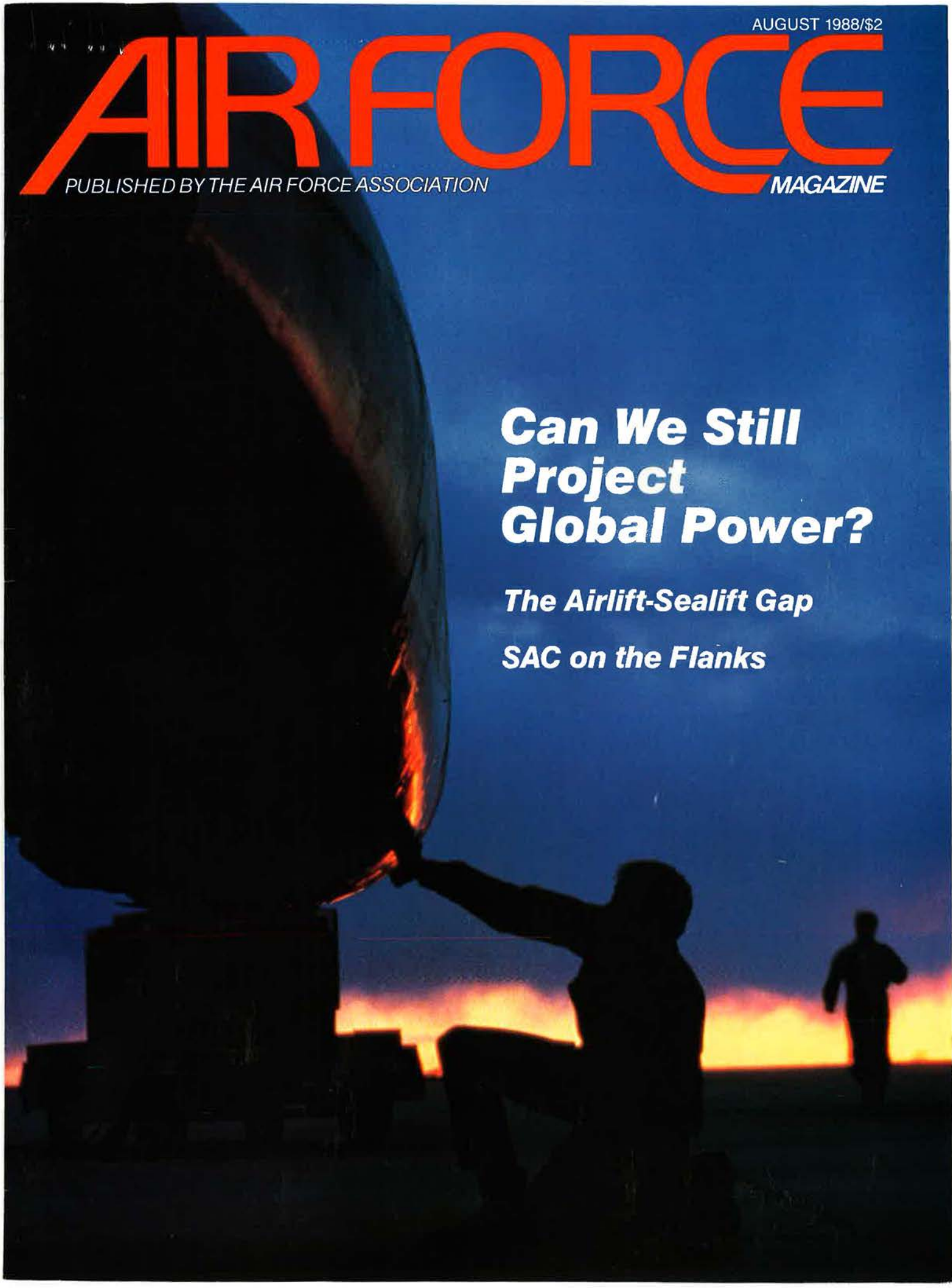
AUGUST 1988/$2

AIR FORCE MAGAZINE

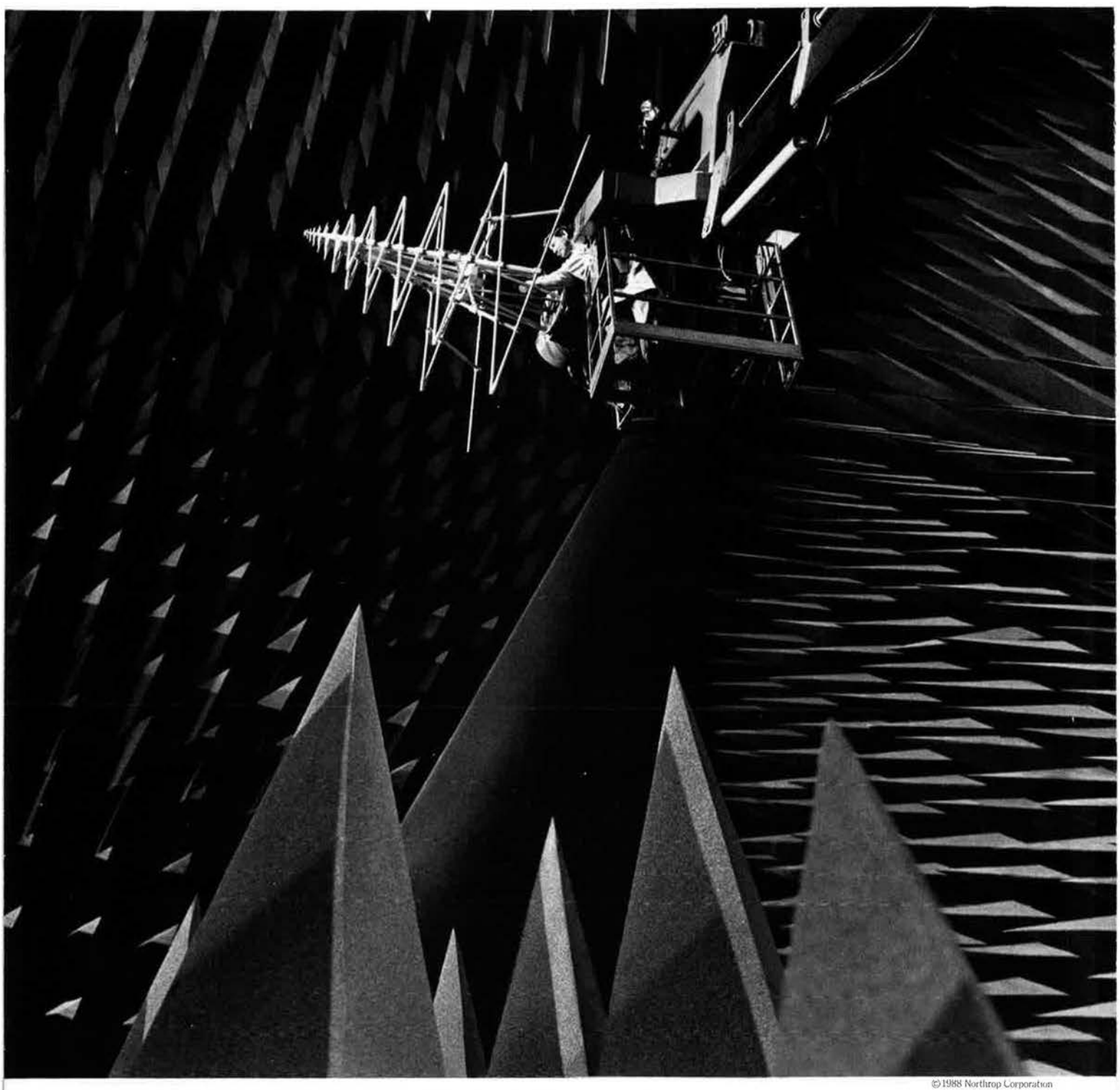
PUBLISHED BY THE AIR FORCE ASSOCIATION



Can We Still Project Global Power?

The Airlift-Sealift Gap

SAC on the Flanks



HOW CAN YOU WIN IF THE GAME NEVER ENDS?

In electronic warfare, change is the only constant. A threat emerges, a countermeasure is developed, and the cycle repeats. Winning requires technology that can meet each new challenge.

Northrop has that technology. To analyze aircraft signatures and perform threat simulation. To develop and build waveguides and hybrid circuits. To manufacture and deliver fully integrated systems.

Enhanced by a $60 million, 5 year investment in advanced ECM engineering and production capability. Assuring effective upgrades of existing systems and reduced time to develop new ones. Smart systems that automatically power manage valuable jamming resources. Reprogrammable systems that can be rapidly updated.

Across the electronic spectrum, on strategic and tactical platforms, Northrop is the nation's largest producer of integrated airborne countermeasures. Providing combat pilots with the electronic defenses they need to do the job, and win.

NORTHROP

Making advanced technology work

Defense Systems Division, Electronics Systems Group
600 Hicks Road, Rolling Meadows, IL 60008-1098

The next step for SAM.

The Gulfstream IV. As the C-20F Gulfstream, it will be the perfect partner for the C-20 Gulfstreams already at work with Special Air Missions at Andrews Air Force Base.

Almost every day of every week, our nation's government and military leaders are being flown somewhere in the world in a C-20 Gulfstream, the U.S. Air Force version of our Gulfstream III executive jet.

In fact, the C-20 Gulfstreams have proven to be so versatile, so dependable since they began entering service in 1983, that SAM is utilizing them at rates averaging nearly 50% over initial projections. And operating cost savings add up with every mission they fly.

The newest generation of Gulfstream jets can enlarge this effectiveness.

For example, it makes non-stop missions of nearly 5,000 statute miles in about 9.5 hours a reality, even against prevailing winds. SAM would enjoy greater flexibility in flight planning and crew scheduling, as well as more cost-effective utilization of aircraft types, particularly on long overseas missions.

This amazing airplane has the most advanced technology in computerized flight management integrated with electronic flight instrument systems. As a result, SAM flight crews would command a transport aircraft with more capabilities for conducting safe, well-managed missions than most commercial airliners provide.

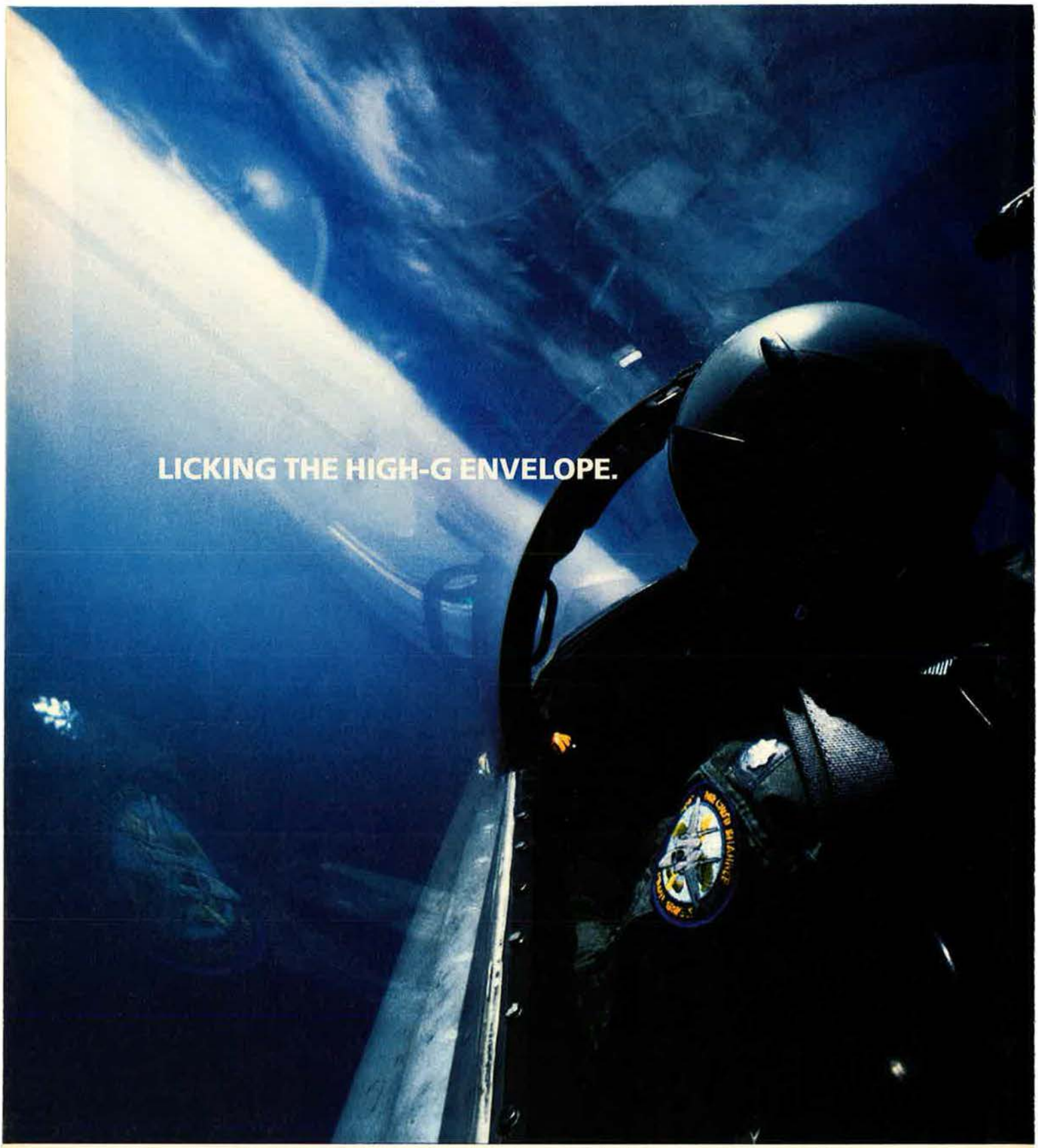
Operating cost savings also would compound at an even faster rate because of the increased fuel efficiency of its new Rolls-Royce Tay engines; the design improvements and reduced maintenance requirements of its many new aircraft systems; and the significant commonalities it has with the C-20 Gulfstream in maintenance procedures, spares supply and support programs.

The way we see it, the Air Force took a big step forward when it began operating its present C-20 Gulfstreams.

When SAM steps into the next generation of Gulfstream jets, it will prove to be a quantum leap.

For more information about maximizing Gulfstream jet aircraft in military applications, contact: Larry O. Oliver, Regional Vice President, Military Requirements, Gulfstream Aerospace Corporation, 1000 Wilson Blvd., Suite 2701, Arlington, Virginia 22209 U.S.A. Telephone (703) 276-9500.

Gulfstream Aerospace
A CHRYSLER COMPANY



No longer is the pilot the limiting factor in high-performance combat aircraft. Not if his pressure suit (or Tactical Life Support System) is controlled by Fluid Systems' Anti-G Valve.

Digital technology and an electronically controlled two-stage poppet offer virtually instantaneous response. Full valve opening in 100 milliseconds. Full suit inflation in one second. With pressure tolerance within one percent.

Wired to the aircraft's flight computer, our Anti-G Valve can even anticipate and react to G-loads before they're incurred.

Keeping a pilot's performance sharp and his aim deadly. Whether your program is on the drawing board or a retrofit. If you want your jocks to stay top guns, we've got the problem licked.

Fluid Systems Division, 1300 West Warner Road, Tempe, Arizona 85284. (602) 893-4428.

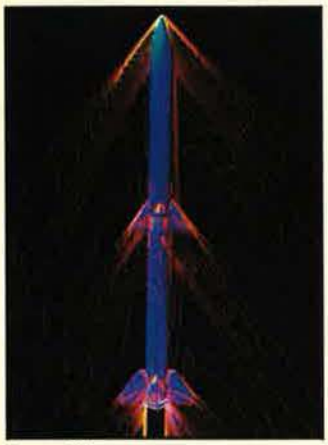
Allied-Signal Aerospace Company

Allied Signal

AUGUST 1988
VOLUME 71, NUMBER 8

AIR FORCE MAGAZINE
PUBLISHED BY THE AIR FORCE ASSOCIATION

Page 62



Page 74

About the cover: Maintenance troops from the 7th Bomb Wing inspect a KC-135 under forward-base conditions at Clinton-Sherman, Okla. A special section on "Airlift and Power Projection" begins on p. 38. (USAF photo by A1C Peter A. Trentacosta)

Special Section: Airlift and Power Projection

Features

Departments

AIR FORCE Magazine (ISSN 0730-6784) August 1988 (Vol. 71, No. 8) is published monthly by the Air Force Association, 1501 Lee Highway, Arlington, Va. 22209-1198. **Phone** (703) 247-5800. Second-class postage paid at Arlington, Va., and additional mailing offices. **Membership Rate:** $21 per year; $48 for three-year membership. **Life Membership:** $300. **Subscription rate:** $21 per year; $25 per year additional for postage to foreign addresses (except Canada and Mexico, which are $8 per year additional). Regular issues $2 each. Special issues (Soviet Aerospace Almanac, USAF Almanac issue, and Anniversary issue) $5 each. **Change of address** requires four weeks' notice. Please include mailing label. **POSTMASTER:** Send change of address to Air Force Association, 1501 Lee Highway, Arlington, Va. 22209-1198. Publisher assumes no responsibility for unsolicited material.

An Editorial

The Hard Realities of War

By John T. Correll, EDITOR IN CHIEF

AMONG the many horrors of war, the death of noncombatants has always stood apart as a special kind of tragedy. Thus the world reacted with great emotional intensity to the news on July 3 that the US Navy had shot down an Iranian airliner in the Persian Gulf.

As this is written in early July, information about what happened is still trickling in. Various facts are in dispute, and the comprehensive inquiry has just begun. Nevertheless, the instant analysts were out early and in full force.

A predictable contingent of them quickly interpreted the event, variously, as an instance of military bungling, a failure of technology, or reckless disregard for human life. More than anything else, these judgments are an extension of pet theories held previously by the analysts or, in some cases, a demonstration of a weak grasp of military matters. For the moment, we will leave the conclusion-jumpers to their sport and comment in a broader context on some hard realities of war.

One such reality is that modern technology may be able to reduce the ambiguity of battle, but offers little hope of eliminating it completely. It may seem to those who develop their opinions introspectively that the radar and computers on the missile cruiser *Vincennes* ought to have made everything perfectly clear in a flash on July 3. Operational military systems are nowhere near so omniscient. IFF (Identification, Friend or Foe) still depends on a combination of radar data and other information, much of it subjective. Radar is getting better. So is IFF. But these capabilities do not promise to remove the element of uncertainty from warfare, and neither does anything else.

Given the speed and range of modern weapons, fighting forces cannot wait to see the whites of the enemy's eyes before opening fire. They must make the best decision they can with the information they have, and they must do it fast. In May 1987, the US destroyer *Stark* hesitated in the face of ambiguity in the Persian Gulf and was hit by an Exocet missile that killed thirty-seven seamen.

A second reality of war is that it is terrible. Once military power is unleashed, it is seldom possible to control—or even foresee—what comes next. The leadership of the armed forces, sometimes accused of excessive reluctance about ventures that might lead to combat, understands this. Others, who are more willing to commit forces for symbolic reasons or who think that military power can be applied in carefully measured increments, may not. Losses and casualties are inherent parts of war. Unfortunately, inadvertent death and destruction are probable, too.

There is no such thing as warless war. Military force is the most awesome of all instruments of power and should not be employed with casual thought.

This was the message of the 1984 "Weinberger Doctrine," named for the then-Secretary of Defense Caspar W. Weinberger, which warned the nation to be very sure of the necessity and firm in its intentions before committing forces to combat.

It should not need restating, but perhaps it does, that the Persian Gulf is in the middle of an active war zone. Eight years of fighting there have taken more than a million casualties. There have been hundreds of attacks on ships in the Gulf itself, and minutes before firing on the airliner, the *Vincennes* had been engaged against Iranian gunboats.

It is foolish to expect life to go on as usual in a war zone. This perspective seems to have escaped some air traffic controllers in the vicinity, though. They say they are annoyed by US Navy challenges to airliners flying overhead and that this causes inconvenience to normal operations. One official complained that American warships "don't understand how to operate around civilian traffic."

Despite the casualty toll, the Gulf War is widely perceived as a "low-intensity conflict" because nuclear weapons have not been used and the battlefield tactics are reminiscent of an earlier era. It is a mistake—and a potentially dangerous one—to think of any armed conflict, low-intensity or otherwise, as a thing apart from the regular spectrum of warfare. This miscalculation is further evident among those who are enthusiastic about Special Operations forces for the wrong reason: They see them as a comparatively safe means of conducting war on the cheap and keeping the casualties down. Anyone who has watched an AC-130 Special Operations gunship at work is likely to hold a different opinion.

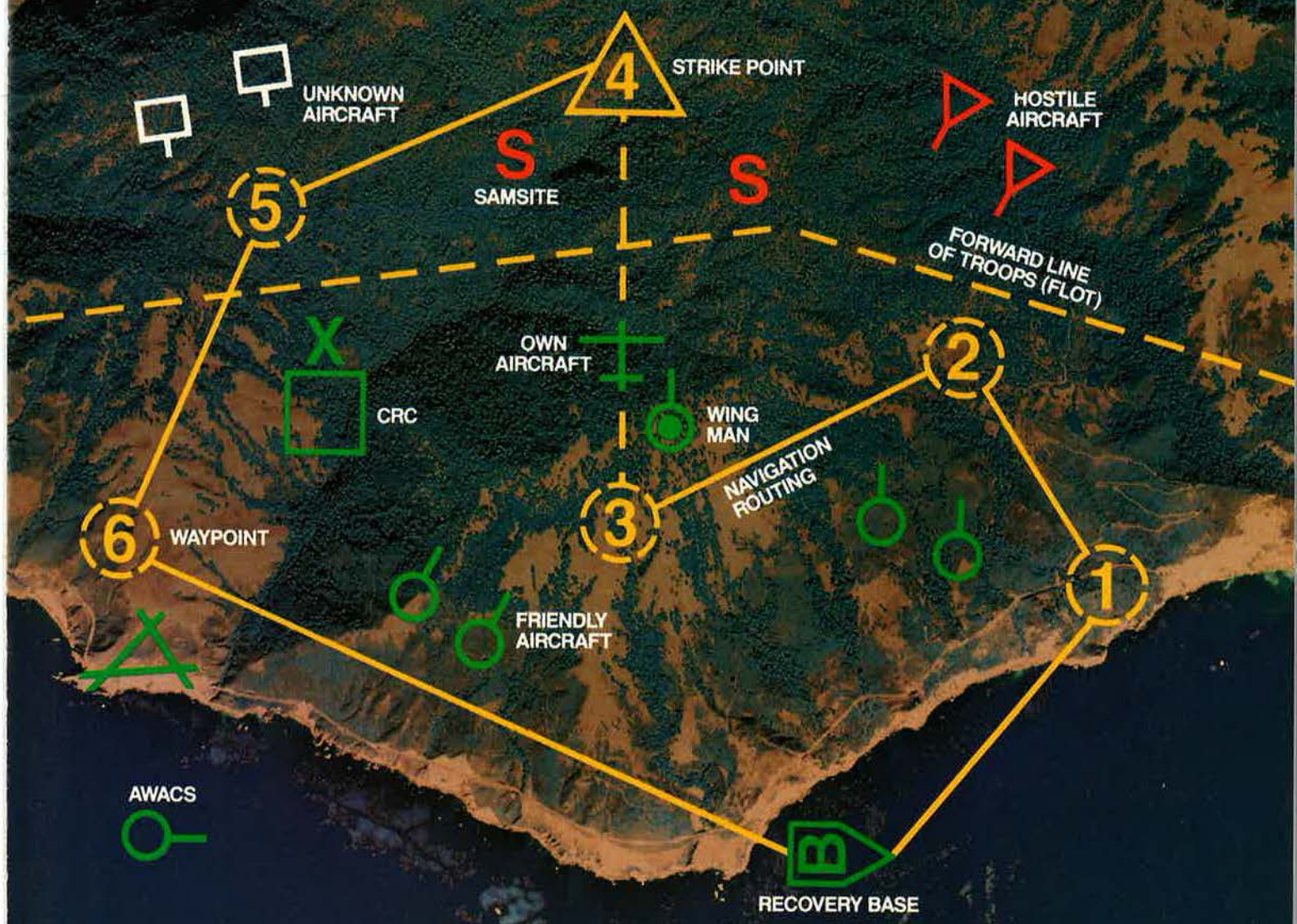
The circumstances surrounding the destruction of Iran Air Flight 655 will be explored endlessly in the months ahead. There will also be much soul-searching about whether American warships ought to be in the Gulf at all. Clearly, the resources of this suffering region are vital to our national interest. That has been recognized in policy at least since January 1980, when the Carter Doctrine pledged that the United States would defend its interests in the Gulf "by any means necessary, including military force."

The question is whether the nation is prepared to accept the consequences and risks that go with such a policy. And that is not a hot potato that the politicians can toss to the Pentagon. As former Secretary of the Navy James H. Webb, Jr., once said, "Nations make war. Soldiers merely fight them."

Eighty percent of the Americans responding to a Washington *Post*-ABC News poll soon after the shootdown accepted the incident as a mistake. It will be instructive to see if this opinion shifts as we analyze at our leisure a decision that the captain of the *Vincennes* made in a few minutes under combat pressure.

We will no doubt learn more about what happened in the Gulf on July 3. But we may also discover some fundamental truths about how well we as a nation comprehend the hard realities of war. ■

TRI-SERVICE JTIDS: NOW NOBODY'S IN THE DARK.



You're in a high-threat tactical environment. Imagine being able to see at a glance the entire battle scenario. Now, for the first time, U.S. forces will have real-time interoperable data to maximize tactical situational awareness on land, sea and in the air. This system capability is provided by the Joint Tactical Information Distribution System (JTIDS).

Contact: Collins Government Avionics Division, Rockwell International, Cedar Rapids, Iowa 52498. (319) 395-2208. Telex 464-421 COLLENGR CDR.

Rockwell International

...where science gets down to business

Aerospace / Electronics / Automotive
General Industries / A-B Industrial Automation

COLLINS AVIONICS


Magnavox
Magnavox
The new EHF SCOTT SATCOM terminal is C³I for ground forces. Like the U.S. Army it serves, SCOTT is rugged and ready to travel. Anywhere it's needed. Any time. Installed in an S-250 shelter. Mounted on the Army's CUCV. SCOTT is a new dimension in battlefield C³I.
And SCOTT survives. Integrated with Milstar, the Magnavox SCOTT terminal features state-of-the-art...
• EHF transmitter/receiver
• EHF antenna technology
• Advanced signal processing
It's C³I the Army and other ground forces can count on every time.
SCOTT—THE C³I SURVIVOR
From HF to EHF. Magnavox spans the spectrum — to give American ground forces the mobile, survivable C³I they need now.
Magnavox
Electronic Systems Company
Northern Virginia Systems Group
120 Ashburn Road
Ashburn, Virginia 22011
(703)478-4000

Airmail

The Threat

The editorial "Where's the Threat?" in the June 1988 issue of AIR FORCE Magazine seems to assume that Mikhail Gorbachev is just another General Secretary.

He isn't. Unlike most of his predecessors, he realizes that the Soviet economy is in terrible shape and that unless the Soviet Union pulls up its socks reasonably soon, it will be in even bigger trouble than it is now.

Unfortunately for Gorbachev, the biggest obstacle to getting the Soviet economy on its feet is the oversized and incredibly inefficient bureaucracy, of which the function of the top level is not to manage the country but to maintain its privileges. The means Gorbachev has chosen to deal with this situation are ones that no other General Secretary has dared to try: To point out that what passes for the history of the Soviet revolution is not "holy writ" after all and to appeal to the people and, what is more important, to the grass-roots bureaucracy (which does all the work) for support, going over the heads of the top-level bureaucracy.

Evidence of what Gorbachev is up to—including a lot of things that Kremlinologists have been saying can't possibly happen—abounds. The current crop of Soviet school graduates will not have to take a written test in history because the current textbooks are, says *Izvestia,* out of line with the facts. *Novy Mir* says that Lenin was excessively harsh in abolishing private property, and the Associated Press quotes one Yuri Afanasyev as saying that Trotsky—up to now described by the Soviet history books as a combination of Benedict Arnold, Simon Legree, and Jack the Ripper—was accused on false evidence and should be rehabilitated.

Finding error in the theoretically errorless Soviet system is a procedure not without risks. In the first place, nobody whose power and influence are likely to be "perestroika'd" out of existence by Gorbachev's brave new world is going to give in without a struggle; secondly, angling for popular support generates rising expectations, and all of those Tatars, Armenians, and people in what used to be the Baltic states—none of whom has ever been crazy about Russian domination—are finding out that they can demonstrate in the streets without necessarily winding up in a prison camp. . . . Gorbachev's message seems to be, "So long as you don't insist on seceding from the Union, I will be sensitive to your needs."

Your editorial says that Gorbachev did not agree to the missile drawdown "as a concession to the West, but rather because he believed that it was the course of greatest advantage to the Soviet Union." Gorbachev's intentions are immaterial. Diplomacy is not a procedure whereby we exchange polite conversation with our friends; it is the art of inducing people whom we do not necessarily approve of to enter into agreements that are to our advantage, usually by offering in exchange something they badly need and won't get unless we cooperate.

The history of the Soviet revolution has been characterized by the fact that what we are assured is a diabolically clever Soviet plan to conquer the world keeps getting postponed by increasingly long chunks of time. At first, it was: "In five years, we will conquer the world." Later, it was: "In ten years, we will conquer the world."

If the United States, by means of not particularly wily diplomacy, continues what economics has begun, there is no reason why Armageddon cannot be postponed indefinitely.

Lt. Col. Frank Holan,
USAF (Ret.)
Putney, Vt.

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.

Three cheers for John T. Correll's insightful analysis of the current Kremlin smokescreen called *glasnost* as spelled out in his June 1988 editorial "Where's the Threat?"

The Soviets have figured out the American media—show us a leader who smiles, and everything else is forgotten. On the surface, some of the methods have changed, but the objectives are still the same. Publicly admit a few failures, and our media assumes that all is new *and* good.

Let's see some real changes—real reductions in conventional troops in Europe by Mr. Gorbachev, real improvements in human rights, real autonomous governments in their European satellites. The day the Berlin Wall goes down is the day that decades of consistent Soviet behavior is reversed. Maybe then we can truly believe.

Or should we?

Terry S. Baugh
Grand Rapids, Mich.

Special Operations

Jeffrey P. Rhodes's June 1988 article "Any Time, Any Place" provided a thorough insight into the Air Force special operations component force structure, its ongoing enhancements, and its relation to the US Special Operations Command (USSOCOM). However, it failed to address a high congressional and DoD priority—enhancement of special operations forces (SOF) command and control (C^2).

In response to the requirement for upgraded tactical communications, Military Airlift Command initiated the SOF C^2 Upgrade Program in 1983. Program funding over the '87 Five-Year Defense Plan is a relatively low amount that will provide a quantum leap forward in deployable C^2 capabilities. The program directs acquisition of off-the-shelf radios, computers, I/O terminals, and imagery equipment, most of which will be integrated into mobile communications and intelligence vans. It also addresses preprogrammed product improvements so that equipment can be enhanced as new technologies evolve.

AIR FORCE MAGAZINE
PUBLISHED BY THE AIR FORCE ASSOCIATION

Publisher
Charles L. Donnelly, Jr.

Associate Publishers
Charles E. Cruze, Richard M. Skinner

Editor in Chief
John T. Correll

Senior Editors
James W. Canan, Robert S. Dudney

Aeronautics Editor
Jeffrey P. Rhodes

Staff Editor
Colleen A. Nash

Military Relations Editor
James A. McDonnell, Jr.

Contributing Editors
John L. Frisbee
Brian Green
Gen. T. R. Milton, USAF (Ret.)
John W. R. Taylor ("Jane's Supplement")

Managing Editor
Richard M. Skinner

Assistant Managing Editor
Hugh Winkler

Director of Production
Robert T. Shaughness

Art Director
Guy Aceto

Research Librarian
Pearlie M. Draughn

Editorial Assistants
Grace Lizzio, Daniel M. Sheehan

Administrative Assistant
Ronda M. Ryan

Advertising Director
Charles E. Cruze
1501 Lee Highway
Arlington, Va. 22209-1198
Tel: 703/247-5800
Telex: 44-0487 COURTESY
Telefax: 703/247-5855

Director of Marketing Services
Patricia Teevan—703/247-5800

Assistant Director of Marketing Services
Elizabeth B. Smith—703/247-5800

AREA ADVERTISING MANAGERS
East Coast and Canada
By Nicholas—203/357-7781

Midwest
William Farrell—312/446-4304

West Coast
Gary Gelt—213/641-7970

UK, Benelux, France, Scandinavia, Germany, and Austria
Richard E. Ewin
David Harrison
Overseas Publicity Ltd.
46 Keyes House
Dolphin Square
London SW1V 3NA, England
Tel: (44) 1-834-5566
Telex: 24924 OPLIM G
Telefax: (44) 1-630-5878

Italy and Switzerland
Dr. Vittorio F. Negrone, Ediconsult Internationale S.A.S. Piazzo Fontane Marose 3
16123 Genova, Italy
Tel: (010) 543659
Telex: 211197 EDINTI
Telefax: 10-566-578

BPA Circulation audited by Business Publication Audit

Airmail

To date, thirty-five additional personnel have been added to operate and maintain newly acquired equipment. They are assigned to one of three recently created Special Operations Contingency Communications Elements (SOCCEs), which have been patterned after similar existing units at Twenty-first Air Force and Twenty-second Air Force. Once fully manned, each SOCCE will consist of forty-nine personnel.

When employing an appropriate force at the appropriate time and at the appropriate location, precise command and control of that force is absolutely critical. The men and equipment being added under the SOF C^2 Upgrade Program will make this possible in today's rapidly changing environment.

Maj. Terry J. Mallon, USAF
Scott AFB, Ill.

Specified Command?

The article "New Clout for the CINCs" in the June 1988 issue contains what, on the surface, appears to be an administrative oversight in its failure to list Military Airlift Command (MAC) as a specified command along with SAC and Forces Command. Better not wipe MAC off the books just yet—here's why.

On October 1, 1988, if the US Transportation Command (USTRANSCOM) is declared fully operational, then strategic airlift forces will be chopped to DoD's newest unified command. But here's the problem: What of the tactical airlift force, which is currently not in the USTRANSCOM charter? Most people would agree that a C-130 is not a strategic airlift asset; however, what about a C-130 flying nonstop from the US to Grenada in support of Operation Urgent Fury? The distinction between strategic and tactical airlift becomes really confused when the C-17 is brought into the picture.

Both MAC and SAC were made specified commands for several good and valid reasons. One of these was the need for responsive support by eliminating layers of bureaucracy. This allows for JCS-to-CINC coordination instead of time lost coordinating through a service headquarters and then to the component command. These good and valid reasons have not gone away with the formation of USTRANSCOM. Additionally, MAC's "significant others," such as special operations forces, will find the going tough not being part of either a specified command or a unified command.

Finally, it is difficult to assess if USTRANSCOM is "fully operational," since there is little to no funding available to test its capability prior to October 1, 1988. Just because a command is able to coordinate lift requirements in peace doesn't mean it can do it in war. The forces need to be exercised. No one can argue against the need for better joint operators, but neither can we jeopardize our warfighting capability to allow for smoother peacetime operations.

Perhaps a solution is to combine all lift assets from MAC, Military Sealift Command, and Military Traffic Management Command into a single, "purple-suit" entity.

Maj. Dick Blanchet, USAF
Scott AFB, Ill.

• *Major Blanchet makes some interesting points concerning MAC's role and future as a specified command. They were not especially pertinent to the magazine article in question, however. The illustrations accompanying the article identified US Transportation Command as an example of a unified command, but not MAC as a specified command, because MAC—despite the lingering issues mentioned by the Major—is now a component of the newer USTRANSCOM.*—THE EDITORS

Keeping Covered

Your June 1988 cover photo of the Army's 7th Light Infantry participating in a joint-service exercise in Honduras identifies quite a paradox.

DoD spends millions to paint aircraft in order to increase survivability. We wear camouflage all over our bodies and wear subdued watches. However, we then issue the soldier what appears to be an ordinary, garden-variety shovel (no green paint) and insert what appears to be a white tube in the end of a bedroll for the world to see.

Our concentrated effort to increase our survivability in combat (simulated or not) goes down the tubes when we do not pay particularly close attention to details. Aren't those the ones that ultimately make the difference between life and death?

Capt. Ted Beck, USAF
Maxwell AFB, Ala.

Overlooked Anniversary?

Re: The "June Anniversaries" box on page 36 of the June 1988 issue.

I was somewhat disappointed to notice that June 6, 1944, was not even mentioned in the "June Anniversaries" box. Unless I missed another ar-

Strap yourself into the cockpit with these exciting new videos.

Jet Fighter

An exciting overview of America's current front-line jet fighters that puts you in the cockpit for a 9G ride you won't soon forget. This is a close-up look at the F-14, F-15, F-16, F/A-18, and the new F-20. *Jet Fighter* puts you in the cockpit so you can experience dogfights and weapon demonstrations that will leave you speechless. *All action!*

FG 9101 **45 Minutes** **$39.95**

Combat Helicopters

The remarkable versatility of the helicopter is revolutionizing modern warfare. From the land and sea the helicopter is a crucial newcomer on today's battlefield. Action footage includes "tank killing" savagery never before released for public viewing. Over twelve different combat helicopters are featured in this visually stunning and exciting program.

ST 0200 **60 Minutes** **$59.95**

Breckenridge Air Show '87

Witness all the action, sights, and sounds of the tenth annual Breckenridge Air Show. See the aerobatics and battle recreations that feature Spitfires, Howard Pardue's Bearcat, P-40s, B-25s, Corsairs, Wildcats, and more.

PF 8555 **90 Minutes** **$39.95**

Escort: The P-51 Mustang

From the Mustang's development to her glory days as deep escort into Germany, this action-packed film is the definitive record of the legendary P-51. Made with the cooperation of the USAF, interviews with combat pilots including Ace Donald Strait (13½ kills) are interwoven with superb air-to-air and in-the-cockpit footage.

TC 1000 **60 Minutes** **$39.95**

Eagle Country

Have you ever dreamed of flying in the world's hottest fighter aircraft? The F-15 Eagle's superior dogfight capabilities will keep you at the edge of your seat as the F-15s go head-to-head against F-14s, F-16s, and F/A-18s. This one is for anyone interested in aviation!

ST 6015 **85 Minutes** **$59.95**

The Red Baron

This is the story of Manfred von Richthofen, WWI's premier ace who shot down 80 Allied planes! This Ace of Aces was the greatest aerial tactician of World War I. Included are interviews with the last surviving pilots who flew with and against him. Excellent WWI dogfight footage, crashes, and The Red Baron's last flight are highlighted in this compelling story of the most legendary personality in the annals of aviation.

TN 2215 **60 Minutes** **$29.95**

Military Video Report #1

Rare Vietnam air combat footage, including MiG shootdowns, highlights this exciting film featuring legendary Thud pilot Leo Thorsness. Also included is outstanding air-to-air footage of the F-4 MiG killer. *All Action!*

PC 8011 **60 Minutes** **$39.95**

Military Aircraft Video Report #2

The Blue Angels put on a great show in their brand new F/A-18s. Also included is rare footage of the F-8 Crusader's first supersonic flight, and sit back and enjoy the fast-paced world of the S-3 Viking. Also included are special profiles of the latest F-15E, A-7 upgrade project, and the Navy F-16. If you're into military aircraft, this is for you.

PC 8012 **60 Minutes** **$39.95**

Air War In Vietnam

The most awesome display of aerial firepower ever unleashed was in Vietnam. *Air War In Vietnam* uses the pick of air combat footage to tell the story from the first U.S. advisor to the massive U.S. bombings. Also included is captured North Vietnamese footage of their antiaircraft defenses.

ST 6016 **60 Minutes** **$59.95**

VIDEO PICK-OF-THE-MONTH

KAMIKAZE

One of the most extraordinary films is now available on video. Witness the raw realism amid the heat of battle as camera crews captured the horror of the Kamikaze. For 82 days the Japanese launched a "one-way air force" that sunk 164 allied ships and caused more than 10,000 casualties. This was the advent of the "human death machine." *Gripping!*

NF 1100 **B&W** **84 Minutes** **$29.95**

Send $2.95 for your FUSION catalog, or receive FREE with your order.

The Air Force At War
S • E • R • I • E • S

Volume 1: Wild Blue Yonder

The Unite States Air Force Story: The story of the American "Flyboys" from the first war plane in 1909 is vividly told in this fascinating program.

MP 1184 **45 Minutes** **$29.95**

Volume 2: Target For Today: The 8th Air Force Story

This is the definitive film, utilizing rare authentic footage of 24 hours in the life of a WWII 8th Air Force bomber crew from the first weather report to final debriefing.

VC 7010 **90 Minutes** **$29.95**

Volume 3: Hell Over Korea

A gripping account of the savagery of Bloody Ridge, T-Bone, Punch Bowl, and The Battling 24th with it's back to the wall at Pusan. A handful of P-51s flew 24-hour air strikes to slow five North Korean divisions sweeping across the 38th.

FG 2973 **100 Minutes** **$39.95**

Volume 4: Vietnam: The Weapons of War

Vietnam was a war fought in the jungles and in the sky. Each type of fighting required special "weapons of war." This film documents the role of advanced American military weapons in Vietnam. The footage of firepower has never been matched anywhere on a video cassette.

NE 7636 **98 Minutes** **$29.95**

SAVE $20

Order the entire Air Force at War Series

PP 4396 **4 Volumes** **Now Only $99.80**

TO ORDER, please send check, money order or credit card (no cash) to:

FUSION VIDEO

17214 So. Oak Park Ave. - Dept. AF 8808 - Tinley Park, IL 60477

ALL CASSETTES ARE VHS ONLY.

1-800-338-7710 Inside Illinois 312-532-2050

Name _____

Address _____

City _____ State _____ Zip _____

☐ **YES!** Please send me a FUSION CATALOG with my order.

☐ I am enclosing $2.95 for a FUSION CATALOG.

CASSETTE NUMBERS

Bill my credit card: ☐ Visa ☐ Master Charge

Account Number Expiration Date

Authorization Signature of Cardholder

Video Cassette Total $ _____

Shipping & Handling $3.95

TOTAL Amount $ _____ Illinois residents add 7% sales tax.

For Faster Service, Call Our 24-Hour Toll-Free Hotline: 1-800-338-7710

F-16 ... Perfect Choice For CAS/BAI.

The battlefield of the 90's will be a fluid, high-threat environment. Aircraft employed in Close Air Support/Battlefield Interdiction roles must be responsive and flexible to meet commanders' constantly changing needs.

The multi-mission F-16 incorporates advanced avionics and weapon systems into a rugged airframe. Its maneuverability and high reliability enable it to survive CAS/BAI missions under any weather, day or night, while delivering a wide variety of ordnance with pinpoint accuracy.

The F-16 ... combat proven ... perfect choice for Close Air Support and Battlefield Interdiction roles.

GENERAL DYNAMICS

A Strong Company For A Strong Country

ticle, that very important date in Air Force history was not mentioned in the magazine anywhere.

Surely the role played by the Army Air Forces on D-Day—the Normandy invasion—deserves at least a "one-liner."

Col. Billy M. Raby, USAF (Ret.)
Bend, Ore.

• *Colonel Raby is correct in noting that the D-Day invasion of Normandy was not mentioned in the June 1988 issue. Readers of the monthly "Anniversaries" box are encouraged to note, however, that the "Anniversaries" box is not meant to be an all-inclusive listing of significant aerospace dates. Since the feature is expected to be a long-running one, the monthly box lists* selected *significant dates at five-year and ten-year marks. Thus, the date of the D-Day invasion will appear in the "Anniversaries" box in the June 1989 issue.*

Readers are encouraged to submit suggestions for "Anniversaries" listings to Aeronautics Editor Jeffrey P. Rhodes, who compiles the "Anniversaries" box. Bear in mind that space limitations dictate that not all suggestions can be used.

Incidentally, Colonel Raby may be interested in Contributing Editor Gen. T. R. Milton's essay on D-Day, "Airpower Made D-Day Possible," in the June 1984 issue.—THE EDITORS

Close Air Support

Let me make sure I understand this.

Chuck Myers *(see "Airmail," p. 9, June '88 issue)* has determined that the Air Force is experiencing "agony" on the close air support (CAS) issue. Air Force efforts to maintain a viable force structure are "pathetic." The Air Force men and women responsible for the CAS mission are not engaged in "career-enhancing activity." The "heavily endowed" USAF factions should conduct "an experiment" to find a better way to get the job done.

Should there by any doubt as to the wisdom of this philosophy, a Luftwaffe colonel who was shot down more than thirty times in a war fought forty-five years ago is cited as an authority. Heavy stuff!

While Mr. Myers is certainly entitled to air his views and does so eloquently, he has been unable to find any Army or Air Force combat commanders who agree with him. On the other hand, he has found enough support in Congress and DoD to cause millions of dollars to be spent on countless studies of the CAS mission. Funding for these studies comes at the expense of force structure. I assume funding for Mr. Myers's "experiment" would come from the same place.

I offer an alternative to the DoD and congressional leaders Mr. Myers addresses. Survey a sampling of airmen with extensive combat experience, and a thorough understanding of the capabilities and limitations of today's airpower. Find out what they think.

I'm sure tactical air forces airmen would be pleased to share their thoughts with you at considerably less cost.

A. F. Herrmann, Jr.
Grand Prairie, Tex.

Antique Aircraft?

In the May 1988 Almanac issue, I found a statement that is astounding. It is in reference to the information provided on the KC-135 *(see "Gallery of USAF Weapons," p. 184, May '88 issue).*

The statement is that, with updates and modifications, the KC-135 will be "fully operational past the year 2020." If that is true, then we are casually accepting the idea that we will be flying sixty-five-year-old airplanes! If "past the year 2020" means only ten or twenty years past, then we will be flying seventy-five-year-old and eighty-five-year-old airplanes. If we can accept an eighty-five-year-old airplane, then can a 100-year-old airplane be far behind?

There will be people flying the same airplanes that their great-grandfathers flew.

How did this happen? What happened to the acceleration of progress? How did we come to accept sixty-five-year-old airplanes in such a casual manner?

Something is wrong!

Robert W. Fuehr
Alhambra, Calif.

The Big Picture

I would like to compliment AIR FORCE Magazine for its recently initiated department, "The Chart Page," edited by Staff Editor Colleen Nash. Graphical presentation of budgetary and other information puts the current situation into proper historical perspective.

It is very easy, for example, for critics to say that military spending is now at twenty-five percent of the federal government budget while failing to add that once upon a time it accounted for more than half of the budget and has been declining. Critics also tend to be very careless about the use of such expressions as national budget (which does not exist) when they mean Gross National Product or federal government budget (which are two different things).

The graphics that you have been publishing go a long way toward helping those of us out here who write letters to editors and to members of Congress so that they can see the actual picture.

How often do we hear that "it's only numbers"? Or how often do well-meaning (and some not-so-well-meaning) people throw around erroneous numbers and are believed? Yet when politely confronted with facts and context, they back off and withdraw.

If there is anything I can do to encourage you to keep "The Chart Page" going, I would be more than happy to do so. These graphical presentations are absolutely essential to get the big picture to the average editor or member of Congress who doesn't have the historical context of these issues.

Albert Masetti
Ridgewood, N. J.

Airlift Operations

Military Airlift Command's Airlift Operations School (AOS) is in the process of completing pictorial displays of the various airlift operations of years gone by. We have completed displays on "The Hump" and Berlin Airlift and are now moving on to Korea.

We would greatly welcome any contributions of photos dealing with airlift operations during the Korean War. We are interested in depicting all aspects of the airlift system (logistics, maintenance, cargo, operations, etc.).

Additionally, we are also looking for information on Air Transport Command's "Brass Hat" Squadron. This unit delivered President Roosevelt to the Teheran, Yalta, and Cairo conferences and President Truman to the Potsdam conference.

Anyone interested in contributing information or pictures is invited to contact the address below.

Capt. Chris Krisinger, USAF
Hq. MAC, AOS
Bldg. 1522
Scott AFB, Ill. 62225-5448
Phone: (618) 256-5188
AUTOVON: 576-5188

52d MAS

On June 1, 1988, the 52d Military Airlift Squadron was reactivated at Norton AFB, Calif. We will be flying

the C-141B StarLifter, and Lt. Col. James S. Parker is the new squadron commander.

The squadron had been deactivated in February 1969 at Dover AFB, Del., after seven years of "temporary" duty at Rhein-Main AB, Germany, flying the C-124 Globemaster in support of European Theater airlift. The squadron was initially activated as the 52d Transport Squadron on June 15, 1942, at Camp Williams, Wis., and flew the C-47 and C-53.

We are very anxious to make contact with past squadron members in order to complete the history of the squadron and to obtain photographs that could be displayed in our Heritage Room.

Please contact the address below.

Lt. Col. Robert M. Zeluff, USAF
52d MAS/DO
Norton AFB, Calif. 92409-5205
Phone: (714) 382-4643
AUTOVON: 876-4643

F-111 "Aardvark"

I am currently involved in the production of an extended study of the General Dynamics F-111 series of aircraft. In order to provide adequate coverage of the aircraft's operational use, I am anxious to hear from any air or ground crew associated with the "Aardvark" during its career. It would be of particular interest to hear from flyers with Vietnam experience.

Any materials, such as photographs, that are sent would be handled with care and returned after a period of loan.

Please contact me at the address below.

Peter E. Davies
28, Claremont Rd.
Bishopston
Bristol BS7 8DH
Avon, England

Thunderbirds

I am the editor of a quarterly publication dedicated to the history and future of the Air Force's Air Demonstration Squadron, the Thunderbirds.

Past and present team members as well as anyone with an interest in the Thunderbirds who want to learn more about the team or to participate in this project are asked to contact me at the address below.

Rick Mitchell
428 Madingley Rd.
Linthicum, Md. 21090

D-M Boneyard

I am presently in the process of writing a book about the Military Aircraft Storage and Disposition Center, now called the Military Aerospace Maintenance and Regeneration Center, at Davis-Monthan AFB, Ariz.

If you flew any planes out to Davis-Monthan for storage or retirement, I would like to hear from you. I am especially looking for anyone who has any photographs taken at the facility.

Special care and attention will be taken with any materials sent to me, and photographs will be returned after copying. Photo credits will be given to contributors.

