now," Major Julian says.

"No," Major Jones interrupts with an amendment. "They're *covered* now."

The unit's twenty-four O-2 instructors are all experienced pilots whose previous assignments had them bending sticks in F-4s, F-15s, A-10s, and other front-line fighters.

One O-2 instructor nearing the end of his three-year assignment is Capt. Guy M. Orlowski. When flying Phantoms at Spangdahlem AB, Germany, a few years ago, he knew his next assignment would be a "satellite tour" away from regular fighter duty. He chose Patrick because of its geographic advantages, expecting FAC work to be relatively simple.

"I had a rude awakening," he recalls. "I didn't really know what a FAC did, but quickly found there was a lot to learn. A pilot needs a broad scope of tactical knowledge to do this job well."

One incentive to attract top pilots as FAC instructors that Tactical Air Command has used effectively is the unwritten promise of a good follow-on assignment. Captain Orlowski, for example, will be looking through an F-15 HUD this time next year.

He believes that his tour as a FAC will make him a better fighter pilot and that there are few flying jobs in the Air Force that give a young pilot more responsibility than a FAC has. "Part of my job," Captain Orlowski said, "is to help my students develop judgment. They really don't have time to address that in UPT. Being a FAC is a helluva lot of responsibility for a young lieutenant who never did more than say 'two' on somebody's wing before." ■

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# THE BULLETIN BOARD

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

## In Praise of Engineers

Earlier this year, the Air Force celebrated the thirty-fifth annual National Engineers Week with a variety of ceremonies across the country. President Reagan also noted the week with a proclamation that said, "Electrical, mechanical, industrial, aeronautical, civil, and architectural engineers, among others, can be proud of the role they have played in bringing our nation to its present prosperity."

The President went on to say, "A restless curiosity, willingness to take risks, and the desire to find out how to do things better than they have been done before" are the qualities that have made "America's engineers world leaders in the development and application of new technology."

Maj. Gen. Clifton D. Wright, the Air Force's Director of Engineering and Services, said, "Since the beginning of the Air Force, our engineering talent has been the backbone for maintaining bases from which our combat forces can operate efficiently."

The Department of Defense Design Awards, which biannually recognize outstanding architecture and landscape design in projects for the military services, also saluted Air Force engineering efforts by giving four of the eight awards announced in 1984 to Air Force designs, including the Blue Seal Award, which recognizes the best overall project. Named were:

**Blue Seal Award,** to the Air Force Academy Library; **Excellence in Architecture for Engineering,** to Heating Plant, F. E. Warren AFB, Wyo.; **Excellence in Architecture for Welfare and Recreation,** to Commissary, Los Angeles AFS, Calif.; and **Excellence in Architecture for Facilities,** to Regional Operations Control Center, Griffiss AFB, N. Y.

During National Engineers Week, AFA presented its eleventh Minton Award, which each year goes to the author of the best article appearing in the Air Force's *Engineering and Services Quarterly.* This year's Award (which is named for the seventh Air Force Director of Engineering) was presented by AFA Executive Director Russell E. Dougherty to Maj. Robert J. Bittner at an engineers' luncheon hosted by General Wright *(see photo).* The article, which appeared in the Summer 1984 issue, was entitled "A Flexible Approach."

## The Computers Are Coming

About to be unveiled by the Air Force is a base-level computerized personnel system that is expected to reduce paperwork drastically and to improve service to commanders and customers. It is expected that the system, dubbed Personnel Concept III, will perform much of the routine processing of personnel tasks and free up personnel technicians to devote more time to counseling military members on critical career decisions.

While some fear that increased computerization of the personnel job will lead to greater depersonalization of service, boosters of the plan—which will be tested next year—point out that, if successful, it will allow the CBPO staff to spend more time working with people and less on paperwork. As envisioned, the system will link microcomputers, terminals, and printers in orderly rooms and base agencies to the personnel files in the base mainframe computer.

Mather AFB, Calif., is slated to get the first test program, with a follow-up approximately one year later at Moody AFB, Ga. Mather AFB was chosen, say officials, because it has a variety of missions, with both SAC and ATC wings assigned there. The Advanced Base Concepts Program, which tests advanced computer and communications applications, is already at Mather, and the new personnel system will be able to take advantage of previous research. Moody AFB was chosen because it is one of the Model Installation Program bases and because it has a tactical air forces mission similar to that at many overseas locations.

The concept was put together by a group of former CBPO chiefs and personnel system managers at the Air Force Manpower and Personnel Center in Texas. "We've made rapid gains in computer technology during the last few years," stated Maj. David Hofeling, who spearheaded the effort. "It will allow the Air Force to reduce personnel positions by about 1,500 during the next few years, while increasing the quality and timeliness of service," he claims.

Computer experts at AFMPC will write a basic group of about fifteen programs, covering such personnel actions as records management, processing, strength accounting, and assignments, for the initial test phase. Eventually, automated programs will be written to cover almost all personnel administrative requirements.

If the test is a success, it is anticipated that all CBPOs could have the automated capability by 1992.

## Veteran Testing Proceeds Apace

The status of two on-going studies concerning Vietnam veterans were re-

***AFA recently awarded its Minton Award for the best article appearing in USAF's* Engineering and Services Quarterly. *Maj. Robert J. Bittner, right, author of this year's winning article, accepts the award from AFA Executive Director Russell E. Dougherty as Maj. Gen. Clifton D. Wright, USAF's Director of Engineering and Services, looks on.***

cently updated, and both appear to be going well.

In what has been tabbed the Vietnam Experience Twin Study, or VETS, the VA is mail-surveying about 10,000 Vietnam-era twins. Detailed questions about health status are being asked, and the tabulated answers will help determine what effects, if any, the Vietnam experience had on veterans' health.

Meanwhile, the Agent Orange Project (locating, contacting, and interviewing veterans exposed to Agent Orange defoliant) is ahead of schedule. As of last April, 4,064 had been interviewed. Given this encouraging early performance, study monitors are hopeful that the 30,000 interviews deemed necessary for a valid survey will be done on time.

In a related part of the study, a pilot group of 147 veterans went through the medical examination process at the Lovelace Medical Foundation facilities in Albuquerque, N. M. This tested the system used to contact the men, bring them to Albuquerque, and put them through two very full days of examinations with as little inconvenience to the veterans as possible. The test allowed changes to the system, which, just last month, started to accept the first of the 10,000 main study participants.

In a unique computer-age development, the Center for Disease Control in Atlanta, Ga., which is mounting the study, has taken advantage of a modern way to get information on the Agent Orange studies to veterans who are computer hobbyists.

Any veterans who use personal computers and subscribe to the CompuServe Consumer Information Service can "log on" to the Service from their homes or offices to find information that CDC has provided on the studies and to discover answers to many of the questions that veterans ask most about the project. Using an electronic mail system within CompuServe, veterans can send their own questions and comments about the studies directly to CDC. Further information on this is available from David Aldstadt, Executive Director of the Vietnam Veterans Leadership Program, Box 16080, Columbus, Ohio 43216.

## Military Voting Up

Military participation in the 1984 general election process increased substantially, with 55.3 percent voting or attempting to (some 8.4 percent attempted to vote absentee, but received the ballot too late or not at all).

This was particularly gratifying to military officials, since the percentage of the general public who voted did not increase appreciably. Henry Valentino, Director of the Federal Voting Assistance Program, attributed the fine service showing primarily to the command support proffered by the uniformed forces, plus the improvements made in some state laws to facilitate the process.

*Maj. Gen. John B. Conaway, Director of the Air National Guard, shares a few moments with TSgt. Ruben Turner (center) and Sgt. John Thomas, F-4 crew chiefs with the 113th Tactical Fighter Wing at Andrews AFB, Md. (ANG photo by Gwillym Hughes)*

The Air Force and Navy had the highest voting rate among the services, with fifty-four percent of air and sea people trekking to the polls or sending in their absentee returns. Age was strongly associated with the likelihood of voting—older persons were found much more likely to vote than younger ones. This percentage increased directly with advancing age.

Other figures showed that, of federal civilian employees overseas, almost fifty percent voted; military dependents turned in a 71.5 percent rate of absentee ballot return. Voters were more satisfied with the quality of voting assistance received than nonvoters, although the latter may have used this as a rationale for not casting their ballot. "No candidate preference" was the single most important reason given for not voting.

These results were obtained from a survey of 22,500 active military members and more than 3,000 overseas government civilian employees. In addition, 2,500 unit voting officers and 500 local election officials from the most populous counties and those adjacent to military installations were polled.

In a related survey of some 10,000 US citizens living overseas and not affiliated with the federal government, it was found that some twenty-eight percent voted, a two percent increase over 1980. About 2,500,000 civilians not affiliated with the government live overseas, and DoD has been charged with offering them voting assistance on the same basis as federal civilians and military. It appears that length of time overseas, for this group, is the prime determinant of voting interest. Citizens abroad for one year or less voted at a fifty percent rate; those abroad more than twenty years voted at only a nineteen percent rate.

## Coors Helps Students From Vet Families

The Adolph Coors Co. recently established a $500,000 Veterans' Memorial Scholarship Fund for the children and dependents of American veterans and of servicemen and women killed in the line of duty, missing in action, or taken prisoner of war.

Eligible scholarship applicants include such dependents who are under twenty-two and who have completed their freshman year of college or equivalent with a grade point average of at least 2.75 on a 4.0 scale. One hundred $5,000 scholarships will be distributed to students across the country, payable in installments over the remaining three years of undergraduate study. Recipients will be selected according to academic ability and financial need.

Those interested may write Adolph Coors Co., Veterans Memorial Scholarship Fund, Mail Number 329, Golden, Colo. 80401. *Do it now!* Completed applications must be postmarked before *July 15, 1985.*

## Women Lead as Aviation US Record Holders

The National Aeronautic Association, the official US representative of the world governing body for aviation and space records, the Fédération Aéronautique Internationale, recently totted up the records and came up with some interesting findings.

Women pilots, they found, are the leading holders of aviation and space records and possess the first three positions. Far out in front, with 328 national and 328 world records, is Marie McMillan of Las Vegas, Nev.

She captured most of those records during one 9,000-mile trip in March 1984, which she called the "Flying Grandma's Odyssey." On that one, she set city-to-city speed records all over the Caribbean in a series of flights.

Next on the list of record-holders is Brooke Knapp, President and Chairman of Jet Airways, Inc., of Los Angeles, Calif. She holds 210 records. Most were set in a Gulfstream III executive jet. Third on the list is the late Jacqueline Cochran, who set 130 records in a variety of military and civil airplanes.

The leading man on the list is fourth overall—Bob Thompson, who holds seventy records. Next, with sixty, is Doug Matthews.

### Older Veterans' Health Care Studied

The House Veterans' Affairs Subcommittee on Hospitals and Health Care recently held a joint hearing with the Select Committee on Aging to determine the adequacy and effectiveness of federal and private health care delivery in meeting the needs of the elderly, especially the aging veteran.

That this is a hot topic was pointed up by a recent wrap-up released by the VA of a number of studies and surveys. It highlighted that there are now more than 1,000,000 veterans (of about a total of just under 29,000,000) who are over age seventy-five. Almost 5,000,000 are over sixty-five. The veteran population is growing smaller—but older. By the year 2000, it is expected that more than 9,000,000 veterans will be over sixty-five.

These projections add to the impetus behind the congressional hearings. The Subcommittee Chairman, Rep. Bob Edgar (D-Pa.), said, "The fact that Americans now have an average life expectancy of seventy-five is a strong testament to the success of modern medicine. Now we must make certain that the resources for quality health care are made available and that they address the special needs of the elderly." Representative Edgar was particularly interested, he said, in the possible "strain on VA resources brought about by a dramatic increase in the number of older veterans seeking medical treatment." Results of the hearings will be available later.

### CHAMPUS Help for Travelers

If you're eligible for CHAMPUS, are away from home on a trip, and need nonemergency medical care, you can now get a nonavailability statement from the commander of a nearby military hospital, if that hospital can't provide the care.

DoD isn't worried about the reason for the trip, its distance, or its duration. However, it does ask the local commander reasonably to determine that the trip was not made and that the civilian care was not obtained primarily to avoid using a military hospital in the beneficiary's home area. Commanders are encouraged to "exercise prudent judgment, discretion, and compassion" in deciding

# THE BULLETIN BOARD

# SENIOR STAFF CHANGES

**PROMOTIONS:** To be **General:** John L. **Piotrowski;** Robert D. **Russ.**

To be **Lieutenant General:** Merrill A. **McPeak;** William E. **Thurman.**

To be **ANG Major General:** Wess P. **Chambers,** ArizANG; Charles S. **Cooper** III, NYANG; Glenn W. **Osgood,** Jr., MeANG; Robert W. **Schaumann,** MinnANG.