Any help in researching this amazing facility would be welcomed.

Scott A. Wonderly
5992 Turnbull Dr.
Orlando, Fla. 32822
Phone: (407) 277-1067

USAFA Symposium

The Department of History at the United States Air Force Academy will sponsor the Thirteenth Military History Symposium on October 12–14, 1988. The topic of the symposium is "The Intelligence Revolution: A Historical Perspective."

For information concerning symposium registration, readers are urged to contact the address below.

Hq. USAFA/DFH
Attn: Capt. Mark Clodfelter, USAF
USAF Academy
Colorado Springs, Colo. 80840-5701
Phone: (719) 472-3230
AUTOVON: 259-3230

Cape Canaveral

I am currently doing research that will eventually lead to the writing of a book about launch operations conducted at Launch Complexes 5, 6, 26-A, and 26-B at Cape Canaveral AFS, Fla.

I am in need of and would greatly appreciate any information and photos pertaining to these launch complexes. I am especially interested in the unmanned launches from 1953–62 and the Project Mercury launches from 1959–63.

I will reimburse for postage and return any materials sent, if so desired. Please send any information to the address below.

Edward J. Bizub
1579 Franklin St.
Clark, N. J. 07066

35th Fighter Group

I have just signed up to write a history of the 35th Fighter Group and its squadrons during World War II.

Anyone who served with the 35th during the war would be an important contributor to this extensive book, and I would very much like to hear from any 35th veterans. I will need personal recollections, photos, and documents to round out the history, which will also include material on the Japanese side of each action, based on extensive research in Japan.

All items will be copied and returned on request.

Jeff Ethell
Rte. 1, Box 3154
Front Royal, Va. 22630

Ocala Chapter

AFA's new Ocala Chapter is now a fact. During the course of our first meeting, it was noted that there is some Army Air Forces history to the Ocala area.

I would be grateful to hear from any readers who were stationed in the Ocala area during World War II. Information on units stationed at Ocala, types of aircraft, anecdotes, photographs (which we would copy and return), newspaper clippings, etc., are the sort of things Chapter members would like to find.

We do know that some glider training was done in the Ocala area. Any information about such training would also be appreciated.

Please contact the address below.

R. J. Schaetzl
Ocala Chapter
2439 S. E. 35th St.
Ocala, Fla. 32671

C-123B/K Provider

I am trying to collect as much data as I can on the Fairchild C-123B/K Provider before trying to build a flying scale model of the aircraft.

In particular, I need scale drawings and blueprints of fuselage bulkheads, exterior details, and airfoil sections of the wing and tail surfaces.

All materials sent will be handled meticulously, carefully reproduced, and promptly returned. If you have any information that might be of value, please contact me at the address below.

Lt. Col. Bruce F. Mundie, USAF (Ret.)
P. O. Box 28613
BWI Airport, Md. 21240
Phone: (301) 977-2144

Project Numbers

Does any reader know for what purpose the *project number* was stenciled over the type, model, series, and serial number stencil on the left side of the fuselage of an aircraft, usually under the cockpit?

Some of these numbers had four digits, others five, and some had DOM (whatever that meant) just before the number. An example: AAF Project No. 93025R, AAF Model P-51D-25-NT, AF Serial No. 44-84886.

If any readers can shed light on these markings, please contact me at the address below or the Research Chief at the Air Force Museum at Wright-Patterson AFB, Ohio.

Dave Menard
5224 Longford Rd.
Dayton, Ohio 45424

P-51H Crash

I would like to correspond with anyone who has information on a P-51H, serial number 44-64261, that crashed in the Yukon on August 10, 1949. The aircraft was piloted by Lt. John E. Bylander and belonged to the 62d Fighter Squadron, 56th Fighter Group.

Please contact me at the address below.

David A. Beulke
347 Eastern Ave., S.
Brookings, S. D. 57006

A-26C Invader

I am a volunteer at the Pima Air Museum. I would like information or pictures concerning an A-26C Invader, serial number 43-22494.

With the assistance of the 868th TMTS Bravo Flight, the museum is restoring the aircraft to its World War II colors. The aircraft is also missing the lower turret. We require drawings or technical data so that we can make a turret to install on the aircraft.

Any assistance would be appreciated.

Robert B. Lumpkin, Jr.
9366 E. Stella Rd.
Tucson, Ariz. 85730

C-124 Globemaster

I'm developing the text for an upcoming book about the C-124 Globemaster II. I'm interested in contacting anyone in the active-duty Air Force, Air National Guard, and Air Force Reserve who has flown, maintained, or supported the airplane that was known as "Old Shaky."

Photos, stories, and general information are most welcome.

MSgt. Earl Berlin, Jr., USAF
52d TFW/MAYMA
PSC Box 848
APO New York 09123-5362

Roll Call

I am seeking information on and addresses and pictures of servicewomen who were in the WAC detachment at New Castle AAB in Wilmington, Del., with Air Transport Command during World War II.

I am working on a project with Dr. Herbert O. Fisher, a special assistant to the restaurant corporation that owns the Air Transport Command Restaurant located on the perimeter of the deactivated New Castle AAB. The project concerns the omission of any pictures in the restaurant of WAC personnel who were stationed at New Castle AAB during the war. The walls are covered with pictures, but none is of a WAC.

A reunion and dedication of a section of the restaurant to acknowledge the WAC's service at New Castle is planned. Any information about women who served at New Castle during World War II would be appreciated.

Dorothy Brierton Wadsley
333 Pearl St.
New York, N. Y. 10038
Phone: (212) 571-7718

Three members of Harold Blog's crew, which was shot down over Berlin on May 19, 1944, are "missing."

"The Data General difference: rugged systems plus..."

... the building blocks you need for your C³I applications.

When you need high-performance and reliability in computers designed for difficult, deployable and mobile stations, look to Data General.

Only Data General's rugged systems give you powerful 32-bit, real-time systems that are also standards-adherent, easily upgradable from 2 to 6 MIPS in the field, and meet or approach Mil-SPEC at a fraction of the cost.

But Data General doesn't stop there. We give you more of the critical building blocks you need for C³I. Such as multiple environments, including TEMPEST and commercial off-the-shelf products. We offer software compatibility across the entire line. Industry and Mil-standard communications and languages. Development and target systems.

Plus, everything we offer is backed by superior service and support, and priced to make the most of your budget.

Find out how the Data General difference can work for your program. For a copy of "Building Blocks for Tomorrow's C³I," send the coupon below. Or call 1-800-DATAGEN.

Data General

3400 Computer Drive, ADV/C³I, Westboro, MA 01580

Please send me the "Building Blocks for Tomorrow's C³I" brochure.

Name _____

Company _____ Phone _____

Address _____

City _____ State _____ Zip _____

CALL 1-800-DATAGEN

Data General is the official technical computer sponsor of the United States Olympic Committee. 36USC380

Airmail

I would appreciate any help in locating Henry Miller, bombardier, Stan Polosky, waist gunner, and John Ott, ball turret gunner.

Please contact me at the address below.

George W. Dennis
11 Shady Meadows Lane
Muttontown, N. Y. 11791
Phone: (516) 364-0179

I am trying to locate two members of the crew of the B-24 *Windy City* who served with the 724th Bomb Squadron, 451st Bomb Group.

They are James A. Peterson, navigator, and Richard P. Carpenter, bombardier.

Any information would be greatly appreciated.

Mrs. Fred F. Fennema
5459 Appleblossom
Friendswood, Tex. 77546

I am trying to locate my former crew members. We made up Crew 34 of the 28th Bomb Squadron, 19th Bomb Group, Twentieth Air Force. We flew B-29s out of North Field on Guam from May–August 1945.

Missing crew members include Joseph J. Stafani, John E. Schenk, Charles H. Shumard, Allen H. Smith, and Harold U. O'Bryan.

Any help would be appreciated.

Harold J. Roberts
3109 Ryecroft Rd.
Birmingham, Ala. 35223

I am trying to locate 1st Lt. Gordon MacDonald, who was attached to a B-24 unit—the 855th Bomb Squadron, 491st Bomb Group, Eighth Air Force.

We flew our first mission on D-Day, June 6, 1944. In July or August of that year, Lieutenant MacDonald had to land in Switzerland, but escaped and returned to our group in November or December 1944.

Anyone with any information about Lieutenant MacDonald is asked to contact me at the address below.

Bill VanCleave
595 E. Main St.
Alamo, Tenn. 38001
Phone: (901) 696-5956

I am looking for anyone who was in the 341st Signal Company in Italy during the summer of 1944, especially anyone familiar with the "Big Fence" operations.

Please contact the address below.

Milton Radovsky
10710 Lockridge Dr.
Silver Spring, Md. 20901
Phone: (301) 593-4428

We are looking for members of Crew 6587, which flew B-24s from Manduria, Italy, with the 721st Bomb Squadron, 450th Bomb Group.

Crew members include Paul Llewellyn, pilot, Bill Doxey, navigator, Merlyn Gorham, gunner, and Andrew Kinney, gunner.

Please contact the address below.

Al Goodman
2804 Wall Ave.
Waukegan, Ill. 60087
Phone: (312) 244-0121

I am looking for Russell Jones, who came from New Mexico. He was an instructor at the Bryan Instrument School at Bryan, Tex., before being posted to France in 1944. He served as a C-47 pilot with the 312th Service Group.

I would appreciate learning the whereabouts of Russell.

Lt. Col. Robert J. Hahlen,
USAF (Ret.)
2009 19th St.
Monroe, Wis. 53566-3036

The Complicated Story on ASAT

By James W. Canan, SENIOR EDITOR

The weapon worked, but with testing and deployment banned, USAF canceled it when the budget was cut. This leaves a hole in our space strategy, and no solution is yet in sight.

Washington, D. C. Secretary of the Air Force Edward C. "Pete" Aldridge, Jr., notes elsewhere in this month's issue that USAF's commitment to exploiting space as an operational arena has been called into question over the years. *(See "Recovery in Space," p. 68.)* The critics doing the calling have accused the service of slighting some vital space programs, among them the one to develop and deploy antisatellite weapons, because it allegedly does not yet understand how important its control of space will be to the security of the nation.

At first blush, the Air Force seemed to be guilty as charged when earlier this year it included its program to test and finish developing an F-15-launched ASAT weapon among those to be killed amid fiscal austerity.

Secretary of Defense Frank C. Carlucci accepted the Air Force's decision and scrubbed the ASAT program from his relatively stringent Fiscal Year 1989 defense budget.

But there was a lot more to the Air Force move than met the eye. It did not mean that USAF has given up on ASAT weaponry, for such a move—and attitude—could be fatal. As Secretary Aldridge once put it, "The Soviet Union's greatest strength is its antisatellite capability," and the lack of such capability "is our greatest weakness."

The ASAT story is a complicated one. Let's go back a little in time.

Ten years ago, in July 1978, diplomatic teams from the United States and the Soviet Union got together in Helsinki, Finland, for the opening round of first-ever negotiations on limiting or banning ASAT weapons.

The US delegation was guided in those so-called "ASAT talks" by Presidential Decision Memorandum 37, a freshly issued White House document that was regarded as a landmark in the development of US national-security policy with respect to space.

PDM 37 committed the US to pursue "activities in space in support of its right of self-defense, thereby strengthening national security, the deterrence of attack, and arms-control agreements." The document said that the US would welcome a ban on weapons in space, but would nonetheless "vigorously pursue the development of its own capabilities" there in the absence of such a ban.

PDM 37's punch line was: "The United States finds itself under increasing pressure to field an antisatellite capability of its own in response to Soviet activities in this area."

The Soviets at the time were entering their second decade of such activities. They had begun testing ASAT weapons in 1968. Designed to overtake target satellites and destroy them by shooting pellets through their thin skins, the Soviet hunter-killer ASAT weapons were pretty crude at first, but improved over time.

The Soviets stopped testing ASAT weapons in 1972 after having signed the SALT I ABM Treaty with the US. But the testing started up again in 1975 and was in full cry by 1977.

That year, the Soviets launched target satellites and ASAT interceptors in a veritable flurry of planetary flybys. The ASAT satellites showed their stuff in orbits ranging from 150 miles to 1,200 miles, a beltway in which several types of increasingly vital US "force-multiplier" satellites—reconnaissance, weather, and navigation—routinely course.

The Soviet ASAT weapons displayed greater maneuverability and did their nasty jobs with greater dispatch than any that the US intelligence community had ever monitored in space.

On October 4, 1977, at about the twentieth anniversary of Sputnik's flight at the dawn of the space age, Dr. Harold Brown, then US Secretary of Defense, went public with the somber conclusion that "the Soviet Union has an operational capability that could be used against some US satellites."

He reaffirmed this in his annual report to Congress in January 1978 and also noted that the Soviets were "engaged in other . . . activities that appear to be ASAT-related"—an allusion to their development of high-energy lasers, among other things.

Dr. Brown pointed out, moreover, that the Soviets had begun "using satellites for tactical purposes that include the targeting of US ships" and other surface forces.

What all this meant, the Secretary of Defense told Congress more than ten years ago, was that "our commitment to space defense will increase significantly." PDM 37 then seemed to cinch this as policy in the Carter White House.

Later that year in Helsinki, the US negotiating team served notice on the Russians that the US would draw on its superior space and weapons technologies to beat them at their own ASAT game unless they agreed to give it up and go for an anti-ASAT treaty.

No dice. The ASAT talks went nowhere. The Soviets continued testing their orbital interceptors. The US revved up the ASAT program that it had begun in 1975, the one aimed at launching satellite-homing nonnuclear MV (Miniature Vehicle) warheads on two-stage rockets from high-flying F-15 fighters.

Even though that program came along smartly in recent years, it is now in limbo. The US still is in no shape to honor the commitment to space defense that Secretary Brown made to Congress ten years ago and that the Reagan Administration's revised National Space Policy, issued just last January, affirms in these words:

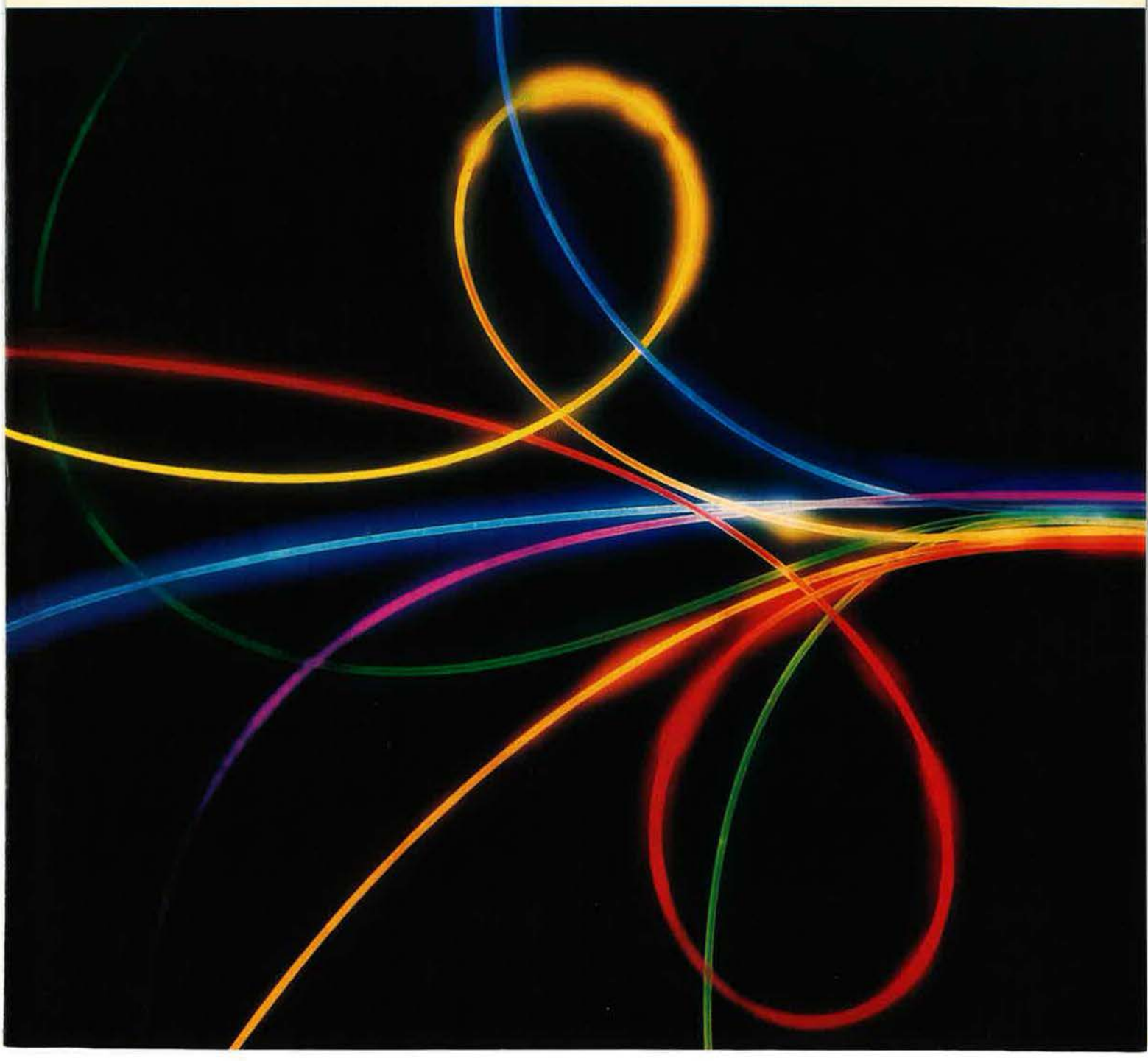
"The Department of Defense will

WE BEND THE SPECTRUM TO YOUR WILL. From DC to light, Sanders signal exploitation lets you shape the electromagnetic spectrum into a full range of both passive and active systems.

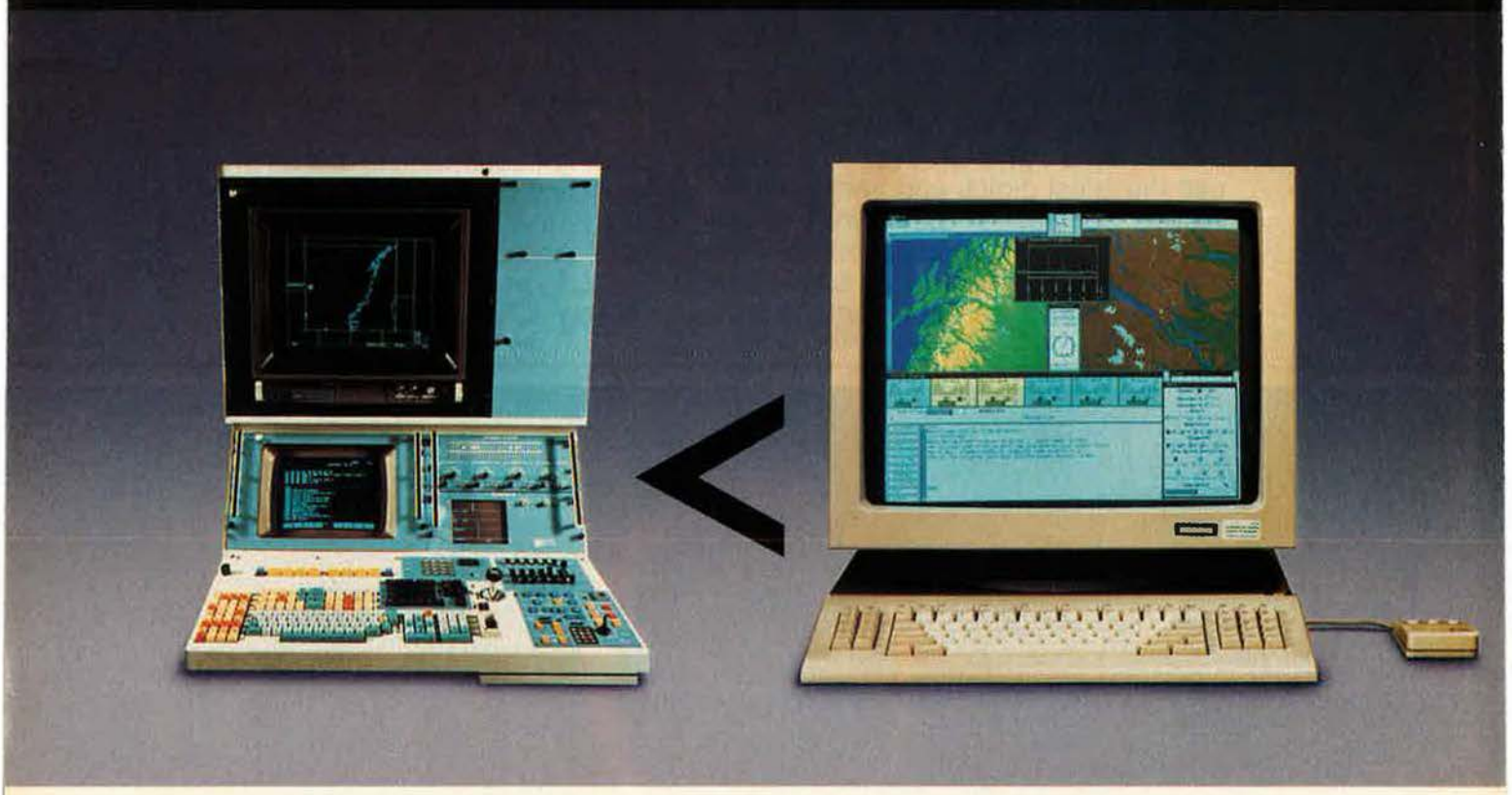
Sanders signal processing systems use the latest digital and analog techniques, software and hardware to give you the most advanced capabilities available today. Sanders provides surveillance, tactical systems and countermeasures for the U.S. Armed Forces and government agencies, plus allied governments. You'll find our systems at shore sites, on ships, submarines and land vehicles, as well as aircraft and spacecraft.

When you seek the most capable processing equipment for any kind of signal, you'll find nobody is more flexible than Sanders at finding cost-effective ways to bend the spectrum to your will.

Sanders
A Lockheed Company



E-SYSTEMS



Not All Cryptologic Workstations Are Created Equal.

On the left is the cryptologic workstation that so many operators are using to receive and manage reconnaissance information. It's from E-Systems.

On the right, meet the graphics-based, mouse-controlled workstation for controlling and interpreting data. It consolidates information into an easy-to-read, easy-to-manage format. It is also from E-Systems.

We've improved the picture... dramatically. With a workstation that brings operators a simplified keyboard.

With software that produces big, multifunction color displays that are exceptionally easy to use. With enhanced graphics that integrate information beautifully for an innovative man-machine interface — one that boosts operator efficiency. All on a cryptologic workstation that is 60% smaller than the current machine.

No longer will operators face a maze of special function keys. Gone, too, will be a lengthy training requirement. While it once took operators two weeks or more to learn the current system, our new cryptologic workstation slashes that by half.

This is the future of cryptologic operations. And it's ready for your demonstration today.

The new cryptologic workstation is undergoing field trials now. For your in-plant demonstration, contact Loyd Davis at E-Systems, Inc., Melpar Division, 7700 Arlington Boulevard, MSA 130, Falls Church, Virginia 22046, (703) 849-1625.

E-SYSTEMS
The science of systems.

develop and deploy a robust and comprehensive ASAT capability with programs as required and with initial operational capability at the earliest possible date."

The Air Force was on the verge of providing the nation with such capability when its ASAT program came unstuck. Over the past few years, it had fired five ASAT missiles, four against points in space and one against a US target satellite that had outlived its usefulness and was orbiting in vain. All the tests were said to be successful.

But then Congress, in the spirit of arms control and in keeping with the cessation of Soviet ASAT testing in 1982, imposed a moratorium on additional launches of the Air Force's MV weapon.

This, says the Air Force, is why it withdrew funding for its ASAT program from the defense budget and then flat-out canceled the program last March.

Critics of that cancellation claim that the Air Force was simply venting its spleen—that it could and should have kept the program going against the day that Congress would once again approve ASAT testing. Such critics point out that there remains plenty of support for ASAT testing in some Capitol Hill circles, most notably in the Senate Armed Services Committee, which indeed expressed its displeasure with the Air Force for having called off the program.

Air Force Systems Command Commander Gen. Bernard P. Randolph recently addressed the situation. Calling the ASAT program "the most controversial" of all in the space-control arena, General Randolph declared:

"We can't field an ASAT system because of political reasons. Congress prohibited testing of the air-launched miniature vehicle, and it made no sense to continue this major investment with no hope of completing the program. If Congress had not prohibited testing, Systems Command could have delivered all RDT&E ASATs next year, with production missiles on their heels."

Lacking the ASAT weapons, the Air Force "has a space control mission, but no way to carry it out," General Randolph noted.

This is no small problem for the US and one that is unmitigated by the recent trend toward reduction of nuclear arms. While ASAT weapons are often thought of in the context of global nuclear war, they would be just as important in a nonnuclear war because some of their prime targets, the other side's low-flying reconnaissance satellites, are especially vital to the prosecution of tactical combat.

Some such satellites are said to have become so capable in their coverage and real-time transmission of situational and pictorial data that they can be used to select tactical targets on the spot even as combat goes on.

Examples on the Soviet side are the Radar Ocean Reconnaissance Satellites (RORSAT) and Electronic Ocean Reconnaissance Satellites (EORSAT), which keep watch from low orbits for one reason only—to offset the US advantage in naval forces by detecting and fixing the positions of those forces so that they can be targeted by Soviet long-range standoff weapons from under, on, and over the seas.

It is no secret that these very same ocean-watching satellites were to have been the prime targets of the US ASAT weapons now on hold.

The US does not have satellites in space exactly like the Soviet RORSAT and EORSAT birds. But it does have some there that carry out closely related missions—and a great deal of the urgency that characterizes USAF's spacelaunch recovery program stems from the need to boost more of the latest generation of just such satellites into their various orbits.

Air Force Gen. Robert T. Herres, Vice Chairman of the Joint Chiefs of Staff, once provided this summary of the situation while serving as Commander in Chief of US Space Command:

"Our high-tech edge over the Soviets is more and more satellite-dependent. 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."

To which General Herres's successor as Commander in Chief of US Space Command, Air Force Gen. John L. Piotrowski, utters a hearty amen.

General Piotrowski testified earlier this year before the House Armed Services Committee, a panel in which reposes much of the congressional opposition to the US testing of ASAT weapons. He assailed the idea that a moratorium on such testing "provides or guarantees equilibrium, with neither country having an effective antisatellite system.

"We are told," General Piotrowski continued, "that the Soviet ASAT system is a rudimentary device, based on 1960s technology, and does not represent a significant threat to US space systems.

"These assertions do not square with the facts."

He claimed that the ASAT testing moratorium imposed by Congress was in fact "a significant advantage" for the Soviets, who, he said, are "fully aware of the strategic importance of military satellites to the United States and the severe impact their loss would have on US military capability."

The US Space Command Commander in Chief also declared: "Many view the Soviet antisatellite threat as one-dimensional. It is not. The Soviets possess diverse and complementary antisatellite capabilities."

These, he said, include "directed-energy systems [such as lasers] and direct-ascent antiballistic missiles, which could be employed in an antisatellite role."

It is not necessary to destroy or physically punish a satellite to put it out of action. In this regard, General Piotrowski claimed that the Soviets are capable of using electronic warfare systems and "radio-electronic combat techniques" against US space platforms.

Such electronic attacks, he said, would be "absolutely compatible with Soviet military doctrine and have recently been discussed openly by the Soviets as having high utility against our spacecraft."

The Soviets have said that they could not possibly resort to their coorbital ASAT weapons with any confidence in wartime because the system has not been tested in space since 1982.

Picking up on this, congressional critics of US ASAT testing claim that such testing may provoke the Soviets to respond in kind, a turn of events that would lead the Soviets to modernize their presently untrustworthy ASAT technology.

This, General Piotrowski noted, "fails to consider the possibility that 'crude' or 'simple' technology may be perfectly adequate, especially in wartime. We should avoid falling into the trap of judging the Soviet systems by our own high technological standards."

He also observed: "The Soviets have used the SL-11 booster—which launches their coorbital antisatellite—on numerous occasions since 1982. It has proven to be an almost perfectly reliable system."

The long and short of it, said General Piotrowski, is that the current situa-

tion—as opposed to the one in which US ASAT weapons were being brought along—is "dangerously destabilizing."

Why? Because if the US cannot respond in kind to ASAT attacks, it may have to resort to retaliating with nuclear weapons in "an asymmetric response" in order to keep from going deaf, dumb, and blind in space, he said, adding:

"If we did nothing and the Soviets continued to attack our space assets, our forces would be at an extremely serious military disadvantage."

In the late 1970s, just as the US and the USSR had begun ASAT talks and long before the military importance of space had pervaded the public consciousness, the possibility of space hostilities leading to nuclear warfare was raised for public discussion for the first time by the late Dr. Charles S. Sheldon. As Chief of the Science Policy Research Division of the Library of Congress and a leading analyst of US and Soviet space programs, Dr. Sheldon expressed it as starkly and succinctly as anyone ever has, writing:

"If each country ever began to pick off the other's satellites, this indeed might lead to war in space. . . . Any such interference might be taken as a clear signal to initiate a general war. And rather than waiting for its space eyes to be blinded, a nation might seriously consider a preemptive nuclear strike."

A few months ago, Secretary of Defense Frank C. Carlucci sounded out congressional leaders in the defense arena on the possibility of reviving the MV ASAT program. He was told, in effect, to forget it—and so he backed off.

Meanwhile, though, there are solid indications that the Pentagon is indeed intent on going beyond the MV ASAT weapon, which had its technological origins in the early 1970s, in working up weapons of greater variety and refinement.

Air Force Maj. Gen. Thomas Moorman, Director of Space and SDI Programs in the Office of the Assistant Secretary of the Air Force for Acquisition, is chairman of a DoD steering group of general officers assessing the prospects for a "mixed-force ASAT capability."

AFSC's General Randolph says: "Although the air-launched MV is out the window, Space Division is laying the groundwork for a new kinetic-kill system that could lead to an interceptor flight demonstration in the 1990s. We expect to go on contract for studies this fiscal year, using residual funds [$5 million to $10 million] from the F-15 MV ASAT program.

"So as not to put all our eggs in one basket, we're also exploring ground-based laser technology—a chemical oxygen/iodine laser called COIL and an excimer laser. And we're monitoring the laser work in the Strategic Defense Initiative program."

Many defense experts, including former Defense Secretary Brown, have maintained all along that SDI research is more likely to lead to ASAT weapons than to a system of space-based sensors and weapons that would form a full-blown defense against ballistic missiles.

Prominent in SDI research is work on land-based lasers, with emphasis on relaying their beams to faraway places via mirrors in space and on keeping those beams from blurring and losing their punch as they pass through the atmosphere.

The Air Force Weapons Laboratory at Kirtland AFB, N. M., is overseeing such work in SDI's Relay Mirror Experiment (RME) and Low-power Atmospheric Compensation Experiment (LACE) programs, both of which are scheduled to be tested in space next year.

Keeping the intense light of a laser beam concentrated and coherent and preventing the beam from attenuating in the atmosphere is "the key to making a laser ASAT work," General Randolph declares.

At an Air Force Association symposium in Omaha, Neb., last June, Lt. Gen. Aloysius G. Casey, Commander of AFSC's Space Division, pointed out that SDI research on surveillance satellites to track spaceborne targets that do *not* emanate intense heat—such as nuclear reentry vehicles (RVs) in their post-boost and midcourse phases of flight—is also highly important to the development and eventual deployment of advanced ASAT weapons.

"Most of the debate on ASATs has centered on the interceptor, but the more critical aspect is the ability to track the targets," General Casey told the AFA symposium audience. "We need an improved space surveillance system, and the technology is now there."

He said that the existing US ground-based system for surveillance of objects in space is "not complete" in that it "does not allow us to identify things that might be launched over certain parts of the world."

As to ASAT weapons, the General said: "We're in a study mode right now. We're looking at everything—ground-launched and air-launched. We're thinking the problem through, but we're in a bit of a quandary."

And the payoff from PDM 37 in the form of actual ASAT weaponry is still not in hand.

The Procurement Scandal

At this writing, payoffs of a different sort have engendered a procurement scandal that will plague the Pentagon and all too many of its contractors and their consultants for some time to come.

In mid-June, the Federal Bureau of Investigation and the Naval Investigative Service conducted widespread searches of the offices of some forty officials who work for the Department of Defense and in the defense industry.

This dragnet was cast as a result of the federal government's previously discreet investigation—including wiretaps—of what the FBI called "allegations of fraud and bribery" that it had found in weapons-contracting circles.

In the beginning, the investigation seemed to be focusing on the trading of insider information about contracts and potential contracts among Pentagon and private-sector individuals involved in the defense procurement business.

It was said that the value of such contracts could amount to tens of billions of dollars when all is said and done. There could be ramifications in the case beyond those in the narrow insider-information category, sources said.

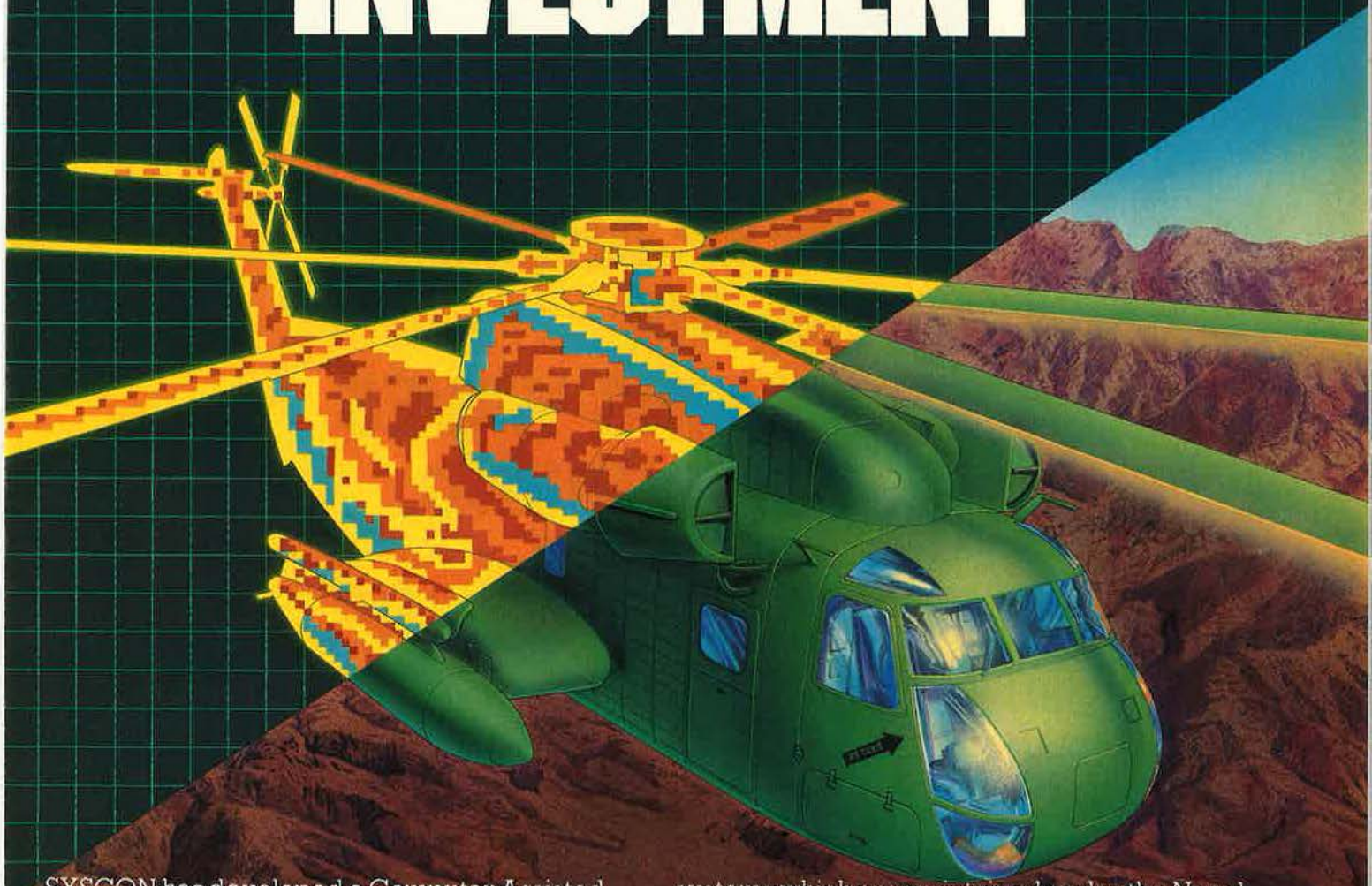
With a federal grand jury having been empaneled to look into the matter, many indictments were expected later this year or early next.

As if the Pentagon's budgetary woes weren't bad enough, now comes a procurement scandal of apparently king-size proportions to compound the problems of cultivating a pro-defense consensus in the country and of keeping the Pentagon's relations with its contractors on an even keel.

There was concern in the Defense Department and in the defense industry that the scandal would be a setback for plans to cut companies' risks and increase their chances of making profits in bidding to develop and build high-tech weapon systems.

Such plans were just beginning to capture fancies in the procurement circles in the services and the Office of the Secretary of Defense when the scandal broke. ■

CAMMS/TOUCHTIME PROTECTS AIRCRAFT INVESTMENT



SYSCON has developed a Computer Assisted Maintenance Management System (CAMMS)™. This system is currently being used by Dynalectron to maintain T2 aircraft for the U.S. Navy.

The escalating costs to the nation of building new equipment demands precise and timely maintenance.

An on line interactive system, the Touchtime™ software satisfies aviation maintenance planning and reporting requirements. The system can be used for the weapons systems which are maintained under the Naval Aviation Maintenance Program (NAMP).

The CAMMS system tracks and reports on a variety of information such as flight data, inspection records, quality assurance, equipment operating time and scheduled maintenance. CAMMS streamlines costs and improves flight safety.

Touchtime software gives maintenance the intelligent edge.

SYSCON & TOUCHTIME

SYSCON Corporation
1000 Thomas Jefferson Street,
N.W., Washington, D.C. 20007

A Harnischfeger Industries Company

THE WILLPOWER

WE KEEP AHEAD IN THE AIR BY MAKING WAVES ON THE GROUND.

At Thomson-CSF we specialize in the design, development and manufacture of advanced high-performance electronic systems for aerospace applications. Both civil and defense. Both airborne and on the ground.

Radar Agrion

All the systems. Weapons systems. Data processing systems. Communications systems. Navigation systems. Air traffic control systems. Air defense systems. Electronic warfare systems. And simulators.

Mirage 2000

We also specialize in research and development. We don't believe in sitting still. Or in being satisfied.

Our customers' needs keep evolving. The threat keeps evolving. We've got to keep evolving. There's always a better way. Our constant objective is to find it. Before the competition does.

TRS 2230 radar

ELECTRONICS
AND DEFENSE SYSTEMS
23, rue de Courcelles
75008 Paris - FRANCE
Tel.: (1) 45.63.12.12 - Telex: 204780 F

Come and see us at Farnborough Air Show

THOMSON-CSF

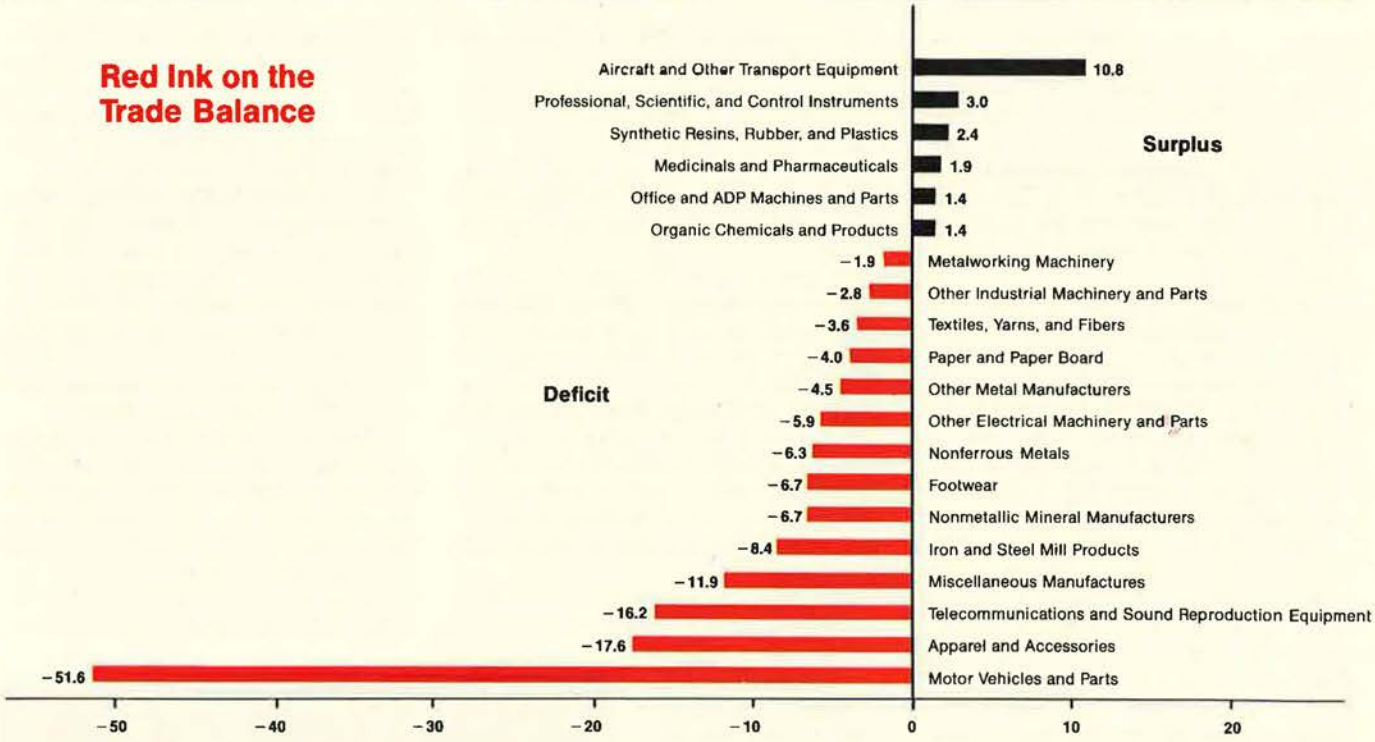
THE BRAINPOWER. THE WILLPOWER. THE WINPOWER.

POLARIS T.AERO-13/1

The Chart Page

By Colleen A. Nash, STAFF EDITOR

Red Ink on the Trade Balance

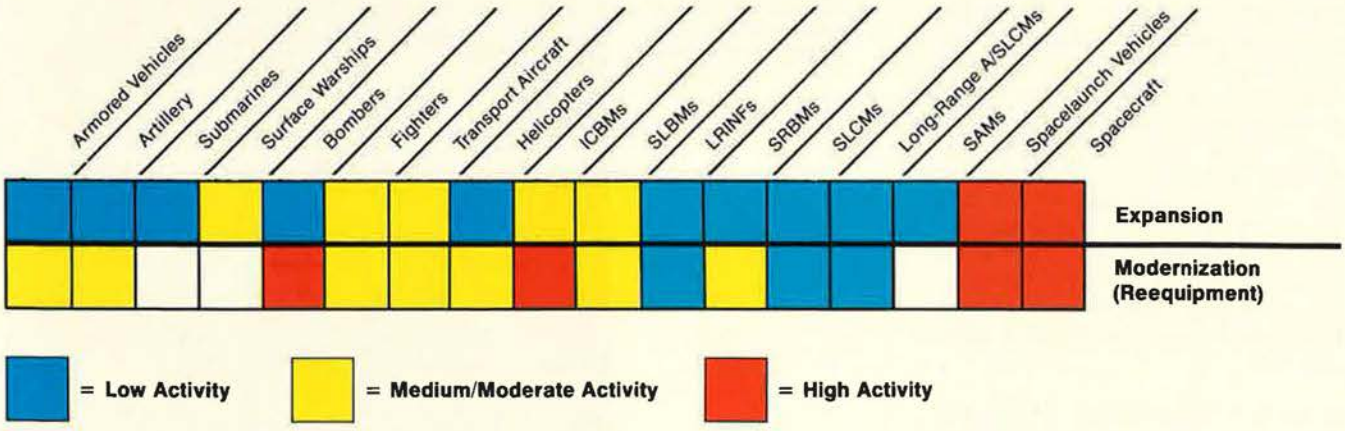


This chart depicts US manufacturing trade balances by commodity groups for 1986. Figures are in billions of dollars. Although aircraft exports continued to make a significant positive contribution to the trade balance, their net contribution declined from $11.2 billion in 1985 to $10.8 billion in 1986.

SOURCE: National Academy of Engineering and the US Department of Commerce

Soviet Development of Military Industry

(1981–87)



SOURCE: Soviet Military Power 1988

Aerospace World

By Jeffrey P. Rhodes, AERONAUTICS EDITOR

Washington, D. C.

★ Forced to leave its base at Torrejon, Spain, as the result of a new defense and mutual cooperation treaty signed late last year, the US's 401st Tactical Fighter Wing appears to have found a new home in Crotone, Italy. The move still has one more hurdle to clear, though, before the wing can leave Spain for Italy.

Allied defense ministers meeting in Brussels, Belgium, unanimously decided on May 26 to formally ask Italy to accept the seventy-two F-16s comprising the 401st TFW. The ministers also decided to use NATO Infrastructure Fund monies to accomplish the move, which is expected to cost approximately $520 million.

Congress had prohibited any US military construction funds to be used for the actual relocation of the wing, but the US will pay approximately $12 million for Morale, Welfare, and Recreational (MWR) facilities at the new base. The US will also lease housing on the base, and roughly $188 million will be paid back to NATO within ten years.

The Italian government agreed on June 4 to the move and in the middle of the month named the Sant'Anna Airport near Crotone in the Calabria region as its choice for the relocation site. Other sites considered included Morocco and several other sites in Italy, including Comiso AB on Sicily, where the US is deactivating the 487th Tactical Missile Wing, a BGM-109G ground-launched cruise missile unit.

Although the Italian parliament is expected to approve the move, its assent had not come as of late June.

The 401st TFW has to leave Spain by May 1991, and if a home had not been found, the wing would have been deactivated. As it stands now, the Air Force will have to select another wing, likely one in the continental US, to deactivate in order to meet congressionally mandated budget ceilings.

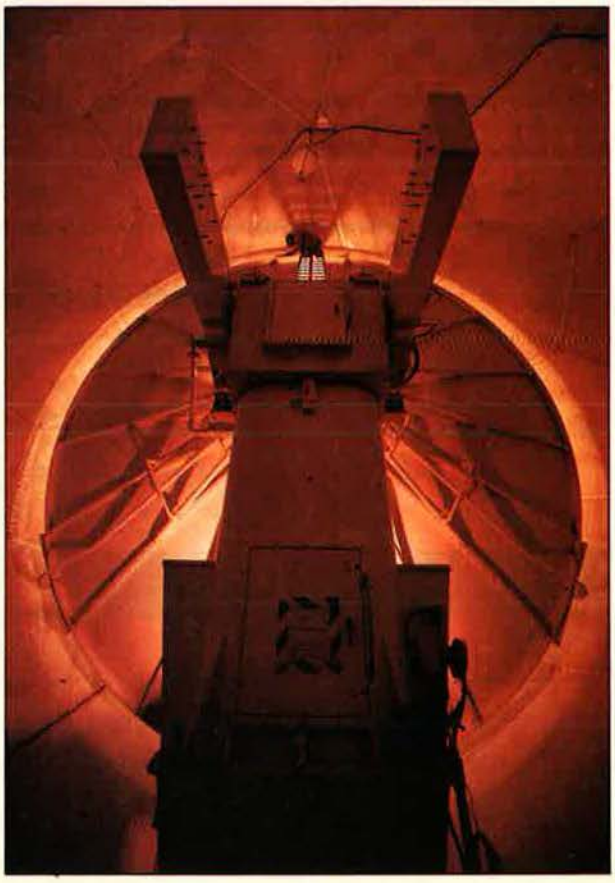
★ Work is progressing on the prototype installation of a new weather radar that can accurately detect the location and gauge the severity of such extreme weather conditions as tornadoes, hailstorms, and flash floods. The Next-Generation Weather Radar (NEXRAD) will provide detailed information on a storm's internal windflow and structure, and this will allow meteorologists to provide accurate and early warnings to affected areas.

NEXRAD uses Doppler radar to measure winds in a storm. Returns from water or dust particles moving away from the radar are on a different frequency from that of particles moving toward the radar. Through the use of "false-color" imagery, in which winds are assigned colors based on intensity and direction, a meteorologist can see where patterns of rotating winds indicate the formation of tornadoes.

NEXRAD can detect a tornado forming when it is still miles above the earth, thus allowing twenty minutes or more to get a warning to the area where the twister will likely touch down. NEXRAD will also be able to predict windshear patterns when the radar is situated near airports.

Because NEXRAD can also provide a detailed picture of the spatial distribution of a storm's water content, correlating the radar's estimate with data from rain gauges will allow for more accurate forecasts of precipitation amounts and location. This in turn helps the National Weather Service (NWS) predict flash floods.

NEXRAD consists of four principal parts—an unattended radar acquisition (RDA) tower, the RDA transmitter/receiver and signal processor, the radar product generator (RPG), and the principal user processing (PUP) terminal, at which the meteorologist interprets the data and issues appropri-



The Next-Generation Weather Radar (NEXRAD) system uses Doppler radar to measure winds in a storm. This unusual view shows the bottom of the twenty-eight-foot-diameter NEXRAD antenna, which uses a pencil-thin beam to detect and measure precipitation, dust, or ice in the atmosphere. A typical scanning pattern will provide weather updates of the entire area every five or six minutes.

No, you don't need quarters to get this one to work. This notional fighter cockpit mockup uses Pilot's Associate (PA) program technologies to help the pilot handle the work load on a "mission" over the German border. The screen on the left is for monitoring aircraft and weapon systems, the middle screen is a detailed tactical display, and the screen on the right depicts the territory being flown over. Lockheed built this PA mockup.

ate warnings. All of the parts will be linked by microwave transmission or fiber optic cable.

The first RDA tower was finished in late May at Norman, Okla., near the National Severe Storms Laboratory. The complete NEXRAD installation is scheduled to be up and running by October. Test and evaluation are to be completed in May 1989. Unisys, NEXRAD's prime contractor, is then scheduled to install ten more radars as part of initial production. Eventually, between 175 and 195 NEXRAD radar sites will be installed in the US and at military locations overseas.