To be **ANG Brigadier General:** Wayne B. **Adams,** NevANG; John A. **Almquist,** ArizANG; Charles R. **Barnes,** IndANG; William D. **Bates,** CalifANG; LeRoy R. **Crane,** MichANG; Charles J. **Gebhardt,** TennANG; Robert E. **Harris,** PaANG; Karl K. **Kramer,** OhioANG; Darrell V. **Manning,** IdahoANG; Paul N. **Maxwell,** MontANG; Pere W. **Saltzgiver,** ConnANG; Richard A. **Stich,** SDANG; Stewart W. **Timmerman,** PaANG; Milton H. **Towne,** WashANG.

**RETIREMENTS:** B/G Richard F. **Abel;** B/G Elmer T. **Brooks;** L/G Robert F. **Coverdale;** Gen. B. L. **Davis;** B/G Milford E. **Davis;** B/G Kenneth R. **Johnson;** M/G George B. **Powers,** Jr.; M/G Click D. **Smith,** Jr.; B/G Donald J. **Stukel;** B/G Regis F. A. **Urschler.**

**CHANGES: Col. (B/G selectee) Billy J. Boles,** from DCS/Personnel, Hq. TAC, Langley AFB, Va., to Vice Cmdr., Hq. AFMPC, & Dep. Ass't DCS/M&P for Mil. Personnel, Randolph AFB, Tex., replacing B/G Frank E. Willis . . . **B/G Edward R. Bracken,** from Vice Cmdr., Oklahoma City ALC, AFLC, Tinker AFB, Okla., to DCS/Maintenance, Hq. AFLC, Wright-Patterson AFB, Ohio, replacing B/G Robert P. McCoy . . . **B/G James E. Chambers,** from Ass't DCS/Ops., Hq. TAC, Langley AFB, Va., to Dep. Dir., Ops., Hq. PACOM, Camp Smith, Hawaii . . . **L/G Charles J. Cunningham,** from DCS/P&R, Hq. USAF, Washington, D. C., to Cmdr., 12th AF, TAC, Bergstrom AFB, Tex., replacing L/G Jack I. Gregory . . . **B/G Lee A. Denson, Jr.,** from Dep. Def. Advisor, US Mission to NATO, OSD, Brussels, Belgium, to Ass't Dep. Dir., Int'l Negotiations, J-5, OJCS, Washington, D. C.

**B/G Christian F. Dreyer, Jr.,** from Cmd. Dir., NORAD Combat Ops., J-31, NORAD/SPACECMD, Cheyenne Mountain Complex, Colo., to Cmdr., 26th AD, TAC, March AFB, Calif., replacing B/G Richard A. Pierson . . . **B/G Anthony J. Farrington, Jr.,** from Vice Cmdr., San Antonio ALC, AFLC, Kelly AFB, Tex., to Cmdr., Air Force Log. Ops. Ctr., Hq. AFLC, Wright-Patterson AFB, Ohio, replacing Col. (B/G selectee) Joseph K. Spiers . . . **B/G (M/G selectee) Gordon E. Fornell,** from Spec. Ass't for ICBM Modernization Matters, DCS/RD&A, Hq. USAF, Washington, D. C., to Cmdr., Armament Div., AFSC, Eglin AFB, Fla., replacing M/G William T. Twinting . . . **B/G Edward W. Giddings,** from Dir., SAF Personnel Council, Washington, D. C., to Cmdr., Air Force District of Washington, Washington, D. C. . . . **B/G Richard B. Goetze, Jr.,** from Cmdr., 40th AD, Wurtsmith AFB, Mich., to Dir., $C^2$, Hq. SAC, Offutt AFB, Neb., replacing B/G Frank B. Horton III.

**M/G Fred A. Haeffner,** from Vice CINC., Hq. PACAF, Hickam AFB, Hawaii, to Cmdr., Hq. AFISC, & Dep. IG for Inspection & Safety, Norton AFB, Calif., replacing M/G Gordon E. Williams . . . **B/G (M/G selectee) Ralph E. Havens,** from Cmdr., 86th TFW, Hq. USAFE, Ramstein AB, Germany, to Cmdr., TUSLOG, Ankara, Turkey, replacing M/G Donald P. Litke . . . **M/G Charles A. Horner,** from Cmdr., USAF Air Defense Weapons Ctr., TAC, Tyndall AFB, Tex., to DCS/Plans, Hq. TAC, Langley AFB, Va., replacing M/G (L/G selectee) Merrill A. McPeak . . . **B/G Frank B. Horton III,** from Dir., $C^2$, Hq. SAC, Offutt AFB, Neb., to Dep. Dir., Nat'l Strat. Target List, JSTPS, Offutt AFB, Neb., replacing B/G C. Norman Wood . . . **Col. (B/G selectee) Lawrence C. Huggins,** from Ass't DCS/Requirements, Hq. TAC, Langley AFB, Va., to IG, Hq. USAFE, Ramstein AB, Germany, replacing B/G Dale C. Tabor.

**B/G Richard A. Ingram,** from Cmdt., ACSC, Hq. AU, Maxwell AFB, Ala., to Dep. Cmdr., Canadian NORAD Region, Canadian Forces Base, North Bay, Canada, replacing retiring B/G Milford E. Davis . . . **B/G Robert L. Kirtley,** from Cmdr., 4th AD, SAC, F. E. Warren AFB, Wyo., to Ass't Dep. Under Sec. of Def. for Research & Engineering (Strat. & Theater Nuclear Forces), OSD, Washington, D. C., replacing retired B/G Elmer T. Brooks . . . **M/G Donald P.**

whether or not to issue the nonavailability statement.

As given policy, members of service families, both active and retired, are urged by DoD to use military hospitals for care whenever possible.

### Short Bursts

The Air Force has selected **thirteen pilots and twenty-seven mission specialist** applicants—out of 125 considered—as **candidates for NASA astronaut duty.** These officers will compete with other service and civilian applicants for about four pilot and eight mission specialist positions.

The VA wants newly married veterans to think about **changing the beneficiary of any VA insurance policies held.** It's not an automatic change, and newlyweds must notify VA that they wish to designate the new spouse as beneficiary.

**Air Force Village** in San Antonio, Tex., is about to unwrap **310 new apartments** in Phase I of Air Force Village II. With Village II in full operation in late 1986, the home for retired officers and widows is expected to be able to support about 600 residents.

If you're talking with Navy folks, don't say **"substance abuse."** That term has been replaced in the Navy's vocabulary by the more specific terms **"drug abuse" or "alcohol abuse,"** as appropriate.

**Raymond J. (John) Vogel** has been named as Chief Benefits Director of the VA. He was director of the Philadelphia regional office. He's an Army Vietnam vet and replaces the well-known and longtime (almost eight years) holder of this post, Dorothy Starbuck. *(See also "The Bulletin Board," February '85 issue.)*

Hoping to **save at least $2 million a year,** the Air Force is extending overseas members serving in long-tour areas who are within eleven months of separation at the end of their tours. Those who would prefer to return to the States at the normal time can do so by extending their service time or by reenlisting.

The VA has announced the **Fifth National Veterans Wheelchair Games** to be held August 8–10, 1985, at the University of Maryland campus near Washington, D. C. The games, providing a competitive sports experience in track and field events, archery, bowling, basketball, billiards, swimming, and weightlifting, are open to all military service veterans who are wheelchair-bound due to **spinal-cord injuries, certain neurological problems, and amputations.** See the nearest VA medical center if you're interested.

Who's the **top judge advocate** of the year? **Maj. Barton B. Davis,** Torrejon AB, Spain, that's who. The Air Force Judge Advocate selected Major Davis. Also selected was **SSgt. Charles L. O'Connors,** Plattsburgh AFB, N. Y., as the **outstanding legal services airman of the year.**

If you want to **donate your remains to science** and you're a veteran, don't worry that this will mean you won't be able to have a memorial headstone or marker. VA notes that such a benefit is still available to any veteran whose remains were donated to science or were cremated and the ashes scattered without interment of any portion of the ashes, whose remains have not been recovered or identified, or whose remains were buried at sea. ■

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**Litke,** from Cmdr., TUSLOG, Ankara, Turkey, to Dep. Dir., Acquisition Mgmt., DLA, Cameron Station, Va., replacing retired M/G Joseph H. Connolly . . . **B/G Charles A. May, Jr.,** from Dep. for Strat. Forces, DCS/RD&A, Hq. USAF, Washington, D. C., to Spec. Ass't for ICBM Modernization Matters, DCS/RD&A, Hq. USAF, Washington, D. C., replacing B/G (M/G selectee) Gordon E. Fornell . . . **M/G (L/G selectee) Merrill A. McPeak,** from DCS/Plans, Hq. TAC, Langley, Va., to DCS/P&R, Hq. USAF, Washington, D. C., replacing L/G Charles J. Cunningham.

**B/G Donald C. Metz,** from DCS/M&P, Hq. AFLC, Wright-Patterson AFB, Ohio, to Dir., SAF Personnel Council, Washington, D. C., replacing B/G Edward W. Giddings . . . **M/G Stanton R. Musser,** from Chief, Office of Mil. Cooperation, Egypt, Cairo, United Arab Republic, to Ass't DCS/L&E, Hq. USAF, Washington, D. C., replacing retiring M/G George B. Powers, Jr. . . . **M/G Michael A. Nelson,** from Cmdr., 13th AF, PACAF, Clark AB, Philippines, to Dep. IG, Hq. USAF, Washington, D. C., replacing retired M/G Harry Falls, Jr. . . . **B/G Robert A. Norman,** from Cmdr., 601st TCW, USAFE, Sembach AB, Germany, to Dep. Def. Advisor, US Mission to NATO, OSD, Brussels, Belgium, replacing B/G Lee A. Denson, Jr. . . . **M/G Peter W. Odgers,** from Cmdr., Air Force Flight Test Ctr., AFSC, Edwards AFB, Calif., to Dep. for B-1B, ASD, AFSC, Wright-Patterson AFB, Ohio, replacing M/G (L/G selectee) William E. Thurman.

**B/G Richard A. Pierson,** from Cmdr., 26th AD, TAC, March AFB, Calif., to Cmdr., USAF Air Def. Weapons Ctr., TAC, Tyndall AFB, Fla., replacing M/G Charles A. Horner . . . **L/G (Gen. selectee) John L. Piotrowski,** from Cmdr., 9th AF, TAC, Shaw AFB, S. C., to Vice C/S, Hq. USAF, Washington, D. C., replacing Gen. Larry D. Welch . . . **B/G Cecil W. Powell,** from Ass't DCS/Ops., Hq. USAFE, Ramstein AB, Germany, to Cmdr., 86th TFW, Hq. USAFE, Ramstein AB, Germany, replacing B/G (M/G selectee) Ralph E. Havens . . . **L/G Bernard P. Randolph,** from Vice Cmdr., Hq. AFSC, Andrews AFB, Md., to DCS/RD&A, Hq. USAF, Washington, D. C., replacing L/G (Gen. selectee) Robert D. Russ . . . **M/G Craven C. Rogers, Jr.,** from Cmdr., 314th AD, PACAF, & Cmdr., Korean Air Def. Sector, Osan AB, Korea, to Vice CINC., Hq. PACAF, Hickam AFB, Hawaii, replacing M/G Fred A. Haeffner.

**L/G (Gen. selectee) Robert D. Russ,** from DCS/RD&A, Hq. USAF, Washington, D. C., to Cmdr., Hq. TAC, Langley AFB, Va., replacing Gen. Jerome F. O'Malley . . . **B/G John C. Scheidt, Jr.,** from Dep. Dir., Ops., Hq. USREDCOM, MacDill AFB, Fla., to Cmdr., 601st TCW, USAFE, Sembach AB, Germany, replacing B/G Robert A. Norman . . . **Col. (B/G selectee) Charles J. Searock, Jr.,** from Exec. Officer to Dep. US Cmdr. Europe, Hq. EUCOM, Vaihingen, Germany, to Vice Cmdr., Oklahoma City ALC, AFLC, Tinker AFB, Okla., replacing B/G Edward R. Bracken . . . **M/G Monroe T. Smith,** from Cmdr., Hq. AFALC, Wright-Patterson AFB, Ohio, to DCS/Acquisition Log., Hq. AFSC, Andrews AFB, Md., replacing retiring B/G Kenneth R. Johnson . . . **M/G James P. Smothermon,** from Vice Cmdr., Hq. ATC, Randolph AFB, Tex., to Cmdr., 314th AD, PACAF, & Cmdr., Korean Air Def. Sector, Osan AB, Korea, replacing M/G Craven C. Rogers, Jr.