The $450 million NEXRAD program is sponsored by the Departments of Commerce (lead agency), Transportation, and Defense. The systems will be used by the NWS, the Federal Aviation Administration (FAA), and the Air Force's Air Weather Service and the Navy's Oceanography Command.

★ The Defense Advanced Research Projects Agency (DARPA) and the Air Force are working together to exploit computer data bases in ways that will automate many of the tasks needed to survive in a future air war. The Pilot's Associate (PA) project will use artificial intelligence (AI) techniques to provide backup in such mission-critical areas as navigation, weapons control, damage assessment, electronic warfare, and even "big picture" tactical planning.

PA was started as a way of seeing if pilot overload could be overcome through computer automation. Experience shows that eighty percent of air combat pilots who are shot down were hit by threats they were never aware of. Despite on-board systems, pilots are liable to be deprived of situational awareness, and losses could result because of it.

One of the two contractors involved in the effort, Lockheed Aeronautical Systems Co.-Georgia, demonstrated for the first time on June 2 how PA might work in practice. Its object: to show how a prospective trouble-plagued mission flown over the German border could be handled by several AI bases working together.

Lockheed's work is part of the Demo 2 stage of a four-part feasibility project that is designed to see how the aims of PA can be met in practice. Things have gone so well that the program has recently been refocused to include installation in an actual but undetermined aircraft.

To show how their version of PA is working, Lockheed has set up a "cockpit" consisting of three large color TV monitors at its Marietta, Ga., plant.

The screens are used to show a variety of functions. The left screen is used to display aircraft and weapon system information, while the middle one is a detailed tactical display. On the right, engineers have set up an "enhanced" tactical display with a larger picture of the territory being used for the mission, a so-called "big picture" view.

During a forty-five-minute demonstration, the aircraft "takes off," experiences first minor, then major, power problems, and then maneuvers to deal with a flight of Tu-26 Backfire bombers and escorting MiG-29 Fulcrum fighters. PA warns the pilot of threats and shows safe passages through the maze of missile belts defending the cross-border territory.

A unique feature of PA is a special "template" that appears on the screen and that outlines exactly how the aircraft threat signature looks at

More and more of Air Training Command's Cessna T-37Bs are sporting a new dark-blue-and-white paint scheme. ATC officials worked with maintenance troops, pilots, safety officers, and aviation artist Keith Ferris to come up with the new design. The paint job is easy to maintain, hides the soot from the engines, and helps in formation training. It will take almost three years to paint the entire 644-plane fleet.

★ **PURCHASES—DARPA** awarded four contractor teams hardware-development phase (Phase One) contracts for the Microwave/Millimeter-wave Monolithic Integrated Circuits **(MIMIC) program.** Under the three-year contracts, the four teams will develop a variety of microwave and/or millimeter-wave monolithic-format integrated circuit chips, primarily from gallium arsenide. The chips are expected to be of great value for radar, electronic warfare, communications, and smart munitions. Martin Marietta/ITT ($49.3 million), TRW ($57.5 million), Raytheon/Texas Instruments ($68.6 million), and Hughes/General Electric ($50.05 million) are the team leaders.

Hughes Technical Services Corp. of Long Beach, Calif., was awarded a $1.5 million contract from Air Force Systems Command's Electronic Systems Division on June 16 to install, operate, and maintain a **"portal monitoring system"** at a Soviet missile plant as **part of the verification process** for the Intermediate-range Nuclear Forces **(INF) Treaty.** The system will monitor production at the Votkinsk Machine Building plant, which had been building SS-20 missiles. The initial contract calls for one month of operations and maintenance of the system, but the contract could be worth $24 million over five years if all options are exercised.

In mid-May, **England, Germany, and Italy signed** a Memorandum of Understanding **(MOU) to proceed** with full-scale development (FSD) of the European Fighter Aircraft **(EFA).** Spain, the fourth partner in the next-generation fighter project, had not signed the MOU at press time. Total development costs are expected to be $10.07 billion, and first flight of the prototype is expected in 1991. The number of aircraft to be produced has not been finalized. Another fighter aircraft set to fly in 1991, Dassault-Breguet's **Rafale,** also recently got the go-ahead from the French government to begin FSD. Both EFA and Rafale are scheduled to be operational in 1996.

Westinghouse and Rockwell International were awarded contracts in mid-May to begin full-scale engineering development **(FSED) of the Peacekeeper Rail-Garrison system.** Westinghouse Electric's Marine Division in Sunnyvale, Calif., was awarded a $167 million contract for development and test of the Missile Launch Car (MLC), which includes the railcar and systems for missile-canister erection and launch of the LGM-118A Peacekeeper ICBM. Rockwell's Autonetics Electronics Systems Division of Anaheim, Calif., was awarded a $161.7 million contract for development and test of the Launch Control System (LCS), Launch Control Car (LCC), and a security car. Both contracts run for five years. Plans call for

Employment Service

Watch for details on a new membership benefit in next month's AIR FORCE Magazine. Through an exclusive arrangement with Employment Transition Service, an organization chartered to translate Air Force skills into job categories sought by the private sector, AFA will be able to help get your name and information on your job skills into the hands of companies that are looking for help. This service will be free of charge to AFA members.

Senior Staff Changes

PROMOTIONS: To be **Lieutenant General:** Gordon E. **Fornell.**

To be **Major General:** John P. **McDonough.**

To be **Brigadier General:** Barbara A. **Goodwin;** Donald J. **Harlin.**

To be **ANG Major General:** John **Anderson,** Jr.; Edward J. **Philbin.**

To be **ANG Brigadier General:** Michael **Adams;** David T. **Arendts;** Charles J. **Bowling;** Nicholas **Eremita;** Don E. **Follis;** Dennis B. **Hague;** Frederick R. **Keith,** Jr.; James E. **Kintzi;** Gary C. **Nelson;** David L. **Quinlan;** Jerald D. **Slack;** John C. **Stafford;** Gerald W. **Swartzbaugh;** Joseph A. **Washington;** John W. **Wood.**

RETIREMENTS: B/G Charles W. **Bartholomew;** L/G James R. **Brown;** L/G Murphy A. **Chesney;** B/G Richard L. **Craft;** Gen. Jack I. **Gregory;** B/G William L. **Hiner;** B/G Paul A. **Maye;** B/G James M. **Rhodes,** Jr.

Also, L/G Truman **Spangrud;** B/G Charles F. **Stebbins;** B/G Norman R. **Thorpe;** L/G William E. **Thurman;** M/G William T. **Twinting;** M/G Gordon E. **Williams.**

CHANGES: B/G Stephen B. Croker, from Ass't DCS/P&P, Hq. SAC, Offutt AFB, Neb., to DCS/P&P, Hq. SAC, Offutt AFB, Neb., replacing B/G (M/G selectee) George W. Larson, Jr. . . . **B/G Howell M. Estes III,** from Cmdr., 14th AD, SAC, Beale AFB, Calif., to Ass't DCS/P&P, Hq. SAC, Offutt AFB, Neb., replacing B/G Stephen B. Croker . . . **M/G (L/G selectee) Gordon E. Fornell,** from Sr. Mil. Ass't to Sec'y of Defense, OSD, Washington, D. C., to Cmdr., Hq. ESD, AFSC, Hanscom AFB, Mass., replacing retiring L/G Melvin F. Chubb, Jr. . . . **Col. (B/G selectee) Timothy D. Gill,** from IG, Hq. PACAF, Hickam AFB, Hawaii, to Dep. Cmdr., Joint Task Force Middle East, USCENTCOM, Navy Mobile Units . . . **Col. (B/G selectee) Barbara A. Goodwin,** from Ass't for Nursing Svcs., Hq. MAC, Scott AFB, Ill., to Chief, USAF Nurse Corps, Hq. USAF, Bolling AFB, D. C., replacing retiring B/G Carmelita Schimmenti.

Col. (B/G selectee) Donald J. Harlin, from Command Chaplain, Hq. TAC, Langley AFB, Va., to Dep. Chief of Chaplains, Hq. USAF, Bolling AFB, D. C., replacing B/G (M/G selectee) John P. McDonough . . . **Col. (B/G selectee) Kenneth F. Keller,** from Exec. Officer to Dep. USCINCEUR, Hq. USEUCOM, Vaihingen, Germany, to Cmdr., 14th AD, SAC, Beale AFB, Calif., replacing B/G Howell M. Estes III . . . **B/G (M/G selectee) George W. Larson, Jr.,** from DCS/P&P, Hq. SAC, Offutt AFB, Neb., to Dep. Comptroller, Budget, SAF/ACB, Hq. USAF, Washington, D. C., replacing M/G Leo W. Smith II . . . **B/G Robert M. Marquette, Jr.,** from Cmdr., 12th AD, SAC, Dyess AFB, Tex., to Cmdr., 12th AD, SAC, Ellsworth AFB, S. D. . . . **B/G (M/G selectee) John P. McDonough,** from Dep. Chief of Chaplains, Hq. USAF, Bolling AFB, D. C., to Chief of Chaplains, Hq. USAF, Bolling AFB, D. C., replacing retiring M/G Stuart E. Barstad.

B/G Raymund E. O'Mara, from Cmdr., 40th AD, SAC, Wurtsmith AFB, Mich., to Cmdr., 57th AD, SAC, Minot AFB, N. D., replacing B/G John L. Borling . . . **B/G David J. Pederson,** from Cmdr., 42d AD, SAC, Eaker AFB, Ark., to Cmdr., 42d AD, SAC, Grand Forks AFB, N. D. . . . **M/G Leo W. Smith II,** from Dep. Comptroller, Budget, SAF/ACB, Hq. USAF, Washington, D. C., to Ass't DCS/P&O, Hq. USAF, Washington, D. C., replacing M/G (L/G selectee) Anthony J. Burshnick . . . **B/G William T. Williams IV,** from Exec. Dir., Joint Strategic Defense Planning Staff, Hq. USSPACECOM, Peterson AFB, Colo., to Dep. Cmdr., Canadian NORAD Region, and Cmdr., 4722d Support Sqdn., TAC, CFB North Bay, Canada, replacing retiring B/G Richard A. Ingram.

SENIOR ENLISTED ADVISOR CHANGE: CMSgt. Charles F. Joseph, to SEA, Hq. AFRES, Robins AFB, Ga., replacing CMSgt. Richard E. Russell. ■

the first of twenty-five two-missile trains to be operational by 1991.

A team led by **Control Data Corp.** was awarded a $118.6 million contract in mid-May for the Advanced Tactical Air Reconnaissance System **(ATARS)** that will replace the camera and film system currently used in tactical reconnaissance aircraft. ATARS consists of an electro optical suite that will allow aircrews to review and edit reconnaissance imagery before transmitting it to ground stations. This capability will allow commanders to see target information within minutes, rather than within hours, of the aircraft's scanning of the target. ATARS, which can be used in all weather and at night, will be installed in Air Force RF-4Cs and in the TARPS (Tactical Air Reconnaissance Pod System) pods used on Navy F-14Ds and F/A-18s.

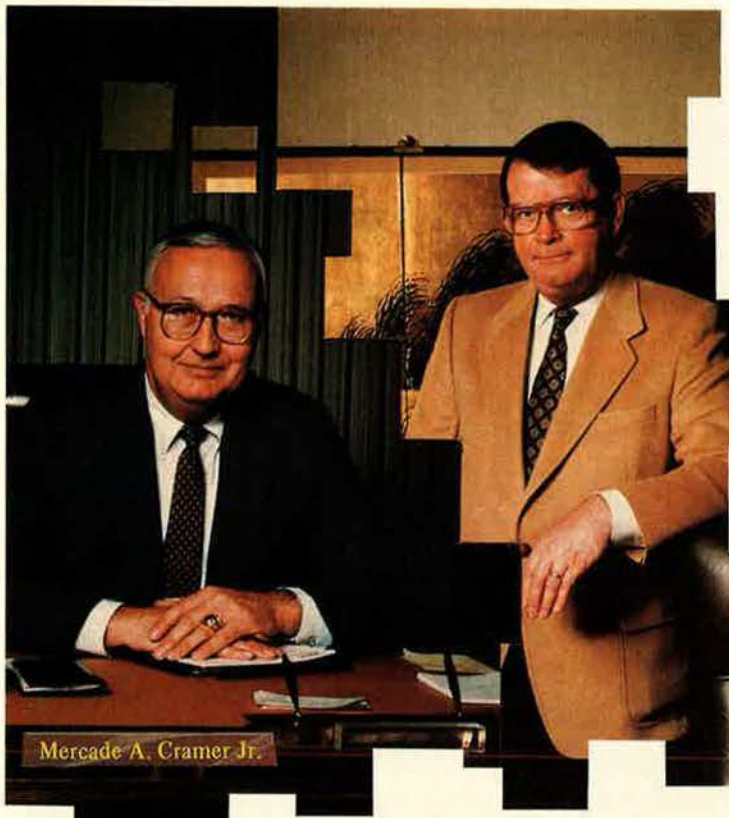
★ **DELIVERIES—Pratt & Whitney** delivered the **first F117-PW-100 engine** for the C-17 airlifter to McDonnell Douglas in ceremonies at P&W's Middletown, Conn., plant on May 18, five months ahead of schedule. The engine, a derivative of the PW2040 commercial powerplant, will be shipped to LTV in Fort Worth, Tex., where it will be installed in its nacelle. The engine will then be tested at McDonnell Douglas's facility at Quartzsite, Ariz. *(For more on the C-17 program, see "The First C-17" on p. 54 of this issue.)*

The **Westinghouse Electronic Systems Group** in Baltimore, Md., delivered the **1,000th AN/ALQ-131** electronic countermeasures pod to the Air Force on June 14. The pod provides coverage for tactical aircraft against radar-guided antiaircraft artillery and airborne and surface-to-air threats. In eleven years of production, Westinghouse delivered 659 Block I versions of the pod and is delivering the improved Block II configuration at a rate of twelve per month.

Martin Marietta delivered the **first production targeting pod** for the Low-Altitude Navigation and Targeting Infrared for Night **(LANTIRN)** system to the Air Force in ceremonies at the company's Electronic Systems Division's Orlando, Fla., facility on June 23, five weeks ahead of schedule. Since July 1983, pilots have flown LANTIRN-equipped F-16s for 1,300,000 nautical miles over 3,700 hours, half of those hours at night. The 2,000th test mission was recently flown at the Air Force Flight Test Center at Edwards AFB, Calif. LANTIRN testing with the F-15E is scheduled to begin in August.

★ **MILESTONES**—A "tip of the hat" or, in this case, tip of the "wrench" goes out to SSgt. Samuel L. Dixon, a KC-10 tanker head crew chief with the 22d Aerial Refueling Wing at March AFB, Calif. On May 14, **Sergeant Dixon's plane,** nicknamed "Shamu," **achieved** the near-unbelievable record of **500 consecutive on-time takeoffs.** This is believed to be an all-time USAF record for prompt departures. The streak for the KC-10 (serial number 84-0187) began on June 26, 1985. Plaques were presented to Sergeant Dixon, SrA. Robert L. Chance, Jr., A1C Gary L. Miolen, and Amn. John H. Donnelly II in recognition of their achievement. MSgt. William S. Jackson IV, the head crew chief for part of the streak, was also honored.

The **first test firing** of the Excimer Moderate-powered Ramen-shifted Laser Device **(EMRLD—or "emerald") was successfully carried out** on May 21 at the White Sands Missile



leadership

Vitro Engineers Change Through Technology

"Vitro has earned its position of industry leadership with hard-working, dedicated employees and successful performance for our clients for 40 years."

Mercade A. Cramer, Jr.
Chief Executive Officer

"With over 6,300 employees in worldwide locations, Vitro maintains its industry leadership by combining diversified technological investments, superior support services, and effective management techniques with proven engineering methodologies."

Raymond F. Carlin, Jr.
Chief Operating Officer

Leadership is the quality of being a leader, of having the capacity to take a position at the front.

Since 1948, Vitro Corporation has met changing national security needs with the innovative, sound approaches to systems engineering challenges which have earned us a leadership role. But, that is just part of our story.

Vitro provides the technostructure — a network of professionally skilled managers — to achieve an operating environment for technological leadership in the engineering and software disciplines essential to successful weapons systems development and acquisition.

Diversified technological investments have been a vital ingredient to Vitro success. Through a carefully selected diversity of key research and development projects and effective corporate partnering, we assure the technological balance necessary to fully meet our clients' program requirements.

Vitro is ready to meet your systems engineering needs — to put technology to work. Give us a call today.

Systems Engineering **Software Engineering**

Vitro
CORPORATION

The Art of Management / The Science of Engineering

14000 Georgia Avenue, Silver Spring, Maryland 20906-2972
For information call our Business Development Director, (301) 231-1300
A Unit of the Penn Central Federal Systems Company

Range in New Mexico. EMRLD produces an intense (which translates into destructive) beam of light that will travel extremely long distances. The laser produced single pulses of light lasting approximately one-millionth of a second each and containing energies of fifteen to twenty joules. The Air Force Weapons Laboratory at Kirtland AFB, N. M., developed the laser, and AVCO Research Laboratory served as the prime contractor.

Neal B. Goldberg, an eighteen-year-old from Fairfax Station, Va., was honored on May 19 as the **20,000,000th man to register for the draft** since registration was reestablished in 1980. Selective Service reports that ninety-six percent of men between the ages of eighteen and twenty-five have registered for the draft. Current laws prohibit giving federal jobs or student aid to those men who have not registered.

The **90th Strategic Missile Wing** at F. E. Warren AFB, Wyo., **celebrated its twenty-fifth anniversary** on July 1. The wing's 200th LGM-30B Minuteman I missile was placed on alert June 15, 1965, and the last of those missiles was replaced with LGM-30G Minuteman III missiles on January 26, 1975. The first LGM-118A Peacekeeper ICBM was installed in the base's 12,600-square-mile complex on June 12, 1986. F. E. Warren is the only base where the Peacekeeper missiles will be housed in silos.

On May 26, the **Civil Air Patrol marked the fortieth anniversary** of its designation by Congress as the only official Air Force auxiliary. The CAP today has fifty-two wings and nearly 2,000 subordinate units. The organization's 73,000 members donate approximately 4,000,000 hours of volunteer service per year in providing emergency services, aerospace education, and development of cadets in the program.

Lt. Gen. Frank E. Petersen, Jr., who in 1952 became the Marine Corps's first black aviator, **will retire** this month after a thirty-eight-year career. General Petersen, who was the only black in the Corps of flag rank, flew 350 combat missions in Korea and Vietnam and at one time held the distinction of being both the Silver Hawk in the Marines and the Navy's Gray Eagle, honors bestowed on the oldest aviator on active duty and still flying.

★ **NEWS NOTES**—The Air Force's **new operations-management career field will allow 500 pilots and navigators to return to flying status.** The new career field combines such areas as base survivability, base operations, operations and training, and adjutant and command post duties into one nonrated specialty. The new career field has nearly 1,100 officer slots structured from lieutenant through colonel. All rated officers are to be withdrawn from the 19XX career field by the mid-1990s.

Air Force Systems Command plans to sell its thirteen remaining **aircraft factories.** The plants are all that are left of the more than 100 factories that were government-owned at the end of World War II. AFSC is offering the contractors currently occupying the plants first option on the buildings, with the other services getting second choice. If no buyer is found, the plants could go up for public sale. The Air Force is selling the buildings, which cost $834 million to build and would cost approximately

$3.4 billion to replace, because the cost of upkeep and repairs has become prohibitive. General Dynamics builds F-16s in Air Force Plant 4 in Fort Worth, Tex., and Northrop is building the new B-2 bomber in Air Force Plant 42 in Palmdale, Calif.

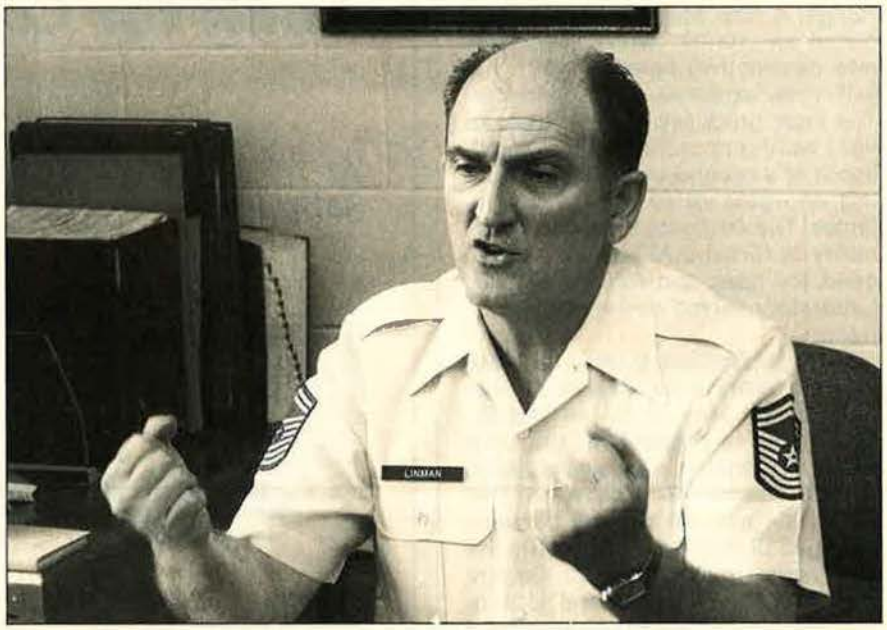
The Navy carried out on May 25 the **eleventh successful test** in twelve attempts of the Lockheed UGM-133A **Trident II,** or D5, sea-launched ballistic missile. The night launch was made from a flat pad at Cape Canaveral AFS, Fla., and the unarmed missile impacted in the Eastern Test Range in the Atlantic. The tenth successful test was achieved on April 28. The Navy plans approximately eight more tests of the D5 before launch tests from a submarine.

In mid-June, the **Royal Australian Air Force completed the first stage of flight tests with** the Texas Instruments AGM-88A high-speed antiradiation missile **(HARM)** on its F-111C aircraft. Further development and testing are required to integrate the aircraft avionics and the HARM so that the missile can be programmed to attack particular radar targets. The second round of tests has not been scheduled.

The Air Force's buildings may be safer than was originally thought. **Only 4.8 percent of the buildings tested for radon** on 135 Air Force bases around the world **showed higher-than-normal accumulations** of the naturally occurring radioactive gas. More than 4,000 buildings on ninety-three Stateside and forty-two overseas locations were tested for the gas, which can cause lung cancer. The bases showing the highest concentrations of radon were Andersen AFB, Guam, and Peterson AFB and the Air Force Academy in Colorado.

The **fourth of five tests** of the redesigned Space Shuttle Solid Rocket Booster **(SRB) was successfully carried out** on June 14 at the Morton Thiokol plant near Brigham City, Utah. The fifth test, scheduled for late July, will include several severe flaws.

And from the "At Last, Success" department, the external tank for the first Shuttle mission (STS-26) since the *Challenger* disaster was mated on June 8 to the two SRBs in the Vehicle Assembly Building (VAB) at the Kennedy Space Center in Florida. The Shuttle Orbiter *Discovery* was towed to the VAB on June 21, and mating was to have been completed by the end of the month. *Discovery* will be rolled out to Pad 39B in July, and launch is currently scheduled for early September. ■



CMSgt. James Linman, the superintendent of the 432d Security Police Squadron at Misawa AB, Japan, is one of a handful of people in the Air Force who have served past thirty years. Chief Linman notes that despite advanced communications and weapons, "the Air Force still doesn't completely trust electronic gadgets when it comes to guarding aircraft . . . because nothing beats the eyes and reactions of a human being." Chief Linman will retire in two years.

Index to Advertisers

HERE'S TO THE WINNERS, WE'RE ON YOUR WAY.℠

FOR GOVERNMENT RATES WORLDWIDE WE'VE GOT THE TICKET.

Our 1988 Government Rate Directory is your ticket to great savings with special Government Rates at over 1200 participating Holiday Inn® and Holiday Inn Crowne Plaza® hotels in 41 countries. Rates that will help you stay within your per diem without sacrificing comfort or service.

Why not send for your free copy today? And then call toll-free 1-800-HOLIDAY to reserve the convenient, reliable accommodations you've come to depend on all over the world. But make your travel plans early, because Government Rates rooms are limited and subject to availability. Most participating hotels also extend their Government Rates to cost-reimbursable contractors.

To get your free copy of our 1988 Worldwide Government Rate Directory, just complete the ticket below.

CALL 1-800-HOLIDAY OR YOUR TRAVEL AGENT.

Capitol Hill

By Brian Green, CONGRESSIONAL EDITOR

Washington, D. C.

Appropriations Actions

The House passed an FY '89 defense appropriations bill consistent with the $299.5 billion defense budget authority and $294 billion in outlays approved in the authorization bills. (Budget authority is legal authority to obligate for funds to be expended; outlays are funds actually to be spent in a given fiscal year.) The Senate Appropriations Committee (SAC) approved the same top-line defense figures in its bill. The bills differ in many specifics.

The SAC approved $50 million for the Small ICBM and $687 million for Peacekeeper rail-garrison basing R&D. The House funding priorities were reversed—$600 million for the SICBM and $100 million for Peacekeeper rail-garrison. The Air Force favors cancellation of the SICBM because of tight budgets.

The SAC approved $4.1 billion for SDI; the House approved $3.5 billion. The SAC also approved thirty-six F-15Es, while the House approved forty-two. The SAC passed only a minor cut in the $3.1 billion aircraft-spares request; the House chopped $339 million. The House bill calls for a four percent military pay raise, while the Senate unit approved the requested 4.3 percent raise. The House okayed the $54 million pilot bonus request, subject to submission by the Secretary of Defense of a comprehensive pilot-retention program. The SAC approved $30 million.

Authorizations Stuck

The conference to resolve differences between the House and Senate FY '89 defense authorization bills is stuck, at this writing, over provisions that pertain to obligations to hire labor for government contracts at prevailing local wages. According to committee staffers, however, other tough issues have been resolved.

The conferees agreed to fund the Small ICBM at $250 million and Peacekeeper rail-garrison basing R&D at $250 million. Another $250 million can be allocated to one program or the other by the new Administration in January 1989. The Senate had earmarked $50 million for the Small ICBM and $700 million for Peacekeeper rail-garrison basing; the House provided $600 million for SICBM and $100 million for Peacekeeper basing. SDI was funded at $4.1 billion, a compromise between $3.5 billion approved by the House and $4.5 billion by the Senate. The conferees agreed to a four percent military pay raise.

Industrial Base

Senate provisions to require negotiations to eliminate "offset" arrangements (that require US spending or investment in a nation purchasing US weapon systems to offset the purchase cost), expand the use of commercial items, and allow establishment of a defense production innovation center were approved. Some House "Buy American" provisions were adopted with modification.

Drugs

The compromise bill now assigns DoD a new mission: interdiction of illegal drugs. Military personnel, however, will not have the power to make arrests. The conferees agreed to devote $300 million of the defense budget, taken from other defense accounts, to this mission.

The Air Force role will center on radar surveillance of the US southern borders.

Arms Control

A House provision to restrict underground nuclear tests to one kiloton was substantially modified. The compromise measure requires creation of a program that would assure the safety and reliability of nuclear warheads in the event that a very low test threshold or a test ban is negotiated.

The conferees also agreed to require a report from the Department of Defense defining "depressed trajectories" and to ban ballistic missile tests that fit that definition sixty days thereafter. The House had banned such tests; the Senate had not.

Provisions were adopted that permit a slight rise in the number of multiwarhead nuclear delivery platforms (ICBMs, SLBMs, and bombers with long-range cruise missiles). These provisions limit the US to platform levels that are very close to those prescribed in the SALT II Treaty. As earlier approved by both the House and Senate (erroneously reported last month in this column as approved only by the House), SDI testing was confined to meet the "narrow" interpretation of the ABM Treaty.

Base Closing

The bill to create a commission that would expedite military base closures may be getting caught in a political quagmire that could complicate final approval.

The House Armed Services Committee (HASC), Government Operations Committee, and Merchant Marine and Fisheries Committee all offered different versions of the bill. The original bill, sponsored by Rep. Dick Armey (R-Tex.) and others, would establish a special one-time commission that would submit to the Secretary of Defense a list of bases to be closed. The Secretary could accept or reject the list. The Senate approved a version similar to the original.

While the Senate bill provides up to $300 million to cover the cost of closings, the HASC version would require DoD to request funding for closing specific bases. Each specific request would be subject to congressional approval. The HASC bill would also require Pentagon reports on the socioeconomic and environmental impact of each base closing. Environmental cleanup of each base would be required within five years of closure, eliminating the option of restricting access to dangerous areas.

The Government Operations Committee included a provision that would require congressional approval of the commission's list. The Senate bill would require approval of the base closings only by the Secretary of Defense. The bases would be closed unless Congress voted to reject the entire list.

The House was to consider the base-closing proposals during July. ■

SERVICE LIFE EXTENSION. THE POWER TO EVOLVE.

The search to find a way of providing economical solutions to aircraft and aerospace systems obsolescence and to delay the need for expensive replacement until requirement and economics come together has led Gruppo Agusta to develop Service Life Extension Programs (SLEP).
A concept which has grown out of our global technological capability, long experience in international co-operation and co-development programs, SLEP provides civil and military operations with the ability to solve short term aircraft and equipment problems.
We have the capability and technology to keep aircraft and their systems operating at peak efficiency using a combination of preventative maintenance and retrofitting new technology into existing airframes.
In this way we can ensure that the overall system is kept up-to-date at minimal cost. Thus protecting your initial investment in equipment by extending its operating life. Not just in aircraft but in the integrated logistic support systems too.
In the world of airplanes, helicopters and aerospace systems Gruppo Agusta provides you with the power to evolve.

ADVANCED IMAGE ART

GRUPPO AGUSTA

Research and Aerospace Technology

EFIM

AGUSTA AVIATION CORPORATION - 1735 JEFFERSON DAVIS HIGHWAY - ARLINGTON, VA 22202 - TEL. (703) 920-4220

Atla

The U.S. Air Force has selected Atlas II as their new 6,000-pound class medium launch vehicle. And inaugurated a new way to do business in space.

In addition to building 11 launch vehicles, General Dynamics Space Systems Division will provide a complete package of services which includes research and development, production, systems tests and integration, launch preparations and launch operations.

Atlas II will boost 10 Defense Satellite Communications System satellites and

lS II

one Space Test Program satellite beginning in 1991 and continuing throughout the decade. A derivative launch vehicle, Atlas IIA, will also be available for commercial missions to complement the current Atlas I.

Atlas, born as an Air Force program, has reliably served both government and private customers for nearly 30 years. Today, the new Atlas II is proud to be back in uniform.

GENERAL DYNAMICS
A Strong Company For A Strong Country

The United States does not have enough airlift and sealift to meet its military commitments. Airlift finally seems headed in the right direction, though. The outlook for sealift is grim.

The Power-Projection Shortfall

BY JOHN T. CORRELL
EDITOR IN CHIEF

THE conventional defense of Western Europe depends on prompt reinforcement by combat units from the United States. Within ten days of a decision to mobilize, the US is committed to raise its strength in Europe to ten Army divisions, sixty tactical fighter squadrons, and one Marine amphibious brigade.

The United States cannot meet that commitment. It does not have enough airlift and sealift to deploy the forces and the support they would require.

According to the Pentagon, US force-projection capability—an aggregate measure that includes airlift, sealift, and prepositioned equipment, munitions, and supplies—has roughly doubled since 1980. That's true. But that progress is still insufficient, which gives some indication of how bad the situation had been.

In October 1978, the federal government conducted its first full-scale simulated mobilization exercise in thirty years. Twenty-four military organizations and thirty civilian agencies took part. The exercise was called "Nifty Nugget," and the scenario sent 400,000 troops to Europe in response to a fast-breaking conventional attack.

The results of the simulation were horrifying. The 400,000 troops were killed in the first few weeks. They ran out of artillery shells, tank rounds, and other ammunition. Their supplies were still floating in the Atlantic or waiting at US ports when the exercise ended after twenty-one days.

Mobilization plans fell apart under pressure. There were huge gaps in understanding among the players. They could not even agree on a definition of "mobilization." Military Airlift Command got twenty-seven validated requests to move the same unit to twenty-seven different places. Airlift fell short, despite augmentation by the reserves and commercial airliners. MAC could handle only about a tenth of the outsize cargo it was called on to take to the battlefront. Coordination among the services was haphazard.

Nifty Nugget set the stage for the gains in force-projection capability that came in the 1980s. It also led to the creation of US Transportation Command. TRANSCOM, activated last October, places critical compo-

The United States is committed to raising its strength in Europe to ten Army divisions in the event of war there, but the nation's force-projection resources would be hard-pressed to move that many troops and the equipment and supplies that they would need to sustain combat operations. Here, paratroopers hit the silk during an airborne exercise.

—USN photo by PH1 D. E. Erickson

One approach to force projection is to preposition equipment and supplies at critical overseas locations. These maritime prepositioning ships contain a virtual supermarket of combat-supporting supplies. But prepositioning can shoulder only so much of the burden. Sealift would be called on to carry the bulk of the load, but US sealift assets are woefully inadequate.

nents of MAC, the Navy's Military Sealift Command, and the Army's Military Traffic Management Command under unified control. This arrangement promises to improve efficiency and coordination, but it does not resolve the basic shortage of resources.

Gen. Duane H. Cassidy, Commander in Chief of TRANSCOM, told the Senate last April that "we simply do not have enough airlift or sealift, nor are we closing the gap. Although we have made progress in increasing airlift capacity, we still face shortfalls. Strategic sealift is encountering a steep, rapid decline."

In his new role, General Cassidy also keeps his old command, MAC, whose airlifters are the healthiest element in force projection. The C-141 StarLifters have been stretched by twenty-three feet, giving them thirty percent more capacity. They have further been retrofitted for aerial refueling. A rewinging of the big C-5s, using stronger materials, has added 30,000 hours to the service life of each of those aircraft. The Air Force is buying fifty C-5Bs for MAC and sixty KC-10s—combination tanker-airlifters—for Strategic Air Command. There have been significant improvements in the Civil Reserve Air Fleet, modified commercial airliners that in wartime would perform nearly all troop movement and carry twenty-five percent of the air cargo.

Work begins this month on the C-17 intertheater-intratheater airlifter *(see "The First C-17," p. 54)*. The Air Force can presently provide 45,400,000 ton-miles per day of airlift. That is well short of the established requirement for 66,000,000, but at least the trend is in the right direction.

The Sealift Shortfall

Not so with sealift. In any major overseas deployment, about ninety-five percent of the dry cargo and ninety-nine percent of the petroleum products would go by sea. Since 1980, the Navy has acquired eight Fast Sealift Ships, container vessels that move at speeds above thirty knots and that have been converted to a roll-on/roll-off configuration for combat unit equipment.

But strategic sealift still depends heavily on the merchant marine fleet. The number of merchant ships the Navy could activate from its Ready Reserve Force increased from zero in 1980 to ninety-six today. These measures have been helpful, but the overall outlook is grim. The merchant marine and the maritime industry are in trouble.

"Today we cannot meet the national commitment of ten divisions to Europe in ten days for several reasons, including the lack of immediately available shipping," General Cassidy says. "Dollars alone will not cure the extensive problems that this industry faces. The Departments of Defense and Transportation, in conjunction with the civil sector, including both unions and shipowners if necessary, must spearhead a national effort to revitalize our commercial maritime industry."

The President's Commission on the Merchant Marine and Defense reported recently that "the current inventory of ships suitable for strategic sealift is inadequate to meet the requirements of even a single-theater conflict" and that by the turn of the century it will be impossible for the United States to fulfill its national strategy with its own sealift resources.

Estimates of the shortfall in sea-

lift vary, but General Cassidy says that "at this point, defining the exact number of ships sufficient to do the job is not as critical as recognizing the continuing downward trend in ships available." He told Congress that the state of the maritime industry is "the most disturbing situation I have encountered since assuming command of USTRANSCOM."

Since 1980, the US flag commercial fleet has declined from 843 active ships to 369. By the year 2000, there will be only 220. Domestic shipyards have not begun work on an American flag vessel since 1985, and no merchant ships are presently under construction in US shipyards. The merchant marine work force has declined sixty percent since 1970 and is still dropping. Seventy-six US shipyards or ship repair facilities have closed since 1982, and thirty-eight major drydocking facilities have shut down. This, of course, would make it harder for the Navy to reactivate reserve ships quickly or to repair battle damage.

The Next Big Step

Much of TRANSCOM's activity in its first year of existence has been in the areas of organizing and planning. The next big step comes October 1, when it assumes operational command of the "common user" forces of the component commands. Resources for service-unique missions will stay under control of the individual military departments.

MAC, for example, will be keeping as service-unique its tactical and special airlift, aeromedical evacuation, rescue, special operations, weather, and audiovisual missions. Assets moving under the purview of TRANSCOM include eighty-five C-5s and 234 C-141s from MAC, 387 Civil Reserve Air Fleet aircraft, fifty-two Navy ships, ninety-four reserve vessels, thirty-one ocean terminals now operated by the Army, and the 2,600 railcars of the Defense Freight Railway Interchange Fleet.

TRANSCOM officials say that before they can develop an effective transportation system, they must solve their automated data-processing problems. Their objective is a single ADP system that integrates the present proliferation of existing ones.

A major initiative is building a command control communications and computer system (C^4S) to manage TRANSCOM's diverse missions and assets.

"Our most pressing C^4S concern is the lack of a communications and computer network for global mobility planning and execution," General Cassidy says. "Fielding programs such as the Worldwide Military Command and Control System [WWMCCS] Information System [WIS] and the Joint Operational Planning and Execution System [JOPES] will provide state-of-the-art decision-making capability in response to crisis or contingency.

"Our long-term objectives in efficient mobilization are dependent on WIS and JOPES, which represent the most critical communications and computer program in USTRANSCOM's wartime mobility planning. We cannot meet our chartered wartime mission without this capability. This program is what USTRANSCOM is all about. Realistically, we will never have enough lift. We must put what lift we do possess to the best possible use. This program is the means to that end."

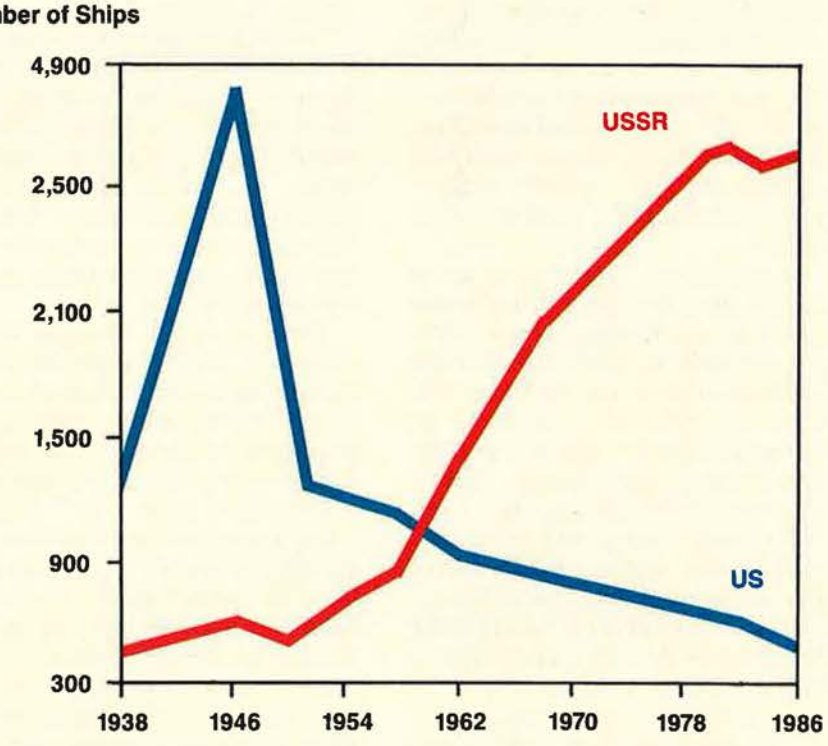
TRANSCOM reports significant progress in joint and combined communications capability. The current C^4S system works well when operations are planned and deliberate, but its limitations show up in fast-moving deployments. The command seems determined to establish global mobility management and is trying to steer these programs safely through the firestorm of budget reductions.

Running Out of People

General Cassidy's concerns do not stop with aircraft, ships, and the industrial base. "We could run out of people before running out of equipment," he says. "There has been much uncertainty introduced into the lives of our personnel. The service member is not sure of the ground he stands on. The spouses are less sure.

"For example, MAC's pilot-reten-

The Merchant Fleets



Source: TRANSCOM

While the number of Soviet ships has increased steadily over the years, the US merchant fleet has declined and now ranks fourteenth in the world.

—Photo by Erik Simonsen

Such aircraft as this KC-10 tanker/transport at March AFB, Calif., offer airlift versatility, but airlifters on the ramp are of no use without aircrews and ground support personnel. TRANSCOM's Commander in Chief, Gen. Duane Cassidy, is worried about the alarming negative trend in Military Airlift Command's pilot-retention rate.

tion rates [cumulative retention for pilots with six to eleven years of service] have declined from seventy-nine percent in FY '83 to thirty-nine percent in FY '87. So far, FY '88 rates appear to be heading even lower. This pilot-retention decline, coupled with the current merchant mariner shortfall, severely impacts USTRANSCOM's wartime capability."

In some MAC units, as many as half of the pilots have given notice that they are leaving service. Reasons include the instability of duty and assignments, the decline of benefits, objections to various Air Force personnel policies, and the lure of other opportunities, mainly from the pilot-hungry airlines. General Cassidy, along with other military leaders, argues hard for better pay and benefits when he testifies to Congress, but MAC is taking some initiatives of its own. One of these is disciplining the airlift system to reduce turbulence for the crews.

"We have instituted a significant reduction in last-minute Channel [regularly scheduled] add-on missions," he says. "We will no longer chase the cargo levels in our aerial ports, but will match our cargo movement to a reasonable capability—one that takes into account our aircrew situation.

"We will discipline the airlift system by prescheduling SAAM [Special Assignment Airlift Mission] missions. MAC can no longer afford to be a 'You call, we haul' outfit. . . . We will strictly manage scheduled return times for active as well as for Reserve crews and will take every action possible to return our crews on time."

The numerical strength of the merchant marine work force has been dropping like a rock. It stands at only 28,000 people today and is projected to decrease further to 12,000 by the end of the century.

"Should we have to mobilize, our initial projected merchant mariner shortfall would be 6,170 seamen," General Cassidy says. "The shortfall would escalate to 8,126 seamen during sustained operations and peak at approximately 20,000 seamen when considering economic shipping and the shipping of critical materials. As you can see, the maritime industry's ability to crew reserve ships and partially replace foreign crews on US flag-of-convenience ships is in jeopardy."

Transition to operational control of TRANSCOM should not be a severe jolt for the component commands. They are accustomed to working together. During last year's Reforger '87, for example, 3,900 pieces of equipment and 15,016 tons of freight, originating at twenty-seven Stateside bases, moved by rail, truck, and ship to Germany, where it linked up with 35,000 troops flown to the exercise area by MAC.

The services perform smoothly in such scheduled exercises as Reforger, which has become something of a showpiece. The deployment of 3,600 soldiers and 1,800 tons of equipment to Honduras in March—conducted on notice of only a few hours, nominally for training but also to show the flag in Central America—also went very well.

For many people, though, the real test for TRANSCOM will be whether or not it can untangle the snarls during a grand-scale mobilization of the Nifty Nugget class.

The answer may not be too long in coming. There's a very good chance that Nifty Nugget II will be staged in 1990. ■

THE A-7 PLUS

Guaranteed to deliver superior CAS/BAI performance at half the cost of a new aircraft.

Specially re-engineered to carry the Close Air Support/ Battlefield Air Interdiction load well into the 21st century, this tough combat veteran writes a new chapter in the A-7's book of performance and capabilities.

It's a whole new generation of A-7—faster, smarter, more agile and more capable. Building on the Corsair's rugged airframe, we have given the A-7 Plus the full range of capabilities that any CAS/BAI mission might call for.

The troops who'll need its support will need it *fast*, so the support needs of the A-7 Plus were kept simple. A small, unimproved forward airstrip and a supply of fuel and ordnance are all it takes.

You can hang a flexible ordnance payload of up to 17,380 pounds on it. Combat radius is almost 900 nautical miles. Even at night or under the weather, the A-7 Plus can come in low and fast, unloading on the target with the accuracy of proven navigation and targeting avionics.

Then it can get out of the threat area quickly, avoiding the enemy with rapid maneuvers, but with no loss of speed or energy.

Best Performance/Best Price

From the bomb run to the balance sheet, this is an amazing airplane. LTV Aircraft Products Group, the A-7's original builder, will deliver the A-7 Plus at a firm, fixed flyaway price. What's more, operating and support costs will be guaranteed, and its economic life warranted through the year 2010.

What it all boils down to is combat effectiveness *plus* cost efficiency. The A-7 Plus is the equal of any CAS/BAI aircraft—but at significant savings across the board.

LTV Aircraft Products Group
Aircraft Modernization and Support Division

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

In a new series of training deployments, SAC prepares to put conventional firepower on the flanks of the theater battle.

SAC Extends Its Wings

BY JEFFREY P. RHODES, AERONAUTICS EDITOR

"STRATEGIC Air Command has been practicing Emergency War Order missions—the ones we would fly in the event of nuclear war—for more than thirty years. We're good at that," said Lt. Col. William Thurston, Assistant Deputy Commander for Operations of the 7th Bomb Wing. "But SAC also has a conventional mission. To get good at that, you have to deploy airplanes. And you don't get good at that unless you actually deploy them."

Getting bombers and nuclear weapons to their targets was and is SAC's primary flying mission. It isn't the only mission, though. For some time now, SAC has put increasing emphasis on its role in nonnuclear conflict. Starting this year, four units that fly Boeing B-52Gs will be tasked with conventional missions exclusively.

During World War II, Korea, and Vietnam, strategic bombers carried iron bombs long distances with telling results. Next time—if there is a next time—the tactics will be different. B-52s cruising toward a target today at 20,000 feet in the daytime would be open to all manner of enemy fighters, antiaircraft guns, and surface-to-air missiles. Standoff, precision-guided conventional munitions might be one solution to such threats, but such munitions won't be available for some time, and even then, quantities will be limited.

That leaves direct attack. The bombers will have to run in to their targets from several directions at once, usually at night and almost always at low altitudes and in any weather. Electronic countermeasures and terrain masking will be imperative. These attacks will also have to launch from bases near the front to maximize flexibility and minimize dependence on tankers.

A notional concept called the "Strategic Area of Responsibility" (SAR) would have the B-52s flying in just such a scenario. SAC bomb wings would deploy overseas in units of seven bombers. Operational control of these B-52s would shift to the theater commander, who would employ them with the advice of a SAC general officer. The bombers would operate from predesignated forward bases with prepositioned munitions and supplies and with fuel provided by the theater command.

Strategic Air Command has always had a conventional mission, but it has never been so emphasized as it is now. Through a series of increasingly difficult deployments, Eighth Air Force is honing its conventional warfighting skills. This Carswell AFB B-52H, launched from a forward location, has just refueled and is heading for a bomb run on the training range at Nellis AFB, Nev.—a graphic example of power projection.

—USAF photo by A1C Peter A. Trentacosta

The bombers would then carry out autonomous preplanned or short-notice missions without tanker support against targets far beyond the range of friendly fighters. These strikes against major targets beyond the deep interdiction range of F-111s or F-15Es would seriously impede the flow of enemy follow-on forces, destroy war-sustaining logistics centers, and force the enemy to spread his fighter and missile defenses over a much greater area.

Something New

With access to such areas as the La Junta radar bomb-scoring site in Colorado and the many "Flag" ranges near Nellis AFB, Nev., most SAC units could do all of their training out of their home base if all they had to do was train for the attack profile. Unlike tactical fighter units, though, SAC bomber units did not often practice the art of bare-base deployment before 1987.

It was not possible to go in a single leap from a well-established, well-supplied, organic base to an austere forward operating location (FOL) and still be able to launch bomber sorties. To prepare for operations at the forty-five fields identified for their use in Europe (and FOLs elsewhere), SAC chose a stepping-stone approach. The most difficult step, the deployment of a numbered air force, will take place this month.

Since most B-52Gs are assigned to Eighth Air Force, the Mighty Eighth has been the first to develop a deployment capability. Units were sent initially on short-notice "Rapid Shot" deployments to Andersen AFB, Guam, and other places with built-in B-52 support facilities. Six bombers, crews, and a small contingent of maintenance people deployed and conducted operations at wartime sortie rates.

The next step was to deploy seven B-52s and supporting tankers to an austere field that could provide minimal support, mainly in the form of buildings for operations and housing. Flying in these "Mighty Force" deployments was highly realistic, but the exercises were mainly for the support units.

Deploying ten to twelve aircraft might not seem that tough. Fly the airplanes to a forward base, set up shop, and launch sorties. It is not that simple. To begin with, each unit got no more than thirty days' notice to develop deployment plans, iron out problems, and go.

—USAF photo by A1C Peter A. Trentacosta

One of the most difficult tasks on a deployment is regenerating aircraft day after day. These 7th Bomb Wing maintenance troops often had to work late into the night to get the bombers and tankers ready to fly the next morning. SAC had carried out only limited practice in the art of deployment before last fall.

The deployment itself involves more than airplanes and aircrews. In order to operate, a unit also needs maintenance, spare parts, ordnance, weather forecasting, communications, food, billeting, and much else. For its "Mighty Force" deployment, the 7th Bomb Wing from Carswell AFB, near Fort Worth, Tex., took 438 of its own people and forty-five communications technicians from other organizations. They even had to take their own dogfood for the four-footed guard troops.

"You either bring it with you, find it, make it, or find a substitute," said SMSgt. Raymond Hovey, the first sergeant on Carswell's deployment. "Improvisation, especially in this environment, is the rule. The objective is to get the job done."

Nearly Bare Base

The site that Eighth Air Force uses for "Mighty Force" deployments is near Burns Flat, Okla. The oil bust left that small town little more than a widening of I-40 an hour or so west of Oklahoma City. Its economic center now is the Clinton-Sherman Industrial Air Park. Many of the facilities at what was Clinton-Sherman AFB until the late 1960s are used by private companies and the Oklahoma State Highway Patrol.

Clinton-Sherman has just enough facilities to make it an excellent training ground for the bomb wings. There is a single long runway, a tower manned by Federal Aviation Administration controllers (the FAA also uses Clinton-Sherman as a training ground), bomb storage igloos, a large administration building, a good-sized multipurpose hall (once the Officers' Club), and maintenance and supply buildings.

Most enlisted men are quartered in dormitories. Male officers and flight crews are billeted in unfurnished houses, and the officer and enlisted women share two houses. "These are really austere conditions—only three TV sets on the entire base," joked Lt. Col. Charlie Glazener, chief of Eighth Air Force Bomber Operations Division, who was at Clinton-Sherman as an observer.

The first organizations into an

area in a wartime deployment would be the security police, Prime RIBS (Readiness In Base Services), and civil-engineering units to set up for the aircraft and the other people to follow. Such was the case at Clinton-Sherman for Carswell's deployment.

A harsh winter left many leaks in the plumbing at Clinton-Sherman before the 7th Bomb Wing's deployment. Second Lt. Jody McClarin and her team of fourteen civil engineers had to work about 1,500 man-hours to get them fixed. They also had to hang 10,000 square feet of sheetrock to make the place habitable. In addition, the CE unit removed five dead skunks (a sixth would later expire under a tanker) and machine-swept the runway to reduce the potential for foreign object damage (FOD). At a really austere base, the civil engineers would have to run plumbing and electricity and erect tents.

The former Officers' Club at Clinton-Sherman has a complete kitchen and refrigerated storage (which CE had to fix on arrival). Otherwise, the RIBS teams would have had to do their cooking in one of the Mobile Kitchen Trailers (MKTs), each of which is able to provide meals for more than 400 people.

Most of the food at Clinton-Sherman, and all of the prepositioned food in the War Readiness Materiel (WRM) stockpiles in Europe and elsewhere, is dehydrated. The eight cooks on the Carswell deployment fixed breakfast, dinner, and midnight breakfast for the troops who worked on the late shift. "Out here everybody appreciates us, and that makes us feel good," said SSgt. Loy Holmes, one of the food-service specialists on the deployment. "You never hear that back on base."

Lunch, however, was a different story. To simulate wartime conditions, the menu offered an MRE (meal, ready-to-eat) or an MFF (meal, flight feeding). These latter-day C-rations are complete 1,200-calorie meals in brown plastic container-bags.

Base security is a primary concern, too.

"Our job doesn't change, but the location does," said MSgt. Alan Kiernan, the NCOIC of Carswell's security police flight at Clinton-Sherman. "We arrive, look around, and post our people out. We concentrate around the resources [aircraft], but we make sure everything is covered." The forty-four enlisted SPs and one officer on the deployment were all from one flight, so they were a cohesive unit. As in a wartime situation, the SPs set up a command and control center and entry control points.

The 7th BMW, with a relatively short haul to Clinton-Sherman, brought its ground equipment by truck. Tow tugs (called "Eukes" from Euclid, the name of one of the manufacturers), generators, and Mk 82 and inert BDU-50 bombs arrived by flatbed. Ground vehicles, such as buses and pickup trucks, were driven up, while the people and smaller equipment flew in on the KC-135 tankers.

Up and Running

As soon as Carswell's B-52Hs arrived, they taxied over to the fuel depot, which was a regular stop after every mission. The fuel depot

—USAF photos by A1C Peter A. Trentacosta

ABOVE: Deployments are great training for everyone involved. There is no going back to the shop for a tool or part—you have to bring what you will need, as A1C Albert C. Perez can testify. TOP: The real-world experience of deploying also provides the opportunity to practice for chemical warfare conditions. SSgt. Sofie Maestas, a KC-135 crew chief, works while wearing chemical-protection gear.

consisted of six 50,000-gallon bladders (2,000,000 pounds of fuel) with associated pumps and hoses set up near the ramp.

The rubber bladders are rugged enough for a person to stand on, and they come complete with wooden pegs to fill bullet holes—just in case. The contents of one bladder will just about fill up a B-52. It became a daily ritual to see twenty-five fuel trucks lined up to discharge their loads into the storage tanks.

The pumps weigh 15,000 pounds each and have a 600-gallon-per-minute capacity (meaning that one of them could drain a standard swimming pool in less than two minutes). The pumps have attached to them a Defense Fuels Agency credit card imprinter, so when refueling is complete, the receipt can be signed.

After fill-up, the planes were "Euked" down to their parking spots on the ramp. One of the oddities at Clinton-Sherman is that part of the ramp is used for automobile brake testing by the Wagner Brake Co. A single red line painted on the concrete is all that separates automobiles going eighty miles an hour from crew chiefs pulling chocks on a KC-135.

The 7th BMW's maintenance crews were probably the hardest working group at Clinton-Sherman. Ninety-four of ninety-five sorties got off on time. All aircraft had to be fully mission-capable (FMC) every day.

"It was a race to see if we could have the part ready in the three to five minutes it took from the time a crew chief radioed in for a part to when he picked it up," said supply specialist MSgt. Kenneth MacKay. "We usually won."

Supply kept ahead with a Combat Supply System (CSS) computer. It tracked the location and stock level of parts and also generated data on what is—and is not—needed in War Readiness Spares Kits (WRSK).

A full WRSK for a B-52 unit amounts to fifty-nine pallets of airlift cargo. That's one reason why any wartime conventional deployment would send only seven aircraft. On this Clinton-Sherman deployment, a Mission Support Kit (MSK), which is about one-tenth of a full WRSK and consists of 52,000 pounds of spare parts, was utilized.

A B-52 can carry fifty-one Mk 82 (500-pound) bombs internally and on external pylons. The SAC Munitions Maintenance Squadrons build up the bombs (attach fuzes and fins) on a flatbed trailer with wooden rails. The truck is then parked near the airplane, and the bombs are rolled to the end of the trailer, where an MHU-83 loader (a "jammer") is used to load them up into the bomb bay one at a time.

Because SAC bombers now fly lower and lower to stay out of harm's way, a "slick" bomb on a low-level release would arrive on the target just as the releasing bomber passed overhead. Consequently, the bombs must be retarded (slowed down) so that the plane will clear the area before impact.

—USAF photo by A1C Peter A. Trentacosta

Clinton-Sherman Industrial Air Park near Burns Flat, Okla., is the ideal training site for Eighth Air Force units. It has enough facilities (a tower and bomb storage igloos, for example) to allow operations to be carried out smoothly, but it is nonetheless an austere location. Such support units as civil engineering, Prime RIBS, and security get a real workout under these forward-base conditions. These maintenance troops from the 7th Bomb Wing at Carswell AFB, Tex., are performing an inspection on a KC-135 engine on the nearly bare runway at Clinton-Sherman.

Using the Ballute

The BSU-49 high-drag fin unit uses a "ballute" (an air-inflated balloon parachute) to slow down the bomb. However, to prevent entanglement in the narrow confines of a B-52 bay, the ballute can't be inflated until the bomb clears the airplane. This is accomplished through the use of an ingenious, B-52-particular device known as a belly band.

A munitions troop wraps the band around either a Mk 82 or a Mk 117 (750-pound) bomb and secures it with Velcro. As the bomb is released, the nose fuze is armed, and another wire (which would normally activate the ballute and the tail fuze) pulls on the belly band instead. After all seventeen feet (the height the top bomb in the bay must fall) of coiled wire in the band pulls out, the ballute deploys, and the tail fuze is activated after the entire bomb is out of the aircraft.

Almost all of the people in the support units worked twelve-hour (or longer) shifts at Clinton-Sherman, so sleep was a high priority. But recreation was a priority, too. "If there is a way, there is certainly a will," said SMSgt. Mike Monti, the NCO Open Mess manager at Carswell and the head of Morale, Recreation, and Wellness (SAC has its own interpretation of the traditional MWR function) in Oklahoma.

Nonstandard recreation items brought along on this deployment included two videocassette recorders, a selection of 115 movies, and a jukebox. Normal MWR items like bicycles and softball bats were also brought. (The Carswell softball team beat a local one soundly.)

"There was some question about renting a satellite dish. It seemed to be violating the spirit of the deployment," said Eighth Air Force's Colonel Glazener. "But we figured that no matter where a unit went, they would get what they could off the [local] economy, so we said OK." Sergeant Monti worked a deal with a nearby firm and, with profits from the all-ranks club, rented a satellite dish for $50 for the duration of the deployment.

"I am very impressed with all of the people on the support side," said Maj. Greg Snyder, a B-52 radar navigator. "We pay lip service sometimes, but what they do does mean a lot to us. We know they are busting their chops, and that makes us want to do a better job."

—USAF photo by A1C Peter A. Trentacosta

This is no drill. These maintenance troops are preparing these BDU-50 practice bombs for an actual drop. A1C Scott L. Bewkes (right) is installing a "belly band," a piece of equipment that allows the bomb to clear the bomb bay before its "ballute" opens. Airman Bewkes is being assisted by Sgt. Richard Espinoza (left) and A1C Eric L. Rose.

The Main Event

One of the biggest hurdles to overcome on a deployment is communications with higher headquarters and other units as well as receiving vital weather and intelligence information. That is where Air Force Communications Command's AN/TSC-107 Quick Reaction Package (QRP) would come in.

This equipment deploys on the third day of a war and establishes initial high-frequency (HF) radio contact and teletype, AUTODIN, and shortwave (SHF) communications. It would also try to set up AUTOVON service. The QRP at Clinton-Sherman was a part of the 3d Combat Communications Group at Tinker AFB, Okla. This unit used tents during the entire deployment.

To meet some unique communications needs, SAC has developed three Combat Contingency Elements (CCEs). These units, which utilize the TSC-88 Command Post, have satellite communications (AFSATCOM) consoles like those on the E-4 National Emergency Airborne Command Post (NEACP) and on SAC's EC-135 "Looking Glass" airborne command post.

"The missions we fly [on a deployment] are real go-to-war kinds of flights," said 1st Lt. Karl Krotzer, a B-52 Electronic Warfare Officer (EWO). "There are no mission planning sessions. You get your package [target and route information], preflight, go out, and do it."

Three-Bomber Cells

The missions to the Nellis range allow the crews to see many more simulated threats and also lets them fly much lower (down to 200 feet) than they do in normal training. Flying in three-bomber cells at low level is another unique part of the training.

"There is more crew coordination involved on these missions," said 2d Lt. Chris Moss, a B-52 copilot. "It's almost like it is choreographed, and that is the way it is supposed to be. One mission on the range equals ten regular missions, and that is the value of them."

For emission control (EMCON) purposes, communications and other electronic output are elimi-

—USAF photo by A1C Peter A. Trentacosta

Although not called for in the Strategic Area of Responsibility concept, aerial refueling tankers are of inestimable importance to SAC as well as to nearly everybody in the Air Force with a flying mission. Carswell's KC-135s were used to ferry people and small equipment up to Clinton-Sherman for the unit's "Mighty Force" deployment and filled up the bombers every day before they flew off to bomb on the Nellis ranges.

nated or kept to a bare minimum, except for severe weather or emergencies where safety becomes a factor. EMCON starts on the ramp, where the crews are cleared to take off by the use of tower lights instead of radio communications, and continues throughout the mission. These "Silent Warrior" procedures are vital to the element of surprise. The tanker crews also practice EMCON and, in fact, refuel the bombers without saying a word.

What It All Means

"These deployments are expensive training, but they are very cost-effective," said Colonel Thurston, who served as the deployment commander. "There is a lot of camaraderie, and a much closer working relationship comes out of it. Everybody gets involved."

The deployments offer a valuable chance to learn. The various units do not bring all of their assigned people, so there were many opportunities for cross training. For example, carpenters taught civil engineers to hang sheetrock. "I've got some worker bees who had never held a live fuze before coming out here, so a deployment is good for them," said MSgt. William C. Cochran, NCOIC of the Munitions Maintenance Squadron technicians.

The 7th Bomb Wing was the first unit to go back to Clinton-Sherman for a second turn of training. "The first time we did this, there were a lot of problems," noted Colonel Thurston. "The first couple of days, we all stood around looking at each other saying, 'What do we do?' Since we had been here once before, this time we knew what to do, and it has been much easier—what to bring, what not to bring. To do this once [deploy], all you would do is identify problems, and you'd never do any work on fixing them."

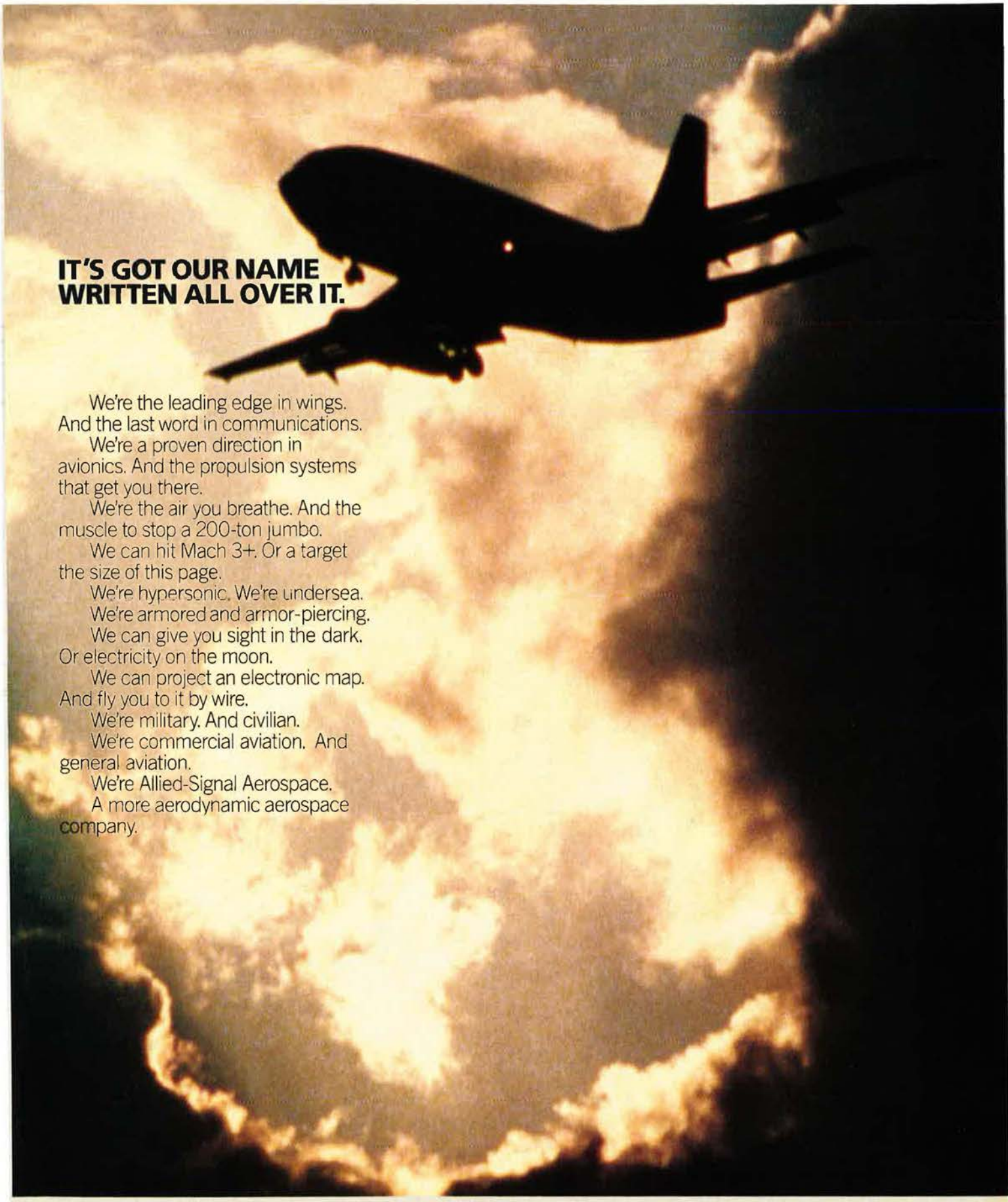
Although two-thirds of the people on the second deployment had not been on the first one, there were fewer problems. The entire wing jelled in a hurry because of the corporate memory of the core group. The wing also brought much less stuff this time, having learned from the earlier trip.

Every Eighth Air Force B-52 unit has now been to Clinton-Sherman at least once. Next to come are more ambitious exercises. This month, "Mighty Warrior" will deploy every B-52, FB-111, and tanker unit in Eighth Air Force and the headquarters section as well.

Originally, some units were to deploy to Europe as part of "Mighty Warrior," but because of budget constraints, only the 42d Bomb Wing from Loring AFB, Me., will go overseas. Clinton-Sherman will be occupied by the 2d Bomb Wing from Barksdale AFB, La., and the 7th BMW will deploy to Hunter AAF near Savannah, Ga., during the exercise.

This deployment, which will be the biggest movement of Eighth Air Force assets since World War II, will end in a concentrated aerial bombardment by B-52s—more than fifty aircraft—on a single target complex at Nellis all within a period of two hours. This mission scenario was described by one Eighth Air Force official as a raid against "a target we want to get very badly."

"When we deploy and when we're out on the range, we know Soviet satellites are probably watching," concluded Major Snyder. "But we are showing them that we can do this mission. It's money in the bank. And that's deterrence, too." ■



Allied-Signal Aerospace Company

Allied Signal

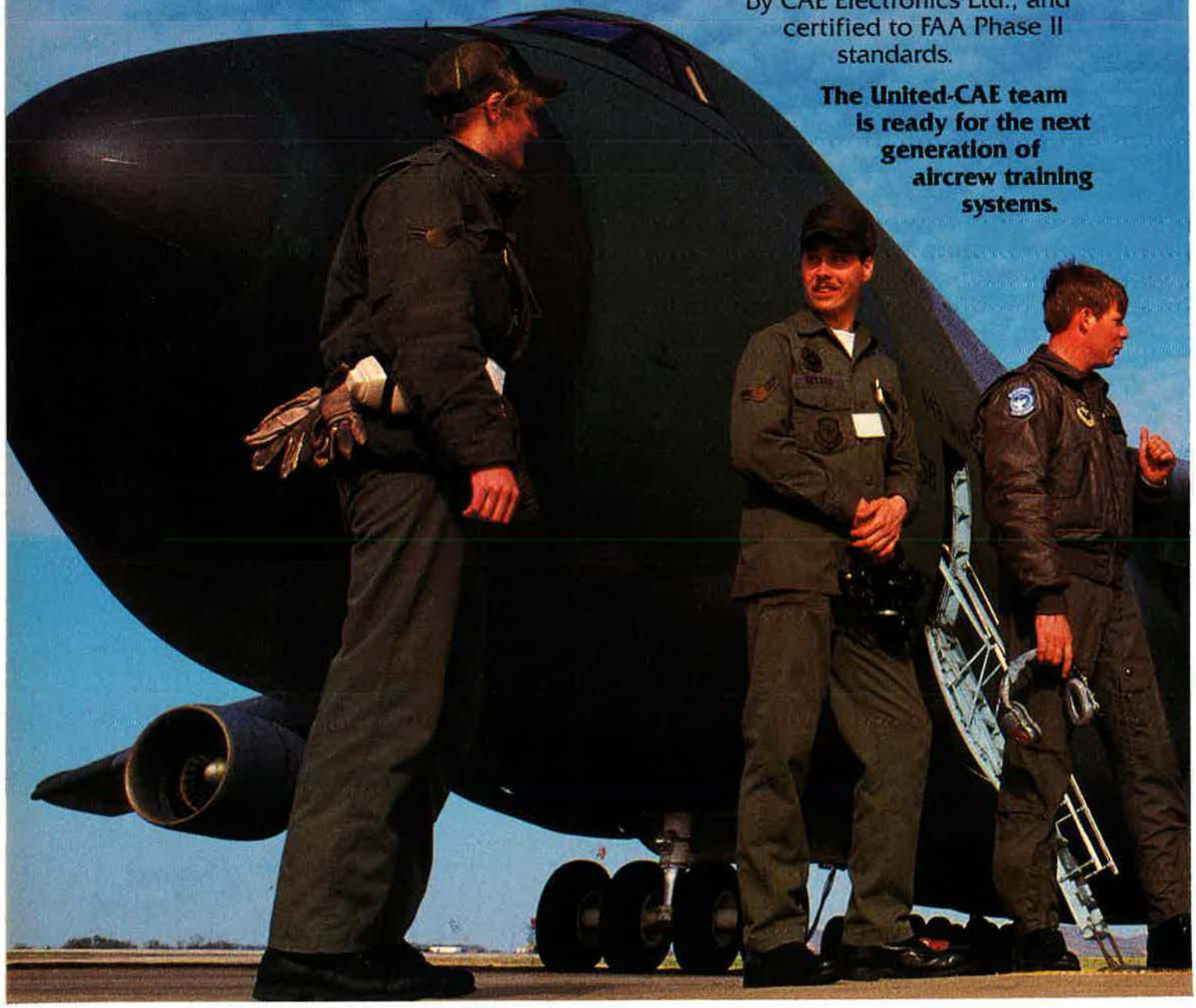
The C-5 Aircrew set the standard

United Trains Aircrews and Guarantees Its Product — Proficient C-5 Crew Members.

The United-CAE team has successfully implemented the C-5 ATS program on schedule and on budget. The C-5 ATS is a state-of-the-art aircrew training system, developed, implemented and operated by United Airlines Services Corporation, and guarantees proficient crew members through the end of this century.

The training system utilizes computer-assisted instruction and other high tech training aids, including six high-fidelity flight simulators, developed and produced by CAE Electronics Ltd., and certified to FAA Phase II standards.

The United-CAE team is ready for the next generation of aircrew training systems.



Training System has for Air Force training.

C-5 students at self-paced computer-assisted instruction terminals.

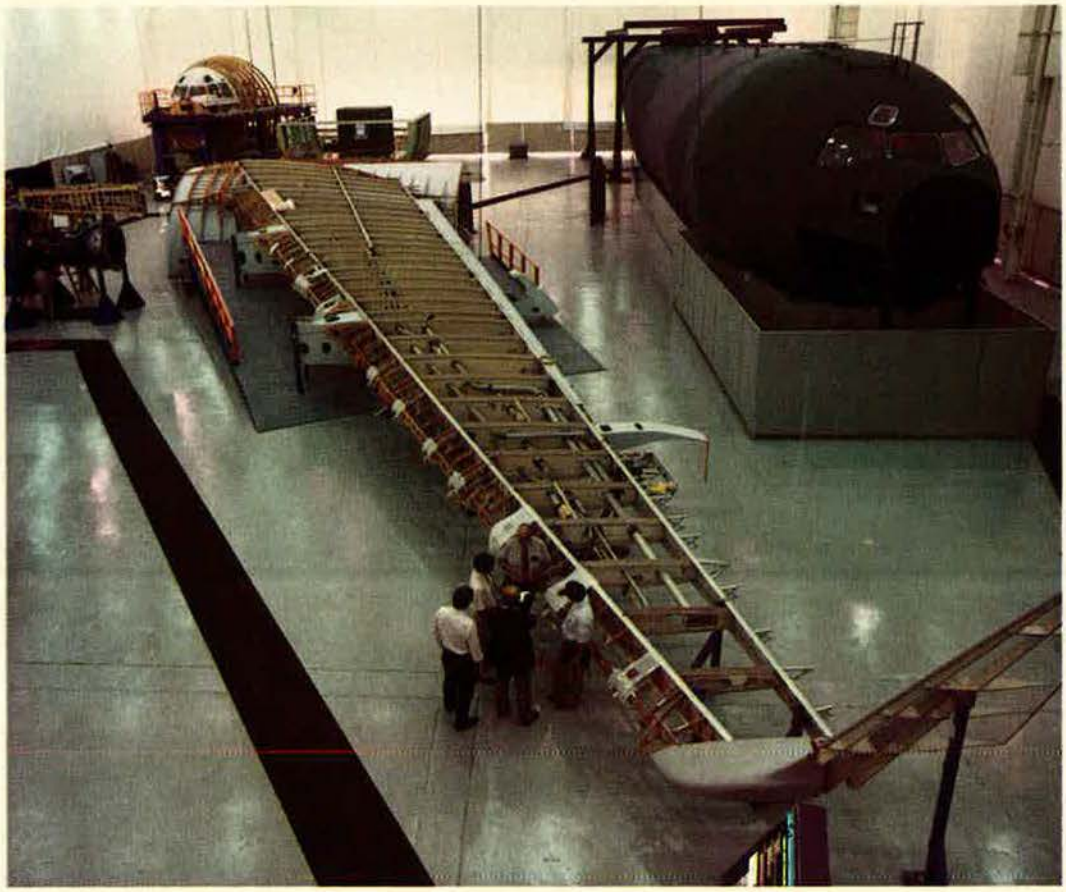
C-5B weapon system trainer developed by CAE Electronics Ltd.

CAE ELECTRONICS LTD.

cae

A subsidiary of CAE Industries Ltd.

UNITED AIRLINES
SERVICES CORPORATION



The plywood and metal mockups at the Douglas plant help to illustrate the size of the C-17. In the foreground is the left wing with its winglet (lower right corner). The externally blown flap system is not fitted to the wing mockup. The fuselage mockup is in the upper right corner in camouflage paint. The three smaller mockups to the left are the Pratt & Whitney F117-PW-100 engine, the detailed cockpit mockup (upper left corner), and a detailed mockup of the cargo bay floor. The C-17 is a true Total Force airlifter, as the Air Force Reserve and the Air National Guard will receive forty-eight aircraft straight from the production line.

The control stick will be unusual. It will be fully movable for pitch control, but only the movable top quarter of the stick will be needed for banking. The top section movements will be slight.

There won't be any ejection seats on the C-17. Two other seats will be provided for instructor pilots or for nuclear surety officers, who would be on board when the plane is transporting nuclear weapons. Rest bunks and the upper escape hatch will be located behind the second set of seats. Originally, there were to be two cargo deck viewing ports at the back of the cockpit, but these have been deleted because of changes made to the crew rest area.

The C-17 will be the first US airlifter to be equipped with winglets. These 9.5-foot-tall, vertical pieces will reduce the effects from the natural wingtip vortices and thus effectively increase the span of the wing. Without the winglets, the C-17's wingspan would have had to be increased by twenty feet, which would have considerably increased the amount of space the planes would need on the ground.

Pilots who have looked at the design think that the winglets will act like "curb feelers," giving an accurate perception of where the ends of the wings are. Judging where the wings end is an important consideration for ground operations.

The C-17s will be powered by four Pratt & Whitney F117-PW-100 turbofan engines, each producing 40,700 pounds of thrust. Known as PW2040s in the civilian world, these engines are used to power many newer Boeing 757 aircraft, and the powerplants have been in commercial service since last September. Use of the P&W 2000 series engines saved a lot of money in development costs, and by waiting for the uprated 2040s, the C-17 will get the benefit of Pratt & Whitney's improvement efforts on the engines.

The airlifter's short-field landing capability will come from an externally blown flap system, a system first pioneered with McDonnell Douglas's YC-15 prototype airlifter of the mid-1970s. The engine exhaust will be blown through and down across huge flaps (each as big as the wing of an MD-80 or DC-9 jetliner), effectively creating a much larger wing surface. This propulsive lift technology will allow the C-17 a sink rate of fifteen feet per second on landing descent and a relatively sedate landing speed of 115 knots.

The plane's ability to back up on the ground comes from a thrust-reversing system built into the engine nacelle. All the vents that must be opened to reverse thrust are located on the top half of the nacelles to prevent the engines from kicking up dust or causing foreign-object damage.

Guaranteeing Maintainability

The main landing gear consists of two three-wheeled bogies in each sponson. The inside wheel on both bogies is offset for even weight distribution. The gear will rotate ninety degrees for retraction. The tires will be radials recently made available in the necessary size. The gear and gear doors for each bogie are mechanically linked, and there is only one actuator. If the actuator fails, the gear can free-fall and then be locked down.

Unlike most new airplanes, only about ten to fifteen percent of the C-17 (the winglets, gear doors, flight control surfaces, and sponsons are the most visible) will be made of composite material. The rest of the plane will be mostly alu-

minum, including one eighty-eight-foot-long wing section, the largest aluminum piece ever machined for an aircraft.

Maintainability has been a major concern in the design of the C-17. McDonnell Douglas has frequently brought Air Force line mechanics into the plant to see if certain assemblies were accessible and could be worked on. In addition to its obvious benefits, maintainability is stressed in design because it figures in the airplane's warranty.

When the full-scale development contract was let in 1985, McDonnell Douglas had to guarantee the Air Force that the C-17 will meet aircraft performance, structural durability, and reliability, maintainability, and availability (RM&A) standards. Any deviation from those standards must be corrected by the manufacturer with no change in price.

Some of those guarantees include 30,000 hours of flight time, with ten percent of those hours to come while the plane is flying at an altitude of 300 feet, where there are tremendous stresses on an airframe. Also guaranteed is an 18.6 maintenance man-hour per flight hour (MMH/FH) standard. The MMH/FH ratio for the C-5B is roughly 35:1.

The first part for the C-17 was machined at the Douglas facility in Torrance, Calif., in early November of last year. The lower frame support corner, a part that supports the edge of the cargo floor where it joins the fuselage, weighed 9.61 pounds after being milled out of a 170-pound block of aluminum. The part, along with the remainder of the big airlifter, will roll out in July 1990.

Where the Program Stands

McDonnell Douglas will build the C-17s in its Building 54, a 1,100,000-square-foot (more than twenty-five acres) building in Long Beach, Calif., sections of which were originally used for DC-10 production.

All of the subcontracts for the C-17 have been awarded, with Lockheed Aeronautical Systems Co.-California (wing components), LTV (engine nacelles and empennage), and Pratt & Whitney (engines) being the major subcontractors. A majority of the more than 15,400 required engineering drawings will have been released and most of the initial tooling completed by the time assembly starts.

The C-17 has, however, experienced weight growth—in the neighborhood of 20,000 pounds—and the estimated empty weight of the airplane is expected to be 265,000 pounds. This extra baggage will reduce the unrefueled ferry range of the C-17 to 4,700 nautical miles, a figure below the originally specified range of 4,914 nm. However, because of midair refueling and in return for some contractor-funded improvements, such as satellite communications gear, the Air Force may be flexible on the requirement.

The first C-17 (aircraft T-1) is scheduled to roll out in July 1990. First flight will be from Long Beach to the Air Force Flight Test Center at Edwards AFB, Calif., a month later. Construction of the first two production C-17As (aircraft P-1 and P-2) was authorized under a $603.6 million contract awarded earlier this year, and those aircraft will fly in late 1990 and early 1991.

The Air Force's FY '89 budget request calls for authorizing $904.1 million for production of the next four aircraft (P-3 through P-6) and $99.9 million for long-lead funding of the next six aircraft (P-7 through P-12).

Early in the test program, a large number of C-17 parts will be taken out and shot at to test ballistic tolerance. This testing was requested by the Army. Originally, the tests were to be done on an actual aircraft, but that notion was quickly overruled.

The first four production aircraft are scheduled to join T-1 in the flight-test program, while it is planned to send P-5 and P-6 to the 437th Military Airlift Wing at Charleston AFB, S. C., which will be the first operational unit. There, P-5 and P-6 will be involved in a three-month test near the end of FY '91. This test will put the aircraft into an operational environment (including operational tests at Fort Bragg, N. C.), will train maintenance crews, and will verify the manufacturer's guarantee.

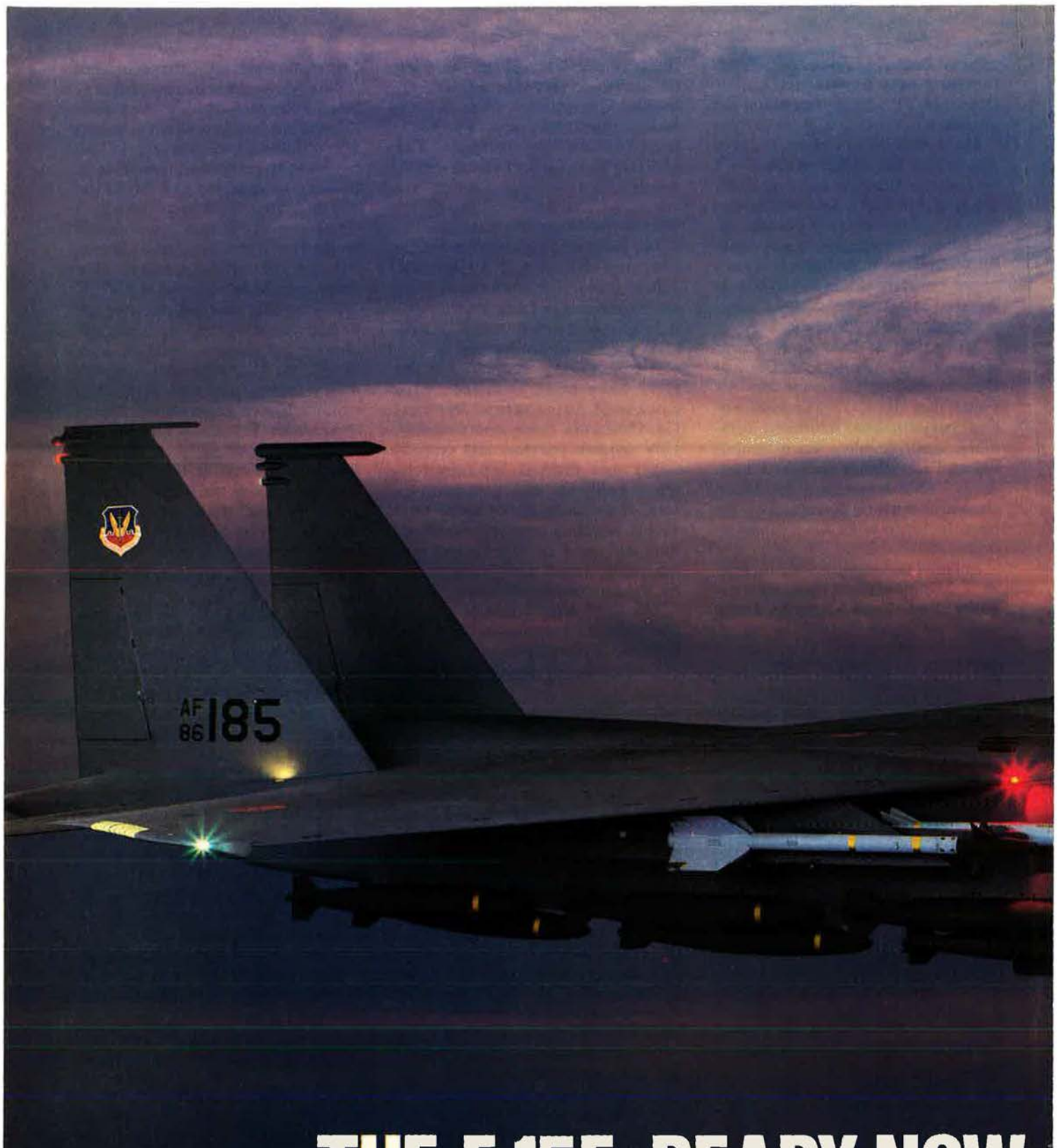
Aircraft P-1 through P-4 are scheduled to come back to Long Beach at the end of the flight-test program to have the test equipment removed, and these aircraft will then be sent on to Charleston. Initial Operational Capability (IOC) is expected to be reached with twelve aircraft in FY '92.

That is the plan for the first thirteen aircraft, but after that, things could get cloudy. Production is supposed to peak at twenty-nine aircraft per year in FY '94 through FY '99, but in the current unfavorable budget climate, a stretchout of the program is probable.

In FY '88, Congress gave the C-17 program ninety-two percent of the funds the Air Force requested for development and production. That pattern of support is not likely to continue. There are also nagging concerns about aircraft survivability and the possible need to include defensive avionics.

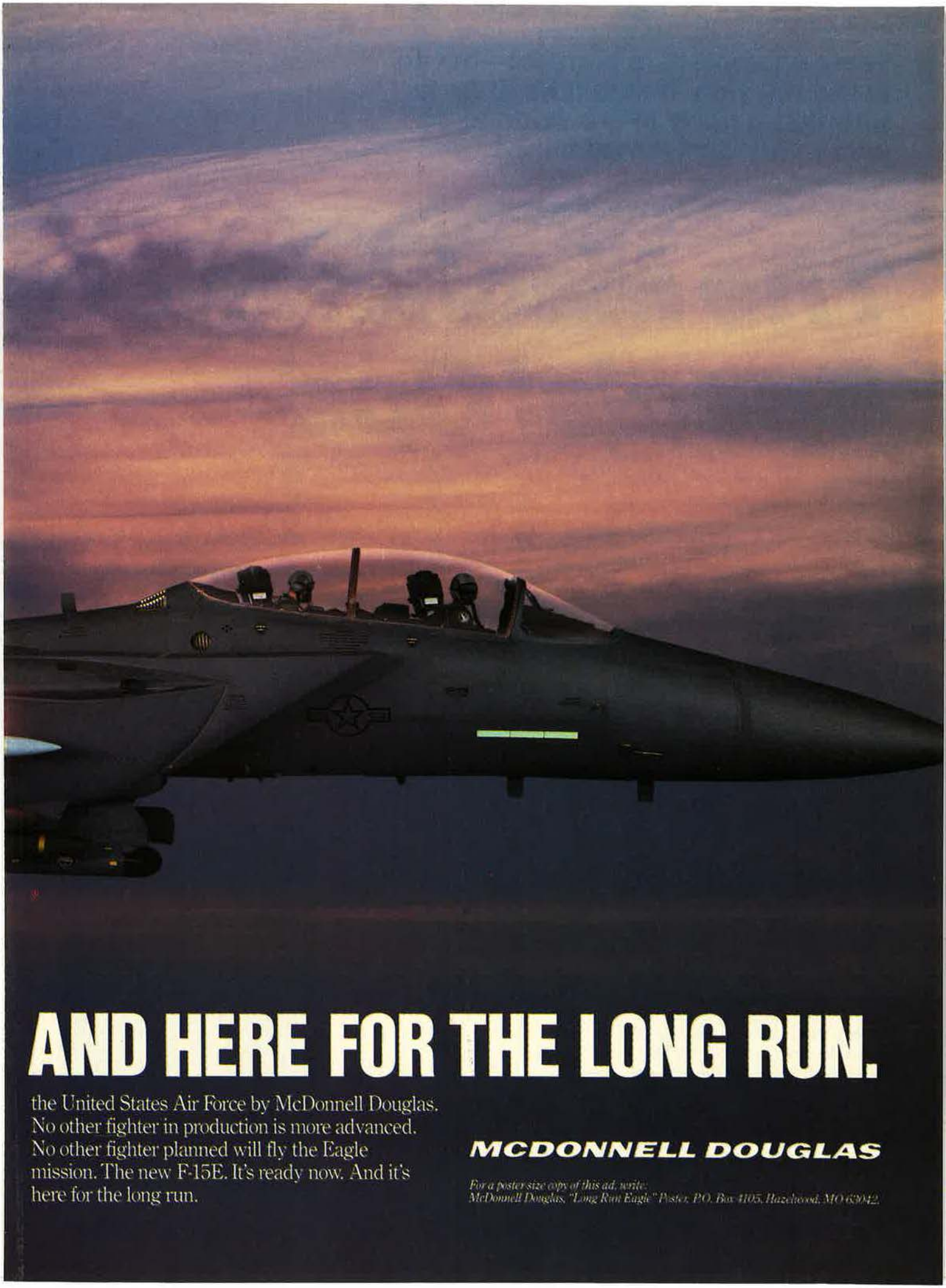
A recent GAO study concludes that even with 210 C-17s, the goal of 66,000,000 ton-miles per day will still not be met, which seemingly leaves the door open for program growth. Strategic Air Command is interested in an EC-17 version to replace its EC-135s in the Airborne Command Post mission. Several foreign countries, including Great Britain and Canada, have also shown passing interest. Foreign Military Sales (FMS) or special-version purchases would bring down unit costs.

The C-17 development program is going great guns, and expectations for it are high. All the C-17 needs now is long-term support and funding. ■



THE F-15E. READY NOW.

The fighter of the future should be ready to go the distance, day or night, good weather or bad -- from now until well into the next century. It should be so cunning it can steal deep into enemy territory virtually unnoticed. So lethal it can destroy key targets on the first pass. So agile it can outfight the toughest competition. And so resilient it can return to fight its dual role mission again and again. And it is. This is a fighter already part of America's arsenal. This is the new Eagle, designed and built for



AND HERE FOR THE LONG RUN.

the United States Air Force by McDonnell Douglas. No other fighter in production is more advanced. No other fighter planned will fly the Eagle mission. The new F-15E. It's ready now. And it's here for the long run.

MCDONNELL DOUGLAS

For a poster size copy of this ad, write: McDonnell Douglas, "Long Run Eagle" Poster, P.O. Box 4105, Hazelwood, MO 63042.

Their equipment is unusual—but so is the mission. It may take them to forbidding parts of the world to do some very dangerous things.

The Machines of Special Ops

BY JEFFREY P. RHODES, AERONAUTICS EDITOR

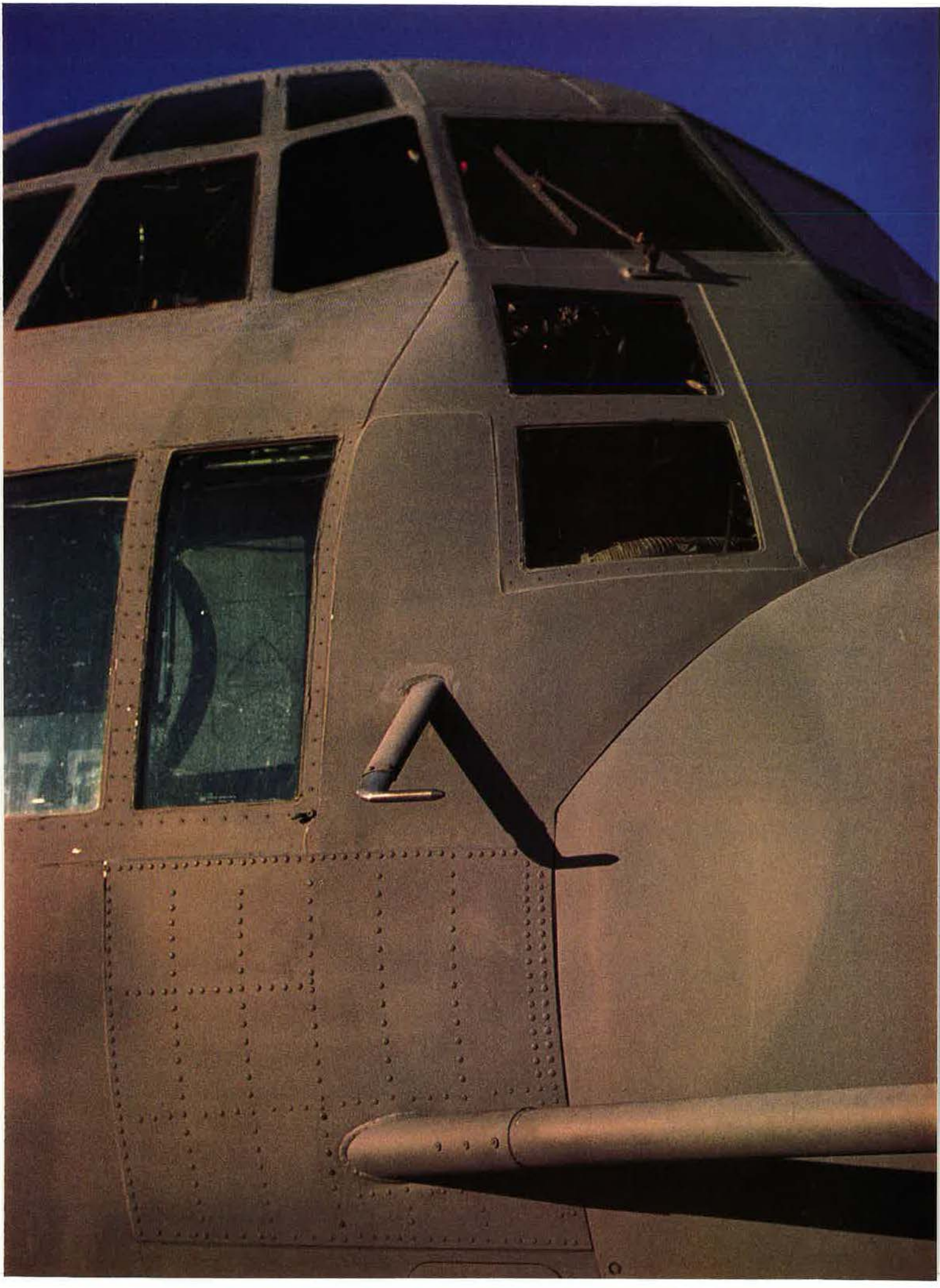
STAFF PHOTOS BY GUY ACETO, ART DIRECTOR

THE people of the 1st Special Operations Wing at Hurlburt Field, Fla., make up a unique group, but the aircraft they fly are really something else. An observer can detect that the Sikorsky MH-53H Pave Low II began life as an HH-53 helicopter, and the MC-130E Combat Talons and AC-130H Spectre gunships were at one time "slick" Lockheed C-130s, but there's nothing ordinary about these aircraft now.

The air-to-air refueling capability that all these aircraft have gives the 1st SOW the ability to overfly or go around countries or areas where landing may be prohibited or politically sensitive.

The machines of Special Ops have to be special. The 1st SOW's motto, "Any Time, Any Place," describes its mission, which may involve unconventional warfare, counterterrorist operations, or other taskings in various denominations of combat. The special operators may be called on to put down firepower, deliver cargo, rescue people, or do other dangerous things in some very forbidding corners of the world.

RIGHT: The extended pitot boom makes it easy to tell that the AC-130H is not your normal Hercules, even if the boom is on the side of the fuselage without the guns. BELOW: The inside of a gunship makes for some cramped office space. This crew is loading four-round clips into the 40-mm Bofors cannon. The "booth," where the sensor operators sit, is the gray shape with the fire extinguisher attached.



Fast, Low, and Dark

"We don't like getting any higher than we would have to fall," said Capt. Dennis Jones, a pilot for the 20th Special Operations Squadron. He was kidding, but not completely.

The Pave Low IIs were originally developed for combat rescue and are among the fastest military helicopters the United States has. Low-level work is fatigue-inducing on the airframe (the MH-53s do air-to-air refueling with the MC-130s at altitudes as low as 500 feet), and a complete service-life extension program (SLEP) has been funded. This will extend the life of the helicopters until near the year 2010.

The helicopter has 1,000 pounds of armor plate and titanium seats to protect the pilots. The crews can also shoot back—with 7.62-mm miniguns or .50-caliber machine guns. The guns are mounted on shock-absorbing pedestals that allow the gunners to use a single hand to fire them. There are also chaff/flare dispensers and electronic countermeasures equipment on board.

The MH-53s are crewed by two pilots, two flight engineers, and two gunners and can carry thirty-seven troops. They get where they are going by means of a forward-looking infrared (FLIR) system and a terrain-following radar. There is a symbol-generator and a projected map display—"just like in the James Bond movie," one member of the "Green Hornets" (20th SOS) said. There is also an inertial navigation system (INS) that came from A-7s, but those systems are now being replaced.

The helicopters have an automatic hover feature that gives the pilots the option, as one said, to "hit the guy we are going to retrieve in the head with the rescue hoist if we want to." The twin engines and titanium/composite rotor blades allow for a rapid deceleration into hover. With two lines running off the cargo ramp and one line coming off the rescue hoist, a full load of troops rappelled out of a hovering Pave Low in twenty seconds during one recent exercise.

Many of the missions are conducted in blackout conditions (obviously in order to minimize the chance of being seen), and many of these systems have to be worked while wearing Night Vision Goggles (NVGs). The NVGs give a surreal but very clear view of the outside world. A newspaper headline can be read from across a darkened room with some of the new-model NVGs.

Among the features to come in the new MH-53J Pave Low IIIs are terrain-following capability off the Navstar Global Positioning System (GPS) satellites and instrument dis-

RIGHT: The Sikorsky MH-53 Pave Low helicopters have an automatic hover feature and are navigated by means of a forward-looking infrared system and a terrain-following radar (part of which can be seen in the cigar-like projection on the nose). BELOW: Because they will have to go into Bad Guy country, the MH-53s are armed with a pedestal-mounted 7.62-mm minigun (as shown here) or .50-caliber machine guns.

ABOVE: The odd combination of vacuum tubes and digital electronics on the AC-130s makes life tough sometimes for the maintenance troops (two of whom are shown above during a preflight inspection). BELOW: One of the most important pieces of equipment on a gunship is a snowshovel. Because of the high rate of fire of the 20-mm guns, one of the gunners has to clear the brass and links from around the gun breeches while they are firing to prevent the guns from jamming.

plays superimposed on the NVGs by means of fiber optics.

"The cockpit leads to some task saturation, but it's no big deal," said Captain Jones. "It goes by quick, and you go, 'Wow, a twelve-hour mission,' when it's over. You sure have no trouble sleeping at night."

Where Others Can't Go

"We don't drop any better than any other crew in MAC can," said Lt. Col. Donald James, a navigator instructor with the 8th Special Operations Squadron. "We just go where the others can't."

As with the helicopters, the MC-130Es are designed for infiltration, resupply, and exfiltration (in both a normal and unusual manner), but at much longer ranges. They are refuelable from jet tankers and can pass along the fuel to the MH-53s by means of a drogue refueling system from wing pods.

Internally, one pallet position has been replaced with a radio operator station, which has secure UHF, VHF/FM, HF, and antijam VHF radios along with provisions for satellite communications. The radio operator sits next to the electronic warfare officer, who has a rear-aspect infrared set, jamming pods, and chaff and flare dispensers at his disposal.

Up front, the Combat Talon has two navigators sitting at a large panel at the back of the cockpit. The MC-130Es have a Night Low-Level Terrain-Following (NLLTF) capability, a "normal" terrain-following radar, a FLIR, a Doppler navigation radar, an INS, and a precision ground mapping (PGM) radar. The operation of the systems is divided between the two navigators, and, yes, they know exactly where they are going.

All that is left for the aircraft commander to do is to read the instruments and fly the plane while the copilot looks out the windscreen and visually checks for obstacles in front. This, naturally, is done at altitudes down to 250 feet at night while wearing NVGs. The NVGs are also worn when landing the plane on blacked-out runways.