**Col. (B/G selectee) Joseph K. Spiers,** from Cmdr., AFLOC, Hq. AFLC, Wright-Patterson AFB, Ohio, to Cmdr., Hq. AFALC, Wright-Patterson AFB, Ohio, replacing M/G Monroe T. Smith . . . **B/G Dale C. Tabor,** from IG, Hq. USAFE, Ramstein AB, Germany, to Ass't DCS/Ops., Hq. USAFE, Ramstein AB, Germany, replacing B/G Cecil W. Powell . . . **M/G (L/G selectee) William E. Thurman,** from Dep. for B-1B, ASD, AFSC, Wright-Patterson AFB, Ohio, to Vice Cmdr., Hq. AFSC, Andrews AFB, Md., replacing L/G Bernard P. Randolph . . . **M/G William T. Twinting,** from Cmdr., Armament Div., AFSC, Eglin AFB, Fla., to Cmdr., Air Force Flight Test Ctr., AFSC, Edwards AFB, Calif., replacing M/G Peter W. Odgers . . . **B/G Henry Viccellio, Jr.,** from Cmdr., 1st TFW, Hq. TAC, Langley AFB, Va., to Vice Cmdr., San Antonio ALC, AFLC, Kelly AFB, Tex., replacing B/G Anthony J. Farrington, Jr.

**M/G Bernard L. Weiss,** from Dir. of Contracting & Mfg. Policy, DCS/RD&A, Hq. USAF, Washington, D. C., to Cmdr., Air Force Contract Mgmt. Div., AFSC, Kirtland AFB, N. M., replacing retiring B/G Donald J. Stukel . . . **Gen. Larry D. Welch,** from Vice C/S, Hq. USAF, Washington, D. C., to CINCSAC, & Dir., JSTPS, Hq. SAC, Offutt AFB, Neb., replacing retiring Gen. B. L. Davis . . . **M/G Gordon E. Williams,** from Cmdr., Hq. AFISC, & Dep. IG for Inspection & Safety, Norton AFB, Calif., to Cmdr., 13th AF, PACAF, Clark AB, Philippines, replacing M/G Michael A. Nelson . . . **B/G Frank E. Willis,** from Vice Cmdr., Hq. AFMPC, & Dep. Ass't DCS/M&P for Mil. Personnel, Randolph AFB, Tex., to Cmdt., ACSC, Hq. AU, Maxwell AFB, Ala., replacing B/G Richard A. Ingram.

**SENIOR ENLISTED ADVISOR CHANGES: CMSgt. David A. Guzman,** to SEA, Hq. PACAF, Hickam AFB, Hawaii, replacing retiring CMSgt. James E. Steinmark . . . **CMSgt. Robert L. Sherwood,** to SEA, Hq. ESC, San Antonio, Tex., replacing retired CMSgt. Okey Warden. ■

# The Honors of Iron Gate

**AFA New Yorkers salute Army Gen. John Vessey at the annual gala for charities.**

*Chairman of the Joint Chiefs of Staff Gen. John W. Vessey receives the Kriendler Award from Iron Gate Chapter President Denis R. Brown.*

**BY JAMES A. McDONNELL, JR.**
**MILITARY RELATIONS EDITOR**

"As Chairman of the Joint Chiefs of Staff, his articulation of the security needs of the nation is firmly grounded on his deserved reputation as a 'Soldier's Soldier.' "

With those words, Denis Brown, President of AFA's Iron Gate Chapter in New York City, presented the Chapter's Maxwell A. Kriendler Award for 1985 to the Chairman of the Joint Chiefs of Staff, Army Gen. John W. Vessey, Jr.

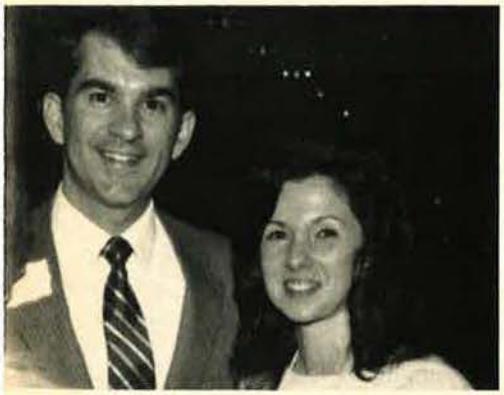
The occasion was the twenty-second annual Iron Gate Salute, the gala charity ball that has become a fund-raiser *par excellence* for Air Force-related charities. The event in March moved the Chapter ever closer to raising its current goal of $2 million in charitable contributions for a variety of organizations, including the Falcon Foundation, the Air Force Historical Foundation, the United States Air Force Museum, the National Aviation Hall of Fame, the Iron Gate Chapter's Air Force Academy and Civil

*The annual Iron Gate Salute raises funds for various Air Force-related charities. This year's Salute moved the Chapter closer to its goal of raising $2 million. Pictured here are Salute Chairman and Mrs. Tom McKee.*

*The evening's entertainment featured a rousing performance by singer Kay Starr. Here, Miss Starr is escorted from the stage by TSgt. Roger Lyons of the Air Force's New York Office of Public Affairs. (Photo by Sid Birns)*

*AFA National President and Mrs. Marty Harris, far left and far right, pause during the Salute to chat with Air Force Chief of Staff Gen. Charles A. Gabriel and Mrs. Gabriel.*

*Before the Salute, Sen. Barry Goldwater visits with, from right, Air Force Secretary Verne Orr, Iron Gate Secretary and Ball Coordinator Dorothy Welker, and AFA National Staffer Dottie Flanagan. Senator Goldwater helped to present five Jimmy Doolittle Fellows and two Ira Eaker Fellows during the evening.*



Air Patrol Scholarship Awards, the Aerospace Education Foundation, and the Air Force Assistance Fund. The Air Force Assistance Fund includes the Air Force Aid Society, Air Force Village, and the Air Force Enlisted Widows Home.

During the evening, AFA's Aerospace Education Foundation Chairman, Sen. Barry M. Goldwater (R-Ariz.), presented five Jimmy Doolittle Fellows and two Ira Eaker Fellows funded by the Chapter to seven aerospace leaders. Honored as Jimmy Doolittle Fellows—each Fellow represents a $1,000 donation to the Foundation—were the Directorate, Air Force Intelligence Reserve Forces, for pioneering a unique approach to Reserve Forces Management (accepted by the Assistant Chief of Staff for Intelligence, Maj. Gen. James C. Pfautz); former Secretary of the Air Force John L. McLucas; Frederick M. Glass, immediate past President of the Iron Gate Chapter; Gen. B. L. Davis, Commander in Chief of SAC; and James F. McGovern, Chief Counsel, Senate Armed Services Committee.

Awarded Ira Eaker Fellows were Maj. Gen. (Lt. Gen. selectee) William E. Thurman—for outstanding accomplishment as project manager of the B-1B program, which delivered the first operational aircraft ahead of time and under budget—and Gene Marianetti, Chief of Special Events at NASA, who accepted on behalf of the NASA Shuttle Astronauts.

The Kriendler Award, the Chapter's highest honor, was presented to General Vessey in recognition of his "dedicated and devoted service" and valuable "advice and counsel" in his demanding role as the top uniformed advisor to the President of the United States.

Adding spice to the evening was the performance of entertainer Kay Starr, who brought back many memories to those in attendance when she sang some of her recording hits, such as "Wheel of Fortune."

The next Salute will be on Saturday, April 5, 1986. ■

# A Hillside Near Khe Sanh

The severely injured HH-3E pilot laid his life on the line to save a rescue force from disaster.

**BY JOHN L. FRISBEE**
**CONTRIBUTING EDITOR**

SHORTLY after midnight on November 9, 1967, Capt. Gerald O. Young, an instructor pilot with the 37th Air Rescue and Recovery Squadron, Danang, headed his HH-3E Jolly Green Giant toward an area southwest of Khe Sanh. Low-hanging clouds shrouded 5,000-foot peaks off to his left. Visibility was poor. It wasn't a good night for a rescue mission in the hill country just below the DMZ, but Captain Young was a veteran of fifty-nine combat missions, including as far north as Haiphong. He and his crew had volunteered for this one.

The previous afternoon, a small US-South Vietnamese reconnaissance team had been surrounded by a NVA battalion. Two helicopters had been shot down during a daylight rescue attempt. Young and his crew were flying backup for another Jolly Green, supported by a C-130 flareship and three Army gunships, in a desperate attempt to save the ambushed patrol.

As the rescue force approached the beleaguered team, the enemy opened up with automatic weapons on the escorting gunships. The primary HH-3E moved through heavy fire into the area, now lighted by flares from the C-130. Hovering along a steep slope, its crew picked up three survivors before they were forced to withdraw to an emergency landing area, badly shot up and leaking fuel and oil. The pilot advised Young not to make another attempt under such extremely difficult conditions. Nevertheless, Young decided on one more try, even though the gunships were low on fuel and ammunition and might not be able to stay with them.

Captain Young approached the slope head-on, hovering with one main wheel on the ground and his rotor blades barely clearing the bank above him. His copilot, Capt. Ralph Brower, directed fire from the gunships while Sgt. Larry Mansey leaped to the ground to help the wounded aboard, covered by SSgt. Eugene Clay at one of the chopper's machine guns. The big bird was sprayed by automatic weapons fire while five survivors were pulled aboard. During takeoff, a direct hit exploded one of the Jolly Green's engines, flipping the craft over on its back as it burst into flames and crashed down the hillside.

Young, hanging upside down in his harness, finally escaped through the broken windshield, his clothing on fire. He rolled down the slope to extinguish the flames, which had inflicted second- and third-degree burns on his legs, back, arms, and neck. Then, with his bare hands, he smothered the flames that were consuming a soldier lying nearby who had been thrown clear of the wreckage. Were there other survivors in or near the burning wreck? Young crawled 100 yards up the hill toward the flames, but was driven back by intense heat and enemy fire.

Gerald Young knew that daylight would bring a rescue force looking for survivors. The first A-1E Sandys to arrive spotted him and the unconscious man he had rescued. Young tried to warn them of a possible flak trap. He knew that the main rescue force would arrive at any moment and that enemy troops were moving back into the area to oppose them. The only way he could help was by leading the hostiles away from the crash site. In his condition, that meant almost certain capture or death.

*Capt. Gerald O. Young: honored for valor in Vietnam in 1967.*

He hid the wounded man whom he had rescued earlier and, despite the agony of his burns, took off into the brush, with enemy troops in pursuit. Each step ahead in the long hours of flight was a triumph of will over searing pain as he lured his pursuers farther and farther from the wreckage. After stumbling and crawling for six miles, he eluded the NVA troops late that afternoon, seventeen hours after the crash, and called in a helicopter to pick him up. A rescue force had finally been able to land at the crash site, retrieve one survivor, and recover the bodies of the dead, including that of the man Gerald Young had hidden.

Captain Young spent six months in hospitals, recovering from his burns. In May 1968, he was awarded the Medal of Honor by President Lyndon Johnson at a ceremony dedicating the Pentagon's Hall of Heroes.

Before retiring as a lieutenant colonel in 1980, Gerald Young served at the Air Force Academy, was instrumental in setting up the forerunner of the Air Force Mast Program (which provides helicopter assistance to civilian highway patrols), flew with the VIP transport squadron out of Andrews AFB, Md., and was Air Attaché to Colombia.

Today, eighteen years after his last combat mission, how does he feel about his Vietnam experience? "The air rescue mission was one of the best in the war," he says. "There is no greater compensation than to participate in saving lives."

By that standard, Gerald Young is a wealthy man indeed. ■

# Air Force Association's Gathering of Eagles—1986

**Las Vegas Convention Center**
**April 27–May 1, 1986**

- *The Confederate Air Force*
- *Magnificent Honors Night Banquet*
- *The USAF "Thunderbirds"*
- *"Live" USAF Tactical Capabilities Exercise*
- *Exciting Aerospace Exhibits*
- *Professional Symposia*
- *Educational Workshop*
- *Gala Stage Show*

# Registration Form

*AFA's Gathering of Eagles 1986*
*Las Vegas, Nevada, April 27, 1986–May 1, 1986*

| | Postmark Date Prior to Nov. 1, 1985 | Postmark Date Nov. 1, 1985 to February 28, 1986 | Postmark Date On and After March 1, 1986 (and on site) |
|---|---|---|---|
| **Package #1:** *(All activities including Honors Banquet—limited to first 3,500 registrants)* | | | |
| AFA Member/Patron | ☐ $195 | ☐ $205 | ☐ $250 |
| AFA Spouse/Dependent | ☐ $195 | ☐ $205 | ☐ $250 |
| | ☐ $195 | ☐ $205 | ☐ $250 |
| | ☐ $195 | ☐ $205 | ☐ $250 |
| Non-Member | ☐ $225 | ☐ $235 | ☐ $250 |
| | ☐ $225 | ☐ $235 | ☐ $250 |
| **Package #2:** *(All activities except Honors Banquet, Wed., April 30)* | | | |
| AFA Member/Patron | ☐ $145 | ☐ $155 | ☐ $200 |
| AFA Spouse/Dependent | ☐ $145 | ☐ $155 | ☐ $200 |
| | ☐ $145 | ☐ $155 | ☐ $200 |
| | ☐ $145 | ☐ $155 | ☐ $200 |
| Non-Member | ☐ $175 | ☐ $185 | ☐ $200 |
| | ☐ $175 | ☐ $185 | ☐ $200 |

**REGISTRATION FORMS MUST BE ACCOMPANIED BY U.S. DOLLAR CHECK OR MONEY ORDER PAYABLE TO "AFA," OR CREDIT CARD AUTHORIZATION**

What Name/Title on your Registration Badge(s):

Your Name: _____

_____

Other Registrants: _____

_____

_____

_____

_____

_____

Your Address: _____
Street Address

_____
City State Zip

_____
Country

Phone Number: ( ) _____

**Send this form and your payment to:**

**"Gathering of Eagles"**
**Air Force Association**
**1501 Lee Highway**
**Arlington, VA 22209-1198**

☐ I enclose $_____ U.S. Dollars (in check or money order only) for _____ Registration Packages

*or:*

☐ Charge $_____ U.S. Dollars to my credit card, as indicated:

☐ AM EX
☐ VISA
☐ MasterCard

Account number: _____

Expiration date: _____

Cardholder's signature:

_____

AFA's "Gathering" airlines—United and Eastern—are offering discount fares to Las Vegas.