The aircraft's back end has been reinforced, and its cargo ramp has been modified for the High-Speed Low-Level Aerial Delivery System (HSLLADS). This system allows

for up to 2,200 pounds of cargo to be dropped while the aircraft is flying at speeds of up to 250 knots. This allows the MC-130 to drop its cargo without slowing or climbing, thus not tipping off enemy radars to the spot where the load was dropped.

Sometimes the simplest things work the best. The HSLLADS pallets are slung down two rails and out the back by a large bundle of (for lack of a better description) industrial-size bungee cords. The effects of winds are thus negated, and the low-level release at high speeds ensures a direct trajectory to the target area. There is also a drop system in which one of the loadmasters attaches a safety harness to himself and walks to the end of the ramp (and even sometimes dangles his legs over the edge), and on the navigator's command, the loadmaster throws the bundle down. This works only for small loads, though.

The Fulton STAR System

The Combat Talons, like all C-130s, can land in a remarkably short space. That's one way to exfiltrate troops, but the MC-130s also have another method—the Fulton STAR (surface-to-air recovery) system.

Here's how it works. The troop (or troops) gets into a special, protective body suit. A helium-filled balloon pulls a cable aloft. The MC-130 comes along with its distinctive nose "whiskers" opened in a V-shape and catches the cable in the base of the "V." The cable is then secured to a rotating anchor plate. Once caught, the troops are yanked off the ground, and the slipstream carries them to the rear of the aircraft, where they just "hang around" until the loadmaster can pull them inside the aircraft.

Meanwhile, the front end of the cable and the balloon (which were also blown back) are cut off by a crewman climbing through the upper escape hatch. The trail end of the cable, still secured to the nose anchor, is caught by one of the loadmasters with a parahook (like a long shepherd's crook) and reeled in and connected to a winch. Once connected, the troops are reeled in. The whole process takes five to seven minutes to complete.

The Fulton STAR system may look like something designed for Barnum and Bailey, but it works quite well. It is expensive and hazardous to use, though, so as a consequence, practice comes only a couple of times a year.

"People think we are a C-5 crew when we go somewhere," said Lt. Col. Dennis Ramsey, a fire control officer with the 16th SOS. "It is pretty crowded inside of a gunship." With a crew of fourteen (five officers and nine enlisted), that is not an overstatement.

The AC-130H gunships certainly have the highest profile of all the aircraft in the special operations fleet. The Spectres are armed with two 20-mm Gatling-type guns (geared *down* to 2,000 rounds per minute). They also carry a 40-mm Bofors cannon (100 rounds per minute) and a 105-mm howitzer that can lay impressive firepower with great precision.

These MC-130E loadmasters are starting to prepare two High-Speed Low-Level Aerial Delivery System (HSLLADS) pallets for a drop at low altitude. Once rigged, the pallets will be catapulted off the rollers by means of industrial-size bungee cords. The MC-130E has a specially modified back end to allow for the HSLLADS drops. This system and the Combat Talon's extensive navigation suite allow for cargo drops on the top of a mountain, if need be.

Lighting Up the Night

Firing at night makes for some interesting sights inside and outside the plane. From the windows or the rear bubble that protrudes beneath the cargo ramp, an observer can see the tracer rounds as they gently arc down the 8,000-foot-offset path from the target that the plane flies as it orbits. Once the rounds impact, the explosion lights up the whole area.

Inside, when the 105-mm is fired, the whole airplane fishtails to the side. The standard of proficiency that the load crews strive for is one of the fifty-five-pound shells hitting the target, one on the way, and one in the gun breech at any given time. Normally, Army 105-mm guns fire their shells upward, but because the AC-130's big stick is pointed down, the shell casings have to be crimped to keep the warhead from sliding down the barrel.

The 40-mm gun is hand-loaded

ABOVE: This MC-130E loadmaster is giving his plane the once-over before a twilight flight over the Florida panhandle. The Combat Talon I fleet will be augmented by the MC-130H Combat Talon II aircraft, which won't feature the distinctive nose "whiskers" of the Fulton STAR system. BELOW: The MH-53 Pave Low helicopters are among the fastest military helicopters the US has. The twin engines and titanium/composite rotor blades allow for rapid deceleration into a hover.

with four-round clips. Several times in the past when the gun needed repair, maintenance crews have gone to the USS *Alabama* battleship memorial in Mobile to get the parts. One of the most important pieces of equipment on a gunship is a snowshovel, used to clear away the brass casings from the 20-mm gun breeches to keep them from jamming.

The 40-mm and 105-mm guns are trainable (unlike the ones on the AC-130As flown by the 711th SOS, an Air Force Reserve unit) and are tied to the gunship's sensor suite, which consists of a Low-Light-Level TV (LLLTV) and an IR sensor. There is also a laser illuminator for operating in complete darkness and the ASD-5 Black Crow sensor, which detects the sparks from truck ignitions or can be used to track a series of handheld radio beacons operated by friendly forces.

The two sensor operators and the EWO work in a booth behind the gun stations, and the targets they find are fed to the Fire Control Officer (FCO), who sits next to the navigator. The pilot, meanwhile, oversees the entire operation by means of an A-7 head-up display that is mounted at his left shoulder.

The sensors are so sensitive that distinctions in the roof gravel of an addition to the squadron building could be discerned from 600 feet away at 9:30 p.m.

The whole team works together to find targets (to within a milliradian—in this case, about four feet) and drive nails (score direct hits).

For all of the destruction the gunships can bring, they are also frequently called in for things like looking for escaped criminals (although they are limited by law as to what they can do) or to find lost boaters at night. After the Eastern Air Lines L-1011 crash in the Florida Everglades in 1972, a gunship was called in to illuminate the area with its high-powered searchlight.

As specialized as the crew positions are, there are no fixed crews. Anybody is fully capable of flying with anybody else. They take obvious satisfaction in doing a risky job well. A former motorcycle-gang member who reformed and joined the Air Force is quoted as telling a gunship crew after an orientation flight, "You guys are crazy!" ■

Secretary Aldridge says the space program is back, stronger than before. He also notes that during the hiatus, our old satellites had the stamina to keep us covered. USAF, he says, must make a "corporate commitment" to space.

RECOVERY IN SPACE

BY JAMES W. CANAN, SENIOR EDITOR

THE United States is on the verge of a strong resurgence in space. The plan that the Air Force forged in 1986 for a comeback there from the Space Shuttle *Challenger* disaster has been put into action and is paying off.

This is how Secretary of the Air Force Edward C. "Pete" Aldridge, Jr., sizes up the US space program, with emphasis on the Air Force's stewardship of the national-security mission in space.

"I call 1988 the year of our recovery in space," Secretary Aldridge declares. "We are back in the business of launching critical payloads. We have created a spacelaunch infrastructure that is stronger than the one we had before *Challenger*."

The oft-delayed resumption of Space Shuttle Orbiter flights, scheduled at this writing for sometime next month, will be a major milestone on the road to such recovery.

But the Air Force has made sure that it will never again need to depend so heavily on the Shuttle as it once did, to its great regret, for gaining access to space.

Unmanned rockets outshine the Shuttles in USAF's space-recovery scenario. Such boosters in several sizes are being developed, produced, and delivered for the purpose of launching a wide variety of national-security satellites, at least two dozen of which have languished all too long in earthbound storage while awaiting rides into space.

But not much longer, it seems. "I'm very positive about our spacelaunch capability," Secretary Aldridge declares. "We have a bunch of launch systems coming on board this year, including the Shuttle. We'll begin working off our launch backlog, and in four years we'll have it all worked off—and we'll have built up a full stable of launch vehicles."

Secretary Aldridge views space and the Air Force's presence there from his vantage point as one of USAF's top policymakers dealing with that so-called "fourth combat medium," one in which many kinds of satellites built and launched by the Air Force support US military missions in many different ways.

The Secretary has also been a prime mover in the Air Force's drive to extend space operations and exploit space technologies. He seems generally satisfied with progress

Secretary Aldridge has down-to-earth goals for space.

—Photo by Paul Kennedy


USAF

thus far. But he is concerned that the Air Force may back away from its commitment to space systems and operations and that vital space technologies will be slighted at the expense of national security in these times of tighter defense budgets.

In his view, space-based radar is already a case in point, and the programs to develop heavy-lift booster rockets and the hypersonic National Aerospace Plane could also be victimized along the way if USAF does not watch out.

Mr. Aldridge became Under Secretary of the Air Force, a post traditionally involved to the hilt with USAF's stewardship of space programs, in August 1981, not long after Space Shuttle *Columbia* had made its historic maiden flight. He took over as Secretary of the Air Force in June 1986, after things had gone sour—*Challenger* blew up, three unmanned launchers failed in shocking succession, and the US space program went into limbo for as long as it would take to put the spacelaunch pieces back together again.

"We were devastated," Mr. Aldridge recalls.

"Absolutely Superb Performance"

Things are much different now. As Secretary Aldridge prepares to take his leave of the Pentagon later this year to return to the private sector, he can take heart not only from what is happening but from what did *not* happen in space during the difficult times.

Satellites that were overdue to be replaced on orbit, but could not be, did not falter or fail. They continued to perform beautifully long past their anticipated operational lifetimes.

"The major story of our recent launch hiatus was the absolutely superb performance of our on-orbit constellations," Mr. Aldridge declares. "They saved our bacon. Some satellites lived longer than we could have expected, and we found ways, through ground systems, to use them innovatively.

"We would have been much better off without the tragic failure of *Challenger* and the accidents to the unmanned boosters. But we were never without the capability to fulfill national-security requirements. We met our goal of assured mission operations in space."

Mr. Aldridge described older US early-warning satellites as having "performed flawlessly" despite their extended tours of sentry duty in space. Other stellar performers while overstaying on orbit were communications and navigations satellites, along with assorted classified "overhead assets."

What is more, Secretary Aldridge asserts, "our systems exceeded those of the Soviets in performance."

This raises a point that he believes must be emphasized, to wit: "The reality is that we are far ahead of the Soviets—technologically and qualitatively—in our national-security space program."

The American public may be getting the wrong idea about this amid the running debate over the leadership and the goals of the civil side of the US space program, Mr. Aldridge fears.

"We need to set the record straight for our national-security space program," he declares.

Given its technological and qualitative advantages, that program comes off well when matched against its Soviet counterpart, Mr. Aldridge believes.

The US national-security space program outstrips that of the USSR.

He tips his cap to demonstrable Soviet advantages in man-days in space, launches per year, and total lift capability. But he claims that such raw, quantitative measurements "are not by themselves an accurate or reliable way to assess the relative strength of our national-security space program.

"The Soviets do possess a robust and resilient spacelaunch capability—and one that the US space program currently lacks. However, we are rapidly working to fix that by attaining our goal of assured launch capability."

Last January, just before the second anniversary of the *Challenger* disaster, Mr. Aldridge sounded an upbeat tone in an address on a highly appropriate occasion—the "roll-in" of the first huge, new Martin Marietta Titan IV booster to its pad at Cape Canaveral, Fla.

He noted that the Air Force had resumed launching bulky satellites into space aboard Titan 34D rockets, one from Cape Canaveral and another from Vandenberg AFB, Calif., in late 1987. Hailing the introduction of the even larger Titan IV rockets, which will embody Centaur upper stages to hurl extra-heavy satellites into deep space, Secretary Aldridge declared:

"From this point forward, we will continue to significantly increase our capability to meet national-security requirements in space . . . and maintain America's space leadership well into the twenty-first century."

The Titan IV boosters will share heavy-lift launch duties with the Space Shuttles. The first Titan IV launch of a payload into equatorial orbit will take place at Cape Canaveral rather soon; the second, sending its military payload into transpolar orbit from Vandenberg AFB, is scheduled for early next year.

The first Titan IV-Centaur launch of an ultraheavy military payload into geosynchronous orbit from Canaveral is scheduled for early 1990.

The Titan IV's employment of the General Dynamics Centaur G-prime upper stage rocket makes it unique among all US boosters, in-

cluding the Shuttle, in its ability to lift payloads as heavy as 10,000 pounds into geosynchronous orbit 22,300 miles above the planet—up where early-warning satellites and many communications satellites, for example, do their jobs and where such satellites as the surveillance sentries of the planned Strategic Defense Initiative (SDI) system would hover, as it were.

NASA has long since abandoned its plan to use the Centaur as an upper stage for the Shuttle. Consequently, each Shuttle will be capable of boosting no more than 5,100 pounds of payload into geosynchronous orbit from low-earth orbit by means of its Inertial Upper Stage (IUS), a rocket that is also compatible with the Titan IV.

The Evolution of Titan IV

The nation has Secretary Aldridge to thank, at least as much as anyone else, for the Titan IV rockets on which the US space program now so heavily relies.

As Under Secretary of the Air Force in 1985, he led the drive to persuade the Administration and Congress to approve the Titan IV (then called the Titan 34D7 Complementary Expendable Launch Vehicle, or CELV) program to build big boosters to augment the Shuttles.

Congress authorized ten Titan IVs. After *Challenger* went down, it added thirteen more, again mainly at Mr. Aldridge's urging. And once it became obvious that the Shuttle fleet would be grounded far longer than originally anticipated, yet another twenty Titan IVs were added to the future production run.

Meanwhile, USAF has refurbished thirteen Titan II ICBM boosters for launching relatively small satellites and has contracted with McDonnell Douglas and General Dynamics to produce new Delta II and Atlas II booster rockets respectively.

The Delta II rockets are earmarked for launching Navstar navigation satellites; the larger Atlas II rockets with Centaur upper stages will launch medium-heavy DSCS III satellites into deep space.

Both varieties of satellites are among those, including many classified types, that are backed up awaiting launchings.

"But we're getting there," Mr. Aldridge says. "By the end of this year, we will have reestablished our launch-vehicle inventory—our full stable of launch vehicles—and 1988 is going to be a very significant year in our space recovery.

"We'll continue to fly Titan 34s. We'll have the first Titan II launch, the first Delta II launch, and the first Titan IV launch. And even though Atlas II won't be launched for a couple more years, this is the year we gave it the go-ahead."

Air Force Systems Command's Space Division (SD) at Los Angeles AFB, Calif., was largely responsible for USAF's space-comeback momentum. SD devised the recovery plan that serves as the blueprint for all launches well into the 1990s and for developing and allocating all new and modified booster rockets needed to bring the whole thing off.

Space Division has done "an excellent job," Mr. Aldridge says.

Titan 34D

It has been suggested that the US, as part of its space recovery plan, should build more launchpads or make better use of the ones it has. Addressing this, Mr. Aldridge says:

"Let's look at it not just from the standpoint of assured access to space but in the broader context of assured mission operations—how we accomplish the missions that the satellites perform.

"We can do that without having to build more and different launchpads. We can do it by putting satellite spares on orbit, and that's exactly where we're heading. We're focusing on on-orbit spares with the DSCS and GPS satellites, and we'll do the same with Milstar [next-generation communications satellites]."

In some instances, the Secretary says, "It may be appropriate to have spares on the ground." By and large, though, "It's better to keep spares in space. They can be put into operation more quickly, and that's a relatively benign environment up there. Things can happen to satellites in storage on the ground—like fires or somebody dropping something on them."

The *Challenger* disaster was a blow, probably the knockout one, to the Secretary's chances of becoming an astronaut. He had been preparing to serve as a crew member on the first flight of a Shuttle Orbiter out of Vandenberg AFB in July 1986, a flight that was scrubbed, along with all others until further notice, after *Challenger* went down.

As time went by, it became apparent that structural changes required to make the Shuttles safer would also make them too heavy to take Air Force payloads of mission-sufficient weights into transpolar orbits from Vandenberg.

So USAF eventually mothballed the new, unused Space Launch Complex Six (SLC-6) that it had built at Vandenberg expressly to launch Shuttles with national-security payloads.

It now turns out that the Shuttles may yet find a home at Vandenberg. NASA hopes to upgrade their solid-rocket motors, adding enough thrust to enable them to shoulder Air Force payloads into transpolar orbits from the West Coast. But don't hold your breath.

"If a decision is made to fly the Shuttle from Vandenberg, it would probably take four to five years for us to be back in operation there," Secretary Aldridge says.

It is entirely possible that the Air Force may never need to use the

Shuttle from Vandenberg, given its prospects for an abundance of unmanned launchers capable of handling Shuttle-sized payloads.

The Legacy of *Challenger*

This is *Challenger*'s legacy.

"Our spacelaunch fleet is much stronger than it would have been if *Challenger* hadn't happened," Mr. Aldridge says. "We would probably never have had this fleet of launch vehicles or the commercial launch industry that we have created because we are buying those vehicles.

"We recognized that we needed an alternative launch capability—something besides the Shuttle—long before the *Challenger* disaster.

Competition is driving down the cost of getting to orbit.

But we probably would not have been able to create the capability—there was always pressure not to do so, and this came from the belief that the Shuttle could do the job."

The Air Force is counting on Shuttle Orbiters to launch many of the national-security satellites now in storage. These particular payloads, says Secretary Aldridge, "have already been integrated with the Shuttle—and it would cost us too much money and take too much time to convert them to fly on expendables.

"They're also very high-priority payloads because they'll be replacing operational satellites.

"Once we get that backlog worked off, then you'll see Department of Defense requirements for Shuttle flights drop to probably only three or four a year, and those will be focused on R&D payloads and experimental payloads that require the presence of man along with them.

"The strategy we're following is this: Any payload that does not require the unique characteristics of man in the loop will fly on expendables. If we don't require man to go along with a payload, we don't want to use that very valuable and unique asset called the Shuttle to fly it."

Cost-cutting is a highly important consideration in USAF's gravitation toward expendable boosters and away from the Shuttle. So is the spinoff benefit to the commercial launch industry.

Citing an example he is "very proud of," Secretary Aldridge points to the competition that Space Division conducted in the booster industry for the rocket to launch DSCS satellites, competition in which General Dynamics prevailed with its Atlas II.

"We got an excellent price of less than $40 million a flight," he says. "We have saved the American taxpayer $100 million on each DSCS flight as a result of the competitive environment and the use of an expendable launcher vs. putting DSCS on the Shuttle."

The payoff in the commercial space arena should also be huge.

In establishing Titan IV, Atlas II, and Delta II production lines, "We now have a large booster, a medium booster, and a small booster at very inexpensive prices that can also compete in the commercial industry for launching satellites," Mr. Aldridge notes.

"We needed those boosters for national security, and we gave the industry the production base for them. So now the launch industry can go out and sell the boosters to the commercial satellite builders who in turn have a stable of launch vehicles they can go to."

Secretary Aldridge has high hopes that the USAF-NASA Advanced Launch System (ALS) technology program will contribute to the upgrading of contemporary boosters over the years ahead and will result in "a family of launch vehicles" well-suited for future military and civil space operations.

Delta

The ALS program was begun as part of USAF's space-recovery program two years ago. In the beginning, it was aimed at coming up with a heavy-lift rocket beyond the class of the Soviet Energia booster and of the old, out-of-service US Saturn booster that was used in NASA's Apollo program. The ALS program has broadened, but its main purpose is the same.

"With the ALS program leading to that ultimate heavy lifter, we are building technologies that can be spun off into existing boosters," Mr. Aldridge says. And this, he adds, will be extremely important to the Air Force in "getting to space cheaply and reliably, which is our main job."

"We had been spending far too much for spacelaunch vehicles," he declares.

Looking to the Future

As a result of the ALS project, Secretary Aldridge says, "We will be able to apply new engines, new avionics, new structures, new fuels, and new checkout procedures to our Deltas and Titans and Atlases and everything else, to upgrade them. At the same time, we'll be reducing the lead time on building the new heavy lifter once there is a requirement for it."

Such a requirement is expected to arise in connection with the 1990s deployment of the US Space Station and of SDI satellites, presuming those programs pan out.

Given the budgetary bind, they may not. As Secretary Aldridge puts it: "ALS is going to suffer budgetary pressures. So will the National Aerospace Plane. And when you start cutting programs like SDI, the Space Station, and other future space capabilities, the requirements for them start being pushed out in time—the requirements that would draw us into a heavy-lift advanced launch system."

Secretary Aldridge is concerned that the relentless pressure on the defense budget to be expected for some time to come "will force a lot of tough decisions to be made—and we'll mortgage the future in trying to protect our near-term capability.

"I worry that pressures within the Air Force are such that we will cut our space technology base."

A prime concern in this regard is space-based radar: "We aren't putting enough money into our technology effort for a space-based radar that I know we'll want some day."

Air Force Gen. John L. Piotrowski, Commander in Chief of US Space Command and of NORAD, wants space-based radar as soon as he can get it, because he believes it is urgently needed to detect enemy bombers and cruise missiles from on high.

Secretary Aldridge quite agrees, saying: "I support space-based radar. I see it as a spaceborne AWACS. We need that capability. But I just don't see it in this budget environment.

"When I'm losing TAC fighter wings because of that environment, how can I start a brand-new space-based radar program? Much as I'd like to do it, I just don't see it happening in the next few years."

But budget pressures could abort USAF's commitment to space.

A major thrust in USAF's program to explore the technology of space-based radar is to "do the radar at an inexpensive price—at a low weight—so we can get it into orbit without having to spend too much money," the Secretary says.

His concerns about the future of individual systems are the stuff of his largest concern of all when it comes to space—that the Air Force may lose out there altogether if it isn't careful.

"I'm worried," Secretary Aldridge says, "about making sure that the Air Force has a goal in mind for space in the future, that we're on a track to get to that goal, and that we don't let these budgetary pressures back us away from those things that I believe are really important for the Air Force in space.

"The main reason I'm worried about all this is that I think space is kind of the future of the Air Force."

Corporate Commitment?

What USAF needs, Secretary Aldridge says, is "a corporate commitment" to space operations. Doesn't it have such a commitment now?

"We do," he replies, "but I think there's a concern that we may be backing away from that commitment because of budgetary pressures. We've had a lot of criticism in the past about our adherence to that commitment."

Such criticism has come from those who have claimed that the Air Force was not "stepping up fast enough to ASAT [antisatellite weapon]," was "pinging at" its GPS and Milstar satellite development programs in its annual budgets, was slighting space-based radar, and was, in general, favoring air-oriented operations and systems over those oriented to space, especially as the latter became more and more expensive.

"It took some time," says Secretary Aldridge, for the military at large to understand just how valuable space systems had become to all terrestrial operations.

He cites as an example "those who once questioned the value of GPS to the Air Force" because of its great expense and who wanted to forgo the program in favor of alternative solutions, such as better inertial navigation systems on aircraft and missiles.

"But look at GPS now," Secretary Aldridge says. "Everybody just loves it—the Air Force, the Army, and the Navy. And the only reason we have it is that the Air Force stuck to its guns, to its commitment to the program and to space.

"That's what we have to keep doing with everything. We will have to cut and slow down a few things, and we can accept that. But let's keep our goals for space in mind and keep on the track and not kill programs that are vital to our commitment to space."

The stakes are huge. In Secretary Aldridge's view, it all comes down to this:

"Our national space program does not need new strategies or one-time space spectaculars. What we need is simple: consistent support of our space program. America has not lost its national-security space leadership, and it does not need to mimic Soviet military space activities.

"We must use space effectively and efficiently to meet our national-security objectives. We have done that in the past, and we will continue to do so into the future. We are on the right path to maintain leadership in our national-security space programs." ■

Armament Division looks ahead to the 1990s and toward autonomous weaponry with long-range effectiveness against many kinds of targets.

"Brilliant" Weapons Gather Momentum

BY EDGAR E. ULSAMER

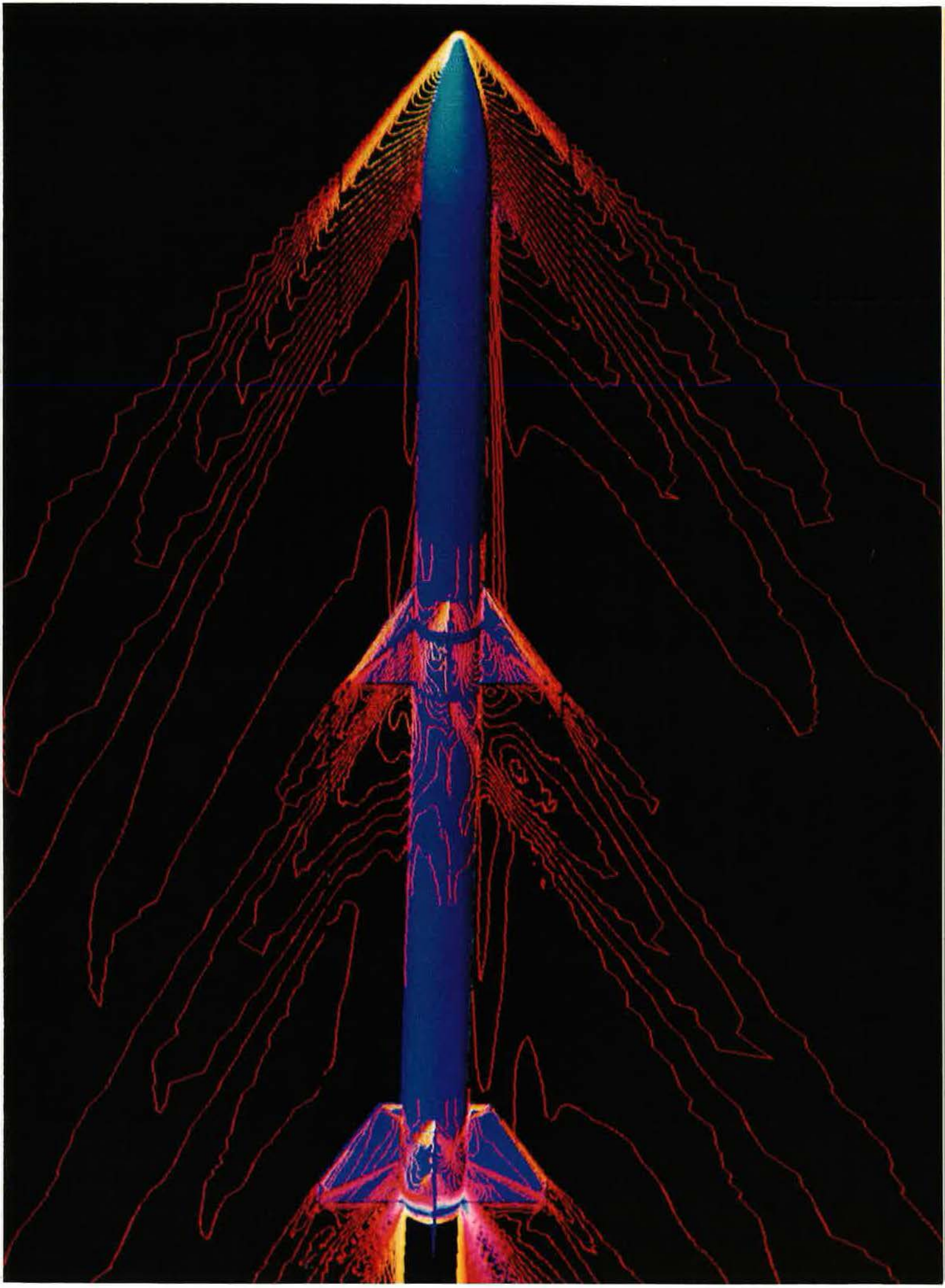
MOMENTUM is gathering for the next generation of standoff weapons. These are "brilliant" systems—a follow-on to today's precision-guided, or "smart," weapons—that autonomously acquire, track, and guide warheads to their targets with great accuracy over long distances. In conjunction with stealthy (low-observable) platforms, these munitions could raise the so-called nuclear threshold dramatically. A high-level commission recently told the White House that "current technology makes it possible to attack fixed targets at any range with accuracies within one to three meters" and that the US has been dragging its feet on developing such weapons. *(See "Discriminate Deterrence," March '88 issue, p. 6.)* Even earlier, Air Force Systems Command's Project Forecast II had described the merger of technologies that would make possible such brilliant weapons.

At the center of this development action is AFSC's Armament Division at Eglin AFB, Fla. The division clearly sees brilliant weapons as its future. Its foremost challenge today is the transition of these technologies into hardware at a time of economic constraint.

In all, Armament Division expects to spend about $2.9 billion this year to improve the accuracy and effectiveness of USAF's nonnuclear weapons. The work encompasses armament with varying degrees of smartness.

Maj. Gen. Richard E. Steere, Armament Division Commander, says that technological progress on a broad front is leading toward weapons that not only are highly accurate and lethal but also, because of their self-sufficiency after launch, largely impervious to electronic countermeasures. It will probably be well into the 1990s, however, before brilliant weapons are actually fielded.

The Advanced Medium-Range Air-to-Air Missile (AMRAAM) is the number-one development and production program of Air Force Systems Command's Armament Division at Eglin AFB, Fla. Here the airflow around an AMRAAM at transonic speeds is depicted by a computer using computational fluid-dynamics techniques, which represent a major advance in the development of all modern aerial vehicles.



tions, these buy rates will not only be met but exceeded. AMRAAM will be compatible with USAF's F-15 and F-16, the US Navy's F-14 and F/A-18, the German F-4, and the British Tornado and Sea Harrier aircraft.

The Air Force decided in 1979 that the AMRAAM development and acquisition strategy should be based on a "leader-follower" contractual arrangement. Three years later, Hughes Aircraft Co. was awarded the "leader" and Raytheon Co. the "follower" contract. During low-rate initial production, Hughes is slated to manufacture 328 missiles and Raytheon 275. Subsequent production contracts are to be awarded on a competitive basis and to incorporate "producibility" enhancements. Current indications are that this producibility enhancement feature will lower overall acquisition costs by as much as $2.3 billion.

Another intrinsic element of the AMRAAM is P^{3}I (preplanned product improvement). Among the objectives are rapid reprogramming, adjustable countermeasures, advanced counter-countermeasures, and options for smart ordnance packages and dual-mode fuzing. The fully mature AMRAAM version will be able to engage up to eight targets in near real time when linked to the launching aircraft's "track-while-scan" radar. Also, the missile can be "command inertial guided," meaning the weapon's guidance system will use target coordinates provided at launch by the avionics of the aircraft that can be updated in flight by data links. In the terminal phase of flight, the missile's active radar seeker will take over and guide the weapon to its target. AMRAAM packs significantly higher performance into an airframe that is only two-thirds the weight of the AIM-7 Sparrow that it replaces.

Over the longer term, AMRAAM will probably be used for missions other than air superiority. The Navy is interested in adapting AMRAAM for ship-to-air operation. The Air Force has given thought to using AMRAAM for self-defense of such aircraft as the B-1, B-2, AWACS, and Joint-STARS (Joint Surveillance and Target Attack Radar System).

Using the Weapon in Combat

Recent headline-generating ruminations alleging that the complexity of AMRAAM would deter pilots from using the weapon in combat are dead wrong, according to General Steere: "I have heard these allegations from people who have never flown [fighters] before or are not very concerned that they will ever have to." He added that "every fighter pilot—from the most junior to the most senior—recognizes the importance of 'launch-and-leave' and standoff. The red herring of whether the rules of engagement allow you to shoot at an unidentified target is just that."

TAC's Tactical Air Warfare Center, also located at Eglin, is working closely with the Armament Division's AMRAAM SPO. Maj. Gen. John E. Jaquish, TAWC Commander, categorized the AIM-120A as the tactical air forces' (TAF) "number-one program." Speaking on behalf of the TAF, he stressed that "we are delighted with the progress of the AMRAAM program."

Air-to-air missile programs differ from other development programs in that every test firing involves a "pass/fail criterion," meaning the missile must score a technical "kill." (Of the fifty-eight AMRAAM test launches so far against theoretical targets, forty-four were scored "successful" by dint of coming within lethal range of the target. Twelve launches were categorized as "failures" because the missile did not get close enough to the targets, and two shots were labeled "no test" because of extraneous factors.) General Jaquish pointed out that if "we applied these criteria to new aircraft, we would never field one. One ground abort out of Edwards [AFB, and the verdict would be] 'cancel the program.' But that is how AMRAAM has been judged—and that is unfair. . . . We need to understand that test failures are the price of admission to technological progress—and that has plagued AMRAAM."

AMRAAM has also been burdened unduly in that its ECM capabilities are being judged against unrealistically severe threat profiles. These threat profiles, he explained, were drawn up by people "with perfect knowledge of the fire-control systems of the [various carrier aircraft] and of [all AMRAAM design features] who then decreed tests against electronic devices [bearing no relationship] to what the Soviets have now or what we postulate the Soviets might have eventually." He added that this "hurdle" has now been overcome. In stressing the importance of AMRAAM to CONUS air defense, General Jaquish underscored TAC's view that without the AIM-120A, the "F-16 is an incomplete weapon. With AMRAAM, the F-16 becomes a top air-to-air machine."

Turning to AMRAAM's counterpart in the short-range air-to-air sector, the AIM-132 advanced short-range air-to-air missile (ASRAAM) under development by three European NATO nations with US participation, the TAWC Commander did not see a corresponding urgency. He suggested that improved versions of the AIM-9 Sidewinder, such as the operational "Mike" variant and the AIM-9R now under test by the Navy, could serve as adequate stopgaps. (A special export version of the US Navy-developed Sidewinder, the AIM-9PIV, is being developed by the Armament Division. More than a dozen foreign countries are interested in this variant, which will cost less than the "Mike" version.)

Among the host of current-generation air-to-ground munitions that AD is developing for TAF, the hypervelocity missile (HVM), a low-cost, multiple-kill-per-pass smart weapon suitable for both close air support (CAS) and battlefield air interdiction (BAI) missions, was singled out by the TAWC Commander. The HVM's make-or-break feature, General Jaquish stressed, is low cost: "It has to be affordable so that we can buy and shoot a lot of them." Under development by the Air Force on a joint service basis—USAF, US Army, and the Marines—HVM is slated to cost no more than $8,700 per round (expressed in FY '85 dollars) and to go, in the case of the Air Force, on the A-10, F-15, F-16, and follow-on CAS aircraft. The weapon, using a high-velocity kinetic energy penetrator, is suitable for use against a range of mobile targets, from trucks to the new Soviet T-80 tank. The weapon, which is in its ground launch demonstration phase, is being developed by LTV. ■

Edgar Ulsamer, a longtime Senior Editor of this magazine, retired last summer, but still keeps close tabs on aerospace issues.

CHEAP SHOT

LTV's Hypervelocity Missile: Fast, accurate and affordable.

The column of enemy tanks is still several miles away when the attacking aircraft swings onto its firing run. Its FLIR is already tracking their heat signatures. Less than three seconds later, with the aircraft still safely out of range, the missiles slam into their targets with uncanny accuracy.

Low Cost, High Firepower

One of the most awesomely effective weapons ever developed for Close Air Support/Battlefield Air Interdiction, the Hypervelocity Missile (HVM) weapon system was designed to deliver maximum firepower at a cost far below anything in our current inventory. A product of the Missiles Division of LTV Missiles and Electronics Group, HVM is a masterpiece of simplicity and ingenuity. It carries no warhead, relying instead on its blistering 5000-foot-per-second speed to blast a penetrator rod through heavy multi-plate armor, even at highly oblique angles at extreme range.

Its guidance system is a simple CO_2 laser, mounted on the aircraft. With only an aft-looking receiver on the missile, the amount of expensive "throwaway" hardware is held to an absolute minimum. And because HVM is a "wooden round" with no warhead, storage and handling are simpler, safer and cheaper.

Multiple Targets, Maximum Effect

The system can track and attack multiple targets simultaneously—any ground vehicle, fixed or mobile. In live fire tests an HVM was purposely aimed more than 100 feet off-target. Automatic guidance brought the missile to impact near the target center.

With no bulky on-board guidance system or warhead, the HVM is small enough to permit a large loadout—up to 24 per aircraft, at a low installed drag.

No other weapon system has ever given the CAS/BAI pilot the HVM's unique advantages in speed, accuracy and survivability—advantages matched only by its cost-efficiency and low susceptibility to countermeasures.

LTV Missiles and Electronics Group, Missiles Division, P.O. Box 650003, Mail Stop MC-49, Dallas, Texas 75265-0003.

LTV Missiles and Electronics Group
Missiles Division

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

Military Airlift Command is a combat organization, and don't you forget it.

When You Call It an Airline, Smile

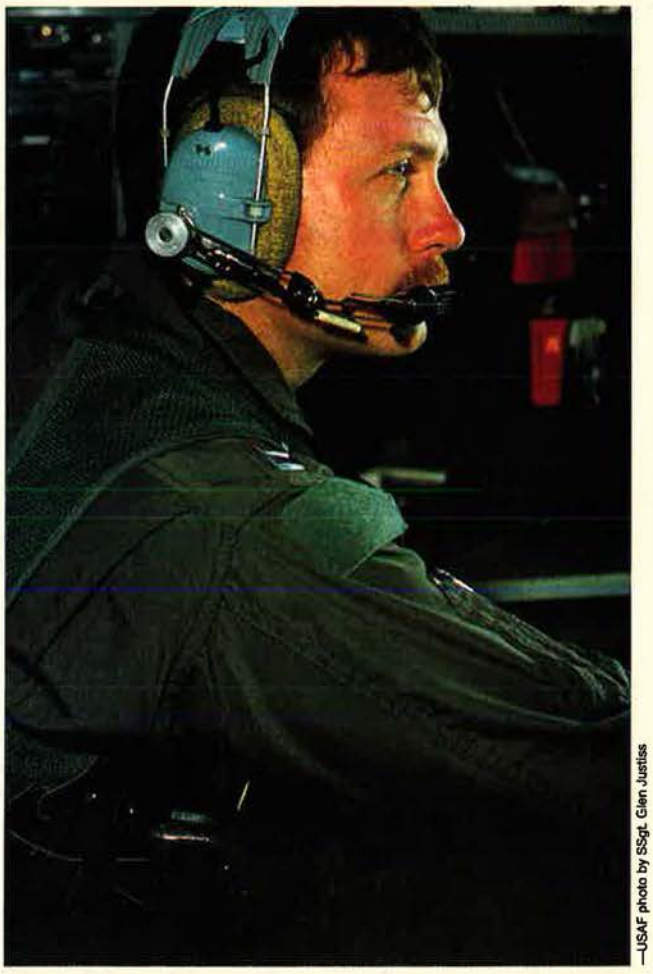
BY BRUCE D. CALLANDER

"TAKE down the service flag, Mother," the newly graduated pilots used to chant. "Your son is in the ATC."

That was in the early days of World War II, when all new pilots hoped for assignments to fighter or bomber units. Being picked for the Air Transport Command was considered the next best thing to being returned to civilian life. According to the song, such status didn't even warrant one of those small, blue-starred flags that families hung in their windows to indicate they had someone in service.

When ATC was formed in the summer of 1942, its main job was to ferry aircraft from the factories to the using combat units. By war's end, however, its mission had expanded into an extensive airlift operation that took ATC crews into the combat zones and cost them numerous casualties. The nasty bit of doggerel about the service flag no longer applied, and airlifters finally gained recognition as combat flyers as well.

Forty-six years and two name changes later, Military Airlift Command is unmistakably a front-line combat force. In recent years, it has



Although the image still persists that Military Airlift Command is just an airline in war paint, MAC is a full-fledged combat command. Most MAC crews don't sit on alert, but they do have to be ready to go anywhere in the world on minimal notice. This is Capt. Jack Nelson, a C-130 navigator from the 21st Tactical Airlift Squadron, during an exercise in Korea.

—USAF photo by SSgt. Glen Justiss

taken on not only in-country tactical airlift but the up-front missions of special operations and combat rescue.

But many people overlook those recently acquired close-support roles and persist in seeing MAC primarily as an oversized airline whose crews just happen to wear military uniforms and spend much of their time delivering VIPs to summit conferences. That image is one that MAC commanders take pains to dispel.

Col. John C. Tait, Commander of the 60th Military Airlift Wing (MAW) at Travis AFB, Calif., bristles at the airline analogy. The 60th MAW is the only MAC wing flying both the C-141 and the C-5. It is the largest such airlift organization in the Air Force, serves the Pacific and Indian Oceans from Alaska to Antarctica, and flies wherever else in the world it is needed. It launches as many as a dozen flights a day on regular channel routes throughout the region. It flies global special air missions, resupplies Operation Deep Freeze in Antarctica, and responds to calls for humanitarian airlift wherever they occur.

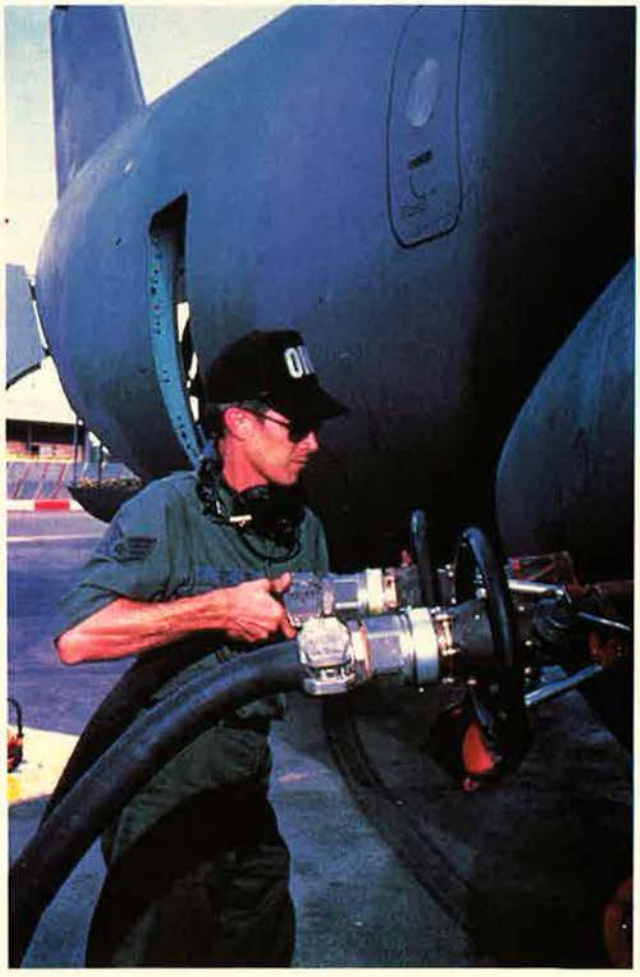
As the host unit at Travis, it handles more cargo and passengers than pass through any other military terminal in the United States. On a given day, its operations board reads like a timetable for Northwest or TWA. On the face of it, the 60th MAW does fit the image of the commercial carrier in military dress.

Colonel Tait argues that his wing's main reason for being, however, is to move combat troops to where the action is and to keep them supplied while they are there. What the 60th and the rest of the MAC wings do in the meantime is in preparation for that mission. The extensive peacetime airlift operations are a by-product of the ongoing training of air crews and support personnel. The fact that they haul people and goods over global routes is almost incidental and presents a practical alternative to flying the massive carriers empty.

Even in peacetime, the wartime mission is never far beneath the surface at Travis. Routine cargo, neatly strapped to pallets, moves through the sprawling terminal of the 60th Aerial Port Squadron for today's overseas customers. Not far away, however, soldiers in combat fatigues stand twenty-four-hour guard over a collection of small vehicles, artillery pieces, and ammunition.

Within hours, this prepositioned equipment, along with a 600-man battalion of light infantry, could be aboard C-141s and en route to some distant trouble spot, as it did recently to Honduras on notice of no more than a few short hours. A thousand sorties later, the Army's entire 7th Infantry Division (Light) could be in position with a total of more than 10,000 combat-ready troops.

The 7th, the first of five lightly equipped, highly mobile divisions planned by the Army, is based at Fort Ord, Calif., a few hours' convoy drive south of Travis. The close liaison between Army and Air Force leaders, like the prepositioned war supplies, is a constant reminder that MAC's first job is to be ready to move the troops to wherever there's trouble.



MAC's mission is to move combat troops to where they are needed and to keep them supplied while they are there. The extensive peacetime operations the command carries out serve as good training for that mission. This C-141B is being refueled prior to taking off for some far-distant base.

—USAF photo by TSgt. Joseph G. Fallon

Although a good portion of MAC's business is hauling people, they are generally of this variety, and the in-flight "entertainment" is usually briefings about the weather and expected opposition at jump or landing zones. This member of the Army's 7th Light Infantry Division is deplaning at Travis AFB, Calif., after a recent deployment to Honduras.

In the Beginning

To be sure, that was not always the case. Today's global airlift system traces its ancestry to an aerial delivery service set up months before the United States entered World War II. In May 1941, the then-Army Air Corps formed Ferrying Command to fly American-built aircraft to departure points in the United States and Canada under the Lend-Lease agreement with Britain.

Six months after Pearl Harbor, Ferrying Command became Air Transport Command. ATC continued to ferry planes to the using combat units, but it soon became the airlift agent for the entire War Department. It opened global air routes and developed chains of bases stretching from South America to Africa and Europe and hopscotching the islands of the Pacific. Combat crews by the tens of thousands were shepherded across the Atlantic and Pacific under ATC's auspices.

At the war's end, the long-range airlift capabilities of both the Army and the Navy were merged into the Military Air Transport Service. For a time, MATS did behave pretty much like a commercial airline. It hauled not only cargo but most military passengers. MATS transports were only slightly more austere than civilian airliners. Many had plush seats, WAF flight attendants, and their own monogrammed dinnerware. MATS dietitians even had the questionable distinction of developing the frozen flight lunches that evolved into the infamous "TV dinners" of the period.

By the early 1960s, however, MATS's days as a military airline had become numbered. The commercial carriers, protesting that they were missing out on a profitable source of revenue, lobbied Congress to force the services to contract out most of their passenger airlift. As a result, many of the troops flown to the Vietnam War went via commercial airlines.

MATS also gained an additional wartime airlift capability in the deal, however, since the contract airlines were required to dedicate some of their planes to the Civil Reserve Air Fleet. Under the arrangement, the selected CRAF planes, already partially modified for the military role, are earmarked to augment USAF's airlift forces in an emergency or national crisis.

The change in MATS was the result of more than a political move by the airlines, however. The 1960s were a time of brushfire wars and small, scattered crises. The services found they needed the means to get troops and equipment to distant trouble spots in a hurry. At the time, the commercial airlines had few aircraft that could carry heavy cargo and battle-ready soldiers. The logical solution was to equip MATS with new carriers designed specifically for what would become known as strategic airlift.

In 1966, by act of Congress, MATS became Military Airlift Command, gaining the same status as the Air Force's other combat commands. Eleven years later, President Jimmy Carter approved MAC's elevation to the status of a specified command of the Department of Defense. In effect, this made it the airlift agent for all services with a chain of command through the Joint Chiefs and Defense Secretary directly to the President.

In 1974, MAC gained an even more visible combat mission when Tactical Air Command turned over all C-130 airlift operations in the continental United States. A year later, MAC took on worldwide C-130 airlift, meaning that it not only would move troops to the overseas theaters but within them as well. On March 1, 1983, MAC also took over TAC's Special Operations Forces and placed them under the Twenty-third Air Force, along with the Aerospace Rescue and Recovery Service.

The Payoff

In just over forty years, MAC had evolved from a noncombatant ferry service into a multimission combat command. In the fall of 1983, just months after formation of the Twenty-third Air Force, the United States launched Operation Urgent Fury in Grenada, and MAC tapped virtually all its US wings for some kind of contribution.

MAC transports carried Army Rangers, airborne troops, and combat equipment to the island. They returned with freed medical students and other Americans. MAC gunships suppressed hostile fire. MAC aeromedical units evacuated 164 wounded US servicemen and foreign nationals. MAC's Air Weather Service provided weather support. Aerospace Audiovisual

Service, another component of MAC, documented activities with still pictures, motion pictures, and video coverage. During the brief operation, MAC flew almost 1,000 missions, airlifted 15,400 tons of cargo, and transported almost 37,000 passengers.

MAC's tactical operations are the ones most likely to make the TV newscasts because they are close to the action and are telegenic. But MAC leaders insist that strategic airlift is just as vital a combat mission. At Travis, the 60th MAW has no gunships or other tactical weapons, but Colonel Tait views everything his wing does as a rehearsal for such contingencies as Grenada.

Sometimes, the rehearsals surprise even MAC's closest neighbors, as they did recently when Travis's heavy transports began to practice low-level, terrain-following delivery missions.

The townspeople of adjacent Fairfield and Suisun City had been accustomed to the presence of large aircraft since the early days of World War II. The Pacific Wing of Air Transport Command flew cargo versions of the B-24 (C-87s) from what was then Fairfield-Suisun Army Air Field. In later years, the communities adjusted to SAC bombers and progressively larger MAC airlifters. C-141s and C-5s came and went almost unnoticed.

In the spring of 1987, however, the heavy transports began to skim the neighboring hills at 1,000 feet, and the phones began to ring at Travis. The practice route, northeast to Lake Tahoe, was authorized by the Federal Aviation Administration, but the sight of huge planes flying at what seemed like treetop level drew a swift reaction from homeowners in the sparsely settled areas well away from the locations of the base's normal activities.

Base officials had some difficulty convincing such critics that the planes indeed were flying at the prescribed 1,000 feet. From the ground, a C-141 at that altitude looks big enough. The look-alike C-5 is roughly half again as large and even at the same altitude appears to by flying even lower. It took some doing to convince the neighbors that the flights presented no hazard. The big, friendly airliners that had passed high overhead for years suddenly were looking suspiciously like warplanes preparing for battle.

The Global Stage

In fact, that is exactly what they were doing. But they are also doing it when they cruise the world's air lanes at a reassuring 35,000 feet. It is a rehearsal on a grand scale and on a vast stage.

Travis is geographically located in northern California, but it exercises Texas-size bragging rights. It sprawls over more than 7,500 acres of real estate, owns more than $6 billion worth of resources, and employs 8,000 active military, 3,400 civilians, and 5,500 reservists. It hosts the headquarters of the Twenty-second Air Force. It is the West Coast terminal for medical evacuation flights from the Pacific. Its hospital, David Grant USAF Medical Center, has a staff of 1,125, and a new composite medical facility will have almost 300 beds and another seventy-five-bed Aeromedical Staging Facility.

Travis launches about 1,300 aircraft carrying about 14,000 passengers per month. Its Deep Freeze operations alone airlift some 1,600 passengers and 700 tons of equipment to and from the Antarctic every year.