When making airline reservations, be sure to identify yourself with the special AFA account numbers as follows:

| | ACCOUNT NUMBER | TOLL FREE LINE |
|---|---|---|
| **United Airlines** | **# 609-G** | **(800) 521-4041** |
| **Eastern Air Lines** | **# EZ4P13** | **(800) 468-7022 or in Florida: (800) 282-0244** |

# Air Force Association's Gathering of Eagles—1986

*Las Vegas, Nevada, April 27, 1986–May 1, 1986*

**APPLICATION FOR HOTEL RESERVATIONS**

| HOTELS | Single | Double | 1-Bedroom Suite | 2-Bedroom Suite |
|---|---|---|---|---|
| MGM Grand | $77 | $77 | $178-up | $260-up |
| Caesar's Palace | 70 | 70 | 200 | 300 |
| Flamingo Hilton | 60 | 60 | 150-up | 240-up |
| Dunes | 58 | 58 | 180 | 250 |
| Imperial Palace | 60 | 60 | 150 | 210 |
| Maxim | 38 | 38 | — | — |
| Continental | 45 | 45 | — | — |
| Alexis Park (All Suites) | 70/90 | 70/90 | — | — |
| Tropicana | 42 | 42 | 125 | 250 |
| Hacienda | 55 | 55 | 100 | 165 |
| Marina | 42 | 42 | 100 | 150 |
| Sands | 55 | 55 | 125-up | 225-up |
| Desert Inn | 75 | 75 | 150-up | 225-up |
| Frontier | 54 | 54 | 185 | 225 |
| Riviera | 55 | 55 | 150 | 200 |
| Sahara | 55 | 55 | 90-up | 180-up |
| Landmark | 52 | 52 | 95-125 | — |
| Las Vegas Hilton | 64 | 64 | — | — |
| Mardi Gras (All Suites) | 33 | 33 | — | — |

## Application for Hotel Reservations

*(Please print or type)*

Please list three choices of hotels:

1st _____

2nd _____

3rd _____

Room will be occupied by:

_____
Name

_____
Affiliation

_____
Street

_____
City State Zip

Type of Accommodation

____ Single Rate ____

____ Double Rate ____

____ 1 B/R Suite Rate ____

____ 2 B/R Suite Rate ____

Date of Arrival: _____

_____ Hour _____AM-PM

Date of Departure: _____

_____ Hour _____AM-PM

**Note:**

1. The AFA Housing Bureau will handle all reservations. Do not contact hotels. If changes need to be made after receiving confirmation, contact hotel directly.
2. A deposit of one night's lodging must be sent directly to the hotel once you receive confirmation.
3. Room assignments will be made on a first-come, first-served basis.
4. If a block of rooms is required, attach a list of individuals needing rooms to this form with arrival and departure dates and times.

*Fill out this form completely and mail to:*

**"AFA Housing Bureau"**
Las Vegas Convention & Visitors Authority
3150 Paradise Road
Las Vegas, Nevada 89109-9096

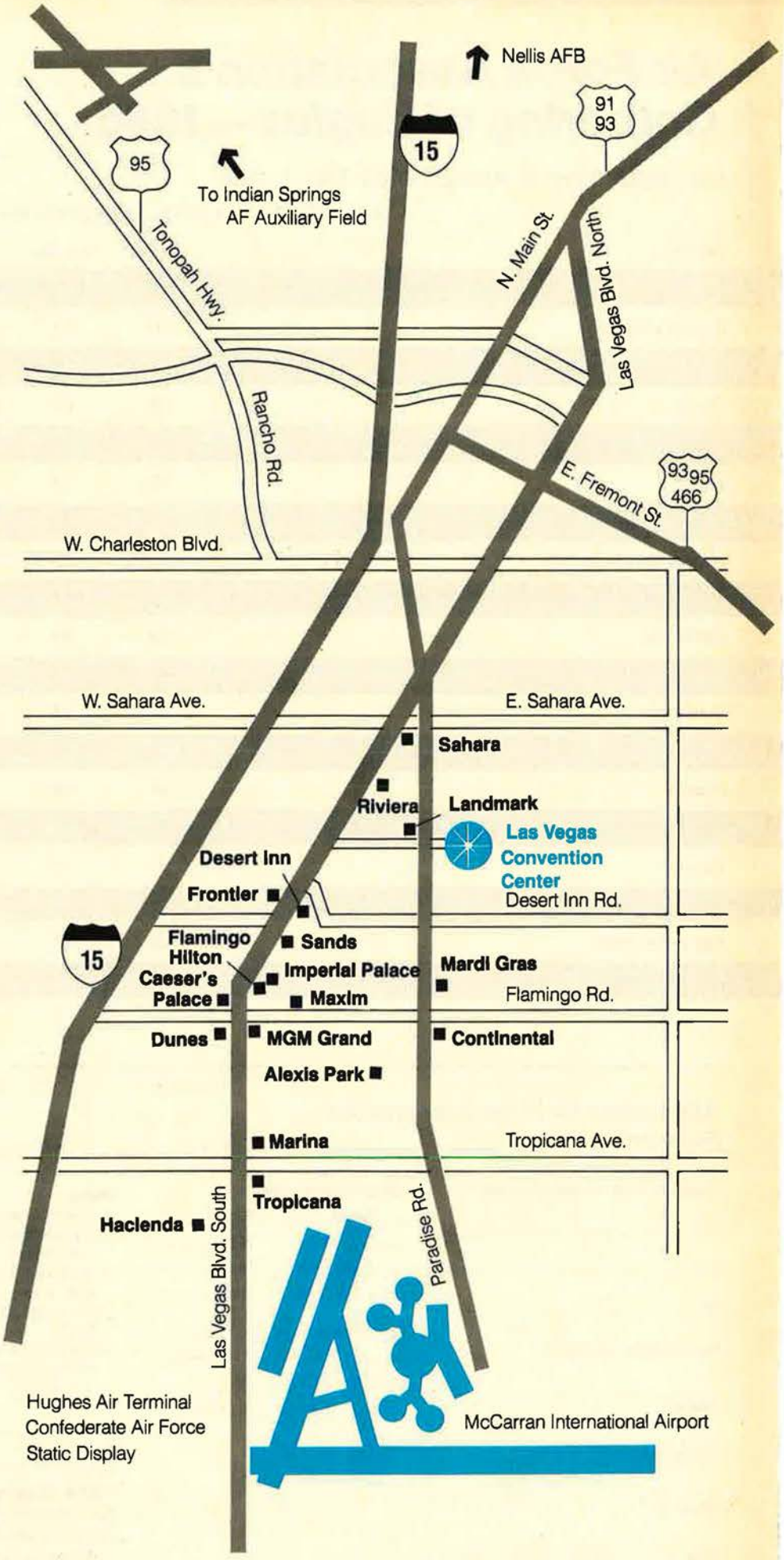
To reserve a room at one of the 19 hotels in which AFA has blocked rooms, fill out the housing form on the previous page and return it to the "AFA Housing Bureau" in Las Vegas at the address indicated on the form. The Housing Bureau will handle all reservations. Do not contact hotels. (However, if you need to make a change after you've received confirmation, contact the hotel directly.) Once you receive confirmation from the hotel, send a deposit of one night's lodging directly to the hotel.

Room assignments are on a first-come, first-served basis.

If a block of rooms is required, attach a list of names with arrival and departure times and dates to the housing form on the previous page.

Remember, this form is not to be mailed to AFA, but must be sent directly to the AFA Housing Bureau in Las Vegas. The cut-off date for reservations is March 25, 1986.

Locations for AFA's "Gathering" hotels are indicated on the map.



# AFA INTERCOM

By Robin L. Whittle, AFA DIRECTOR OF COMMUNICATIONS

## New Jersey AFA President Helps USAF Save $2 Million

Everyone at McGuire AFB, N. J., had been urged to conserve energy even before the drought and severe energy crunch hit New Jersey in April. Quotas for reductions in energy usage at the base were not being met. In an article that appeared in the base newspaper, Col. Jim LeCleir, Commander of the 438th Military Airlift Wing, appealed to the base population to conserve energy wherever possible.

New Jersey AFA President Gil Freeman became aware of the problem and, at AFA's New Jersey Fall Ball last October *(see "Intercom," February '85 issue, p. 126),* seized the opportunity to discuss it with Karen R. Keesling, Principal Deputy Assistant Secretary of the Air Force for Manpower, Reserve Affairs and Installations. During their discussion, Mr. Freeman, who is the Special Assistant to the Commissioner of the New Jersey Department of Energy and thus an expert in energy conservation, promised Secretary Keesling that he would look into the situation.

In a follow-up meeting with Colonel LeCleir, Mr. Freeman suggested that low-flow showerheads could be introduced on base to save water and energy. Colonel LeCleir expressed interest in the idea and assigned Col. James L. Cole, Jr., wing Vice Commander, as project officer.

But Mr. Freeman didn't stop there. He contacted his friend, Eugene J. McCarthy, vice president/customer services of the Jersey Central Power & Light Co., to propose that the utility donate low-flow showerheads to the base. A test was initiated to determine whether or not low-flow showerheads could provide an adequate shower. Previous devices had cut the water flow too much. But a technical change had greatly improved low-flow showerheads, and the test results proved excellent. "The showerheads received rave reviews in the test program," Colonel Cole said.

Jersey Central Power & Light agreed to donate 2,500 low-flow showerheads with a retail value of $25,000 to McGuire AFB as part of the energy-conservation program. Then the severe drought hit. Water became an extremely scarce resource. However, at McGuire, the showerheads were saving an estimated 5,000 gallons a year per showerhead, for a total of about 13,000,000 gallons annually. This prompted Jersey Central Power & Light to donate low-flow showerheads to all hospitals, schools, and municipal facilities throughout its thirteen-county service area.

***Energy-saving showerheads are just the ticket for, from left, Col. Gerald Weiss, McGuire AFB Commander; John Martin, Jersey Central Power & Light official; Col. David Brooks, McGuire AFB engineer; George Mattson, McGuire Chapter Vice President; New Jersey AFA President Gil Freeman; Hal Clayton, JCP&L official; Col. James LeCleir, 438th MAW Commander; and Eugene McCarthy, JCP&L vice president. See item.***

Then, the utility, recognizing the potential savings, joined in a cooperative effort with New Jersey Gov. Thomas H. Kean and the New Jersey Department of Energy and donated low-flow showerheads to all its customers. In a letter to customers, L. C. Kline, Manager of Energy Services, said the "simple device has the potential for annual electrical energy savings well in excess of 30,000,000 kilowatt hours as well as significant energy savings for both gas and fuel sources."

He said further that the low-flow showerheads would reduce water consumption by up to fifty percent over the standard showerhead. "Widespread use of these energy/water conservation devices would translate into billions of gallons of water savings throughout New Jersey," he said.

In fact, at McGuire AFB, the showerheads are expected to yield savings in energy costs to the Air Force in excess of $2 million over the next ten years. "Also of importance are the benefits in water savings to the state of New Jersey," said Mr. Kline. He noted that, in addition to the cost savings to the Air Force, the showerheads will help the utility to reduce demand and ultimately save customers money in energy costs.

"This is an excellent example of the benefits the government can derive through partnership with business," said Vice President for Customer Services McCarthy.

It is also an example of how one active AFA leader—serving as a catalyst and a conduit—can foster a mutual, beneficial relationship between the Air Force and the community in which it is located. Said Colonel LeCleir in a letter to Mr. Freeman, "Many thanks for keeping us in mind for such an initiative. This is the kind of energy-saving suggestion we constantly look for."

# INTERCOM

## Austin Chapter Hears Hans Mark Speak On Space Program

Former Air Force Secretary and NASA Deputy Administrator Dr. Hans Mark, who is chancellor of the University of Texas system, "captivated his blue-suit audience with behind-the-scenes anecdotes on just how a handful of scientists and politicians led the United States to space preeminence," reported Jack Jones in the April 28 Killeen *Daily Herald*.

The former Air Force Secretary told the AFA Austin Chapter audience that the Soviets had been very much in the race to put a man on the moon in the 1960s, but lost three of their giant moon rockets in the effort, with one exploding on the launchpad and two failing to achieve orbit when their second stages didn't work. Once the US landed on the moon on July 20, 1969, the Soviets halted their moon program and turned to building a permanent space station, the Salyut, Dr. Mark told the AFA gathering.

"The Russians, faced with three large failures, decided to do something slow and easy rather than risk a try at the more complicated reusable space shuttle. That's why they have their Salyut today. They are now building a carbon copy of our Space Shuttle. . . . They will fly their shuttle in its first orbital flight about 1989 or 1990," he said. As for their Salyut station, "it is pretty primitive. It is essentially Gemini technology," Dr. Mark said.

NASA planners have set 1992, the 500th anniversary of Christopher Columbus's discovery of the new world, as the year for launching America's first permanently manned space station. According to Dr. Mark, the US needs a manned space station for several reasons: as a fixed base upon which to perform maintenance on satellites, as a staging base for future flights to the moon and to Mars, as a gravity-free laboratory where certain experiments can only be performed, and as a work place where a technical competency can be developed that will lead the US to find a strategic defense against ballistic missiles.

Dr. Mark told the Austin Chapter that he agrees with President Reagan that the Strategic Defense Initiative (SDI) is feasible. He believes that an area defense against ICBMs is two or three decades away, but, in the near term of a decade, the United States could at least perfect a point defense against submarine-launched ballistic missiles (SLBMs). "That would provide some security for our MX missiles," he said.

"I think it was terribly important for the President to raise the issue—to say that technology is developing in such a way that we must rethink the doctrines under which we deploy our nuclear forces. The time is coming when we will have to make new political arrangements that will determine how stability will be maintained in a world where we no longer have a balance of terror."

Dr. Mark briefly described some of NASA's future missions as well—putting a spacecraft in orbit about Jupiter, orbiting a mapping craft around Venus, putting a spacecraft in polar orbit around the sun, and launch of the space telescope, which Dr. Mark called "the single most important scientific instrument we have yet to put into space."

***Dr. Hans Mark recently spoke on the US space program before a meeting of AFA's Austin Chapter. Pictured during the meeting are, from left, Waggoner Carr, Austin Chapter Executive Vice President; Maj. Gen. George A. Edwards, USAF (Ret.), Austin Chapter President; Dr. Mark; and Lt. Gen. Jack I. Gregory, then Commander of the Twelfth Air Force. See item. (Photo by C. L. "Jack" Jones)***

## AFA Member Receives Two Purple Hearts Forty-one Years Late

Reno Chapter member Albert R. Rymer was recently awarded two Purple Hearts for wounds received in combat forty-one years ago. Nevada Gov. Richard H. Bryan presented the honors during a special ceremony. Mr. Rymer was wounded twice—once on March 9, 1944, and again on March 22, 1944.

Mr. Rymer's military record was lost during the confusion at the end of the war, but the incidents were not forgotten, thanks to his former commanding officer, Maj. Gen. Dale O. Smith, USAF (Ret.). General Smith remembered the flights that led to Mr. Rymer's wounds and noticed during a recent reunion that Mr. Rymer was not wearing the medals. General Smith set in motion the process that corrected the oversight.

The AFA member was wounded the first time during a bombing mission over Germany. His plane was attacked by enemy fighters while on approach to the target. His B-17 lost a propeller, its oil lines were shot out, and Rymer was hit by pieces of shrapnel.

Two weeks later, Mr. Rymer was again wounded by enemy fighter action. This time he was hospitalized and sent home. Now, forty-one years later, he's received his due.

"I feel honored," the veteran said during the ceremony. "It just shows you, your country never forgets."

## Sedona Chapter Helps Arizona Celebrate Aviation Week

"It was a gorgeous day in Sedona, Ariz., when the first of the planned flybys appeared from the north early on Saturday, April 13," reports J. Edward Przybys, Sedona Chapter leader and founder. The lead plane was a KC-135 from the 161st Air Refueling Group based at the Sky Harbor IAP in Phoenix.

"Trailing very close to the lead plane were three F-15 Eagles from Luke AFB, Ariz., followed by two T-38s courtesy of Williams AFB, Ariz.," Mr. Przybys said.

More than 2,000 people attended the Sedona Chapter-sponsored air-

*Reno Chapter member Albert R. Rymer, center, was recently presented two Purple Hearts for wounds suffered forty-one years ago in World War II. Maj. Gen. Dale O. Smith, USAF (Ret.), right, Mr. Rymer's former commander, instigated the belated presentation. Looking on at the presentation was Nevada Gov. Richard H. Bryan.*

show, which was held in recognition of the statewide Aviation Week. A number of static displays, including antique aircraft, added to the ambience. The displays were sponsored by the Army National Guard, the Sedona and Coconino County search and rescue group, and the Civil Air Patrol, among others.

The Verde Valley Hometown Brass Band entertained at the Sedona airport, and the Civil Air Patrol held an open house at their new airport facility. One of the "hottest" attractions was the Air Force Orientation Group's forty-seat mobile trailer theater that featured a dramatic sight-and-sound show using 1,100-slides and fifteen projectors. The show ran twelve minutes, but had a lasting effect on the audiences, Mr. Przybys reports.

Following the airshow, AFA's Sedona Chapter sponsored a banquet that featured Col. Peter R. Wilkinson, System Program Director, Mission Control Program Office, Space Division, Los Angeles AFS, Calif., as speaker. Colonel Wilkinson discussed the importance of remaining on the cutting edge of technology.

Pointing out that "we must evolve or fall behind," Colonel Wilkinson supported the Strategic Defense Initiative as "simply a research program to determine if [ballistic missile defense] is an appropriate path to follow." Colonel Wilkinson, who is responsible for the planning and control of DoD Shuttle missions and satellite programs, said that military activity in space is vital to the nation's defense.

During the banquet, Sedona Chapter President Tom O'Connell presented scholarships to Northern Arizona University AFROTC cadets John Skinner and Jeff Mullen. Embry-Riddle Aeronautical University AFROTC cadets Mark Mitchell and Dawn Dunsmore received scholarships from the Chapter earlier in the week. Also honored was Florence Henninger, Sedona Chapter Secretary, for her help in putting the program together. After the banquet, "everyone danced the night away to the music of *All That Jazz*," Mr. Przybys said. A full page write-up by Dick Riley appeared in the Sedona daily *Red Rocks News*.

AFA's Sedona Chapter was selected as the outstanding small-size AFA chapter (twenty to 150 members) in 1984 and recruited the highest percentage of new members that year.

## On the Scene in AFA's Busy and Active Grass Roots

AFA's Charles A. Lindbergh Chapter held a dinner dance in Fairfield, Conn., honoring **Gen. Robert T. Herres,** Commander of Space Command and Commander in Chief of North American Aerospace Defense Command, and presented him with an Ira C. Eaker Fellowship "for living the Eaker and Lindbergh traditions of leadership in advancing the principles and integrity of America," reports Lindbergh Chapter President **John Henry Griffin** . . . Three new AFA chapters were chartered recently in Massachusetts—Paul Revere Chapter, **Bill Lewis,** President; Pioneer Valley Chapter, **Bob Picknally,** President; and the Pace Chapter, **Father Raymond Valle,** President . . . A new AFA Chapter in Iowa named for former **CMSAF Richard D. Kisling** was chartered on April 18. **Maj. Gen. Jack Farris,** Deputy Chief of Staff for Plans and Operations at Hq. SAC, was the featured speaker at the chartering ceremony. The Chapter President is **John T. Hines,** and his chapter is the only active chapter in the state.

WHIO-TV in Dayton, Ohio, has provided production facilities to videotape the "Young Astronaut Program—How the Media Has Helped." This presentation by Wright Memorial Chapter Aerospace Education Chairman **Phil Woodruff** focuses on the media's contributions to the Program. The Wright Memorial Chapter, with base and community assistance, initiated the Young Astronaut Program in fifty Dayton area schools . . . "A Salute to TAC" was the theme of South Car-


***One of the most popular attractions at the Sedona Chapter's Air Show, which was held during Arizona's statewide Aviation Week, was the Air Force Orientation Group's traveling theater. The theater's twelve-minute sight-and-sound presentation featured 1,100 slides and fifteen projectors. See item.***

olina State AFA's outstanding convention, which featured **Lt. Gen. Robert E. Kelley,** Vice Commander of TAC, as speaker. A number of excellent promotional pieces and a printed program with messages from **Gov. Richard Riley, Mayor W. A. McElveen, Jr.,** South Carolina State AFA President **J. "Doug" Catington,** and **Lt. Gen. John Piotrowski,** Commander, Ninth Air Force, highlighted a full two-day meeting that included a golf tournament, several mixers, a business meeting and workshop, an awards luncheon, spouse tours, static displays, firepower demonstrations, and an evening banquet at which General Kelley spoke on TAC's winning team.

AFA National Director and Executive Committee member **Howard Strand** recently rebutted a pro-Communist letter to the editor that appeared in the Battle Creek, Mich., *Enquirer.* Asking why "anyone who believes such rot doesn't go and live in one of the socialist, Communist countries they so obviously admire," Mr. Strand pointed out a number of blatant errors in the letter. He questioned how anyone could believe that Hungary, Czechoslovakia, Afghanistan, Poland, or any other country poses or ever posed an invasion threat to the USSR. To compare Grenada or even Vietnam with instances where millions of people were killed by direct and indirect Communist takeovers, Mr. Strand charged, "is to tell everyone you haven't the slightest idea of what you are talking about—Afghanistan, 700,000 dead; Cambodia, 2,000,000 dead; Ethiopia, more than 1,000,000 dead—need I go on?" His letter appeared in the March 30 *Enquirer.*

# INTERCOM

*Gavel and charter in hand, AFA's three new chapter presidents in Massachusetts are off and running. Pictured here are, from left, Bill Lewis, Paul Revere Chapter; Bob Picknally, Pioneer Valley Chapter; Father Raymond Valle, Pace Chapter; and AFA National President Marty Harris. (Photo by Terry Heaton)*

Former AFA National Director **Robert L. Carr** has been nominated by readers of the Pittsburgh *Post-Gazette* and by WPXI-TV to receive the Jefferson Medal for outstanding citizenship from the American Institute for Public Service in Washington, D. C. . . . On April 14, AFA's Chicagoland-O'Hare Chapter cosponsored a program with local units of the Armed Forces Communications and Electronics Association (AFCEA) and the Association of the Old Crows that featured **Maj. Gen. Alan G. Sharp,** Commander of the Air Force Reserve's Fourteenth Air Force at Dobbins AFB, Ga. The event was planned by **Brig. Gen. Walter "Gibby" Vartan,** USAFR, President of the Reserve Officers Association and Chicagoland-O'Hare Chapter leader; **Len Lesjak,** Chicagoland-O'Hare Chapter Vice President; **Ken Raab,** AFCEA Chapter President; and **Jim Langhorn** of the Old Crows . . . **Beverly Busenlehner** was honored with a Certificate of Appreciation from AFA's Chautauqua Chapter in Jamestown, N. Y., for her election as the first woman commander of the Chautauqua County Veterans Council . . . "Take an hour of your time—fifteen minutes to renew your own membership in AFA and forty-five to recruit a new member," the Executive Committee of AFA's San Bernardino Area Chapter advises in an April 16 letter inserted into the monthly newsletter. Executive Committee members **Norm Miner, Jim Davidson, Ed Dvorak, Gene Moneymaker, Donna Hayden, Billie Rau, Ken Jacobi, Mike Salis, Bob Custer, Frank DePhillipo, Phil Arvizo, and Chuck Obershaw** conclude by telling members that "if you can't participate in any other way, at least give one hour of your time to strengthen our Association through stronger membership."

"All About AFA" is the subtitle of a column that appears on the first Monday of every month in the Warner Robins, Ga., *Daily Sun.* The column details activities by AFA's Carl Vinson Memorial Chapter, says Chapter President **Joe Sherrill Stafford** . . . AFA's Jerry Waterman Chapter in Tampa, Fla., held a very successful Open House Reception for the Air Force Thunderbirds and the Army's Golden Knights parachute team on March 24.