MAC's evolution into a global airlift command is nowhere more apparent than at Travis. The off-the-shelf transports and converted bombers it sent off during World War II carried pilots, navigators, a few strong-armed enlisted men, and rudimentary navigation equipment. Over the Pacific, they followed routes charted only a decade or so earlier. As the island-hopping Allies gained new territory, ATC crews found their own way and laid down corridors for the combat crews to follow. Flyers barely out of their teens plotted their courses to dots in the ocean and arrived safely a remarkable percentage of the time.

Not only the planes but the early navigational aids were crude compared with those of today. Radio communication was chancy, and navigators often relied on little more than the compasses and sextants that had guided mariners centuries before.

By contrast, today's C-141s and C-5s leave Travis for distant points on the globe with the ease of a suburban commuter. Except for those flying airdrops and some other specialized missions, they carry no navigators. In their place are inertial navigation systems, computerized black boxes, two or three to an aircraft. The INS is programmed before takeoff with courses through various turning points to the ultimate destination.

Its tiny gyroscopes provide a basic reference to position, sense every turn, and feed the information to the computer. Pilots can adjust the system with fixes from other navigational aids, but the system balks at accepting obviously unreasonable human corrections. In a sense, the traditional professional rivalry between pilots and navigators has become a contest between the computer and its human operators. The computer usually wins.

The next generation of inertial systems will have laser gyros and no moving parts. Just beyond that lies the Navstar Global Positioning System, which will take its position readings from eighteen orbiting satellites. Tied into the full range of military and civilian navigation aids, Navstar will give crews continuous readings on their latitude, longitude, and altitude anywhere in the world.

A Matter of Course

Such technological wonders are accepted as a matter of course by a generation raised on television and video games. David Carbin, an Air Reserve technician with the 60th Avionics Maintenance Squadron at Travis, sits on the towering flight deck of a parked C-5 and plays the buttons on the INS as he would some electronic instrument in a rock band. He frowns at a questionable position reading and concludes that the C-5 has been moved since the system was last set up.

Travis assigns different coordinates to each parking space on the ramp, and the INS can sense when its plane has been taxied to another place. Carbin is on intimate terms with the anatomy of the INS and apparently finds nothing remarkable in the fact that it can tell him where he is on the globe to within a matter of feet.

Electronic devices do more than navigate. They monitor a variety of

subsystems and diagnose malfunctions. They advise altitudes to fly for fuel economy. They supply weather information and a host of communications options. In the C-17, not only the navigator but the flight engineer will be eliminated on most flights. Its normal crew will consist of one loadmaster and two pilots.

For the foreseeable future at least, there is little danger that pilots too will become technologically unemployed. In fact, MAC's more immediate problem is retaining enough of them.

Hiring by commercial airlines, long a problem for the service, has significantly increased in recent years. Experienced airlift pilots are particularly attractive to the commercial carriers, and many are receiving tempting offers to defect. The exodus is becoming critical. MAC officials, recalling some serious past raids from the airlines, are concerned.

Maj. Gen. Alexander K. Davidson is Commander of MAC's Twenty-second Air Force. He notes that many pilots, particularly those who have never worked in the private sector, complain about the demands of the airlift mission on both pilots and their families. Many pilots cite such irritants as their main reason for going to the airlines.

Although he indicates that MAC is working hard to reduce or eliminate irritants, General Davidson concedes that irregular schedules, frequent separations from families, and uncertainties about the future do go with the territory in military airlift. But he argues that a pilot's life in the airlines, particularly in the early years, also can be unsettled and uncertain. General Davidson believes that the prospect of higher pay on the outside is a greater factor in the pilots' minds than most care to admit.

A Little Help From Its Friends

The problem is not a new one. The loss of expensively trained pilots long has been a major worry for the services. Years ago, the Air Force conceded that since it could not match airlines' pay, it would have to do what it could to improve the lot of its pilots and accept a certain level of attrition as its contribution to the resource of flyers available to the nation as a whole.

Like many bases, Travis receives at least a partial return on its investment. Along with the active-duty 60th MAW, the base hosts the 349th Military Airlift Wing (Associate), an Air Reserve unit with more than 5,500 members. Between eighty and ninety percent of the pilots in the 349th work full time for the airlines and fly for MAC in their Reserve status.

The 349th, the only Air Force Reserve unit checked out in both the C-141 and the C-5, supports about one-third of the air cargo missions flown from Travis. Other Reserve and Air Guard units carry a similar load from other bases, including a healthy share of the tactical airlift and special operations missions.

The 349th belies the traditional image of the old Reserve unit that breaks the monotony of once-a-month meetings with an occasional proficiency flight in some outdated aircraft. Its pilots fly the same equipment used by the 60th, often sharing the cockpit with active-duty crew members. In a mobilization, both the air crews and ground elements of the 349th would integrate fully with the 60th.

Keeping the Reserve unit ready to fill that role is not without its problems. Maj. William R. Tefteller, Assistant Deputy Commander for C-5 Operations of 349th MAW, is another of the Air Reserve technicians at Travis who serves full time as a civilian employee and maintains a dual status as a member of the Reserve wing. His full-time job includes scheduling Reserve crews to fly.

Major Tefteller concedes that a perceived favoritism for the Reservists causes some tension, but it is, he contends, like disputes within a family. On the job, such differences are set aside, and the active and reserve members work well together. In any case, he says, the days of the stepchild Reserve unit flying cast-off aircraft are gone.

Air Guard and AFRES units not collocated with active-duty units are receiving their own first-line transports, such as the C-5 and the C-141. They participate in major exercises and fly with active-duty units in humanitarian airlift operations.

Besides its four airlift squadrons, the Reserve wing at Travis has four maintenance squadrons, nine aerial port squadrons, and a medical services squadron, six of which are geographically separated units, another medical services squadron, a

One of MAC's most critical taskings is aeromedical airlift. Getting the injured from the front is just as important as getting troops and equipment to the front in many cases. "Casualties" are being offloaded from this C-130 into the waiting ambulances during a recent Reforger exercise in Germany.

contingency hospital, an aeromedical evacuation squadron, three civil engineering squadrons (two of which are geographically separated), a weapon systems squadron, a communications squadron, and a USAF clinic. All train to the same standards as those of the 60th.

Col. Raymond Holmes, Deputy Commander for Maintenance with the 60th, says he makes no distinction between active-duty and reserve members in the shops. They work side by side, and it is not unusual to see a reserve NCO supervising active-duty mechanics. Colonel Holmes rates today's airmen of both components as the best he has seen.

The mixed maintenance team keeps a remarkable percentage of the Travis fleet moving on a day-to-day basis. In an emergency, Colonel Holmes says, it could muster a far larger work force and respond almost with the speed of a fighter unit ordered to scramble.

The C-130s and C-141s will get the troops and some priority equipment to the front, but the C-5 fleet is critically important for hauling large quantities of resupply items and oversize loads like tanks and helicopters to the rear areas near the battle. This UH-60 Black Hawk is being unloaded during a recent Reforger exercise.

It Still Looks Like an Airline

For all of its combat readiness, however, MAC remains one of the world's major air carriers. It has an active force of close to 100,000 military and civilian members. It owns more than 1,000 aircraft. It operates thirteen US bases and two overseas bases and uses 276 others in twenty-four countries overseas. From its headquarters at Scott AFB, Ill., it manages three numbered air forces.

The Twenty-second Air Force at Travis directs the local 60th MAW and two similar wings at McChord AFB, Wash., and Norton AFB, Calif. MAC's two training bases are Altus AFB, Okla., and Little Rock AFB, Ark. It also has tactical airlift wings in Texas, Arkansas, and the Philippines and support flying groups as distant as Alaska, Japan, and Korea.

The Twenty-second is duplicated in the east by the Twenty-first Air Force, headquartered at McGuire AFB, N. J. It directs MAWs in Delaware, both Carolinas, and Maryland and tactical airlift units in England and Germany.

The Twenty-third Air Force, with headquarters at Hurlburt Field, Fla., maintains special operations units in Florida, Panama, the Philippines, and Germany and integrates special operations, combat rescue, weather reconnaissance, and aeromedical airlift worldwide.

Air Reserve and Guard units mirror the active-duty forces in every type of operation. Like the 349th MAW at Travis, Reserve associate wings in southern California, Washington, South Carolina, Delaware, and New Jersey share bases and aircraft with active-duty forces. Other AFRES units operate from separate locations with their own aircraft, flying everything from tactical airlift to special operations to weather reconnaissance and medical evacuation.

The Air Guard flies C-130s in five tactical airlift wings and fourteen tactical airlift groups scattered from Virginia to Alaska. Guard groups on both coasts fly HC-130s and Jolly Green Giant helicopters on rescue and recovery missions, and an ANG special operations group flies EC-130s from Pennsylvania.

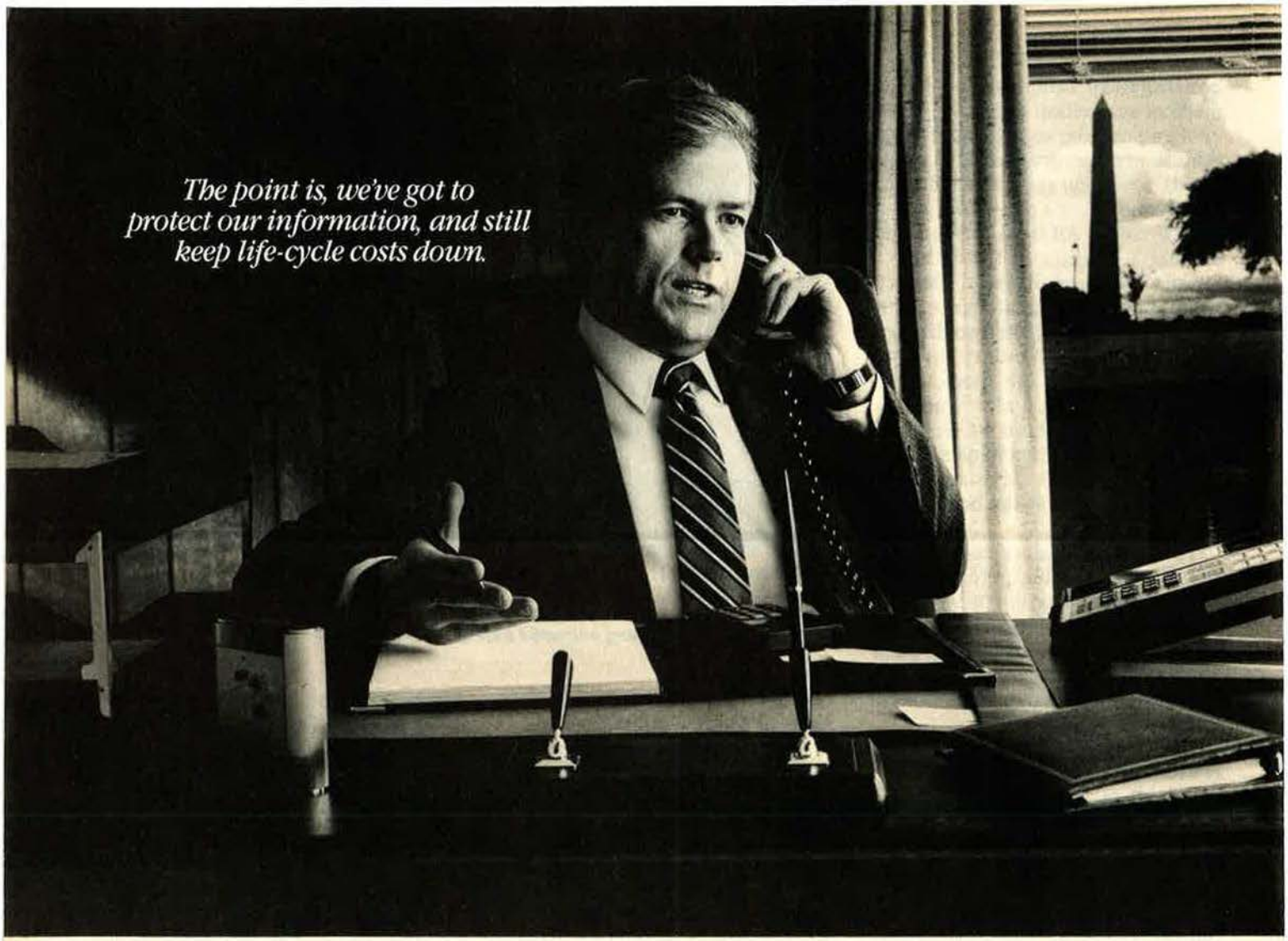
In a full mobilization, the reserve forces would add about 70,000 members and about 400 aircraft to MAC forces, bringing aboard about forty flying units and some 160 combat support units. About half of MAC's organic wartime capability is in reserve. The CRAF fleet would add substantially to the total.

No commercial carrier can match the variety of MAC's inventory. It flies everything from the eight-passenger Beech C-12 to the huge C-5. Its rescue forces use four types of helicopters. Its special operations units use three versions of the C-130, equipped with everything from cannon and miniguns to the latest in electronic warfare gear. It has flying ambulances able to carry forty litter patients and swift C-21s (Learjets) that can double in the aeromedical role when needed.

MAC carries Presidents, Cabinet members, and as many as 2,000,000 other passengers in a given year. In peace and war, ninety-five percent of its passengers are carried by commercial contract flights. It hauls almost half a million tons of cargo annually and flies about 4,500 medical evacuation missions. Still, MAC leaders insist, it is all practice, a honing of skills and a sharpening of claws.

You can put back the service flag, Mother. Your child is in MAC. ■

A Fifteenth Air Force B-24 bombardier during World War II, Bruce D. Callander was recalled to active duty as an information officer during the Korean War. Between tours of active duty, he earned a B.A. degree in journalism at the University of Michigan. In 1952, he joined the staff of Air Force Times, *becoming Editor in 1972. Now a free-lance writer, Mr. Callander has written several articles for* Air Force *Magazine, including "Navigators With a Difference," which appeared in the December '87 issue.*



For a growing number of government agencies, that means secure phones with nothing less than a 4.8 Kb/s capability.

That's why AT&T has developed what is now the only dual rate 2.4 and 4.8 Kb/s secure phone on the market: the AT&T Security-Plus Communications Terminal (STU-III).

AT&T's terminal is ready today to protect your secure communication, and with a design that is easy and cost-effective to upgrade. Looking ahead, this assures that improvements in voice processing, now under development at AT&T Bell Laboratories, can be integrated into existing AT&T terminals. The result: reduced life-cycle costs.

Unlike 2.4 Kb/s equipment, AT&T's 4.8 Kb/s transmission offers a major advantage: improved voice quality/voice recognition levels. This provides extra assurance that you are connected with the right party and reduces the strain of a lengthy secure conversation.

The AT&T Security-Plus Communications Terminal (STU-III): right for today, ready for tomorrow.

By doubling transmission speed, the 4.8 data rate moves sensitive information faster, decreases long distance transmission charges, even reduces set-up time.

AT&T's feature-rich STU-III gives you one-button access to its functions: Clear Data or Clear Voice; Secure Data or Secure Voice. It accommodates up to four independent identities and levels of security —and up to 32 crypto-ignition keys. It offers a remote interface to access its functions.

Also, physical security is engineered into its design, preventing tampering.

But the most reassuring feature of the AT&T Security-Plus Communications Terminal is the credibility of the company that builds it. A company with more than a century of quality communications experience.

For more information, call AT&T at **1 800 262-3787**. (NC residents call collect: **919 279-3411**.)

AT&T
The right choice.

JANE'S

ALL THE WORLD'S AIRCRAFT SUPPLEMENT

AUGUST 1988

Tupolev 'Bear-H' missile carrier from Dolon air base photographed off the northern coast of Alaska *(US Air Force)*

TUPOLEV

TUPOLEV DESIGN BUREAU, USSR

The 1988 edition of DoD's *Soviet Military Power* document reminds readers that "in the early 1980s, two new Soviet bomber programmes emerged, marking an important step in modernising the Soviet strategic long-range bomber force. The first, the 'Bear-H' cruise missile carrier, accounts for the greatest percentage of bomber production in this decade, with over 70 built. The second programme involves the more versatile and capable 'Blackjack' . . . [which] will not be produced in significant numbers until the end of this decade or the early 1990s."

Reference to 'Bear-H' as a new programme may appear paradoxical, as the original version of the bomber was photographed during a military flypast over Moscow 33 years ago. But DoD had no hesitation in adding that "the backbone of the modern Soviet intercontinental bomber force of the 1980s will remain the 'Bear-H', armed with the AS-15 'Kent' ALCM. The Soviets also have in their inventory about 100 other 'Bear' bombers and air-to-surface missile carriers.

"Soviet strategic aviation capabilities are enhanced through training and exercises. 'Bear-H' bombers are regularly observed simulating attacks against North America. . . . Additionally, older 'Bear' bombers carrying the AS-3 ('Kangaroo') air-to-surface missile are being rejuvenated through a modification programme that upgrades them to carry the newer AS-4 ('Kitchen') supersonic ASM. More than 45 of these reconfigured aircraft, designated 'Bear-Gs', are now operational.

"Prior to the recent introduction of longer-range cruise missiles, Soviet bombers would have had to penetrate Canadian or US airspace to launch their attacks. Now the 'Bear-H' can launch its long-range AS-15 cruise missiles from well offshore and still hit targets in North America." And this is only one of several important tasks assigned to the 'Bear' force. Some of the bombers, including missile

armed 'Bear-Gs', have been reassigned to a theatre role, and conduct regular combat training exercises against naval and land targets in the northern Pacific region. Maritime 'Bears' deployed frequently to staging bases in Cuba and Angola are capable of covering the North and South Atlantic from the Mediterranean approaches westward to the US east coast, and southward to the Cape of Good Hope. They are encountered off the US east coast during transits between Murmansk and Cuba, and during elint missions from Cuba. Eight 'Bears' are stationed permanently at Cam Ranh, the former US Navy base in Vietnam.

This seems an appropriate moment, therefore, to take a fresh look at the characteristics of these huge four-turboprop bombers.

TUPOLEV Tu-95 and Tu-142

NATO reporting name: 'Bear'

The first prototype of Andrei Tupolev's four-turboprop Tu-95 bomber was flown in the Summer of 1954. Its high speed, exceeding that once considered practicable for propeller driven aircraft, eclipsed the contemporary four-jet Myasishchev M-4 (NATO 'Bison'). But this is not the only factor that has kept the 'Bear' in continuous production for well over 30 years. Equally important has been its ability to accommodate extensive avionics and the largest air-to-surface missiles and radars yet carried by combat aircraft. Most of the Soviet Navy's current force of 80 'Bears' are of the 'F' model, which differs so greatly from earlier versions that its official designation was changed from Tu-95 to Tu-142. The latest 'Bear-H' version equipping the Moscow Air Army utilises the same basic, much improved airframe. It is aircraft from this Air Army, based at Dolon in the central USSR, that are intercepted routinely by North American Aerospace Defense Command fighters.

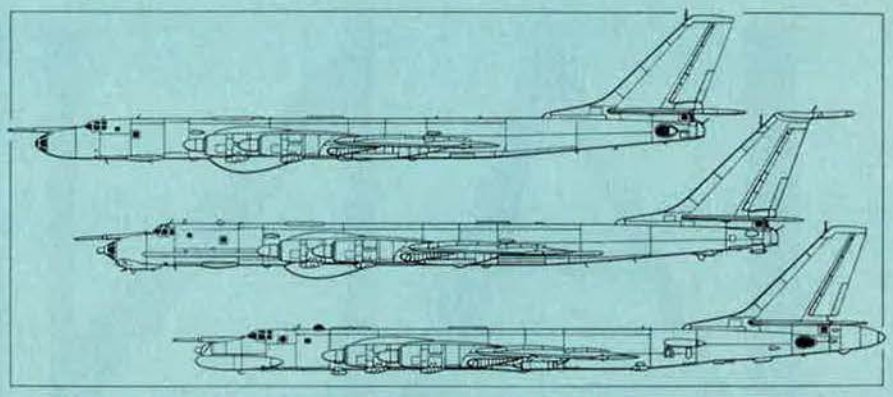
The nine versions identified by NATO reporting names are as follows:

Bear-A. Basic Tu-95 strategic bomber, first shown in Aviation Day display at Tushino in July 1955. Internal stowage for two nuclear or a variety of conventional free-fall weapons. Fitted with chin radar, and defensive armament comprising three pairs of 23 mm cannon in remotely controlled rear dorsal and ventral barbettes and manned tail turret. Two glazed blisters on rear fuselage, under tailplane, are used for sighting by the gunner controlling all these weapons. The dorsal and ventral barbettes can also be controlled from a station aft of the flight deck. Max range with 11,340 kg (25,000 lb) bomb load is 8,000 nm (14,800 km; 9,200 miles). Few remain in service.

Bear-B. First seen in 1961 Aviation Day flypast. Generally similar to 'Bear-A' but able to carry a large air-to-surface aeroplane type missile (NATO reporting name 'Kangaroo') under fuselage, with associated radar (NATO 'Crown Drum') in wide undernose radome, replacing the original glazing. Defensive armament retained. A few 'Bear-Bs' operate in maritime reconnaissance role, with flight refuelling nose-probe and, sometimes, an elint blister fairing on the starboard side of the rear fuselage. Some carry a pointed canister under each wing, for air sampling.

Bear-C. Third Tu-95 strike version, able to carry 'Kangaroo'; first observed near NATO naval forces in September 1964. Generally similar to 'Bear-B' but with an elint blister fairing on *both* sides of rear fuselage. Refuelling probe standard. Has been observed with a faired tail housing special equipment, like that first seen on a 'Bear-D' and illustrated on a 'Bear-G'.

Bear-D. Identified in August 1967, this maritime reconnaissance version of the Tu-95 has a glazed nose, an undernose radar (NATO 'Short Horn'), a large underbelly radome for I band surface search radar (NATO 'Big Bulge'), an elint fairing on each side of the rear fuselage like 'Bear-C', a nose refuelling probe, and a variety of blisters and antennae, including a streamlined fairing on each tailplane tip. The housing for I band tail warning radar above the tail turret is much larger than on previous versions. Tasks include pinpointing of maritime targets for missile launch crews on board ships and aircraft that are themselves too distant to ensure precise missile aiming and guidance. 'Bear-D' carries no offensive weapons. About 15 operational.



Top to bottom: Tu-142 'Bear-F' Mod 1, Tu-142M 'Bear-F' Mod 4, Tu-95 'Bear-G' *(Pilot Press)*

A 'Bear-D' was the first version seen, in 1978, with the normal tail turret and associated radome replaced by a faired tail housing special equipment. A similar tail is now fitted to 'Bear-G'.

Bear-E. Reconnaissance version of Tu-95, basically similar to 'Bear-A' but with refuelling probe and rear fuselage elint fairings as on 'Bear-C'. Six camera windows in bomb bay, in pairs in line with the wing flaps, with a seventh window to the rear on the starboard side. Few only.

Bear-F. Anti-submarine aircraft. First of the Tu-142 series of extensively redesigned 'Bears', with more highly cambered wings and longer fuselage forward of the wings. Deployed initially by the Soviet Naval air force in 1970, since when several variants have been seen. Re-entered production in the mid-1980s. Originally, 'Bear-F' had enlarged and lengthened fairings aft of its inboard engine nacelles, and undernose radar. The main underfuselage J band radar housing is considerably farther forward than on 'Bear-D' and smaller in size; there are no large blister fairings under and on the sides of the rear fuselage; and the nosewheel doors are bulged prominently, suggesting the use of larger or low pressure tyres. 'Bear-F' has two stores bays for sonobuoys, torpedoes, and nuclear depth charges in its rear fuselage, one of them replacing the usual rear ventral gun turret and leaving the tail turret as the sole defensive gun position. The variants of 'Bear-F' are identified as follows:

Mod 1: As original 'Bear-F' but reverted to standard size nacelles. Chin mounted J band radar deleted. Fewer protrusions.

Mod 2 (Tu-142M): Fuselage nose lengthened by 23 cm (9 in) and roof of flight deck raised. Angle of refuelling probe lowered by 4°.

Mod 3: MAD boom added to fin tip. Fairings at tips of tailplane deleted. Rear stores bay lengthened and made less wide.

Mod 4: Chin radar reinstated. Self-protection ECM thimble radome on nose, plus other fairings. Entered service with the air force of the Soviet Northern Fleet in 1985.

Most of approximately 60 'Bear-Fs' in service are to Mod 3 or Mod 4 standard.

Bear-G. Tu-95, generally similar to 'Bear-B/C' but reconfigured for elint missions and to carry two AS-4 ('Kitchen') air-to-surface missiles instead of one AS-3 ('Kangaroo'), on a large pylon under each wingroot. Features include an ECM thimble under the inflight refuelling probe, a streamlined ECM pod on each side at the bottom of both the centre and rear fuselage, and a 'solid' tailcone, containing special equipment, similar in shape to that on some 'Bear-Ds'. More than 45 in service, all with the Irkutsk Air Army.

Bear-H. New production version, based on the Tu-142 type airframe of 'Bear-F' but with a shorter fuselage, of the same length as 'Bear-B/C'. Equipped to carry long-range cruise missiles, including the AS-15 (NATO 'Kent'). Aircraft observed up to mid-1987 had only an internal (rotary?)

'Bear-F' Mod 3 introduced an MAD boom at the fin tip

The Tu-95 'Bear-G' is a reconfigured 'Bear-B or C' equipped to carry 'Kitchen' supersonic ASMs
(UK Ministry of Defence)

launcher for six of these ALCMs, but pylon mountings for four more can be attached under each wing-root. Built at Kuybyshev, 'Bear-H' achieved initial operational capability in 1984, and more than 70 had been built by Spring 1988. Features include a larger and deeper radome built into the nose and a small fin-tip fairing. There are no elint blister fairings on the sides of the rear fuselage, and the ventral gun turret is deleted. Some aircraft have only a single twin-barrel gun, instead of the usual pair, in the tail turret.

Bear-J. Identified in 1986, this is the Soviet equivalent of the US Navy's E-6A and EC-130Q TACAMO aircraft, equipped with VLF communications avionics to maintain an on-station/all-ocean link between national command authorities and nuclear missile armed submarines under most operating conditions. Operational in comparatively small numbers by 1988, with the Soviet Northern and Pacific Fleets, it appears to use a modified Tu-142 'Bear-F' airframe.

In 1988, India took delivery of two ex-Soviet Navy 'Bear-Fs' for maritime reconnaissance.

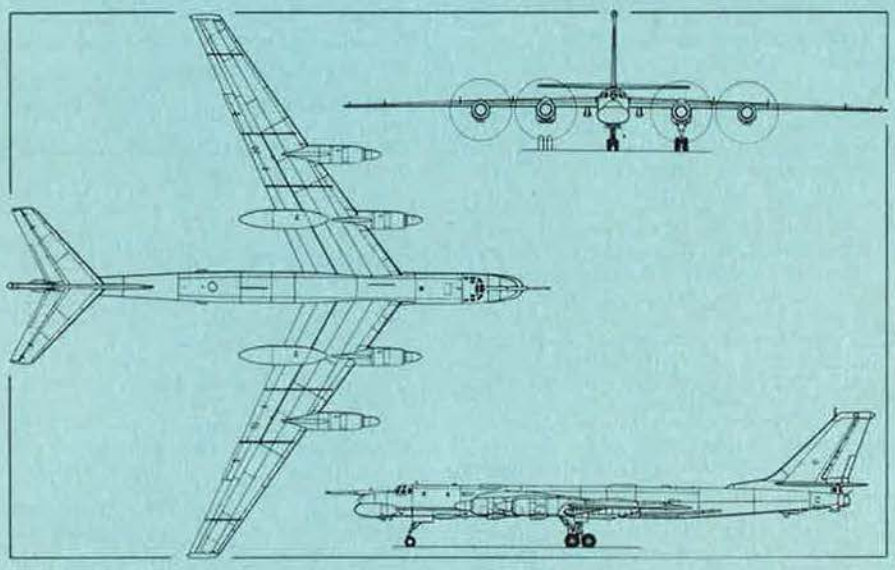
TYPE: Four-turboprop long-range bomber and maritime reconnaissance aircraft.

WINGS: Cantilever mid-wing monoplane. Slight anhedral. Sweepback 37° at quarter-chord on inner panels, 35° at quarter-chord on outer panels. All-metal structure, with four spars in inboard panels, three spars outboard. All-metal three-segment hydraulically powered ailerons and two-segment Fowler flaps on each wing. Trim tab in each inboard aileron segment. Spoilers in top surface of wing forward of inboard end of ailerons. Three boundary layer fences on top surface of each wing. Thermal anti-icing system in leading-edges.

FUSELAGE: All-metal semi-monocoque structure of circular section, containing three pressurised compartments. Those forward and aft of the weapons bay are linked by a crawlway tunnel. The tail gunner's compartment is not accessible from the other compartments.

TAIL UNIT: Cantilever all-metal structure, with sweepback on all surfaces. Adjustable tailplane incidence. Hydraulically powered rudder and elevators. Trim tabs in rudder and each elevator. Thermal anti-icing system in tailplane leading-edge.

LANDING GEAR: Hydraulically retractable tricycle type. Main units consist of four-wheel bogies, with tyres of approx 1.50 m (5 ft) diameter and hydraulic internal expanding brakes. Twin wheels on nose unit. All units retract rearward, main units into nacelles built on to wing trailing-edge. Retractable tail bumper consisting of two small wheels. Braking parachute may be used to reduce landing run.



Tupolev 'Bear-H' equipped to carry AS-15 'Kent' ALCMs *(Pilot Press)*

'Bear-H' cruise missile carrier photographed during a practice strike

POWER PLANT: Four Kuznetsov NK-12MV turboprops, each with max rating of 11,033 kW (14,795 ehp) and driving eight-blade contra-rotating reversible-pitch Type AV-60N propellers. Fuel in wing tanks, with normal capacity of 95,000 litres (25,100 US gallons; 20,900 Imp gallons).

ACCOMMODATION AND ARMAMENT: See notes applicable to individual versions and under 'Fuselage'.

OPERATIONAL EQUIPMENT ('Bear-D'): Large I band radar (NATO 'Big Bulge') in blister fairing under centre-fuselage, for reconnaissance and to provide data on potential targets for anti-shipping aircraft or surface vessels. In latter mode, PPI presentation is data linked to missile launch station. Four-PRF range J band circular and sector scan navigation radar (NATO 'Short Horn'). I band tail warning radar (originally NATO 'Bee Hind'; later 'Box Tail') in housing at base of rudder.

DIMENSIONS, EXTERNAL ('Bear-F', approx):

Wing span	51.10 m (167 ft 8 in)
Length overall	49.50 m (162 ft 5 in)
Height overall	12.12 m (39 ft 9 in)

WEIGHT ('Bear-F', estimated):

Max T-O weight	188,000 kg (414,470 lb)

PERFORMANCE:

Max level speed at 7,620 m (25,000 ft)	500 knots (925 km/h; 575 mph)
Over-target speed at 12,500 m (41,000 ft)	450 knots (833 km/h; 518 mph)
Max unrefuelled combat radius	4,475 nm (8,285 km; 5,150 miles)

EMBRAER

EMPRESA BRASILEIRA DE AERONÁUTICA SA, Av Brig Faria Lima 2170, Caixa Postal 343, 12225 São José dos Campos, SP, Brazil

EMBRAER EMB-120 BRASILIA

Brazilian Air Force designation: VC-97

Design of this twin-turboprop passenger and cargo transport started in September 1979. The first prototype (PT-ZBA) made its initial flight on 27 July 1983, the second (PT-ZBB) on 21 December 1983, and the third (PT-ZBC) on 9 May 1984. These aircraft were used for flight test and certification trials. Nos. 2 and 5 were static and fatigue test aircraft; No. 6 was a pre-series demonstration aircraft.

Certification by the Brazilian CTA was granted on 10 May 1985, and FAA (FAR Pt 25) type approval on 9 July 1985. Type certification by the British CAA, French DGAC, and German LBA was granted in 1986. The first customer, Atlantic Southeast Airlines of the USA, received its first Brasilia at the Paris Air Show in June 1985. By 9 May 1988, firm orders totalled 153, with 142 more on option. By the same date, a total of 75 had been delivered, including two VC-97s, of ten on order, for the Grupo de Transporte Especial of the Brazilian Air Force at its Brasilia air base. The first order for the corporate version was received from United Technologies Corporation (USA) in August 1985. Furnished for 18 passengers, it was delivered in September 1986. Scheduled production rate was three aircraft per month in 1987, rising to four per month in 1988.

From Brasilia c/n 120028, delivered to DLT in October 1986, composite materials equivalent to 10 per cent of the aircraft's basic empty weight have been used in the airframe, as noted in the following descriptive details:

TYPE: Twin-turboprop general purpose transport.

WINGS: Cantilever low-wing monoplane. Wing section NACA 23018 (modified) at root, NACA 23012 at tip. Dihedral 6° 30' from roots at 66 per cent chord. Incidence 2°. Sweepback 0° at 66 per cent chord. Single continuous fail-safe structure, attached to underside of fuselage on three special frames. Main wing box has three spars (at 15, 28, and 66 per cent chord), ribs, stiffeners, and skin. Spar caps machined from 2024 or 7050 aluminium alloy extrusions; skin panels are of 2024 or 7475 laminations, chemically milled. Leading-edges, wingtips, and root fairings of Kevlar reinforced glassfibre. Hydraulically actuated electrically controlled double-slotted Fowler trailing-edge flap, of carbonfibre construction, inboard and outboard of each engine nacelle; small plain flap beneath each nacelle. No slats, slots, spoilers, or airbrakes. Small fence on each outer wing between outboard flap and aileron. Internally balanced all-metal ailerons. Lateral trimming by tabs (two in starboard aileron, one in port aileron). Ailerons actuated by dual irreversible mechanical actuators operated manually by cable controls. Pneumatic boot de-icing of leading-edges, using engine bleed air.

FUSELAGE: Semi-monocoque pressurised structure, of circular cross-section throughout most of its length. Chemically milled skin, reinforced by extruded stiffeners; C frames attached to skin by shear clips. Entire structure is of 2024, 7050, and 7475 aluminium alloys, and meets the damage tolerance requirements of FAR Pt 25 (Transport category) up to Amendment 25-54. Nosecone of

Launch customer for the Embraer EMB-120 Brasilia was Atlantic Southeast Airlines of Atlanta, Georgia

Kevlar reinforced glassfibre; tailcone also of Kevlar reinforced glassfibre on aircraft without APU. Pressurised area contained within flat bulkhead forward of flight deck and spherical rear bulkhead aft of baggage compartment. Twin ventral strakes under rear fuselage.

TAIL UNIT: Cantilever T tail, of three-spar metal construction except for leading-edges and tips, which are of Kevlar reinforced glassfibre. Fixed incidence swept tailplane, with horn balanced elevators. Sweptback fin, with Kevlar reinforced glassfibre dorsal fin. Serially hinged two-segment rudder actuated hydraulically by Bertea CSD unit. Mechanically actuated trim tab in each elevator. Pneumatic boot de-icing of leading-edges, using engine bleed air.

LANDING GEAR: Retractable tricycle type, with Goodrich twin wheels and oleo-pneumatic shock absorber on each unit (main units 12 in, nose unit 8 in). Hydraulic actuation; all units retract forward (main units into engine nacelles). Hydraulically powered nosewheel steering. Goodyear tyres, size 24 × 7.25 in (main), 18 × 5.5 in (nose); pressure 6.90–7.58 bars (100–110 lb/sq in) on main units, 4.14–4.83 bars (60–70 lb/sq in) on nose unit. Goodrich carbon brakes standard (steel optional). Hydro-Aire anti-skid system standard; autobrake optional.

POWER PLANT: Two Pratt & Whitney Canada PW118 turboprops, each rated at 1,342 kW (1,800 shp) for T-O and max continuous power, and driving a Hamilton Standard 14RF-9 four-blade constant-speed reversible-pitch fully-feathering propeller with glassfibre blades containing aluminium spars. Fuel in two-cell 1,670 litre (441 US gallon; 367.4 Imp gallon) integral tank in each wing; total capacity 3,340 litres (882 US gallons; 734.7 Imp gallons), of which 3,312 litres (875 US gallons; 728.5 Imp gallons) are usable. Single-point pressure refuelling (beneath outer starboard wing), plus gravity point in upper surface of each wing. Oil capacity 9 litres (2.4 US gallons; 2 Imp gallons).

ACCOMMODATION: Pilot and co-pilot on flight deck, with dual controls. Main cabin accommodates cabin attendant and 30 passengers in three-abreast seating at 79 cm (31 in) pitch, with overhead lockable baggage racks, in pressurised and air-conditioned environment. Passenger seats are made of carbonfibre and Kevlar, floor and partitions of carbonfibre and Nomex sandwich, side panels and ceiling of glassfibre/Kevlar/Nomex/carbonfibre sandwich. Provisions for wardrobe, galley, and toilet. Downward opening main passenger door, with airstairs, forward of wing on port side. Type II emergency exit on starboard side at rear. Overwing Type III emergency exit on each side. Pressurised baggage compartment aft of passenger cabin, with large door on port side. Also available with all-cargo interior; executive or military transport interior; or in mixed-traffic version with 24 or 26 passengers (toilet omitted in latter case), and 900 kg (1,984 lb) of cargo in enlarged rear baggage compartment.

SYSTEMS: AiResearch air-conditioning/pressurisation system (differential 0.48 bars; 7 lb/sq in), with dual packs of recirculation equipment. Duplicated hydraulic systems (pressure 207 bars; 3,000 lb/sq in), each powered by an engine driven pump, for landing gear, flap, rudder, and brake actuation, and nosewheel steering. Emergency standby electric pumps on each system, plus single standby handpump, for landing gear extension. Main electrical power supplied by two 28V 400A DC starter/generators; two 28V 100A DC auxiliary brushless generators for secondary and/or emergency power; one 24V 40Ah nickel-cadmium battery for assisted starting and emergency power. Main and standby 450VA static inverters for 26/115V AC power at 400Hz. Single high-pressure (127.5 bars; 1,850 lb/sq in) oxygen cylinder for crew; individual chemical oxygen generators for passengers. Pneumatic de-icing for wing and tail leading-edges, and engine air intakes; electrically heated windscreens, propellers, and pitot tubes; bleed air de-icing of engine intakes. Optional Garrett GTCP36-150(A) APU in tailcone, for electrical and pneumatic power supply (fitted to second and third prototypes).

AVIONICS: Collins Pro Line II digital avionics package includes as standard dual VHF-22 com transceivers, dual VIR-32 VHF nav receivers, one ADF-60A, one TDR-90 transponder, CLT-22/32/62/92 control heads, one DME-41, one WXR-270 weather radar, dual AHRS-85 digital strapdown AHRS, dual ADI-84, dual EHSI-74, dual RMI-36, one Dorne & Margolin DMELT-81 emergency locator transmitter, dual Avtech audio/interphones, Avtech PA and cabin interphone, Fairchild voice recorder, and IET standby attitude indicator. Optional avionics include third VHF com, second transponder and DME, WXR-300 weather radar, two EFIS-86 electronic flight instrument systems, one MFD-85 multifunction display, one or two J.E.T. RNS-8000 3D or Racal Avionics RN 5000 nav, one APS-65 digital autopilot, one or two FCS-65 digital flight directors, flight entertainment music, one or two Canadian Marconi CMA-771 Alpha VLF/Omega, one or two ALT-55 radio altimeters, altitude alerter/preselect, microwave landing system, ground proximity warning system, flight recorder, and Motorola Selcal. Second (Bendix) avionics package is available optionally. Other types of avionics equipment, for special versions of the aircraft, are as required for the missions concerned.

DIMENSIONS, EXTERNAL:

Wing span	19.78 m (64 ft 10¾ in)
Wing chord:	
at root	2.81 m (9 ft 2¾ in)
at tip	1.40 m (4 ft 7 in)
Wing aspect ratio	9.9
Length overall	20.00 m (65 ft 7½ in)
Length of fuselage	18.73 m (61 ft 5½ in)
Fuselage: Max diameter	2.28 m (7 ft 5¾ in)
Height overall	6.35 m (20 ft 10 in)
Elevator span	6.94 m (22 ft 9¼ in)
Wheel track (c/l of shock struts)	6.58 m (21 ft 7 in)
Wheelbase	6.97 m (22 ft 10½ in)
Propeller diameter	3.20 m (10 ft 6 in)
Propeller ground clearance (min)	0.48 m (1 ft 7 in)
Passenger door (fwd, port):	
Height	1.70 m (5 ft 7 in)
Width	0.774 m (2 ft 6½ in)
Height to sill	1.47 m (4 ft 10 in)
Cargo door (rear, port):	
Height	1.36 m (4 ft 5½ in)
Width	1.30 m (4 ft 3¼ in)
Height to sill	1.67 m (5 ft 5¾ in)
Emergency exit (rear, stbd):	
Height	1.37 m (4 ft 6 in)
Width	0.51 m (1 ft 8 in)
Height to sill	1.56 m (5 ft 1½ in)
Emergency exits (overwing, each):	
Height	0.91 m (3 ft 0 in)
Width	0.51 m (1 ft 8 in)
Emergency exits (flight deck side windows, each):	
Min height	0.48 m (1 ft 7 in)
Min width	0.51 m (1 ft 8 in)

DIMENSIONS, INTERNAL:

Cabin, excl flight deck and baggage compartment:	
Length	9.35 m (30 ft 8 in)
Max width	2.10 m (6 ft 10¾ in)
Max height	1.76 m (5 ft 9¼ in)
Floor area	14.97 m² (161.14 sq ft)
Rear baggage compartment volume:	
30-passenger version	6.40 m³ (226 cu ft)
all-cargo version	2.70 m³ (95 cu ft)
passenger/cargo version	11.00 m³ (388 cu ft)
Cabin, incl flight deck and baggage compartment:	
Total volume	approx 41.8 m³ (1,476 cu ft)
Max available cabin volume (all-cargo version)	31.10 m³ (1,098 cu ft)

AREAS:

Wings, gross	39.43 m² (424.42 sq ft)
Ailerons (total)	2.88 m² (31.00 sq ft)
Trailing-edge flaps (total)	3.23 m² (34.77 sq ft)
Fin, incl dorsal fin	5.74 m² (61.78 sq ft)
Rudder	2.59 m² (27.88 sq ft)
Tailplane	6.10 m² (65.66 sq ft)
Elevators, incl tabs	3.90 m² (41.98 sq ft)

WEIGHTS AND LOADINGS:

Weight empty, equipped	7,070 kg (15,586 lb)
Max fuel	2,659 kg (5,862 lb)
Max payload	3,470 kg (7,650 lb)
Max T-O weight	11,500 kg (25,353 lb)
Max ramp weight	11,580 kg (25,529 lb)
Max landing weight	11,250 kg (24,802 lb)
Max zero-fuel weight	10,500 kg (23,148 lb)
Max wing loading	292 kg/m² (59.8 lb/sq ft)
Max power loading	4.29 kg/kW (7.04 lb/shp)

PERFORMANCE (at max T-O weight, ISA):

Max operating speed	272 knots (504 km/h; 313 mph) EAS
Max level speed at 6,100 m (20,000 ft)	328 knots (608 km/h; 378 mph)
Max cruising speed at 6,100 m (20,000 ft)	298 knots (552 km/h; 343 mph)
Long-range cruising speed at 7,620 m (25,000 ft)	260 knots (482 km/h; 299 mph)
Stalling speed, power off:	
flaps up	117 knots (217 km/h; 135 mph) CAS
flaps down	87 knots (162 km/h; 100 mph) CAS
Max rate of climb at S/L	646 m (2,120 ft)/min
Rate of climb at S/L, one engine out	206 m (675 ft)/min
Service ceiling	9,085 m (29,800 ft)
Service ceiling, one engine out	5,240 m (17,200 ft)
FAR Pt 25 T-O field length	1,420 m (4,660 ft)
FAR Pt 135 landing field length, max landing weight at S/L	1,370 m (4,495 ft)
Min ground turning radius	15.76 m (51 ft 8½ in)

Range at 7,620 m (25,000 ft), reserves for 100 nm (185 km; 115 mile) diversion and 45 min hold:

with max (30) passenger payload (2,721 kg; 6,000 lb) 945 nm (1,750 km; 1,088 miles)
with max fuel and 1,920 kg (4,233 lb) payload (21 passengers)
1,610 nm (2,983 km; 1,854 miles)

OPERATIONAL NOISE LEVELS (FAR Pt 36, BCAR-N and ICAO Annex 16):

T-O	78.6 EPNdB
Approach	89.1 EPNdB
Sideline	76.8 EPNdB

IAI

ISRAEL AIRCRAFT INDUSTRIES (Aircraft and Bedek Aviation Divisions), Ben-Gurion International Airport, Israel 70100

IAI is the major aerospace organisation in Israel. Its Aircraft Division is responsible for all aircraft of Israeli design, many of which have been featured in Jane's Supplements in AIR FORCE Magazine in the past. They include the Arava STOL military/civil transport (February 1978), Westwind executive jet (February 1981), Kfir multirole fighter (June 1983), and, most recently, the Lavi advanced combat aircraft (April 1987). Aircraft Division is also responsible for manufacture of the country's Scout, Mastiff, and Pioneer unmanned aerial vehicles.

Bedek Aviation Division performs most of IAI's military and civil upgrading and retrofit programmes, current examples including the Phantom 2000 and Super Phantom *(see October 1987 Supplement)* and the modification of a number of large transport aircraft to passenger/cargo, tanker, EW, and reconnaissance mission configurations. Other ongoing work at Bedek includes the turnaround inspection, overhaul, repair, retrofit, outfitting, and testing of more than 30 types of aircraft. Among these are various models of the Boeing 707/727/737/747/767, McDonnell Douglas DC-8/DC-9/DC-10, and Lockheed C-130/L-100; combat aircraft that can be handled include the A-4 Skyhawk, F-4 Phantom, F-15 Eagle, F-16 Fighting Falcon, and Mirage III. Power plants processed encompass 30 types of civil and military piston, turboprop, turbojet, and turbofan engines and their components, including the JT3D, JT8D, JT9D, F100, J79, Atar 9C, TFE731, T56, PT6, C-250, T53, and T64.

IAI NAMMER (TIGER)

In addition to its upgrade programmes for existing Mirage III/5 aircraft, which are undertaken by Bedek Aviation Division, IAI's Aircraft Division has proposed the Nammer as a new-build joint venture aircraft that could be developed with one or more international partners.

Externally, as shown in the accompanying three-view drawing, the Nammer can be identified by a longer nose than the Mirage or single-seat Kfir, fitment of Kfir type canard surfaces on the engine air intake trunks, an additional fuselage plug aft of the cockpit, and a 'clean' fin without the large dorsal airscoop of the Kfir. Like current Kfirs, it would be equipped with a contemporary Israeli weapon delivery and navigation system (WDNS), HOTAS (hands on throttle and stick) cockpit controls, and a related stores management and release system (SMRS). There are two internally mounted 30 mm cannon, with 140 rds/gun, plus nine external wing and fuselage stations for weapons, drop tanks, and a wide range of other stores, including a capability for launching 'smart' weapons. An Elta EL/M-2032 lookup/lookdown pulse-Doppler multimode fire control radar would be standard; a radar warning system (with information presented on the tactical display), automatic chaff/flare dispensers, and a jamming system would be optional. UHF/VHF com and radio navigation systems would be to customer's requirements.

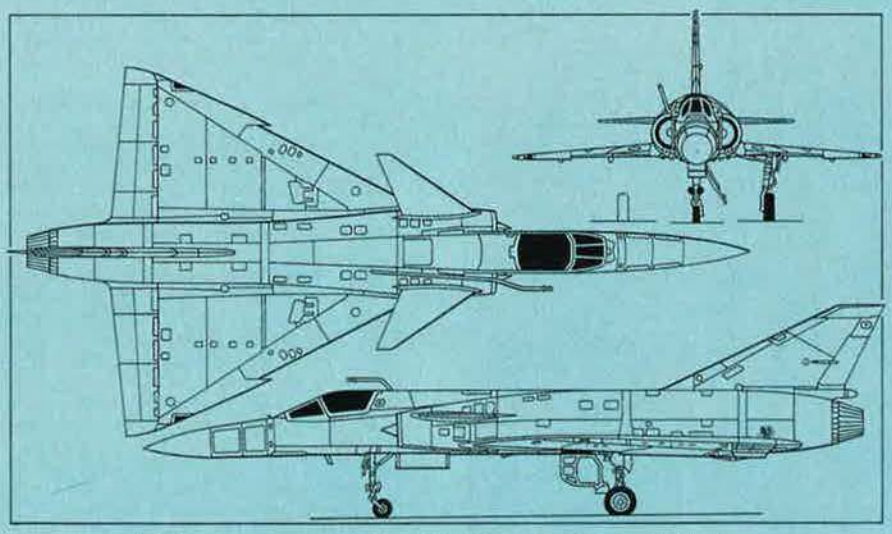
POWER PLANT: One General Electric/Flygmotor F404/RM12 turbofan, rated at 55.6 kN (12,500 lb st) dry and 80.7 kN (18,140 lb st) with afterburning. See under 'Weights' for fuel load. In-flight and single-point ground pressure refuelling standard.

DIMENSIONS, EXTERNAL:

Wing span	8.22 m (26 ft 11½ in)
Wing chord at root	8.04 m (26 ft 4½ in)
Wing aspect ratio	1.9
Foreplane span	3.73 m (12 ft 3 in)
Length overall	16.00 m (52 ft 6 in)
Height overall	4.55 m (14 ft 11¼ in)
Wheel track	3.10 m (10 ft 2 in)
Wheelbase	4.87 m (15 ft 11¼ in)

AREAS:

Wings, gross	34.8 m² (374.6 sq ft)
Foreplanes (total)	1.66 m² (17.87 sq ft)



IAI Nammer upgraded version of the Mirage III and 5 *(Jane's/Mike Keep)*

Bedek conversion of a Boeing 707 to three-point probe-and-drogue tanker with A-4 Skyhawks

WEIGHTS:

Max fuel: internal	2,994 kg (6,600 lb)
external	3,719 kg (8,200 lb)
Max external stores	6,260 kg (13,800 lb)
T-O weight 'clean'	10,251 kg (22,600 lb)
Typical combat weight	9,049 kg (19,950 lb)
Max T-O weight with external stores	16,511 kg (36,400 lb)

PERFORMANCE (estimated, at 9,049 kg; 19,950 lb combat weight except where indicated):

Max level speed:	
at S/L	750 knots (1,390 km/h; 863 mph)
at altitude	Mach 2.2
Stabilised ceiling	17,680 m (58,000 ft)
Max instantaneous turn rate at 4,575 m (15,000 ft)	21°/s

Combat radius (tanks dropped when empty):

- interceptor, one 1,300 litre tank and four IR air-to-air missiles, out and back at 12,200 m (40,000 ft) at Mach 1.8, incl 2 min combat 250 nm (463 km; 288 miles)
- combat air patrol at 9,150 m (30,000 ft) at Mach 0.85, one 1,300 litre and two 1,700 litre tanks and four IR air-to-air missiles, incl 60 min loiter and 2 min combat 746 nm (1,382 km; 859 miles)
- ground attack (hi-lo-lo-hi) at 544 knots (1,008 km/h; 626 mph) approach speed, two 1,700 litre tanks, two Mk 82 bombs, and two IR air-to-air missiles 537 nm (995 km; 618 miles)
- ground attack (lo-lo-lo-hi) at 535 knots (991 km/h; 616 mph) approach speed, one 1,300 and two 1,700 litre tanks, four CBU-58 cluster bombs, and two IR air-to-air missiles 573 nm (1,062 km; 660 miles)

g limit +9

BEDEK HEAVY TRANSPORT CONVERSIONS

Bedek Aviation Division has carried out, or can offer, a variety of configuration conversions for large transport aircraft, including the following:

Boeing 707/720. Bedek has refurbished and resold numerous Boeing 707s and 720s, often after conversion from passenger to cargo, sigint, hose or boom refuelling tanker, or other configurations, and several of these have been recorded in various editions of *All the World's Aircraft*. A sigint/tanker conversion with wingtip refuelling pods and Elta EL/L-8300 sigint system was illustrated in the 1987–88 edition. Also available is an AEW version mounting an Elta Electronics Phalcon solid state L band radar with six conformal phased array antennae: two on each side of the fuselage, one in an enlarged nose, and one under the tail. In addition to the radar, the Phalcon system incorporates a sophisticated monopulse IFF, wide-range ESM system, and a comint data processing system for tactical situation display.

Modifications involved in the tanker conversion include local reinforcement of the outer wings, supports for additional wingtip fuel pods where applicable, and fuselage reinforcement for the boom support point or tail reel hose exit; an additional hydraulic system to power the fuel pumps and boom or tail reel; adaptation of the fuel supply system to

Elta sigint stations on board a Bedek 707 sigint/tanker conversion

the tanker role; electrical system changes to add external illumination, refuelling system controls, boom operator's station with 3-D optronic viewing system, and director lights for pilots of receiver aircraft; and avionics to individual customer requirements.

WEIGHTS (707-320C tanker, approx):

Operating weight empty	65,770 kg (145,000 lb)
*Internal fuel weight	72,575 kg (160,000 lb)
**Additional fuel weight in wingtip pods	up to 13,605 kg (30,000 lb)
Tanker T-O weight	151,950 kg (335,000 lb)

*90,300 litres (23,855 US gallons; 19,863 Imp gallons)
**17,034 litres (4,500 US gallons; 3,747 Imp gallons)

Boeing 747-100 and -200 Combi. Bedek announced at the 1987 Paris Air Show that it was converting a Boeing 747-100 to prototype Combi configuration, for certification in 1988. Changes include installing a 3.05 × 3.40 m (10 ft 0 in × 11 ft 2 in) upward opening main deck cargo door aft of the wing on the port side, with local reinforcement of the fuselage; reinforcing the cabin floor to increase load carrying capacity; installing a fully powered ball mat/roller cargo handling system and restraint system, and a bulkhead between the passenger and cargo compartments; and interior modifications adapted to selected passenger/cargo combinations. Basic configuration options to be offered are: (1) all-cargo, with up to 29 main deck standard pallets or containers; (2) Combi, with passengers at front and 7 to 13 pallets aft; and (3) all-passenger, with interior layout to customer's specification. Versions to accommodate non-standard containers, and similar conversions of the Model 747-200, can be made available optionally.

WEIGHTS (747-100 Combi, estimated):

Operating weight empty	148,325 kg (327,000 lb)
Max payload	98,883 kg (218,000 lb)
Max T-O weight	334,750 kg (738,000 lb)
Max landing weight	265,350 kg (585,000 lb)
Max zero-fuel weight	247,435 kg (545,500 lb)

Lockheed C-130/L-100 Hercules. Bedek Aviation has already accomplished several successful conversions of C-130 series aircraft to such configurations as in-flight refuelling tanker and sigint platform, with appropriate airframe modifications and avionics refits. Operational configurations currently being offered for any C-130B to C-130H variant, or their L-100 counterparts, include: (1) probe and drogue aerial refuelling tanker, with transfer fuel in an 11,356 litre (3,000 US gallon; 2,498 Imp gallon) cargo compartment tank plus two underwing fuel pods; (2) maritime surface patrol and ASW, with appropriate surveillance, acoustic, MAD, armament, or stores management systems, and operator stations; (3) C³I and electronic warfare platform, with comint, elint, communications, and EW systems to customer's requirements; (4) search and rescue, with a rescue kit, flare storage/launch, and operator station in a logistic pallet installed on the rear loading ramp; (5) emergency assistance, with an insulated cabin mounted on a logistic pallet for ambulance or 'flying hospital' missions, or in a firefighting configuration with up to 11,356 litres (3,000 US gallons; 2,498 Imp gallons) of water and retardant in pallet mounted tanks in the cargo hold; and (6) VIP, 65-seat passenger, or passenger/cargo combi transport, with full airliner type seating, toilet, and galley facilities, pallet-mounted in an air-conditioned environment.

WEIGHTS (C-130H tanker, approx):

Operating weight empty	35,380 kg (78,000 lb)
*Internal fuel weight	29,030 kg (64,000 lb)
**Additional fuel weight in underwing pods	10,885 kg (24,000 lb)
Tanker T-O weight	75,295 kg (166,000 lb)
Max overload T-O weight	79,380 kg (175,000 lb)

*36,643 litres (9,680 US gallons; 8,060 Imp gallons)
**13,627 litres (3,600 US gallons; 2,997 Imp gallons)

Israeli Air Force Skyhawks and Phantoms queue to refuel from a Bedek converted C-130 tanker

BELL

BELL HELICOPTER TEXTRON INC, PO Box 482, Fort Worth, Texas 76101, USA

BELL MODEL 209 SUPERCOBRA

US Marine Corps designation: AH-1W

During 1980, Bell flight tested an AH-1T Improved SeaCobra powered by two General Electric T700-GE-700 turboshafts with a combined output in excess of 2,386 kW (3,200 shp). This installation was made in an AH-1T loaned by the US Marine Corps as part of an R&D programme to establish the specification of a helicopter with enhanced capability for future procurement. Improvements that were proposed for retrofit to existing AH-1Ts included installation of General Electric T700-GE-401 turboshafts with a combined output of 2,423 kW (3,250 shp); a new combining gearbox; and a number of detail improvements. The T700-GE-401 has intermediate and contingency ratings of 1,260 kW (1,690 shp) and 1,285 kW (1,723 shp) respectively. The fuel system is designed to survive 23 mm shell damage.

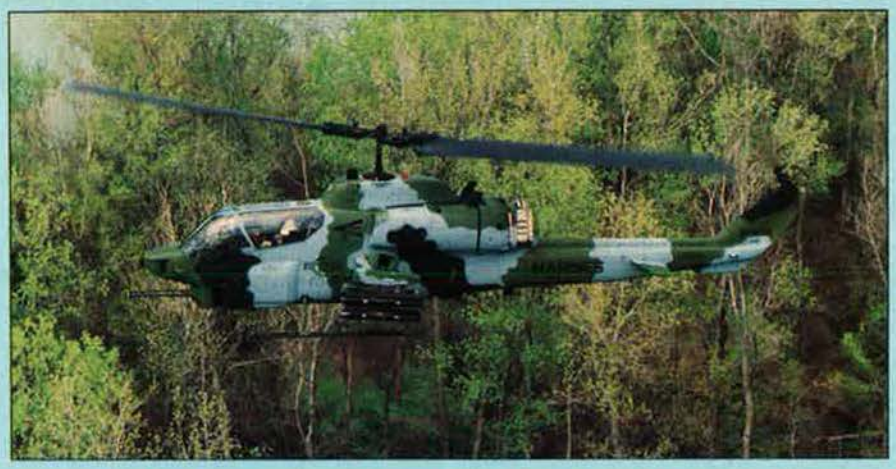
A T700-GE-401 testbed helicopter, then designated AH-1T+, made its first flight on 16 November 1983. Early in 1984 Congressional approval was given for the procurement of 44 production AH-1W SuperCobras, 22 each in FYs 1985 and 1986. The first AH-1W was delivered on 27 March 1986 for a seven-month test programme with Naval Air Systems Command. A second AH-1W began a three-month electromagnetic interference test programme in the Spring of 1986. Deliveries of all 44 AH-1Ws had been completed by early 1988. The USMC also plans to update its fleet of approximately 40 AH-1Ts to AH-1W standard, with the first modification funded to begin in November 1986, for delivery in 1989. The first AH-1T uprated to AH-1W standard for the USMC is to be fitted with a larger main rotor based on Bell's Model 680 bearingless research rotor.

Missions assigned to the AH-1W include anti-armour, troop carrying helicopter escort, multiple weapon fire support, armed reconnaissance, and search and target acquisition. A night targeting system, known as the Cobra Laser Night Attack System (CLNAS), is under development by Israel Aircraft Industries for USMC AH-1Ws and Israeli operated AH-1S HueyCobras.

TYPE: Twin-engine attack and close support helicopter.

ROTOR SYSTEM AND DRIVE: Two-blade main rotor system, similar to that of the Bell Model 214, with strengthened main rotor head incorporating Lord Kinematics Lastoflex elastomeric and Teflon faced bearings. Main rotor blades, of Wortmann FX69-H-098 section, have an aluminium spar with steel leading-edge and aluminium faced honeycomb material aft of spar. Single tab on each main rotor blade. Tail rotor also similar to that of Model 214, with increased diameter and blade chord, constructed from aluminium honeycomb with stainless steel skin and leading-edge. Main rotor brake standard. Main rotor/engine rpm ratio: 1:64.354. Tail rotor/engine rpm ratio: 1:13.708.

WINGS: Small mid-mounted stub-wings, to carry armament and offload rotor in flight, of conventional all-metal construction. Section NACA 0024-0030. Dihedral 0°. Incidence 14°. Sweepback at quarter-chord 14° 42′.



Bell AH-1W SuperCobra attack and close support helicopter of the US Marine Corps

FUSELAGE: Conventional all-metal semi-monocoque fail-safe structure, with low silhouette and narrow profile.

TAIL UNIT: Sweptback vertical fin/tail rotor pylon. Elevator, of inverted aerofoil section and conventional construction, mid-mounted on tailboom forward of fin.

LANDING GEAR: Non-retractable tubular skid type. Ground handling wheels optional.

POWER PLANT: Two General Electric T700-GE-401 turboshafts, each rated at 1,260 kW (1,690 shp). Fuel contained in two interconnected self-sealing rubber fuel cells in fuselage, with protection from small arms fire up to 0.50 calibre ammunition; total capacity 1,153 litres (304.5 US gallons; 253.5 Imp gallons). Gravity refuelling point in forward fuselage, pressure refuelling point in rear fuselage. Provision for carriage of two or four external fuel tanks, each of 291 litres (77 US gallons; 64 Imp gallons) capacity; or two 378 litre (100 US gallon; 83 Imp gallon) tanks; or two 100 and two 77 US gallon tanks on underwing stores stations. Oil capacity 19 litres (5 US gallons; 4.2 Imp gallons).

ACCOMMODATION: Crew of two in tandem, with co-pilot/gunner in front seat and pilot at rear. Cockpit is heated, ventilated, and air-conditioned. Dual controls, night vision capability, and armour protection standard. Forward crew door on port side and rear crew door on starboard side, both upward opening.

SYSTEMS: Three independent hydraulic systems, pressure 207 bars (3,000 lb/sq in), for flight controls and other services. Electrical system comprises two 28V 400A DC generators, two 24V 34.5Ah batteries, and five inverters: main 115V AC 1kVA single-phase at 400Hz, standby 115V AC 750VA three-phase at 400Hz. AiResearch environmental control unit.

AVIONICS: AN/ASN-75B compass set, AN/ARN-89B ADF, AN/APX-100(V) transponder, AN/ARN-118 Tacan, AN/APN-154(V) radar beacon set, AN/ARC-182(V), AN/APN-194 radar altimeter, AN/APR-39(V) radar signal detecting set, AN/APR-44(V) radar warning system, KY-58/TSEC secure voice set, and AN/ALQ-144(V) countermeasures set.

ARMAMENT: Electrically operated General Electric undernose turret housing M197 three-barrel 20 mm gun. A 750 rd ammunition container is located in the fuselage directly aft of the turret; firing rate is 750 rds/min, but a 16-round burst limiter is incorporated in the firing switch. Gun can be tracked 110° to each side, 18° upward, and 50° downward, but barrel length of 1.52 m (5 ft) makes it imperative that the M197 is centralised before wing stores are fired. Underwing attachments for up to four LAU-61A (19-tube), LAU-68A, LAU-68A/A, LAU-68B/A, or LAU-69A (seven-tube) 2.75 in Zuni rocket launcher pods; two CBU-55B fuel-air explosive weapons; four SUU-44/A flare dispensers; two M118 grenade dispensers; Mk 45 parachute flares; or two GPU-2A or SUU-11A/A Minigun pods. Provision on each outboard underwing stores station for carriage of up to four TOW missiles in two two-round clusters, eight AGM-114 Hellfire missiles, or one AIM-9L Sidewinder missile. Canadian Marconi TOW/Hellfire control system. AN/ALE-39 chaff system with one MX-7721 dispenser mounted on each stub wing.

DIMENSIONS, EXTERNAL:

Main rotor diameter	14.63 m (48 ft 0 in)
Main rotor blade chord	0.84 m (2 ft 9 in)
Tail rotor diameter	2.97 m (9 ft 9 in)
Tail rotor blade chord	0.305 m (1 ft 0 in)
Distance between rotor centres	8.89 m (29 ft 2 in)
Wing span	3.23 m (10 ft 7 in)
Wing aspect ratio	3.74
Length overall, rotors turning	17.68 m (58 ft 0 in)
Length of fuselage	13.87 m (45 ft 6 in)
Width overall	3.28 m (10 ft 9 in)
Height to top of rotor head	4.11 m (13 ft 6 in)
Height overall	4.32 m (14 ft 2 in)
Elevator span	2.11 m (6 ft 11 in)
Width over skids	2.13 m (7 ft 0 in)

AREAS:

Main rotor blades (each)	6.13 m² (66.0 sq ft)
Tail rotor blades (each)	0.45 m² (4.835 sq ft)
Main rotor disc	168.11 m² (1,809.56 sq ft)
Tail rotor disc	6.94 m² (74.70 sq ft)
Vertical fin	2.01 m² (21.70 sq ft)
Elevator	1.41 m² (15.20 sq ft)

WEIGHTS:

Weight empty	4,627 kg (10,200 lb)
Mission fuel load	946 kg (2,086 lb)
Max useful load (fuel and disposable ordnance)	2,065 kg (4,552 lb)
Max T-O and landing weight	6,690 kg (14,750 lb)

PERFORMANCE (at max T-O weight, ISA):

Never-exceed speed	190 knots (352 km/h; 219 mph)
Max level speed at S/L	152 knots (282 km/h; 175 mph)
Max cruising speed	150 knots (278 km/h; 173 mph)
Rate of climb at S/L, one engine out	244 m (800 ft)/min
Service ceiling	more than 4,270 m (14,000 ft)
Service ceiling, one engine out	more than 3,660 m (12,000 ft)
Hovering ceiling IGE	4,495 m (14,750 ft)
Hovering ceiling OGE	914 m (3,000 ft)
Range at S/L, with standard fuel, no reserves	343 nm (635 km; 395 miles)

KAWASAKI

KAWASAKI HEAVY INDUSTRIES LTD (Aircraft Group), 1-18 Nakamachi-Dori 2-chome, Chuo-ku, Kobe, Japan

KAWASAKI T-4

Kawasaki was named by the Japan Defence Agency on 4 September 1981 as the prime contractor to develop a new intermediate trainer to replace Lockheed T-33As and Fuji T-1A/Bs in service with the JASDF. The designation XT-4 was allocated officially to the type during its development.

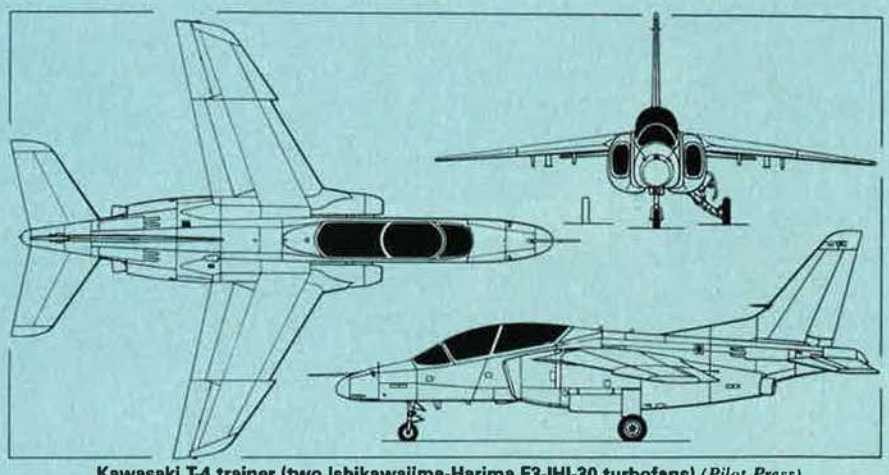
Current plans call for procurement of about 200 production T-4s, for pilot training, liaison, and other duties. Funding was approved in the FY 1983 and 1984 defence budgets to procure four flying prototypes. The first 12 production aircraft were approved in the FY 1986 defence budget, and the next 20 in FY 1987.

The T-4 is based on Kawasaki's KA-851 design, by an engineering team led by Mr Kohki Isozaki. Mitsubishi (centre fuselage and engine air intakes) and Fuji (rear fuselage, wings, and tail unit) each have a 30 per cent share in the production programme. Kawasaki, as prime contractor, builds the forward fuselage, and is responsible for final assembly and flight test.

The T-4 was required to have high subsonic manoeuvrability, and to be able to carry external loads under the wings and fuselage. Basic design studies were completed in October 1982, and prototype construction began in April 1984. The first XT-4 (56-5601) made its first flight on 29 July 1985, and all four prototypes were delivered between December 1985 and July 1986, preceded by static and fatigue test aircraft. Production began in FY 1986, and the first production T-4 was expected to fly in May 1988. Deliveries of the first 12 aircraft are due to begin in September and be completed by the end of March 1989. They will enter service with the JASDF training wing at Hamamatsu, near Tokyo.

TYPE: Tandem two-seat intermediate jet trainer and liaison aircraft.

WINGS: Cantilever mid-wing monoplane. Super-



Kawasaki T-4 trainer (two Ishikawajima-Harima F3-IHI-30 turbofans) *(Pilot Press)*

critical aerofoil section, with thickness/chord ratios of 10.3% (root) and 7.3% (tip). Anhedral 7° from roots. Incidence 0°. Sweepback at quarter-chord 27° 30'. Extended chord on outer panels, giving a 'dog-tooth' leading-edge. Main structure of aluminium alloy, with slow crack growth characteristics. Double-slotted trailing-edge flaps of aluminium alloy with AFRP trailing-edges. Ailerons of plain hinged type, made of CFRP and fitted with Teijin hydraulically powered actuators. No tabs.

FUSELAGE: Conventional semi-monocoque structure (frames and longerons), mainly of aluminium alloy with minimum use of titanium in critical areas. Slow crack growth characteristics. CFRP airbrake on each side at rear.

TAIL UNIT: Cantilever structure, with sweepback on all surfaces. Fin and rudder are made of CFRP; all-moving anhedral tailplane is of aluminium alloy except for CFRP trailing-edge. Rudder and tailplane powered hydraulically via Mitsubishi servo actuators.

LANDING GEAR: Hydraulically retractable tricycle type, with Sumitomo oleo-pneumatic shock absorber in each unit. Single-wheel main units retract forward and inward; steerable nosewheel retracts forward. Bendix (Kayaba) mainwheels, tyre size 22 × 5.5-13.8, pressure 19.31 bars (280 lb/sq in); Bendix (Kayaba) nosewheel, tyre size 18 × 4.4-11.6, pressure 12.76 bars (185 lb/sq in). Bendix (Kayaba) carbon brakes and Hydro-Aire (Sumitomo) anti-skid units on mainwheels.

POWER PLANT: Two 16.32 kN (3,670 lb st) Ishikawajima-Harima F3-IHI-30 turbofans, mounted side by side in centre-fuselage. Internal fuel in two 401.25 litre (106 US gallon; 88.3 Imp gallon) wing tanks and two Japanese built Goodyear rubber bag tanks in fuselage, one of 776 litres (205 US gallons; 170.7 Imp gallons) and one of 662.5 litres (175 US gallons; 145.7 Imp gallons). Total internal capacity 2,241 litres (592 US gallons; 493 Imp gallons). Single pressure refuelling point in outer wall of port engine air intake. Provision to carry one 450 litre (119 US gallon; 99 Imp gallon) Shin Meiwa drop tank on each underwing pylon. Oil capacity 5 litres (1.3 US gallons; 1.1 Imp gallons).

ACCOMMODATION: Crew of two in tandem in pressurised and air-conditioned cockpit with wrap-around windscreen and one-piece sideways (to starboard) opening canopy. Dual controls standard; rear (instructor's) seat elevated 27 cm (10.6 in). Stencel SIIIS-3ER ejection seats and Teledyne McCormick Selph canopy severance system, licence built by Daicel Chemical Industries. Baggage compartment in centre of fuselage, with external access via door on port side.

SYSTEMS: Shimadzu bootstrap type air-conditioning and pressurisation system (max differential 0.28 bars; 4.0 lb/sq in). Two independent hydraulic systems (one each for flight controls and utilities), each operating at 207 bars (3,000 lb/sq in) and each with separate air/fluid reservoir pressurised at 3.45 bars (50 lb/sq in). Flow rate of each hydraulic system 45 litres (12 US gallons; 10 Imp gallons)/min. No pneumatic system. Electrical system powered by two 9kW Shinko engine driven starter/generators. Tokyo Aircraft Instrument onboard oxygen generating system.

AVIONICS AND EQUIPMENT: Mitsubishi Electric J/ARC-53 UHF com, Nagano J/AIC-3 intercom, Nippon Electric J/ARN-66 Tacan, Toyo Communication (Teledyne Electronics) J/APX-106 SIF, Japan Aviation Electronics (Honeywell) J/ASN-3 AHRS, Tokyo Keiki (Sperry) J/ASK-1 air data computer, Shimadzu (Kaiser) J/AVQ-1 HUD, and Tokyo Aircraft Instrument J/ASH-3 Vgh recorder.

ARMAMENT: No built-in armament. Two Nippi pylons under each wing for carriage of drop tanks (see 'Power Plant' paragraph); one Nippi pylon under fuselage, on which can be carried target towing equipment, an ECM/chaff dispenser, or an air sampling pod. In weapons training role, can carry three or four 500 lb practice bombs, and has structural provision for outer wing mounted air-to-air missiles.

DIMENSIONS, EXTERNAL:

Wing span	9.94 m (32 ft 7½ in)
Wing chord:	
at root	3.11 m (10 ft 2½ in)
at tip	1.12 m (3 ft 8 in)
Wing aspect ratio	4.7
Length overall	13.00 m (42 ft 8 in)
Length of fuselage	11.96 m (39 ft 3 in)
Height overall	4.60 m (15 ft 1¼ in)
Tailplane span	4.40 m (14 ft 5¼ in)
Wheel track	3.20 m (10 ft 6 in)
Wheelbase	5.10 m (16 ft 9 in)

DIMENSIONS, INTERNAL:

Cockpit: Length	3.20 m (10 ft 6 in)
Max width	0.69 m (2 ft 3 in)
Max height	1.40 m (4 ft 7¼ in)

AREAS:

Wings, gross	21.00 m² (226.05 sq ft)
Ailerons (total)	1.51 m² (16.25 sq ft)
Trailing-edge flaps (total)	2.93 m² (31.54 sq ft)
Fin	3.78 m² (40.69 sq ft)
Rudder	0.91 m² (9.80 sq ft)
Tailplane	6.04 m² (65.02 sq ft)

WEIGHTS:

Weight empty	3,700 kg (8,157 lb)
T-O weight, 'clean'	5,500 kg (12,125 lb)
Max design T-O weight	7,500 kg (16,535 lb)

PERFORMANCE (in 'clean' configuration. A: at weight of 4,700 kg; 10,361 lb with 50% fuel; B: at T-O weight of 5,500 kg; 12,125 lb):

Max level speed: A	Mach 0.9
Max level speed at S/L: A	560 knots (1,038 km/h; 645 mph)
Cruising speed: B	Mach 0.75
Stalling speed: A	90 knots (167 km/h; 104 mph)
Max rate of climb at S/L: B	3,050 m (10,000 ft)/min
Service ceiling: B	15,240 m (50,000 ft)
T-O run, 35°C: B	549 m (1,800 ft)
Landing run: B	670 m (2,200 ft)
Min ground turning radius	9.45 m (31 ft 0 in)
Range (B) at Mach 0.75 cruising speed: internal fuel only	700 nm (1,297 km; 806 miles)
with two 450 litre drop tanks	900 nm (1,668 km; 1,036 miles)
g limits	+7.33/−3

MCDONNELL DOUGLAS

MCDONNELL DOUGLAS CORPORATION (Douglas Aircraft Company Division), 3855 Lakewood Boulevard, Long Beach, California 90846, USA

MCDONNELL DOUGLAS EC-24A

Under a US Navy contract awarded in August 1984, Electrospace Systems Inc of Richardson, Tex., has converted a McDonnell Douglas DC-8-54 airliner for fleet electronic warfare support group (FEWSG) missions, under the designation EC-24A. Airframe modifications to the aircraft (BuAer 163050) were performed by the Electrospace Systems Aircraft Modification Center at Waco, Tex.; following systems installation and integration by Electrospace Systems, the aircraft was delivered to the US Navy in August 1987. The EC-24A is based at Tulsa, Okla.

The EC-24A carries ECM, ESM, and C³CM systems and high-power broad-band jamming equipment. Visible changes to the DC-8 airframe include the addition of ventral canoe-shaped radome fairings and a high frequency probe antenna at each wingtip. The equipment installed by Electrospace Systems for FEWSG missions includes: dual AN/ALT-40 radar jamming systems with steerable antennae; dual AN/ASQ-191 communications transceiver/jamming systems; dual AN/ALE-43 chaff dispensers capable of producing chaff in almost any dipole length within the A–J radar bands; dual AN/ALR-75 ESM receiver systems with pulse analysers to give onboard signal identification capability; six AN/ARC-159 UHF transceivers; dual AN/ARC-186 VHF transceivers; four AN/ARC-190 HF transceivers; dual OE-320 DF systems; dual HP-9826 computer systems; KY-58 secure communications system; and supportive electrical generators and cooling equipment. Systems operator positions are provided in the aircraft's cabin.

A typical mission crew for the EC-24A comprises pilot, co-pilot, flight engineer, and seven systems operators, one of whom is the mission commander. In addition, the aircraft has capacity for up to 1,361 kg (3,000 lb) of cargo and seats for 20 maintenance personnel or additional crew members, enabling it to self-deploy to any part of the world. Unrefuelled range is approximately 4,800 nm (8,895 km; 5,527 miles) and endurance 11 h. The additional drag of the FEWSG mission radomes and antennae has reduced overall performance of the DC-8-54 by six per cent.

EC-24A conversion of a McDonnell Douglas DC-8-54 for fleet electronic warfare support group missions

Viewpoint

Rethinking the Summit

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

It is plainly in the Soviets' interest to arrange a period of peace and quiet; yet their objectives remain unchanged—glasnost *or no* glasnost.

The June Summit evoked memories of other summits; Teheran was host to the first, but Yalta is the assembly that sticks in the mind. By all accounts, Yalta was a grand affair, one in which military leaders from the participating countries played a prominent role. Gen. Larry Kuter represented an ailing Hap Arnold and—characteristically—kept meticulous notes, from which he later wrote an entertaining account entitled "An Airman at Yalta."

There, as in other summits since, our side violated George Kennan's No. 1 rule for dealing with the Russians: Don't try to be chummy. Kennan held the conviction, based on a long diplomatic career spent, for the most part, in close association with the Soviets, that chumminess is a sign of weakness to the Russians. They do not value friendship with foreigners. As for Yalta, there they took us to the cleaners. And, at Potsdam, if they didn't exactly fleece us, they certainly came away with everything they wanted.

Be that as it may, Soviet and American leaders are once more on cordial, if not chummy, terms, and the world breathes a little more easily. Whether or not it should is another question.

Our deployment of the Pershing IIs and GLCMs in Europe, particularly in the Federal Republic of Germany, was undoubtedly the reason that the Soviets came back to the arms-reduction talks. We can recall the all-out campaign, orchestrated from Moscow, against the INF deployment. When that failed, it was time for new tactics.

Here again, another of Ambassador Kennan's dicta comes to mind: "There is nothing—I repeat, nothing—in the history of the Soviet regime that could justify us in assuming that the men who are now in power in Russia, or even those who have chances of assuming power within the foreseeable future, would hesitate for a moment to apply this power against us if by doing so they thought that they would materially improve their own power position in the world."

Although Kennan wrote those words in 1945 and his views later changed somewhat, at that time he was an intimate observer of Soviet behavior.

From all the signs, there should be little doubt as to the sincerity of Gorbachev's desire for better relations with the West. It is, after all, plainly in the USSR's present interest to arrange, if possible, a period of peace and quiet. On the other hand, there is an ominous side to all this.

Since the inception of NATO, a primary objective of Soviet foreign policy has been NATO's dissolution. That, in turn, can best be accomplished by undermining the position of the United States in the Alliance. Once the US pillar is dislodged, the NATO facade will crumble. This Moscow objective has long been clearly understood in NATO by a generation of Europeans with memories of harsher times.

That generation, however, is growing old and is being replaced by a generation that sees military preparedness as an unnecessary extravagance and the presence of American troops in Europe as an anomaly. What is more disturbing, recent German polls show that the USSR is viewed more favorably, by a comfortable ten percent margin, than the United States.

Even Franz-Josef Strauss, the seemingly permanent governor of Bavaria and a stalwart conservative, was disarmed by a recent visit to Moscow. From his days as Defense Minister, Strauss has been identified with NATO hawks, ever on guard against the Soviets. Now, it seems, he no longer fears Soviet aggression. In support of Strauss's relaxed attitude, the Russians are exploiting a wide range of cultural and commercial exchanges with the West Germans. All of this comes at a time when our own future NATO commitments are a subject of speculation.

Even if one gives Mr. Gorbachev high marks for being a decidedly more liberal and personable Soviet leader than his predecessors, the fact remains that the position he holds is that of General Secretary of the Russian Communist Party. He is head of a monolithic, tightly run Party bureaucracy that can stand only so much restructuring.

No mention was made at the Moscow Summit, at least publicly, of KAL 007 or of the brutal and drawn-out murder of Army Maj. Arthur Nicholson, although there was, apparently, a perfunctory expression of regret about the Nicholson murder made to Secretary Carlucci in a private conversation during the Summit. Nor was there any explanation as to why the Warsaw Pact has continued to increase its lead over NATO in tanks, aircraft, and general readiness.

After fifteen futile years, ameliorated by life in Vienna, the Mutual and Balanced Force Reduction delegations are packing up. Nothing has been accomplished, not even an agreement on the data base. Instead, this clever new Soviet campaign may produce a unilateral troop withdrawal—not enough to upset the gross imbalance but enough to gladden the hearts of Russia's newfound European friends.

The Cold War, now in its fifth decade, grew noticeably less cold with the Moscow Summit. While nothing of a substantive nature was agreed to, there was a lot of friendly talk and unprecedented Soviet openness. Nevertheless, we still have an overwhelming force facing NATO in Central Europe, with the Warsaw Pact holding a major advantage in every category of conventional armament. The gap, according to retired Army Gen. Bernard Rogers, becomes wider every year.

Then, there is the Caribbean and Central American mischief being underwritten by Mr. Gorbachev's government. So long as that direct challenge to continental security goes on, the USSR can scarcely be considered a friendly power, *glasnost* or no *glasnost*. ■

For the second year in a row, the 15th Squadron of the USAF Academy has earned the Outstanding Squadron designation.

The War Eagles Do It Again

BY JAMES A. McDONNELL, JR.
MILITARY RELATIONS EDITOR

All smiles are the members of the 15th Squadron as they proudly pose for their Outstanding Squadron portrait.

For the second year in a row, the 15th Squadron of the United States Air Force Academy has earned the Outstanding Squadron designation. This is only the fourth time in the Academy's history that any squadron has accomplished such a triumph.

The 15th Squadron was honored at AFA's twenty-ninth annual salute. This black-tie dinner, which took place in May, highlighted the presentation of AFA's Outstanding Squadron Trophy to the cadets of this hard-working unit.

As AFA President Sam Keith noted when presenting the trophy to the Fall and Spring Cadet Squadron Commanders, "It is very clear to me that you are here tonight because you worked to succeed. The qualities you showed in repeating this accomplishment will be helping to make you better Air Force officers for years to come—that's really the bottom line for this program, and that's why AFA is proud to be a part of it."

The AFA award recognized the winning unit for accomplishment in all aspects of cadet life—academic, athletic, and military. The 15th left no doubt about its qualifications. It was the squadron chosen to represent the Academy and march in the Constitution Bicentennial Parade in Philadelphia last year. It is also the squadron that adopted a Korean foster child and is providing funds for his education.

The War Eagles have placed two of their cadets on the group staff and one on the wing staff. Unbelievably, the squadron has furnished five captains of varsity athletic teams and has sent seven cadets to summer research programs—a number unprecedented in Academy history. Its fourth class was first in the wing academically in the first semester.

The Spring Squadron Commander, Cadet Lt. Col. Alexander DeFazio III, spoke to the some 700 guests on behalf of his 108 classmates. He said that after an "initial reaction shock," squadron members realized that they won again this year because "we picked up where we left off last year." He said, summing up, "We set our standards high and never lowered them. Not everything went according to plan. For example, our marching sometimes left something to be desired. But when the chips were down, somehow we came through."

AFA and community leaders as well as parents and friends of the cadets were in the audience for the dinner, jointly sponsored each year by AFA and its Colorado Springs-Lance Sijan Chapter, headed by Chapter President Bill Croom. The "returning graduate" who served as master of ceremonies was Maj. Gen. Charles A. May, Jr., currently SAC's DCS/Requirements and a member of the Outstanding Squadron in the 1959 graduating class.

Gen. Monroe W. Hatch, Jr., Air Force Vice Chief of Staff, spoke to the group on behalf of the senior Air Force leadership. The new Academy Superintendent, Lt. Gen. Charles R. Hamm, also spoke in his first appearance at this event.

In addition to praising the War Eagles for their individual accomplishments, each speaker emphasized that, in the final analysis, teamwork brought the squadron its reward. As these young men and women take their place on the Air Force team, their teamwork augurs well for their expected contributions. ■

Rescue in the Gulf of Tonkin

Burned and wounded, HU-16 navigator Don Price saved the injured F-4 pilot, then found himself alone in the sea, surrounded by enemy sampans.

BY JOHN L. FRISBEE
CONTRIBUTING EDITOR

IT WAS late in the afternoon of November 14, 1966. For several hours, the Aerospace Rescue and Recovery Service HU-16B had been boring holes in the sky over the Gulf of Tonkin, some 200 miles north of the DMZ. Capt. Donald S. Price, navigator of the Grumman amphibian, was a veteran of 150 missions in SEA since he reported for duty with the 33d Air Rescue Squadron at Naha AB, Okinawa, in October 1964.

The lulling drone of throttled-back engines was interrupted by a call to action. A flak-damaged F-4 was heading for the Gulf where Maj. James Peerson and his backseater, Capt. Lynwood Bryant, hoped to eject southeast of Thanh Hoa. Price's pilot, Capt. David Westenbarger, headed north with throttles firewalled, touching down on a choppy sea near Major Peerson, who was closest to shore.

As pararescueman A1C James Pleiman jumped into the water to help Peerson, artillery and some twenty-five motorized sampans opened fire, bracketing the HU-16 as it floated about two miles offshore. Captain Price, after computing a departure heading, ran to the rear of the aircraft to help SSgt. Clyde Jackson pull Pleiman and the downed pilot to the aircraft with a rope attached to the pararescueman.

Seeing that A1C Robert Hilton was having trouble with his M-16, Price ordered the airman to help Jackson. Grabbing Hilton's M-16, Price began firing at the approaching sampans. The F-4 pilot was halfway into the aircraft when the world went black. An artillery shell had scored a direct hit on the HU-16, setting it afire. Price was thrown against a bulkhead, stunned and bleeding from shrapnel wounds on his head, back, and buttocks and burned by the explosion.

When the haze lifted, Captain Price saw Hilton lying dead on the floor. Sergeant Jackson had been blown out the door, one arm nearly severed. The pararescueman, Pleiman, floated facedown in the water. Near his body, Major Peerson, injured and without a life jacket, struggled to keep his head above water. The HU-16 pilot and his copilot, Lt. Walter Hall, had managed to escape through an overhead hatch, leaving the burning amphibian afloat on a sheet of flame.

Still groggy and bleeding heavily, Captain Price sized up the situation and immediately went to Peerson's aid. Fully clothed and supporting a man nearly twice his weight, Don Price called on all his training as a competitive swimmer and water safety instructor. Pushing the burning gasoline aside with his hands, he towed Peerson 200 yards to temporary safety.

Resting a moment, Price looked up. A Navy helicopter hovered overhead. Price, pummeled by the chopper's downwash, helped Major Peerson into the hoist. As the F-4 pilot was hauled aboard, an artillery shell hit ten yards from Price, another thirty yards away, and automatic weapons fire from the sampans churned the water. The chopper, leaking fuel from several hits, pulled out while another Navy helicopter picked up the remaining survivors, leaving Price alone on an unfriendly sea.

Navigator Don Price won the Air Force Cross for valor in Vietnam.

A hundred and fifty yards away an empty liferaft bobbed on the waves. Barely able to move his legs, Captain Price swam to the raft. The prospect before him wasn't promising. About 400 yards out were several sampans, intent on taking him prisoner. Each time one started to edge in, an A-1 or an F-4 came down, guns blazing. Price remembers seeing a sampan cut in half by cannon fire. That was heartening, but on the other hand, he was drifting toward shore. Once more he slipped into the water and, towing the raft, swam out to sea, his waning strength rekindled by thoughts of his wife and two children back at Naha.

When he could swim no longer, Price—shaking from cold and fatigue—pulled himself painfully back into the raft. There was no response to his calls on the survival radio. Then, after what seemed an eternity, a Navy UH-2B came in low and fast, hovered over the raft, and picked him out of the Gulf. After he received emergency medical treatment aboard a nearby utility ship, doctors on the carrier *Yorktown* spent four hours removing shrapnel and sewing up his wounds. It had been an ordeal of heroism and endurance that few men could have survived.

Don Price, now a retired lieutenant colonel, flew thirty more missions before returning to the States, wearing the Air Force Cross. He is one of only three Air Force navigators who served in Southeast Asia to be awarded the nation's second highest decoration for valor. ■

Airman's Bookshelf

A Memoir of Nuance

Flights of Passage—Reflections of a World War II Aviator, by Samuel Hynes. Published jointly by Frederick C. Biel, New York, N. Y., and the Naval Institute Press, Annapolis, Md., 1988. 270 pages with preface. $16.95.

While *Flights of Passage* is a book, the overriding impression that comes from reading it is that you are watching a movie—the home movies taken by Samuel Hynes. All of the people, places, and events that Hynes encountered in his World War II experiences are brought to life in such vivid detail and with such rich texture that the book reads as though you are sitting with the author in his living room while images from an 8-mm projector flicker on a bedsheet.

Unlike such wartime documentaries as *The Memphis Belle* or *The Fighting Lady* that showed "What Happened in World War II" or the theatrical release *The Best Years of Our Lives,* which delved into "What It All Meant," Hynes's "movie" completes the picture of the war by filling in the background.

Flights of Passage details what was going on as the war was going on—strangers becoming friends, flying, chasing women, all-night drinking binges, flying, marriage, transport ships, boredom, lousy food, flying, returning home, the end of flying.

Author Hynes's Marine Corps career began in 1943 when he was eighteen and ended two years later, two weeks before he turned twenty-one. In between, there was absolutely nothing remarkable. An aviator of average ability, he won an Air Medal and a Distinguished Flying Cross while piloting Avenger torpedo bombers from Okinawa, but he never really flew in combat. He flew seemingly endless antisubmarine patrols, but on two missions when his unit actually bombed something Japanese, he couldn't even go.

Such a lackluster military career set against the larger events of a world war would not normally make for the interesting narrative that this one is. But Hynes pulls it off (and gives it that "home movie" feel) with two writing techniques—a sense of detachment and a meandering way of telling his story.

The events of Hynes's time in khaki obviously made an impression on him, and he obviously was there, but that never comes across in the book. The story is less prosaic—"I flew the N2Ss over Memphis"—than it is evocative—"In this next scene, here we are flying over Memphis, and that is the Mississippi River over there." Hynes and his buddies—Rock, Bergie, and "T" (Hynes's best friend, who eventually became his brother-in-law)—had some uproariously good times, but the author never relives those moments, only fondly recalls them.

The sense of detachment is also shown through the "bit players"—such characters as Spanish John, the enlisted man on Okinawa who wrote pornographic letters to his wife, or the slightly crazed night-fighter pilot who painted his tent, his footlocker, and everything else he owned dark blue. These characters come in, deliver their lines or anecdotes, and exit stage right.

Hynes loses three friends through the course of the book, but two are merely written off—"he was killed," or "he never came back." There is remorse (and some details) over the death of the third friend, but Hynes's description is pained—almost as if he weren't expecting that character to appear. Since the character does appear, the author describes his death, forgets it, and moves along. Even though there is detachment in the descriptions, there is also emotion, and the reader will empathize with that.

The second characteristic that makes *Flights of Passage* so readable is Hynes's wonderful way of meandering through the story. He eventually gets to his main points, but he is not in a hurry. Neither is the reader, because the "side trips" are so interesting.

As an example, the author's tale of his Saturday night trip to the Texas State College for Women while in civilian pilot school in Denton, Tex., is not long, and his memory fails somewhat—he can't exactly remember the girl's name. However, his experience there (he came away with a bruised ego and his hormones in a rage) is a universal one for young males.

Maybe because the author's career was so drab, he took time to notice the people and things around him. Through Hynes's descriptions, the reader can almost "see" the tent on Okinawa where he had to censor enlisted men's mail or the scrapwood bar in the Officers' Club that somebody singed with a blowtorch to give it that "rustic" look. (Hynes notes that it, nevertheless, looked like a burned pine box.)

The narrative also ties stories together. After a typhoon hits Okinawa, the author and his buddies are forced to use aircraft paint to waterproof their tent. Of course, it is the same dark blue the crazy night-fighter pilot used, and Hynes wonders aloud if people are thinking the same things about *him* that he thought of that eccentric aviator.

He also notes that the scene at the San Diego docks when he came home—bands, cheerleaders, families—was the same scene as when he left for the war. He even says that it seemed as if someone were running the movie backward.

The book ends with his last flight before being discharged. He and another Marine aviator go up in the same "Yellow Peril" (N2S or PT-17) that they both started in when learning to fly. Neither one says a word, and neither one has to. Both aviators know it is the "End of Flying," and both know that they will never again be involved in anything so all-encompassing, worthwhile, or harmonizing as World War II. The reader feels a certain wistfulness, too.

Flights of Passage will probably never be used as a history text, and it probably won't be taught as great literature, either. It should be, though. It forms a part of the cloth that World War II was woven with, and it is gracefully—and powerfully—written. It probably shouldn't be made into a

big-screen movie, though—*that* would spoil the fun of reading the book.

—Reviewed by Jeffrey P. Rhodes, Aeronautics Editor.

The MiG Killers

Vietnam MiG Killers: Deadly Duel Over Vietnam, by Robert F. Dorr. Zenith Aviation Books; published and distributed by Motorbooks International, Osceola, Wis., 1988. 128 pages with eighty color illustrations. $24.95.

In the dangerous skies over Vietnam, the North Vietnamese Air Force took on the air warriors of the US Air Force, Navy, and Marine Corps. Air battles pitted elite American pilots against the likes of North Vietnamese ace Colonel Tomb. American aircraft flew against MiG-17s and MiG-21s. Victors earned the right to emblazon their aircraft with kill markings. Ask someone to name a MiG killer, and they might rattle off the names of Steve Ritchie and Robin Olds. Ask someone to name some of the aircraft that shot down MiGs, and they might mention F-4s or F-8s.

In *Vietnam MiG Killers: Deadly Duel Over Vietnam,* Robert F. Dorr spotlights these Vietnam war heroes—the airplanes. Through a stirring assortment of photographs and descriptions of the aircraft that fought during that conflict, he tells the Vietnam air war story. The reader is introduced to the MiG, the Thud, the Phantom, the carrier aircraft, and others.

Beginning in the mid-1960s, a cadre of Soviet-trained North Vietnamese pilots set up shop with a few 1950s-vintage MiG-17s. Hanoi proceeded rapidly from that modest base to build up a formidable, highly disciplined, and capable fighter force that eventually employed seven principal airfields and 200 MiG-17s, MiG-19s, and MiG-21s. In the beginning, the MiGs met such American aircraft as the F-105 Thunderchief—affectionately known as the Thud.

Built as a nuclear bomber, the big F-105 Thunderchief first encountered MiG-17s on April 4, 1965. Two Thuds were blasted out of the sky before they could defend themselves. However, on March 10, 1967, the Thud avenged itself with a double victory over the MiG. But the Thuds were by no means alone.

From Yankee Station in the Gulf of Tonkin, Navy F-8 Crusaders, A-4 Skyhawks, A-1 Skyraiders, and F-4B Phantoms participated in the air war. F-8s flew throughout the conflict from *Essex*-class aircraft carriers and Marine Corps land bases. By the end of the war, Crusaders had shot down twenty MiGs.

The A-4, a lightweight attack aircraft, was effective for air-to-ground strikes, but it wasn't meant to mix it up with MiGs. Yet one Navy pilot paid no heed to this and downed a MiG-17 by using a barrage of Zuni (an unguided, air-to-ground projectile). On two separate occasions, MiG-17s fell prey to the guns of Douglas A-1s, the huge, prop-driven attack planes.

The Navy and Marine Corps went into the war with the F-4B Phantom. As the war progressed, the F-4J version was introduced. Despite its propensity to emit a long, gushing trail of black smoke that made the airplane easy to spot, the Phantom gained supremacy as the principal fighter aircraft of the war.

Like the Navy and Marines, the Air Force pitted the Phantom against the wily MiG. But the first Air Force missions into North Vietnam were flown by Thuds, with fighter escort provided by the F-100D Super Sabre. It was clear that the Hun, as the F-100 was called, did not have the range, maneuverability, or staying power for an air-to-air campaign. The F-104 Starfighter, a few of which had been deployed to Southeast Asia, proved to be even less suitable.

On April 4, 1965, the day that MiG-17s shot down two Thuds, F-4C Phantom jets began to arrive in Thailand. With the arrival of the E models in late 1968, the Phantom began to prove itself as the aircraft best-suited for this type of warfare. F-4E cannon accounted for a final total of forty-three air-to-air victories. One F-4D, serial number 66-7463, currently on display at the US Air Force Academy in Colorado Springs, Colo., is painted with six stars—all signifying MiG kills.

These were the airplanes. They were not alone. They fought side-by-side with other metal heroes, the author relates. These included the B-52s (B-52 guns downed two MiG-21s), HH-3E Jolly Green Giants, F-111As, and A-6s. Many individual aircraft can claim a MiG to their credit. The final tally totaled 195 downed enemy aircraft.

In this well-illustrated book, author Dorr offers a first-rate look at the American aircraft that came to be known as the MiG killers.

—Reviewed by Maj. Miles C. Wiley III, USAF. Major Wiley is currently a faculty instructor at the Air Command and Staff College at Maxwell AFB, Ala.

The AFA Nominees for 1988-89

BY CATHERINE A. STORM
ADMINISTRATIVE ASSISTANT TO THE CHIEF, FIELD ORGANIZATION DIVISION

At a meeting on May 28 in Colorado Springs, Colo., the Air Force Association Nominating Committee selected a slate of candidates for the four national officer positions and the eighteen elective positions on the Board of Directors that will be presented to the delegates at the National Convention in Washington, D. C., on September 19. The Nominating Committee consists of the five most recent past National Presidents, the twelve National Vice Presidents, and one representative from each of the twelve regions.

Nominated for his first term as National President was **Jack C. Price** of Clearfield, Utah. He is the Deputy Director of Distribution for the Ogden Air Logistics Center, Hill AFB, Utah. In this capacity, he directs a large Air Force depot-level complex involved in wholesale and retail receipt, storage, issue, and shipment of materiel worldwide. He is also responsible for quality control, packaging, inventory, and transportation. The Directorate, comprising approximately 2,300 civilian and military personnel, has the responsibility for management of nearly 400,000 items in storage valued at $4.2 billion. Mr. Price controls and manages an annual payroll budget of approximately $58.5 million and a physical plant valued in excess of $100 million.

Mr. Price has held a number of management and supervisory positions with the Ogden Air Logistics Center. His previous position was Chief of the Missile and Aircraft Systems Division in the Directorate of Maintenance. His past positions include Deputy Chief of the Aircraft Division, Chief of the Navigational Instruments, Photographic, and Training Devices Division, as well as Chief of the Missile Division.

The recipient of numerous performance awards, Mr. Price has been active in a number of professional, technical, and managerial associations during his career.

He was born in Iowa and moved to Utah in 1953. He attended Weber State College, where he majored in management logistics. Mr. Price served a six-year tour in USAF prior to and during the Korean conflict. He began his Civil Service career at Hill AFB in 1953.