*AFA chartered its only chapter in Iowa recently. Those present at the chartering ceremony included, from left, Ted Crouchley; Maj. Gen. Jack Farris, SAC's DCS/P&O; Charles Church, AFA National Vice President for the Midwest Region; John T. Hines, Kisling Chapter President; AFA National Director James McCoy; and Roger Stolen.*

*During the recent South Carolina State AFA Convention, State President J. "Doug" Catington presented a plaque to Charleston Chapter President Edith E. Calliham honoring her as the "Outstanding South Carolina AFA Member of the Year." The Convention's theme was "A Salute to TAC."*

**Marion Chadwick,** Vice President/Programs, handled club arrangements, and **Susan Preston** took care of reservations, with **Bridget Porter** and **Joe and Pat Lampariello** assisting . . . **TSgt. Bonnie Clausen,** a medical technician with the 138th Tactical Control Flight, Colorado Air National Guard, has volunteered for a cold-weather survival training exercise at Squaw Mountain and another exercise in the mountains of Idaho. She was also selected for the first-ever training exercise in Denmark with the Danish Air Force. Her accomplishments garnered her the honor of "Outstanding Air National Guard Person for 1984" by AFA's Weld County Chapter in Greeley, Colo. A write-up appeared in the Greeley *Tribune* on March 10 . . . AFA member **Rolland T. Olson** wrote an editorial on the importance of retaining the military retirement system. The editorial took up two pages in the Park Ridge, Ill., *Advocate* on April 4 and was headed "Support National Defense; Retain Service Retirement."

"The future of civil aviation" was the theme of the Florida Highlands Chapter luncheon meeting that featured **Lt. Col. Richard Read,** USAF liaison officer to the Florida Civil Air Patrol Wing, and **Bill J. Langley,** FAA official, as speakers, says Chapter President **Roy Whitton** . . . **Rep. Bill Nelson** (D-Fla.) was the featured speaker for the Cape Canaveral Chapter's third annual "Brevard County Community Salute to the Military" held May 18 at the Holiday Inn Oceanfront in Indialantic, says Chapter Chairman **Don Beck** . . .

***After thirty-nine years, "AFA's own bell-ringer" is finally calling it quits. Clarine Penewell, longtime receptionist for the Air Force Association, retired in June. AFAers who have called or visited the Association's headquarters are likely to remember her warm personality and cheerful willingness to help with problems. For AFA national staffers, the place just won't seem the same without her. All of AFA joins in wishing her a happy and well-deserved retirement!***


**John Maddox,** deputy director of civil engineering at Space Division, received the Dr. Alfred Rockefeller, Jr., Award from AFA's Greater Los Angeles Airpower Chapter as the Outstanding Federal Civil Service Employee of the Year for USAF's Space Division. He was selected as the award's first recipient for managing construction of Space Transportation System launch facilities at Vandenberg AFB, Calif., and for his work on construction of the Consolidated Space Operations Center (CSOC) near Colorado Springs, Colo. His efforts in obtaining approval and funding for 170 military family housing units at Fort MacArthur and a child-care center at Los Angeles AFS were also cited. The award is named in honor of the former Space Division Chief of Presentations.

Former **CMSAF Tom Barnes** keynoted the Wichita Falls Chapter dinner that also honored winners of a scholarship essay contest . . . **Bob Burton,** anchor for KXTV Channel 10, emceed the Sacramento Chapter's annual awards banquet at Mather AFB in March, during which twenty-seven officers, airmen, and civilians were honored for exceptional contributions to the Air Force, for heroism, or for contributions to humanitarian causes, says Communications Director **Mitch Mitchell.** A write-up by military editor **Veda Federighi** appeared in the Sacramento *Union* . . . **Clyde A. Lewis,** Chairman of the Plattsburgh AFB, N. Y., Liaison Committee, received the Air Force Exceptional Service Award from CINC SAC **Gen. B. L. Davis** for exceptional service to the Air Force. The honor is the highest the Air Force bestows on a civilian. Mr. Lewis, a local attorney, was instrumental in securing passage of the Capehart Housing legislation to provide housing for military families. He was honored at a civic testimonial, which Lewis emceed, that recognized the 380th Bomb Wing's fifth Fairchild Trophy win as the best SAC bomb wing in the annual bombing and navigation competition.

"Red Flag" was the topical briefing for Texas State AFA Executive Committee members by **Col. Robert J. Herculson, Jr.,** Vice Commander of the 554th Range Group, Nellis AFB, Nev. The briefing was held in Kerrville in March . . . Noted aviation artist and AFA Life Member **Keith Ferris** recently presented a lithograph of a B-24 bomber to **Don Daley,** President of AFA's Hawaii Chapter. The litho depicted a B-24 similar to one that Mr. Daley piloted in World War II. Mr. Ferris was guest speaker at a luncheon that followed his two-week

# This Is AFA

*The Air Force Association is an independent, nonprofit, aerospace organization serving no personal, political, or commercial interests; established January 26, 1946; incorporated February 4, 1946.*

**OBJECTIVES:** The Association provides an organization through which free men may unite to fulfill the responsibilities imposed by the impact of aerospace technology on modern society; to support armed strength adequate to maintain the security and peace of the United States and the free world; to educate themselves and the public at large in the development of adequate aerospace power for the betterment of all mankind; and to help develop friendly relations among free nations, based on respect for the principle of freedom and equal rights for all mankind.

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orientation visit to USAF units in the Pacific . . . General Robert F. Travis Chapter Membership Vice President **Art Littman** recently presented a $450 check to **Lt. Col. Ed Delorey,** project officer for the Travis AFB Assistance Fund campaign. ■

# INTERCOM

***AFA's Travis Chapter recently donated $450 to the Travis AFB, Calif., Assistance Fund. Presenting the check to Lt. Col. Ed Delorey, project officer for the Travis AFB Assistance Fund, is Art Littman, Travis Chapter Vice President for Membership. Looking on at left is Col. Robert Woods, 60th MAW Commander.***

# UNIT REUNIONS

**AACS**
Airways and Air Communications Service (AAF/USAF) alumni will hold their ninth reunion on October 4–6, 1985, in Washington, D. C. **Contact:** Bob and Jane Dickerson, 2514 Lexington Rd., Falls Church, Va. 22043. Phone: (703) 560-7046.

**Air Commando Ass'n**
The Air Commando Association will hold its reunion on November 8–10, 1985, at the Marriott Tan-Tar-A Resort, Lake of the Ozarks, Osage Beach, Mo. **Contact:** Ray Lahmeyer, Rte. 1, Box 166, Henley, Mo. 65040. Phone: (314) 498-6695. Sam Sartor, P. O. Box 5595, Fort Worth, Tex. 76108. Phone: (817) 246-3051.

**Aircraft Observer, Bombardment (AOB)**
A reunion for personnel who participated in the AOB school at Mather AFB, Calif., during the 1940s and 1950s is planned for October 18–20, 1985, at Mather AFB, Calif. **Contact:** Leon "Cubby" Culbertson or Carl "Lee" Miller, 4631 Las Lindas Way, Carmichael, Calif. 95698.

**Air Rescue Ass'n**
The Air Rescue Association will hold its reunion on September 11–14, 1985, at the Madison Hotel in Seattle, Wash. **Contact:** Al Scott, P. O. Box 98568, Tacoma, Wash. 98498.

**B-17 Anniversary**
Concurrent with the B-17 anniversary celebration, the Boeing Management Association will host two nights of World War II era entertainment on July 26–27, 1985, at Boeing Field in Seattle, Wash. **Contact:** John L. Powell, 243 165th, S. E., Bellevue, Wash. 98008. Phone: (206) 655-3728.

**Central Washington University**
A reunion for all AFROTC graduates of Central Washington University will be held on October 26, 1985, on the CWU campus in Ellensburg, Wash. **Contact:** Gail K. Jones, Alumni Affairs, CWU, Ellensburg, Wash. 98926. Phone: (509) 963-2752. Col. Darwin Nelson, USAF, AFROTC Commander, McChord AFB, Wash. 98438-5000. Phone: (206) 984-5709.

**CBI Veterans Ass'n**
Veterans from the CBI Theater will hold their reunion on July 19–21, 1985, at the Park Plaza Hotel in Boston, Mass. **Contact:** Bob Kadel, P. O. Box 1443, Terre Haute, Ind. 47808. Phone: (812) 232-5575 or (812) 235-6570.

**Data Systems Design Office**
The Supply Community at the Data Systems Design Office at Gunter AFS, Ala., in conjunction with Sperry Corp. representatives, will hold a reunion for retired and active-duty supply personnel on July 25, 1985, at the Civic Center in downtown Montgomery, Ala. **Contact:** U1050-II Committee, DSDO/LGSD, Gunter AFS, Ala. 36114-6340. Phone: (205) 279-3309. AUTOVON: 446-3309.

**Mariana Islands Veterans**
Veterans who served on Guam, Saipan, and Tinian during World War II will tour old sites and present a flag to the Governor of Guam on September 11–20, 1985. **Contact:** Cyril J. O'Brien, 10004 Reddick Dr., Silver Spring, Md. 20901. Phone: (301) 593-8904. Franklin Travel Agency, 344 Suburban Station Bldg., Philadelphia, Pa. 19103. Phone: (1-800) 523-1966 or (215) 563-7327.

**Sherman Field**
Veterans of Sherman Field will hold their reunion on September 13–15, 1985, at the Ramada Inn in Leavenworth, Kan. **Contact:** Roscoe Swenson, 2053 Highland Ave., Salina, Kan. 67401. Phone: (913) 827-2577.

**Strategic Support Squadrons**
The 1st, 2d, 3d, and 4th Strategic Support Squadrons (SAC) will hold a reunion on October 4–6, 1985, at the Sacramento Inn in Sacramento, Calif. **Contact:** L. L. Jones, 3252 Sarah, Bossier City, La. 71112. Tom F. Wirth, Jr., 8541 Oakview Lane, Fair Oaks, Calif. 95628.

**Tuskegee Airmen**
The Tuskegee Airmen will hold their fourteenth national convention on August 5–11, 1985, at the Marriott and the Dayton Stouffer's Hotels in Dayton, Ohio. **Contact:** Harold E. Sawyer, P. O. Box 06409, Columbus, Ohio 43206. Phone: (614) 252-1992.

**1st Air Commando Ass'n**
The 1st Air Commando Association will hold its reunion on October 11–13, 1985, at the Twin Towers Sheraton in Orlando, Fla. **Contact:** Bob Moist, P. O. Box 466, Broderick, Calif. 95605.

**3d Transport Squadron**
Members of the 3d Transport Squadron, including the 14th, 15th, 53d, and 59th Troop Carrier Squadrons and the 62d and 64th Troop Carrier Groups, will hold their reunion on September 21–22, 1985, at the La Quinta Inn in Euless, Tex. **Contact:** Woodrow Gephart, 5405 Harvest Lane, Austin, Tex. 78745.

**7th Photo Group Ass'n**
The 7th Photo Group (Mount Farm, England, 1943–45) will rendezvous with 8th AFHS on October 17–20, 1985, in Wichita, Kan. **Contact:** Claude Murray, 1933 E. Marshall, Phoenix, Ariz. 85016. Phone: (602) 274-5871.

**8th Air Force Historical Society**
The 8th Air Force Historical Society (AFHS) will hold its eleventh annual reunion and will celebrate the fiftieth anniversary of the B-17 on October 17–20, 1985, in Wichita, Kan. **Contact:** 8th Air Force Historical Society, P. O. Box 3556, Hollywood, Fla. 33083.

**8th Photo Recon Squadron**
Members of the 8th Photo Reconnaissance Squadron will hold their reunion on October 3–7, 1985, at the Town and Country Hotel in San Diego, Calif. **Contact:** Andy Kappel, 6406 Walnut, Kansas City, Mo. 64113. Phone: (816) 363-0261.

# INTERCOM

**18th Pursuit Squadron**
The 18th Pursuit Squadron will hold its reunion on October 9–13, 1985, at the Red Lion Inn in Bakersfield, Calif. **Contact:** Arthur J. Crettol, P. O. Box B, Wasco, Calif. 93280. Phone: (805) 758-2249 or (805) 758-5304.

**21st Weather Squadron**
Members of the 21st Weather Squadron, 40th Mobile Communications Squadron, will hold their reunion on September 6–8, 1985, at the Kiandra Lodge in Vail, Colo. **Contact:** Charles Chenault, 1012 Challenger, Austin, Tex. 78734.

**22d Bomb Group**
Veterans of the 22d Bomb Group will hold a reunion on August 21–24, 1985, at the Hyatt Regency Crystal City in Arlington, Va. **Contact:** Jack Clark, Box 4734, Patrick AFB, Fla. 32925. Phone: (305) 636-5004.

**41st Bomb Group**
Members of the 47th, 48th, 396th, and 820th Bomb Squadrons, 41st Bomb Group, Seventh Air Force, will hold their reunion on October 24–27, 1985, in Las Vegas, Nev. **Contact:** Gene Olsen, 2100 Meridian Park Blvd., Concord, Calif. 94520. Phone: (800) 227-2814 or (415) 825-8151.

**Class 43-G**
Members of Class 43-G (Williams Field, Ariz.) will hold their reunion on July 17–20, 1985. **Contact:** Earvie T. Cloyd, 4236 N. 34th Pl., Phoenix, Ariz. 85018.

## Coming Events

July 12–13, **Colorado State Convention,** Air Force Academy . . . July 12–13, **Pennsylvania State Convention,** Pittsburgh . . . July 19–21, **Texas State Convention,** Austin . . . July 26–28, **Florida State Convention,** Orlando . . . August 2–3, **Utah State Convention,** Park City . . . August 2–4, **Michigan State Convention,** Selfridge ANGB . . . August 2–4, **New York State Convention,** Niagara Falls . . . August 2–4, **Virginia State Convention,** Richmond . . . August 2–4, **Washington State Convention,** Bellevue . . . August 9–10, **Arkansas State Convention,** Blytheville AFB . . . August 22–24, **California State Convention,** San Diego . . . August 23–24, **North Dakota State Convention,** Minot . . . September 6–7, **Arizona State Convention,** Sedona . . . September 15–19, **AFA National Convention and Aerospace Development Briefings and Displays,** Washington D. C.

**Class 47-C**
Pilot Class 47-C "Guinea Pigs" will hold a reunion on October 10–14, 1985, in Albuquerque, N. M. **Contact:** Bob Campion, P. O. Box 1830, Richardson, Tex. 75080.

**Class 52-14C**
Members of Class 52-14C Aircraft Observer Aviation Cadets (Ellington, Mather, Waco Fields) will hold their reunion on November 7–11, 1985, in New Orleans, La. **Contact:** Hank Wolf, 32 Stonywood Rd., Commack, N. Y. 11725. Phone: (516) 543-7182.

**Class 55-C**
USAF graduates of OCS Class 55-C will hold a reunion on July 26–28, 1985, at Lackland AFB, Tex. **Contact:** Tom Callahan, 2626 Babcock, #401, San Antonio, Tex. 78229. Phone: (512) 691-2322.

**57th Bomb Wing**
The 57th Bomb Wing will hold its reunion on September 24–29, 1985, in Fort Worth, Tex. **Contact:** Bob Evans, 1950 Cunningham, Speedway, Ind. 46224. Phone: (1-317) 247-7507.

**78th Fighter Squadron**
Veterans of the 78th Fighter Squadron will hold a reunion on July 25–28, 1985, in Milwaukee, Wis. **Contact:** Kenneth J. Sweet, 4045 S. 54th St., Milwaukee, Wis. 53220. Phone: (414) 541-4015.

**79th Fighter Group**
Veterans of the 79th Fighter Group, which includes the 85th, 86th, and 87th Fighter Squadrons, will hold a reunion on August 29–September 2, 1985, at the Boston Marriott Hotel in Boston, Mass. **Contact:** Ed Newbould, 1206 S. E. 27th Terrace, Cape Coral, Fla. 33904. Phone: (813) 574-7098.

**81st Troop Carrier Squadron**
The 81st Troop Carrier Squadron will hold its reunion on October 11–13, 1985, in Montgomery, Ala. **Contact:** T. W. Bonecutter, 620 Randolph St., Wilmington, Ohio 45177. Phone: (513) 382-4351.

**90th Bomb Group**
Members of the 90th Bomb Group "Jolly Rogers" will hold their reunion on November 13–17, 1985, in San Antonio, Tex. **Contact:** Tom Keyworth, 38 Crestlyn Dr. East, York, Pa. 17402. Phone: (717) 741-3998.

**93d Fighter Squadron**
The 93d Fighter Squadron will hold its reunion on October 11–13, 1985, in Myrtle Beach, S. C. **Contact:** Dayno W. Weaver, 108 Sneden Pl. West, Spring Valley, N. Y. 10977. Phone: (914) 356-5756.

**93d Troop Carrier Squadron**
Members of the 93d Troop Carrier Squadron will hold their reunion on October 15–19, 1985, at the Holiday Inn in Cocoa Beach, Fla. **Contact:** Tom Morris, 456 St. George's Ct., Satellite Beach, Fla. 32937. Phone: (305) 773-6960.

**119th Observation Squadron**
The 119th Observation Squadron will hold its reunion on September 19–21, 1985, in Colorado Springs, Colo. **Contact:** Col.

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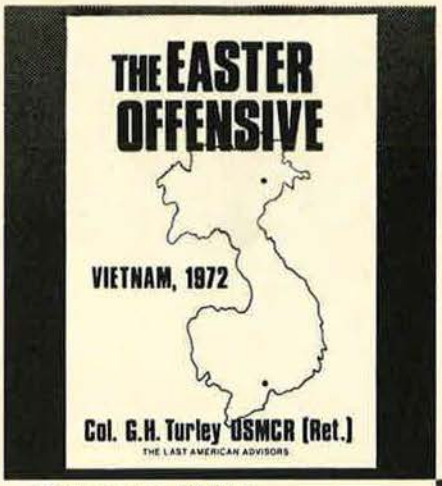


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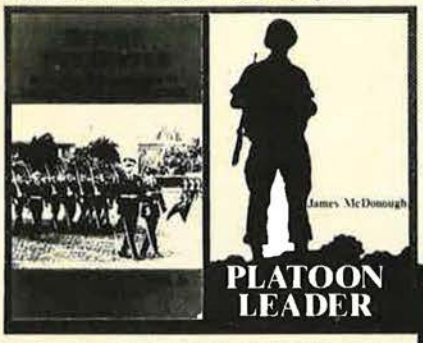


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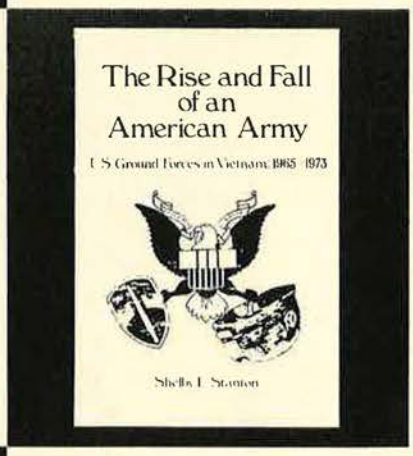


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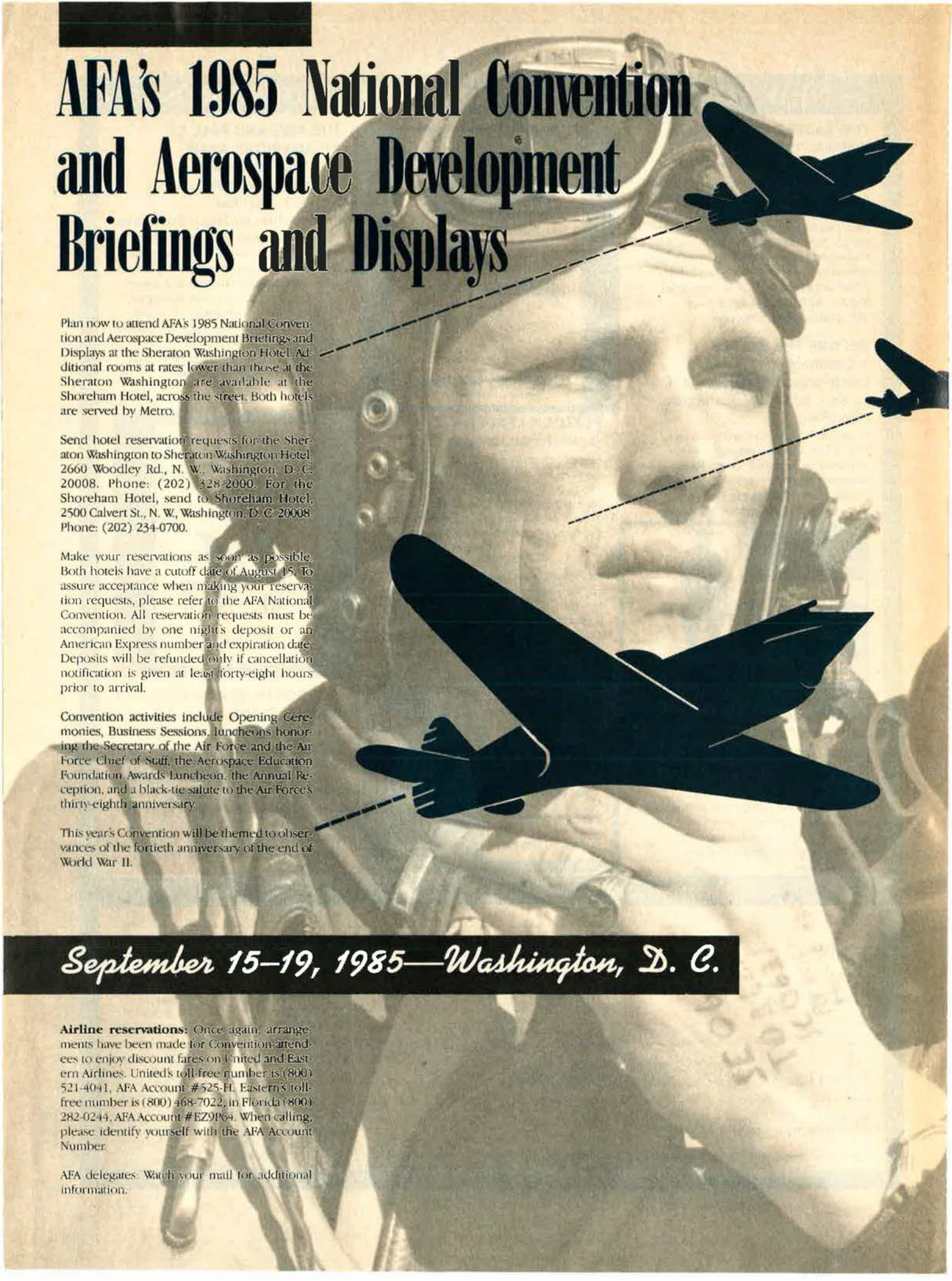
# AFA's 1985 National Convention and Aerospace Development Briefings and Displays



Plan now to attend AFA's 1985 National Convention and Aerospace Development Briefings and Displays at the Sheraton Washington Hotel. Additional rooms at rates lower than those at the Sheraton Washington are available at the Shoreham Hotel, across the street. Both hotels are served by Metro.

Send hotel reservation requests for the Sheraton Washington to Sheraton Washington Hotel, 2660 Woodley Rd., N. W., Washington, D. C. 20008. Phone: (202) 328-2000. For the Shoreham Hotel, send to Shoreham Hotel, 2500 Calvert St., N. W., Washington, D. C. 20008. Phone: (202) 234-0700.

Make your reservations as soon as possible. Both hotels have a cutoff date of August 15. To assure acceptance when making your reservation requests, please refer to the AFA National Convention. All reservation requests must be accompanied by one night's deposit or an American Express number and expiration date. Deposits will be refunded only if cancellation notification is given at least forty-eight hours prior to arrival.

Convention activities include Opening Ceremonies, Business Sessions, luncheons honoring the Secretary of the Air Force and the Air Force Chief of Staff, the Aerospace Education Foundation Awards Luncheon, the Annual Reception, and a black-tie salute to the Air Force's thirty-eighth anniversary.

This year's Convention will be themed to observances of the fortieth anniversary of the end of World War II.

## *September 15–19, 1985—Washington, D. C.*

**Airline reservations:** Once again, arrangements have been made for Convention attendees to enjoy discount fares on United and Eastern Airlines. United's toll-free number is (800) 521-4041, AFA Account #525-H. Eastern's toll-free number is (800) 468-7022, in Florida (800) 282-0244, AFA Account #EZ9P64. When calling, please identify yourself with the AFA Account Number.

AFA delegates: Watch your mail for additional information.

Ralph H. Saltsman, Jr., USAF (Ret.), 19 Wedge Way, Littleton, Colo. 80123. Phone: (303) 798-2771.

**304th Fighter Squadron Ass'n**
Members of the 304th Fighter Squadron will hold a reunion this September in Kansas City, Mo. **Contact:** Tracy P. Little, 3011 Westover St., Shreveport, La. 71108. Phone: (318) 635-2426.

**315th Bomb Wing**
The 315th Bomb Wing will hold its fortieth anniversary reunion on September 12–14, 1985, at the New Tower Inn in Omaha, Neb. **Contact:** George E. Harrington, 4600 Ocean Beach Blvd., Apt. 505, Cocoa Beach, Fla. 32931. Phone: (305) 784-0342.

**352d Fighter Group Ass'n**
The 352d Fighter Group will hold a mini-reunion along with the 8th AFHS on October 17–20, 1985, in Wichita, Kan. **Contact:** Richard J. DeBruin, 234 N. 74th St., Milwaukee, Wis. 53213. Phone: (414) 771-0744.

**354th Fighter Group**
Members of the 354th Pioneer Mustang Fighter Group will hold a reunion on October 9–13, 1985, at the Landmark Motel in Myrtle Beach, S. C. **Contact:** George Bickell, 4212 Majestic Ave., Fairfax, Va. 22053. Phone: (703) 378-6134.

**362d Fighter Group Ass'n**
The 362d Fighter Group Association will hold its convention on October 7–11, 1985, in Memphis, Tenn. **Contact:** Chuck Mann, 1525 Carol Dr., Memphis, Tenn. 38116. Phone: (901) 332-3587.

**364th Fighter Group**
Members of the 364th Fighter Group will hold a reunion on October 10–12, 1985, at the Bahia Hotel in San Diego, Calif. **Contact:** Dan Leftwich, 6630 Caldero Ct., Dayton, Ohio 45415. Phone: (513) 890-3641.

**376th Bomb Group**
The Halpro-376th Liberandos Bomb Group will hold its reunion on October 6–9, 1985, at the El Tropicano Hotel in San Antonio, Tex. **Contact:** Jack K. Brock, 507 W. Silver Sands, San Antonio, Tex. 78216.

**387th Bomb Group**
The 387th Bomb Group, along with the 556th, 557th, 558th, and 559th Bomb Squadrons, will hold a reunion in conjunction with the Confederate Air Force Airsho '85 on October 11–13, 1985, at the Holiday Inn Resort Hotel on South Padre Island, Tex. **Contact:** R. C. "Bob" Allen, 9215 Cherokee Pl., Leawood, Kan. 66206. Phone: (913) 649-6606.

**390th Bomb Group**
The 390th Bomb Group will hold its reunion on October 23–27, 1985, in Long Beach, Calif. **Contact:** John Quinn, 5257 Woodmere Fairway, Scottsdale, Ariz. 85253. Phone: (602) 990-0925.

**429th Bomb Squadron**
Members of the 429th Bomb Squadron will hold a reunion on September 20–22, 1985, in Atlanta, Ga. **Contact:** C. B. "Bennie" Couch, 5663 Mitchell Way, Douglasville, Ga. 30135. Phone: (404) 942-0414.

# INTERCOM

**449th Bomb Group Ass'n**
Veterans of the 449th Bomb Group, including the 716th, 717th, 718th, and 719th Bomb Squadrons and 348th Service Squadron, will hold their second reunion on October 24–27, 1985, in Dayton, Ohio. **Contact:** Lt. Col. Richard F. Downey, USAF (Ret.), 4859 Stanhope Dr., St. Louis, Mo. 63128.

**459th Bomb Group**
The 459th Bomb Group will hold its reunion from October 31 to November 3, 1985, in Tucson, Ariz. **Contact:** John Devney, 90 Kimbark Rd., Rochester, N. Y. 14610. Phone: (716) 381-6174.

**485th Bomb Group**
Veterans of the 485th Bomb Group will hold a reunion on October 9–13, 1985, in Brownsville, Tex. **Contact:** E. L. Bundy, 5773 Middlefield Dr., Columbus, Ohio 43220.

**490th Bomb Squadron**
Members of the 490th Bomb Squadron will hold their reunion on October 16–19, 1985, in San Antonio, Tex. **Contact:** Ivo Greenwell, Rte. 9, Box 638, Claremore, Okla. 74017.

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**Wilmington Warriors Ass'n**
The recently organized Wilmington Warriors Association would like to hear from personnel who served during World War II with the 2d Ferrying Group, Ferrying Division, Air Transport Command, New Castle AAB in Wilmington, Del.

The Association publishes a bulletin twice a year and holds annual reunions. The next reunion will be held on October 3–5, 1985, in Wilmington, Del.

Individuals desiring additional information regarding the Wilmington Warriors Association should contact the address below.

Col. Henry R. Johnston,
USAF (Ret.)
3819 N. Tazewell St.
Arlington, Va. 22207

**331st Bomb Group**
As the historian for the 331st Bomb Group, 315th Bomb Wing, I am looking for information to include in a history of the 331st. I hope to complete the project in time for the 315th Bomb Wing's reunion on September 12–14, 1985, in Omaha, Neb. Therefore, any input will be needed as soon as possible.

Please contact the address below.

Clarence M. Juett
3057 Page St.
Redwood City, Calif. 94063

Bob Stevens'

# "There I was..."

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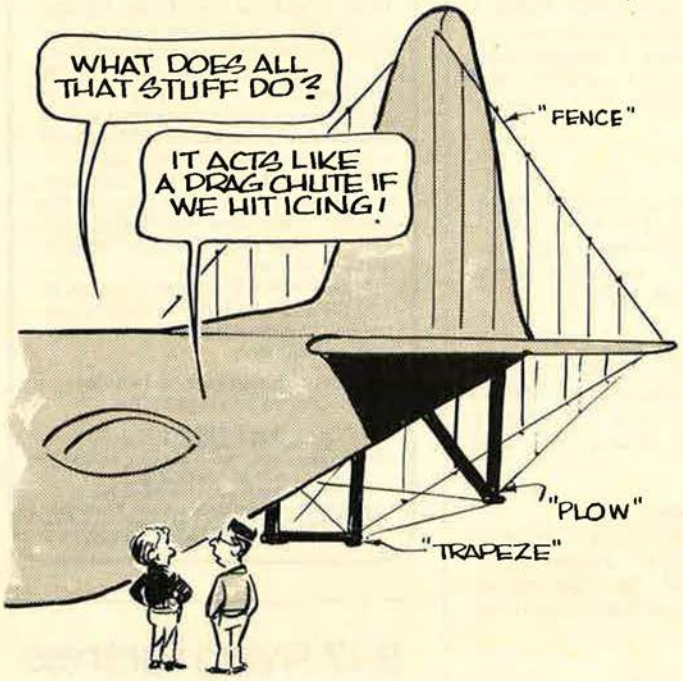


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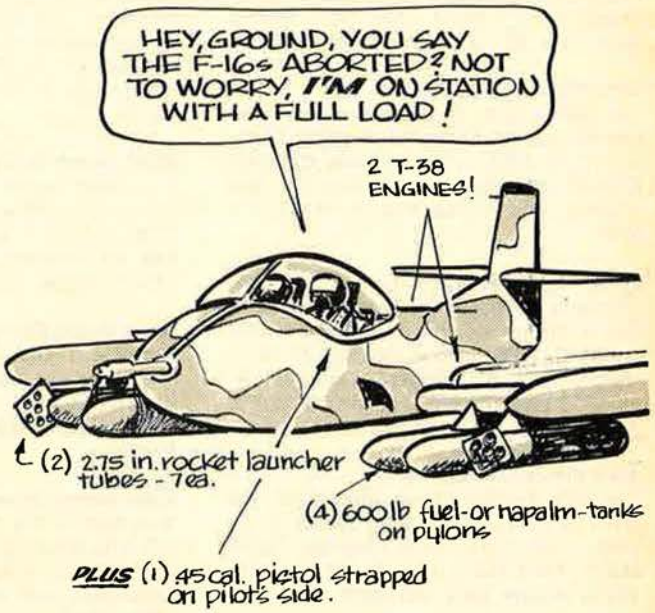


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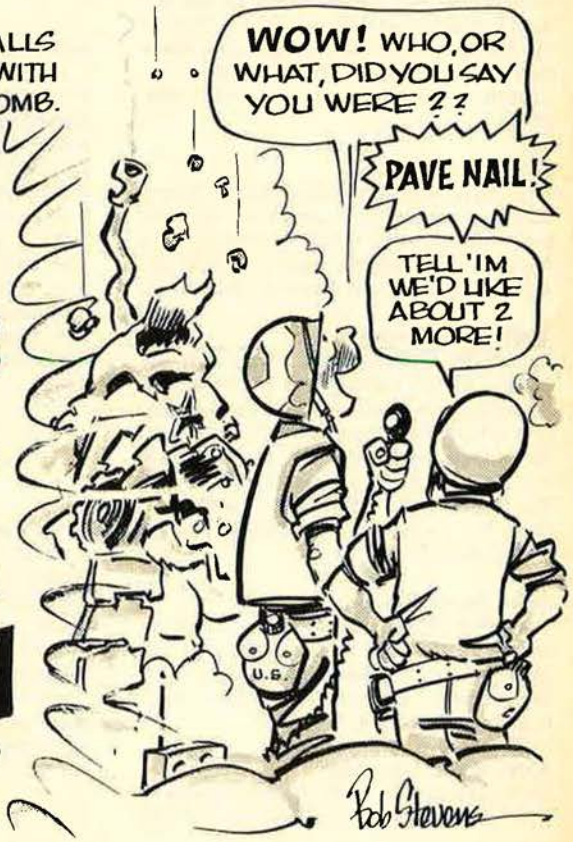

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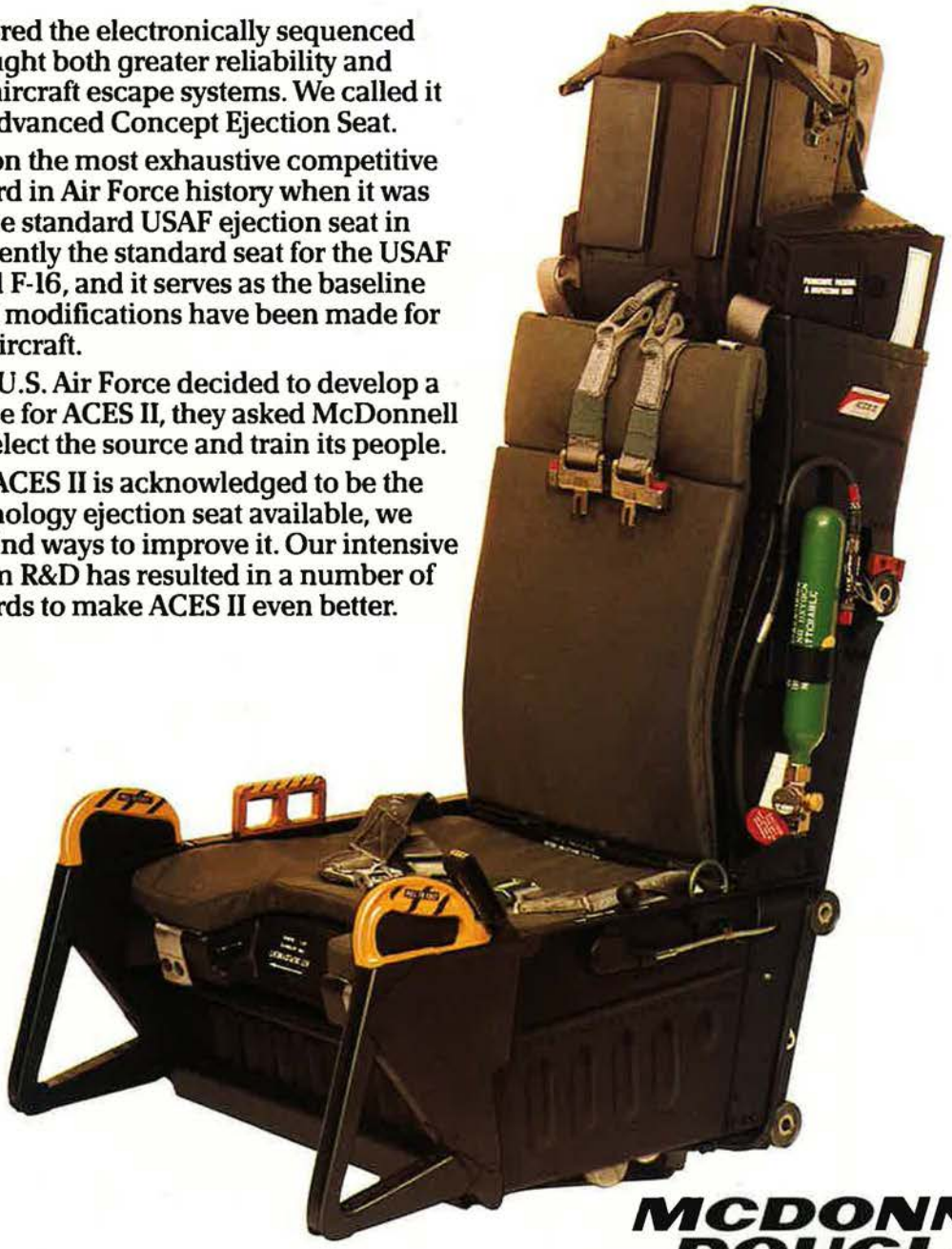

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