Mr. Price served previously on the Executive, Finance, Resolutions, Constitution, and Organizational Advisory Committees of AFA. He has also served as National Secretary, National Vice President (Rocky Mountain Region), Utah State President, Utah State Vice President, Ute Chapter President, Ute Chapter Vice President, Aerospace Education Foundation Trustee, and Aerospace Education Foundation Trustee Emeritus. Currently, he serves as a permanent National Director of the Air Force Association and as a member of AFA's Executive and Resolution Committees. He has received AFA's Presidential Citation, Special Citation, Exceptional Service, and Medal of Merit awards. He is a Life Member of AFA and a Charter Sustaining Life Member of the Aerospace Education Foundation.

Sam E. Keith, Jr., of Fort Worth, Tex., was nominated for his first term as Chairman of the Board. He is a retired General Dynamics executive and former executive vice president of Geoscience and Services, Inc., an energy firm specializing in remote-sensing satellite technology. He currently serves as senior consultant to Arrowhead Associates, an aviation-related firm, and he is also an independent oil and gas developer and investor. A combat veteran of World War II, he later served in Korea. Mr. Keith attended Texas Christian University and Texas A&M and has taken part in numerous national defense forums.

Mr. Keith, an active leader in charitable and civic endeavors, has served as president of Goodwill Industries, cochairman of the Fort Worth Military Ball, and vice president of the Greater Fort Worth Civic Leaders Association.

Mr. Keith served previously on the Executive, Finance, Audit, and Organizational Advisory Committees of AFA. He has also served as National Vice President (Southwest Region), elected AFA National Director (eight times), Texas State President, Fort Worth Chapter President, Aerospace Education Foundation Trustee, Aerospace Education Foundation Trustee Emeritus, and Chairman of the Fort Worth Air Power Council, an official AFA organization. Currently, he serves as National President, permanent member of the Board of Directors, Chairman of the Executive Committee, and Trustee of the Aerospace Education Foundation, and he is invested as a Doolittle Fellow. He has received AFA's Presidential Citation, Exceptional Service Award (twice), and Medal of Merit. He received AFA's Man of the Year Award in 1968 and is a

Jack C. Price

Life Member of AFA and a Charter Sustaining Life Member of the Aerospace Education Foundation.

Nominated for his second term as National Secretary, **Thomas J. McKee** of Waldwick, N. J., is the Director of Air Force Requirements for the Aircraft Systems Division of Grumman Corp. He has been with Grumman since 1977 and is responsible for coordinating efforts to identify potential new Air Force business opportunities through the development and implementation of an overall Air Force marketing strategy and associated plans. He is also responsible for ensuring the maintenance of effective customer liaison and contacts with appropriate corporate departments.

Mr. McKee was born in Montgomery, Ala. He traveled extensively as a dependent in an Air Force family. He earned a bachelor of arts degree in political science from Southeast Missouri State University in 1970 and completed the Emerging Executives Program at Pennsylvania State University in 1983.

Mr. McKee entered USAF in July 1970 and received his commission on completion of Officer Training School at Lackland AFB, Tex. He completed undergraduate pilot training at Reese AFB, Tex., in October 1970. During his seven years of active service, he performed duties as a T-38 Instructor Pilot and Check Pilot in Air Training Command (ATC). He attended USAF Squadron Officer School, Maxwell AFB, Ala., in 1975 and subsequently transitioned to Tactical Air Command (TAC) as an Assistant Flight Commander in A-7D aircraft, Myrtle Beach AFB, S. C. In March 1977, he separated from the Air Force and joined the Grumman Corp.

Mr. McKee previously served as a National Under-40 Director and on the Communications Committee and since 1983 has been Chairman of the National Air Force Salute Committee for AFA's Iron Gate Chapter in New York City. He was recently elected Vice President of the Iron Gate Chapter and has been appointed New York State Vice President for Defense Policy Affairs. Currently, he is Chairman of the Resolutions Committee, a member of the Executive Committee, and a member of the Aerospace Education Foundation's Board of Trustees. He is a Life Member of AFA and a Charter Sustaining Life Member of the Aerospace Education Foundation.

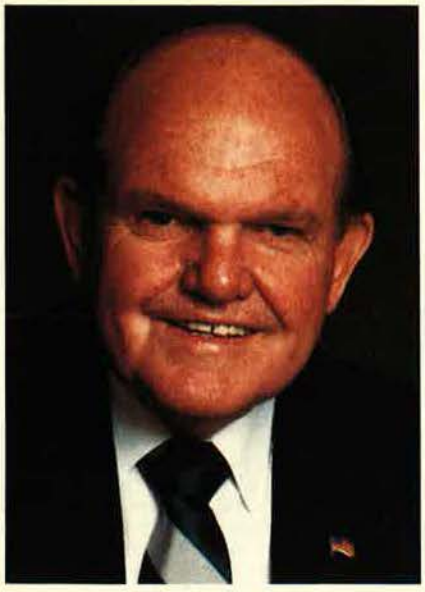
Nominated for his second term as National Treasurer was **William N. Webb** of Midwest City, Okla. He is an advisor in Air Force Association matters for the Commander of the Oklahoma City Air Logistics Center.

Born in western Oklahoma, Mr. Webb completed schooling at Burns Flat, Okla. He attended Southwestern State Teachers College, Weatherford, Okla., in 1945. He moved to Midwest City, Okla., in August 1950 and obtained employment at the Oklahoma City Air Materiel Command, now known as the Oklahoma City Air Logistics Center located at Tinker AFB. He started work at Tinker as a warehouseman and completed his career in April 1981 as the Chief of the Management Organization for Distribution. His responsibilities throughout his career included accounting, manpower, funding, data systems, and engineering.

Mr. Webb became an AFA member in 1960. He has held the office of National Vice President of the Southwest Region and has served on the Finance Committee for ten years. Currently, he is Chairman of the National Finance Committee, a member of the Aerospace Education Foundation's Board of Trustees, State Treasurer, and a member of the Central Oklahoma (Gerrity) Chapter and the Oklahoma Air Force Association Executive Committee. He has twice received AFA's Exceptional Service Award, and he was honored with the first Storz Award for membership.

The following individuals are permanent members of the AFA Board of Directors under the provisions of Article IX of AFA's National Constitution: John R. Alison, Joseph E. Assaf, William R. Berkeley, David L. Blankenship, John G. Brosky, Daniel F. Callahan, Robert L. Carr, George H. Chabbott, Earl D. Clark, Jr., R. L. Devoucoux, James H. Doolittle, Russell E. Dougherty, George M. Douglas, Joe Foss, Barry M. Goldwater, John O. Gray, Jack B. Gross, George D. Hardy, Alexander E. Harris, Gerald V. Hasler, John P. Henebry, Robert S. Johnson, Arthur F. Kelly, Victor R. Kregel, Curtis E. LeMay, Carl J. Long, Nathan H. Mazer, J. B. Montgomery, Edward J. Nedder, J. Gilbert Nettleton, Jr., Jack C. Price, William C. Rapp, Julian B. Rosenthal, Peter J. Schenk, Joe L. Shosid, C. R. Smith, William W. Spruance, Thos. F. Stack, Edward A. Stearn, James H. Straubel, Harold C. Stuart, James M. Trail, A. A. West, Herbert M. West, and Sherman W. Wilkins.

The twenty people whose photographs appear on the following page are nominees for the eighteen elected Directorships for the coming year. Asterisks indicate incumbent National Directors.



Sam E. Keith, Jr.

Thomas J. McKee

William N. Webb

Nominees for AFA's Board of Directors


Becker


Church


duCellier


Falcone


Faust


Flaig


Gibson


Graham


Hanlon


Henderson, H.B.


Henderson, T.W.


Laitos


Lugo


McBride


McCoy


Murphy


Nottingham


Ryon


Scott


Seibel

*Incumbent

***Richard H. Becker,** Oak Brook, Ill. Retired senior account executive. Former National Director, State and Chapter President, Advisory Council Member for the Aerospace Education Foundation, Aerospace Education Foundation Trustee, national committee member, and national committee chairman. AFA Man of the Year for 1983. Current National Director and national committee chairman. Life Member of AFA and Charter Sustaining Annual Member of the Aerospace Education Foundation.

***Charles H. Church, Jr.,** Kansas City, Mo. Bank executive. Former National Vice President (Midwest Region), national committee chairman, and Chapter President. Current National Director and national committee vice chairman. Life Member of AFA and Charter Sustaining Life Member of the Aerospace Education Foundation.

Toby J. duCellier, Fairhaven, Md. Writer and editor. Former Under-40 Director and Chapter President. Current Under-40 Director, national committee member, and Chapter President. Life Member of AFA and Life Member of the Aerospace Education Foundation.

Joseph R. Falcone, Rockville, Conn. Engineer. Former National Director, National Vice President (New England Region), State and Chapter President, and state and chapter officer. Current National Vice President (New England Region) and national committee member. Charter Life Member of AFA and Charter Sustaining Life Member of the Aerospace Education Foundation.

***E. F. Faust,** San Antonio, Tex. Bank executive. Former National Director, National Vice President (Southwest Region), State and Chapter President, national committee member, and national trustee of the Arnold Air Society. Current National Director and national committee member. Life Member of AFA and Charter Sustaining Annual Member of the Aerospace Education Foundation.

Jack B. Flaig, Lemont, Pa. College instructor. Former National Vice President (Northeast Region), State and Chapter President, State Vice President, chapter officer, national committee member, and Aerospace Education Foundation Trustee. Current National Vice President (Northeast Region), national committee vice chairman, and Aerospace Education Foundation Trustee Emeritus. Life Member of AFA and Charter Sustaining Life Member of the Aerospace Education Foundation.

William J. Gibson, Ogden, Utah. Retired Air Force officer and retired airport executive. Former National Vice President (Rocky Mountain Region), State Vice President, and Chapter President, Vice President, Secretary, and Treasurer. Current National Vice President (Rocky Mountain Region) and national committee member. Life Member of AFA and Charter Sustaining Life Member of the Aerospace Education Foundation.

David Graham, Laguna Niguel, Calif. Aerospace industry executive. Former State and Chapter President and State Vice President. Current National Vice President (Far West Region) and national committee member. Life Member of AFA and Charter Sustaining Life Member of the Aerospace Education Foundation.

Thomas J. Hanlon, Buffalo, N. Y. Industry executive. Former National Director, National Vice President (Northeast Region), national committee member, and State and Chapter President. Current national committee chairman. Life Member of AFA.

H. B. Henderson, San Diego, Calif. Aerospace industry executive. Former National Director, National Vice President (Central East Region), national committee member, and State and Chapter President. Current national committee member. Life Member of AFA and Life Member of the Aerospace Education Foundation.

***Thomas W. Henderson,** Tucson, Ariz. Retired real estate broker. Former National Vice President (Far West Region), State President, State Vice President, chapter officer, and national committee member. Current National Director and national committee member. Life Member of AFA and Life Member of the Aerospace Education Foundation.

***Jan M. Laitos,** Rapid City, S. D. Corporate business consultant. Former National Vice President (North Central Region), national committee member, and chapter officer. Current National Director, national committee member, chapter officer, and member of the Aerospace Education Foundation's Advisory Council. Charter Life Member of AFA.

***Frank M. Lugo,** Mobile, Ala. Educator. Former National Director, National Vice President (South Central Region), national committee member, State and Chapter President, Aerospace Education Foundation Trustee, and Advisory Council Member of the Aerospace Education Foundation. Current National Director, national committee member, and member of the Aerospace Education Foundation's Advisory Council. Life Member of AFA and Charter Sustaining Life Member of the Aerospace Education Foundation.

***William V. McBride,** San Antonio, Tex. Retired Chamber of Commerce executive. Former USAF Vice Chief of Staff, National Director, national committee member, Aerospace Education Foundation Trustee, and Advisory Council Member for the Aerospace Education Foundation. Current National Director, national committee member, and Aerospace Education Foundation Trustee Emeritus. Life Member of AFA and Charter Sustaining Life Member of the Aerospace Education Foundation.

***James M. McCoy,** Bellevue, Neb. Insurance executive. Former Chief Master Sergeant of the Air Force, National Director, national committee chairman, and national committee member. Current National Director, national committee chairman, national committee member, and Aerospace Education Foundation Trustee. Life Member of AFA and Charter Sustaining Life Member of the Aerospace Education Foundation.

***Bryan L. Murphy, Jr.,** Fort Worth, Tex. Manager of management systems and procedures. Former National Vice President (Southwest Region), State and Chapter President, chapter officer, and national committee member. Current National Director and national committee member. Life Member of AFA.

***Ellis T. Nottingham,** Atlanta, Ga. Marketing executive. Former National Director, state officer, Chapter President, Under-40 Director, and national committee member. Current National Director and national committee member. Life Member of AFA and Life Member of the Aerospace Education Foundation.

***William L. Ryon, Jr.,** Cabin John, Md. Marketing executive. Former National Vice President (Central East Region), State and Chapter President, chapter officer, and national committee member. Current National Director and national committee member. Life Member of AFA and Charter Sustaining Life Member of the Aerospace Education Foundation.

***Walter E. Scott,** Dixon, Calif. Travel agency owner. Former National Secretary of the Aerospace Education Foundation, state officer, national committee member, Aerospace Education Foundation Trustee, Aerospace Education Foundation Trustee Emeritus, and Advisory Council Member for the Aerospace Education Foundation. Current National Director, national committee chairman, and National Secretary of the Aerospace Education Foundation. Founder of the Aerospace Education Foundation Scott Associates Program. Life Member of AFA and Charter Sustaining Life Member of the Aerospace Education Foundation.

***Mary Ann Seibel,** St. Louis, Mo. Administrator. Former National Director, Under-40 National Director, national committee member, and Chapter President. Current National Director and national committee member. Life Member of AFA and Charter Sustaining Life Member of the Aerospace Education Foundation. ■

E-SYSTEMS

Our Pledge

I pledge allegiance to the flag
of the United States of America
and to the republic for which it stands,
one nation
under God,
indivisible,
with liberty
and justice for all.

— Francis Bellamy, 1892

E-SYSTEMS

The science of systems.

JANE'S

Essential Intelligence

Recent and forthcoming aerospace information, intelligence and analysis publications from Jane's Information Group.

All Yearbooks contain product descriptions and specifications, supplier information, photographs, indexes etc.

Jane's all the Worlds Aircraft 1988-89
Technical details of all piloted aircraft, powered and unpowered, currently under development, in production or available in the form of plans amd assembly kits.
£95/US $165

Interavia ABC Aerospace Directory 1988
Annually updated directory of the civil and military aerospace sectors worldwide. Fully comprehensive and cross referenced.
£155/US $225

Jane's Air-Launched Weapons 1988
Updatable reference binder on world's air-to-air, air-to-surface and cruise missiles, bombs, rockets and guns.
£175/US $240

Soviet High Command R.Woff
The first updatable binder publication monitoring personnel, structure, politics and policies of the Soviet High Command, with detailed biographies, command structures, analyses of personnel movements and changes etc., compiled by a leading Soviet specialist.
£550/US $825

Jane's Weapon Systems 1988-89
Yearbook covering main land, sea and air non-infantry-portable weapon systems of the world and corresponding defensive systems including missiles, electronic warfare, underwater warfare and radar.
£100/US $187.50

Current Aircraft Prices
Information on the prices of all non-Eastern bloc military, commercial and business aircraft currently in production as well as data on orders and options.
£125/US $175

Jane's Military Communications 1988
Yearbook covering all categories of military communications equipment for army, navy, airforce and special forces use worldwide.
£100/US $187.50

Commercial Air Transport Industry 1988
Comprehensive profile of the world's commercial jet and turboprop aircraft manufacturers and current aircraft programmes.
£390/US $530

Jane's Airports and Handling Agents
Comprehensive annual directory of worldwide airports and handling agents published on a regional basis – Far East, Asia and Australia; Central and Latin America including the Caribbean; United States and Canada; Middle East and Africa; and Europe.
£98/US $150 per region
£400/US $600 full set

Jane's Avionics 1988-89
Yearbook covering all aspects of world civil and military airborne electronic equipment, with equipment technical details and histories of development, photographs and manufacturer contact information.
£95/US $165

Jane's Battlefield Air Defence 1988-89
Battlefield air defence weapons, described with specifications, operational use, versions, user countries, etc. Published September
£60/US $90

Jane's Airport Equipment 1988-89
Detailed annual overview of all equipment and suppliers to the airport, ATC and airline ground operations industries worldwide.
£65/US $105

Airborne Electronic Warfare Martin Streetly
Introduction to the principles and methods of airborne electronic warfare.
£30/US $45

Jane's Military Training Systems 1988-89
New Yearbook covering all aspects of military training and simulation hardware and systems for land, sea and air. Published October
£75/US $112.50

Air Defense Initiative
The US Department of Defense Air Defense Initiative program will develop a coordinated high technology approach to all aspects of air surveillance, engagement and battle management. This study identifies areas to receive funding, forecasts technological and commercial developments and identifies contractors.
£800/US $1450

World Military Aircraft Forecast
World requirements for all types of fixed-wing military aircraft; comprehensive coverage of over 380 worldwide military aircraft programs and over 100 countries.
£1350/US $2450

NATO's Central Region Forces A. Cordesman
In-depth strategic analysis of the defence forces of the nine Central Region NATO countries.
£30/US $45

Weapons and Tactics of the Soviet Army David Isby
The second, revised, edition of the standard reference on all aspects of the Soviet Army's weapons and tactics.
£30/US $45

World Unmanned Aircraft Kenneth Munson
All unmanned aircraft – drones, targets, remotely piloted vehicles – in service. Essential data, illustrations and text.
£25/US $40

Soviet Helicopters (Revised Edition) John Everett-Heath
Development history and technical analysis of all post-war Soviet helicopter designs. Published September
£25/US $37.50

Jane's Armour and Artillery 1988-89
Yearbook covering AFVs and artillery around the world with detailed descriptions, performance data, lists of users, etc.
£85/US $127.50

If your field of interest is not covered by any of the above titles, contact the Direct Mail Manager at the address below for details of other Jane's aerospace titles.

JANE'S · INFORMATION · GROUP

ORDERS AND ENQUIRIES:

USA/US Forces Abroad
Jane's Information Group, Dept. DSM, 20 Park Plaza, BOSTON, MA. 02116,USA
Bulk order enquiries:
Contact V.P. Sales
Surface postage 10% extra
Orders over US $150 post free surface

Europe/Rest of World
Jane's Information Group, Dept. DSM, 163 Brighton Road, Coulsdon, Surrey CR3 2NX, UNITED KINGDOM
Bulk order enquiries:
Contact Sales Manager
Surface postage 10% extra
Orders over £100 post free surface

Oklahoma State Convention

Oklahoma State AFA held its annual state convention last June, during which a slate of new state officers was elected. Prior to the balloting, Maj. Gen. William P. Bowden, Commander of the Oklahoma City Air Logistics Center at Tinker AFB, Okla., where the meeting was held, addressed the Saturday morning business session.

During his address, General Bowden discussed the status of the B-1 and B-2 strategic bomber systems. He also described renovations and new construction at Tinker AFB.

Later that evening at the convention banquet, Rep. Mickey Edwards (R-Okla.) delivered a keynote address, and the AFA National Vice President for the Southwest Region, Oliver R. Crawford, addressed the banquet crowd. Banquet attendees also learned the results of the morning's vote.

Elected to state office were Aaron Burleson, President; Ken Calhoun, Executive Vice President; Dave Blankenship, Vice President for Membership; Dewey King, Vice President for Organization and Development; William Webb, Treasurer; and LaVerne Shaw, Secretary. Mr. Blankenship is also an AFA National Director, and Mr. Webb has just been nominated for a second term as AFA National Treasurer.

AFA National Director Bryan Murphy reported on the results of the recent AFA Membership Committee meeting in Colorado Springs, Colo., during the convention's business session.

Many convention attendees relaxed on the golf course during the afternoon, and awards for the day's duffers were presented by General Bowden during the evening banquet.

AFA Life Member Directory

During September and October of this year, AFA Life Members will be receiving phone calls from the Harris Publishing Co., which is compiling the new *Air Force Association Directory of Life Members*. These calls will be made with the complete approval of the Air Force Association.

Harris representatives will be phoning Life Members to verify the accuracy of the data listed in each Life Member's entry in the directory. In addition, the representative will offer each Life Member the opportunity to purchase a copy of the directory.

The cost of the AFA directory is self-liquidating through directory sales. AFA has been assured that there is no requirement whatsoever for any Life Member to purchase the directory. Any suggestions to the contrary should be reported directly to AFA headquarters.

The Life Member directory promises to be a highly professional publication, and it should serve as a valuable reference guide for AFAers. AFA Life Members are encouraged to assist the Harris Publishing Co. in its effort to make the directory as accurate and as current as possible.

The Carl Vinson Chapter in Georgia recently became the first AFA chapter ever to sign up more than 100 Community Partners. Maj. Gen. Richard F. Gillis, Commander of the Warner Robins Air Logistics Center at Robins AFB, Ga., extends his congratulations on the landmark achievement to Chapter Vice President Tom Reed, left, Chairman of the Chapter's Community Partners campaign, and Jim Milton, right, Vinson Chapter President.

Carl Vinson Chapter

The Carl Vinson Memorial Chapter in Georgia, selected in 1987 for the Donald W. Steele, Sr., Memorial Award as AFA Unit of the Year, added to that distinction recently when it became the first AFA chapter to recruit more than 100 Community Partners. The Chapter is presently at 108 Community Partners and counting.

Maj. Gen. Richard F. Gillis, Commander of the Warner Robins Air Logistics Center at Robins AFB, Ga., extended his congratulations to the Chapter and saluted its achievement. Vinson Chapter Communications Director Joseph Molony reports that Chapter Vice President Tom Reed, Chairman of the Community Partners campaign, and Chapter President Jim Milton accepted the General's congratulations on behalf of the Chapter.

Prominent notices on the Chapter's landmark Community Partner roster appeared in the Warner Robins *Daily*

AFA State Contacts

Following each state name are the names of the communities in which AFA chapters are located. Information regarding these chapters or any of AFA's activities within the state may be obtained from the appropriate contact.

ALABAMA (Birmingham, Gadsden, Huntsville, Mobile, Montgomery, Selma): **Robie Hackworth,** 206 Dublin Circle, Madison, Ala. 35758 (phone 205-532-4920).

ALASKA (Anchorage, Fairbanks): **Theron L. Jenne,** 2501 Banbury Dr., Anchorage, Alaska 99504 (phone 907-337-3360).

ARIZONA (Green Valley, Phoenix, Sedona, Sierra Vista, Sun City, Tucson): **Robert A. Munn,** 7042 Calle Bellatrix, Tucson, Ariz. 85710 (phone 602-747-9649).

ARKANSAS (Blytheville, Fayetteville, Fort Smith, Hot Springs, Little Rock): **Bud A. Walters,** 903 Dixie Dr., Blytheville, Ark. 72315 (phone 501-763-1825).

CALIFORNIA (Apple Valley, Camarillo, Edwards, Fairfield, Fresno, Los Angeles, Merced, Monterey, Novato, Orange County, Pasadena, Riverside, Sacramento, San Bernardino, San Diego, San Francisco, Sunnyvale, Vandenberg AFB, Yuba City): **Harold Strack,** 28063 Lobrook Dr., Rancho Palos Verdes, Calif. 90274 (phone 213-541-6226).

COLORADO (Boulder, Colorado Springs, Denver, Fort Collins, Grand Junction, Greeley, Littleton, Pueblo): **Jack G. Powell,** 1750 S. Ironton, Aurora, Colo. 80012 (phone 303-370-4787).

CONNECTICUT (Brookfield, East Hartford, Middletown, Storrs, Stratford, Torrington, Waterbury, Westport, Windsor Locks): **Joseph Zaranka,** 9 S. Barn Hill Rd., Bloomfield, Conn. 06002 (phone 203-242-2072).

DELAWARE (Dover, Milford, Newark, Rehoboth Beach, Wilmington): **Horace W. Cook,** 112 Foxhall Dr., Dover, Del. 19901 (phone 302-674-1051).

DISTRICT OF COLUMBIA (Washington, D. C.): **Denny Sharon,** 1501 Lee Highway, Arlington, Va. 22209-1198 (phone 703-247-5820).

FLORIDA (Avon Park, Broward County, Cape Coral, Daytona Beach, Fort Walton Beach, Gainesville, Homestead, Jacksonville, Leesburg, Miami, New Port Richey, Ocala, Orlando, Palm Harbor, Panama City, Patrick AFB, Port Charlotte, Redington Beach, Sarasota, Spring Hill, Tallahassee, Tampa, Vero Beach, West Palm Beach, Winter Haven): **Roy P. Whitton,** P. O. Box 1706, Lake Placid, Fla. 33852 (phone 813-465-7048).

GEORGIA (Athens, Atlanta, Columbus, Dobbins AFB, Rome, Savannah, St. Simons Island, Valdosta, Warner Robins): **Robert W. Marsh, Jr.,** P. O. Box 542, Springfield, Ga. 31329 (phone 912-964-1941, ext. 206).

GUAM (Agana): **Michael C. Wilkins,** Box CV, Agana, Guam 96910 (phone 671-646-5259).

HAWAII (Honolulu, Puunene): **Don J. Daley,** P. O. Box 3200, Honolulu, Hawaii 96847 (phone 808-525-6296).

IDAHO (Boise, Mountain Home, Twin Falls): **Chester A. Walborn,** P. O. Box 729, Mountain Home, Idaho 83647 (phone 208-587-7185).

ILLINOIS (Belleville, Champaign, Chicago, Elmhurst, Moline, Peoria, Rockford, Springfield-Decatur): **Glen W. Wensch,** R. R. #1, Box 54, Champaign, Ill. 61821 (phone 217-352-2777).

INDIANA (Bloomfield, Fort Wayne, Grissom AFB, Indianapolis, Lafayette, Marion, Mentone, South Bend, Terre Haute): **Don McKellar,** 2324 Pinehurst Lane, Kokomo, Ind. 46902 (phone 317-455-0933).

IOWA (Des Moines, Sioux City): **Carl B. Zimmerman,** 608 Waterloo Bldg., Waterloo, Iowa 50701 (phone 319-232-2650).

KANSAS (Garden City, Topeka, Wichita): **Cletus J. Pottebaum,** 6503 E. Murdock, Wichita, Kan. 67206 (phone 316-683-3963).

KENTUCKY (Lexington, Louisville): **Bryan J. Sifford,** Rte. 4, Box 431, Cynthiana, Ky. 41031 (phone 606-234-1642).

LOUISIANA (Alexandria, Baton Rouge, New Orleans, Shreveport): **Paul J. Johnston,** 1703 W. Medalist Dr., Pineville, La. 71360 (phone 318-640-3135).

MAINE (Bangor, Loring AFB, North Berwick): **Alban E. Cyr, Sr.,** P. O. Box 160, Caribou, Me. 04736 (phone 207-496-3331).

MARYLAND (Andrews AFB area, Baltimore, Rockville): **William T. Reynolds,** 11903 Chesterton Dr., Upper Marlboro, Md. 20772 (phone 301-249-5438).

MASSACHUSETTS (Bedford, Boston, East Longmeadow, Falmouth, Florence, Hanscom AFB, Lexington, Taunton, Worcester): **Leo O'Halloran,** 420 Bedford St., Suite 290, Lexington, Mass. 02173 (phone 617-264-4603).

MICHIGAN (Alpena, Battle Creek, Calumet, Detroit, East Lansing, Kalamazoo, Marquette, Mount Clemens, Oscoda, Petoskey, Southfield): **William Stone,** 7357 Lakewood Dr., Oscoda, Mich. 48750 (phone 517-724-6266).

MINNESOTA (Duluth, Minneapolis-St. Paul): **Earl M. Rogers, Jr.,** 325 Lake Ave. South, Duluth, Minn. 55802 (phone 218-727-8711).

MISSISSIPPI (Biloxi, Columbus, Jackson): **Henry W. Boardman,** 10 Bayou Pl., Gulfport, Miss. 39503 (phone 601-896-8836).

MISSOURI (Kansas City, Richards-Gebaur AFB, Springfield, St. Louis, Whiteman AFB): **Raymond W. Peterman,** P. O. Box 9605, Kansas City, Mo. 64134 (phone 816-761-7453).

MONTANA (Bozeman, Great Falls): **Ed White,** 2333 6th Ave., South Great Falls, Mont. 59405 (phone 406-453-2054).

NEBRASKA (Lincoln, Omaha): **Ralph Bradley,** 3902 Davenport, Omaha, Neb. 68131 (phone 402-554-6220).

NEVADA (Las Vegas, Reno): **Emery S. Wetzel, Jr.,** 2938 S. Duneville St., Las Vegas, Nev. 89102 (phone 702-362-1767).

NEW HAMPSHIRE (Manchester, Pease AFB): **Robert N. McChesney,** Scruton Pond Rd., Barrington, N. H. 03825 (phone 603-664-5090).

NEW JERSEY (Andover, Atlantic City, Belleville, Camden, Chatham, Cherry Hill, Forked River, Fort Monmouth, Jersey City, McGuire AFB, Middlesex County, Newark, Old Bridge, Trenton, Wallington, West Orange, Whitehouse Station): **Robert Gregory,** R. D. #2, Box 216, Wrightstown, N. J. 08562 (phone 609-758-2973).

NEW MEXICO (Alamogordo, Albuquerque, Clovis): **Louie T. Evers,** P. O. Box 1946, Clovis, N. M. 88101 (phone 505-762-1798).

NEW YORK (Albany, Bethpage, Brooklyn, Buffalo, Chautauqua, Griffiss AFB, Hudson Valley, Nassau County, New York City, Niagara Falls, Patchogue, Plattsburgh, Queens, Rochester, Rome/Utica, Suffolk County, Syosset, Syracuse, Westchester, Westhampton Beach, White Plains): **Gerald V. Hasler,** P. O. Box 5254, Albany, N. Y. 12205 (phone 518-785-5020).

NORTH CAROLINA (Asheville, Charlotte, Fayetteville, Goldsboro, Greensboro, Kitty Hawk, Littleton, Raleigh, Wilmington): **Robert C. Newman, Jr.,** 3037 Truitt Dr., Burlington, N. C. 27215 (phone 919-584-7069).

NORTH DAKOTA (Concrete, Fargo, Grand Forks, Minot): **Ralph Ehlers,** 1207 Glacial Dr., Minot, N. D. 58701 (phone 701-852-3221).

OHIO (Akron, Cincinnati, Cleveland, Columbus, Dayton, Mansfield, Newark, Youngstown): **Cecil H. Hopper,** 537 Granville St., Newark, Ohio 43055 (phone 614-344-7694).

OKLAHOMA (Altus, Enid, Oklahoma City, Tulsa): **Terry Little,** 4150 Timerlane, Enid, Okla. 73703 (phone 405-234-9624).

OREGON (Eugene, Klamath Falls, Portland): **Hal Langerud,** 10515 S. W. Clydesdale Terrace, Beaverton, Ore. 97005 (phone 503-644-0645).

PENNSYLVANIA (Allentown, Altoona, Beaver Falls, Bensalem, Coraopolis, Drexel Hill, Erie, Harrisburg, Homestead, Indiana, Johnstown, Lewistown, Mon Valley, Philadelphia, Pittsburgh, Scranton, Shiremanstown, State College, Willow Grove, York): **David L. Jannetta,** P. O. Box 643, Altoona, Pa. 16603 (phone 814-943-8023).

PUERTO RICO (San Juan): **Fred Brown,** 1991 Jose F. Diaz, Rio Piedras, P. R. 00928 (phone 809-790-5288).

RHODE ISLAND (Warwick): **Thomas R. Portesi,** 102d Tactical Control Squadron, North Smithfield ANG Station, Slatersville, R. I. 02889 (phone 401-762-9100).

SOUTH CAROLINA (Charleston, Clemson, Columbia, Myrtle Beach, Sumter): **Wesley H. Davis,** 7916 Bay Springs Rd., Columbia, S. C. 29233 (phone 803-788-5267).

SOUTH DAKOTA (Rapid City, Sioux Falls): **John Kittelson,** 141 N. Main, Suite 308, Sioux Falls, S. D. 57102 (phone 605-336-2498).

TENNESSEE (Chattanooga, Knoxville, Memphis, Nashville, Tri-Cities Area, Tullahoma): **Everett E. Stevenson,** 4792 Cole Rd., Memphis, Tenn. 38117 (phone 901-767-1315).

TEXAS (Abilene, Amarillo, Austin, Big Spring, College Station, Commerce, Corpus Christi, Dallas, Del Rio, Denton, El Paso, Fort Worth, Harlingen, Houston, Kerrville, Lubbock, San Angelo, San Antonio, Waco, Wichita Falls): **John P. Russell,** 118 Broadway, Suite 234, San Antonio, Tex. 78205 (phone 915-698-8586).

UTAH (Bountiful, Clearfield, Ogden, Salt Lake City): **Marcus C. Williams,** 4286 South 2300 West, Roy, Utah 84067 (phone 801-627-4490).

VERMONT (Burlington): **Ralph R. Goss,** 8 Summit Circle, Shelburn, Vt. 05482 (phone 802-985-2257).

VIRGINIA (Alexandria, Charlottesville, Danville, Harrisonburg, Langley AFB, Lynchburg, Norfolk, Petersburg, Richmond, Roanoke): **Don Anderson,** Box 54, 2101 Executive Dr., Hampton, Va. 23666 (phone 804-868-8756).

WASHINGTON (Seattle, Spokane, Tacoma, Yakima): **Alwyn T. Lloyd,** P. O. Box 24271, M/S 6A-30, Seattle, Wash. 98124 (phone 206-234-8027).

WEST VIRGINIA (Huntington): **Ron Harmon,** 1933 Ohio Ave., Parkersburg, W. Va. 26101 (phone 304-485-2088).

WISCONSIN (Madison, Milwaukee, Mitchell Field): **Gilbert Kwiatkowski,** 8260 W. Sheridan Ave., Milwaukee, Wis. 53218 (phone 414-463-1849).

WYOMING (Cheyenne): **Irene G. Johnigan,** 503 Notre Dame Court, Cheyenne, Wyo. 82009 (phone 307-775-3641).

During the recent annual awards banquet hosted by the Pueblo Chapter in Colorado, Bill Ludlum, left, Director of the McDonnell Douglas Delta Plant, received a Chapter Community Service Award from Chapter Vice President William Feder, Sr. Mr. Ludlum received the award for his strong support of many community action projects in the Pueblo area.

Sun and the Robins *Rev Up*, underscoring the Chapter's motto—"Every Day in Middle Georgia Is Air Force Appreciation Day."

McGuire Encourages Young Astronauts

AFA's Thomas B. McGuire, Jr., Chapter in New Jersey is extending its support to the Young Astronauts program at the Challenger School at McGuire AFB, N. J. The Chapter hosted a meeting in April during which members of the Challenger Young Astronauts Chapter enthusiastically briefed the AFAers on their Young Astronauts projects.

The Chapter initially sponsored the Young Astronauts program at the Challenger School, underwriting the $20 initiation fee for the program last year. Chapter President Esther Gregory reports that the Chapter is also arranging a tour of McGuire AFB for the Young Astronauts.

Other AFA chapters might want to take a cue from the example of the McGuire Chapter and its support of this youth-oriented program.

In the Field

The Pueblo Chapter in Colorado recently held its annual awards banquet. Chapter Vice President **William Feder, Sr.**, presented a Community Service Award during the banquet to **Bill Ludlum,** Director of the McDonnell Douglas Delta Plant. Mr. Ludlum was cited for his outstanding support of community action projects in Pueblo. He is also an active supporter of the Pueblo Memorial Airport Aircraft Museum.

At a meeting last May, members of AFA's Tallahassee Chapter in Florida gathered to hear an address by **CMSgt. Wayne L. Fisk** of the USAF Enlisted Heritage Hall at Gunter AFB, Ala. Chief Fisk participated in a daring attempted rescue of POWs during the Vietnam War and served with the US team that carried out the *S. S. Mayaguez* rescue operation. Among the guests at the May meeting were Tallahasse Chapter President **Roger Inman** and AFA National Director **Herbert "Bud" West.**

AFA Life Member and Southern Indiana Chapter member **James C. Campbell II** has been named as the 1988–89 Corps Commander for AFROTC Detachment 218. Detachment 218 includes approximately 150 cadets from Indiana State University and the Rose-Hulman Institute of Technology.

Cadet Colonel Campbell received the honor during a spring dining-out held in Terre Haute, Ind. **Col. Jack E. Cartwright,** Professor of Aerospace

Coming Events

August 4–6, **California State Convention,** San Diego . . . August 5–7, **New York State Convention,** Long Island . . . August 12–13, **Illinois State Convention,** Chicago . . . August 18–19, **Delaware State Convention,** Dover AFB . . . August 19–20, **Oregon State Convention,** Portland . . . August 20, **Indiana State Convention,** Grissom AFB . . . August 26, **Arkansas State Convention,** Little Rock . . . August 27, **Arizona State Convention,** Casa Grande . . . September 19–22, **AFA National Convention and Aerospace Development Briefings and Displays,** Washington, D. C.

CMSgt. Wayne L. Fisk of the USAF Enlisted Heritage Hall at Gunter AFB, Ala., addressed a May meeting of AFA's Tallahassee Chapter in Florida. Pictured are (from left) John E. Schmidt, Jr., Chapter Executive Council member, Chapter President Roger Inman, AFA National Director Herbert West, Leon County Veterans Service Officer Dale Doss, and Chief Fisk.

Among those attending the June Oklahoma State AFA convention were (from left) Oliver R. Crawford, AFA National Vice President for the Southwest Region, and Mrs. Nancy Crawford, Mrs. Jo Little and outgoing Oklahoma AFA President Terry Little, and AFA National Director Bryan L. Murphy. The Oklahoma AFAers elected a new slate of state officers during the convention.

Studies, conducted the change of command ceremony.

After graduation, Cadet Campbell will be commissioned as a second lieutenant and will be trained as a navigator at Mather AFB, Calif.

The Eglin Chapter in Florida recently honored Niceville High School AFJROTC cadet **Brandi Barham** as the top AFJROTC cadet in Okaloosa County. On hand with congratulations at the awards dinner honoring Cadet Barham and other cadets was **Brig. Gen. (Maj. Gen. selectee) Thomas R. Ferguson, Jr.**, director of the advanced medium-range air-to-air missile program at Eglin AFB's Armament Division.

Cadet Barham was awarded a $2,000 scholarship by the Chapter during the awards ceremony, and two runner-up cadets received scholarships worth $1,500 each. The Eglin Chapter sponsors more than $12,000 a year in scholarships and gifts for outstanding JROTC cadets in the northwest Florida area. ■

Unit Reunions

Camp Stoneman
The Chamber of Commerce and the Pittsburg Historical Society of Pittsburg, Calif., will host a reunion on September 8–10, 1988, for former military and civilian personnel who were processed through Camp Stoneman during World War II and the Korean conflict. **Contact:** Pittsburg Chamber of Commerce, 2010 Railroad Ave., Pittsburg, Calif. 94565. Phone: (415) 432-7301.

Mill Pond Project Pilots
Pilots of the "Mill Pond Project" will hold a reunion on October 7–10, 1988, at Hurlburt Field, Fla. **Contact:** Lt. Col. Harold T. Stubbs, USAF (Ret.), 1910 W. Shore Dr., Garland, Tex. 75043. Phone: (214) 278-9203.

Southern Airways School Alumni
Permanent party military personnel and former contractor employees of Southern Airways School, Bainbridge AFB, Ga. (1950s era), will hold a reunion in Bainbridge, Ga., during the Labor Day weekend. **Contact:** Col. Vernon O. Darley, USAF (Ret.), 6671 Peacock Blvd., Morrow, Ga. 30260. Phone: (404) 961-5135.

Tactical Reconnaissance
Tactical Reconnaissance members will hold a reunion on September 9–11, 1988, at John Ascuaga's Nugget in Reno, Nev. **Contact:** Lt. Col. Gordon Newman, USAF (Ret.), 1355 Doral Circle, Reno, Nev. 89509. Phone: (702) 827-1747 or (702) 747-4839 (Bob Beier).

4th Combat Cargo Squadron
Members of the 4th Combat Cargo Squadron who served in the CBI will hold a reunion in conjunction with the CBI Hump Pilots Association on September 14–18, 1988, in Niagara Falls, N. Y. **Contact:** Peter Kote, West Oak Hill Rd., Jamestown, N. Y. 14701. Phone: (716) 664-2507.

8th Photo Reconnaissance Squadron
Members of the 8th Photo Reconnaissance Squadron, Fifth Air Force, will hold a reunion on October 5–8, 1988, in Burlingame, Calif. **Contact:** Andy Kappel, 6406 Walnut, Kansas City, Mo. 64113. Phone: (816) 363-0261.

20th FS/ATS/MAS Alumni
Members of the 20th Ferrying Squadron, 20th Air Transport Squadron, and 20th Military Airlift Squadron will hold a reunion on October 6–9, 1988, at the Comfort Inn in Dover, Del. **Contact:** Lee B. Whalen, P. O. Box 212, Camden, Del. 19934.

24th Combat Mapping Squadron
Members of the 24th Combat Mapping Squadron (WW II) who were stationed at Guskhara, India, and Peterson Field, Colo., will hold a reunion on September 8–11, 1988, at the Ramada Inn North in Colorado Springs, Colo. **Contact:** David Segal, 9287 Vista Del Lago, Boca Raton, Fla. 33428. Phone: (407) 483-2490.

Class 41-G
Members of Class 41-G will hold a reunion on October 6–9, 1988, in Westlake Village, Calif. **Contact:** Al Young, 12100 Alder Grove St., Moorpark, Calif. 93021. Phone: (805) 529-5402.

49th Fighter Group Ass'n
The 49th Fighter Group (WW II, Korea, and Vietnam) will hold a reunion on September

Reunion Notices

Readers wishing to submit reunion notices to "Unit Reunions" should mail their notices well in advance of the event to "Unit Reunions," AIR FORCE Magazine, 1501 Lee Highway, Arlington, Va. 22209-1198. Please designate the unit holding the reunion, a time and location, and a contact for more information.

Terry Bell
Operations
Manager
PES

I can save you money on leasing a new car!

...And help with your comparison shopping, too!

If you're in the market to lease a new car, truck or van-or want to get comparative prices before buying a new car-I can help you save money through this AFA sponsored program.

Customers tell me that leasing a new car is so convenient that they wish they'd done it years ago. And inexpensive, too! They just complete a form like the one below and ask me to send them detailed leasing information for the car of their choice. I also send them actual price information on the same car-both dealer and retail prices-so that if they decide to buy, rather than lease, they have current information for comparative shopping purposes when visiting automobile dealer showrooms. One of my repeat customers calls leasing a car "a good deal with no muss and no fuss!"

And most of the time it really is. About the only exception is that some of the more exotic pricing information is not always available on foreign cars ... but I can almost always help you with full leasing information on all domestic and foreign cars.

So, if you're in the market to lease a new car, please ask us to help. I think we can save you both time ... and money!

New Vehicle Cost and Lease Request

Year _____ Make _____

Model _____ Body Style _____

Equipment Selection

Engine ☐ 4 cyl. ☐ 6 cyl. ☐ Other _____
Transmission ☐ Automatic ☐ Manual
Air Conditioning ☐ Standard ☐ Auto. temp. control
Emission ☐ California ☐ High altitude
Gauges ☐ Standard ☐ Electronic
Mirrors ☐ LH remote ☐ RH manual ☐ Other _____
Moldings ☐ Bodyside ☐ Rocker panel ☐ Other _____
Paint ☐ two-tone ☐ stripe
Power Equipment ☐ Brakes ☐ Steering
☐ Antenna ☐ Door locks
☐ Mirrors ☐ Windows ☐ Tailgate/trunk release
☐ Seats _____ driver _____ passenger _____ bench
Radio ☐ AM ☐ AM/FM Stereo
☐ AM/FM Stereo with cassette player
☐ AM/FM Stereo w/cassette & premium sound
Roof ☐ Full vinyl ☐ Other _____
Seats ☐ Bench ☐ Notchback 55/45 ☐ 45/45
☐ Bucket ☐ Other _____
Seat Trim ☐ Cloth ☐ Vinyl ☐ Leather
Steering Wheel ☐ Tilt ☐ Telescopic
Tires ☐ White SW ☐ Black SW ☐ Other _____
Wheel Covers ☐ Standard ☐ Wire
Wheels ☐ Aluminum ☐ Other _____
W/S Wipers ☐ Intermittent ☐ Rear Window
Other ☐ H. D. battery ☐ H. D. cooling
☐ Bumper guards ☐ Impact strips
☐ Cruise control ☐ Console
☐ Defogger, rear window ☐ Glass, tinted
☐ Door edge guards ☐ Light group
☐ Floor mats (F & R) ☐ Visor, illuminated vanity
☐ Headlamps group ☐ Luggage rack

Additional Equipment

_____

_____

Proposed leasing period
☐ 36 months ☐ 48 months ☐ 60 months

☐ Check enclosed for $7.00
☐ Charge $7.00 to:
☐ AFA/VISA ☐ Other VISA ☐ MasterCard .

Acct. No. _____ Exp. Date _____

Signature _____

Name _____ Rank _____

Address _____

City _____ State _____ Zip _____

Phone H: (___)_____ O: (___)_____

Mail the New Vehicle Request and $7 for each new car inquiry to: AFA Auto Lease Program, c/o PES, Box 208, Wauseon, OH 43567.

For more information call (800) 227-7811, or in Ohio, (419) 335-2801.

Program not available in the state of Louisiana.

AFA's 1988 NATIONAL CONVENTION AND AEROSPACE DEVELOPMENT BRIEFINGS AND DISPLAYS

A CREED TO BELIEVE IN— FREEDOM

SHERATON WASHINGTON HOTEL
SEPTEMBER 18–22

CONVENTION ACTIVITIES INCLUDE

- *Opening Ceremonies*
  Keynote Address:
  Lt. Gen. Colin L. Powell, USA
  Assistant to the President
  for National Security Affairs
- *Aerospace Education Foundation Luncheon*
  Honoring Distinguished Americans with
  Doolittle and Eaker Fellowships
- *Business Sessions*
  Address by:
  Hon. Michael H. Armacost
  Under Secretary of State
  for Political Affairs
- *Secretary's Luncheon*
  Hon. Edward C. Aldridge, Jr.
  Secretary of the Air Force
- *Annual Reception*
- *AEF Roundtable*
  "The Defense Industrial Base"
- *Chief's Luncheon*
  Gen. Larry D. Welch
  Chief of Staff, US Air Force
- *Air Force Anniversary Dinner-Dance*
  Program: Featuring
  Mitch Miller and the USAF Band

Hotels available other than the Sheraton Washington are: Normandy Inn, 2118 Wyoming Ave., N.W., Washington, D.C. 20008. Phone (800) 424-3729. Connecticut Avenue Days Inn, 4400 Connecticut Ave., N.W., Washington, D.C. 20008. Phone (800) 528-1234. Washington-Hilton, Connecticut Ave. at Columbia Rd., N.W., Washington, D.C. 20009. Phone (800) 445-8667.

SHERATON WASHINGTON HOTEL
SEPTEMBER 18–22
(202/328-2000)
NOTE: THIS FORM NOT FOR USE BY DELEGATES.
WATCH YOUR MAIL FOR INFORMATION.

ADVANCE REGISTRATION FORM

Air Force Association National Convention & Aerospace Development Briefings & Displays
September 18–22 Sheraton Washington Hotel Washington, D.C.

Type or Print

NAME _____

TITLE _____

AFFILIATION _____

ADDRESS _____

CITY, STATE, ZIP _____

NOTE: Advance registration and/or ticket purchase must be accompanied by check made payable to AFA.
Mail to AFA, 1501 Lee Highway, Arlington, VA 22209-1198.

Current Registration Fee (after September 6) $135.

Please reserve the following for me:
☐ *Current Registration Packets @ $125* . . . . . $ _____
Includes credentials and tickets to the following Convention functions:
Secretary's Luncheon
Chief's Luncheon
Annual Reception

. . . . . .

Tickets may also be purchased separately for the following:
☐ *AEF Luncheon @ $48 each* . . . . . $ _____
☐ *Secretary's Luncheon @ $48 each* . . . . . $ _____
☐ *Chief's Luncheon @ $48 each* . . . . . $ _____
☐ *Annual Reception @ $48 each* . . . . . $ _____
☐ *Anniversary Reception & Dinner Dance @ $109 each* . . . . . $ _____
Total for separate tickets . . . . . $ _____
Total amount enclosed . . . . . $ _____

28–October 3, 1988, in Seattle, Wash. **Contact:** Jim Reynolds, 6057 45th Ave., N. E., Seattle, Wash. 98115. Phone: (206) 523-3114.

Classes 52-H/58-N
Members of Classes 52-H through 58-N and associated personnel who were stationed at Stallings AFB, N. C., will hold a reunion on October 21–23, 1988, in Kinston, N. C. **Contact:** Col. Robert W. Reeves, USAF (Ret.), 4519 Sunset Dr., Panama City, Fla. 32404. Bill Dyer, 1607 Cambridge Dr., Kinston, N. C. 21501. Phone: (919) 527-0425.

56th Fighter Group
Members of the 56th Fighter Group (WW II) are invited to join in a special dedication reunion hosted by the 56th Tactical Training Wing on October 15–18, 1988, at MacDill AFB, Fla. **Contact:** John C. McClure, 2674 Leslie Dr., N. E., Atlanta, Ga. 30345. Phone: (404) 939-6420.

62d Troop Carrier Group
The 62d Troop Carrier Group (WW II) will hold a reunion on October 24–27, 1988, at the Holiday Inn Capital Plaza in Sacramento, Calif. **Contact:** Wally Sheehan, 4025 Sangamon St., Carmichael, Calif. 95608. Phone: (916) 944-2109.

312th Troop Carrier Squadron
Members of the 312th Troop Carrier and the 938th Consolidated Aircraft Maintenance Squadrons will hold a reunion on August 27, 1988, at Hamilton Field, Calif. **Contact:** Harold McLaughlin, 707 Oak Meade Dr., Vacaville, Calif. 95688. Phone: (707) 448-1393.

333d Fighter Squadron
Members of the 333d Fighter Squadron (WW II) and postwar members of the 44th Fighter Squadron will hold a reunion on September 29–October 2, 1988, at the Howard Johnson Plaza in Albuquerque, N. M. **Contact:** Homer Garcia, 7204 Pickard Ave., N. E., Albuquerque, N. M. 87110. Phone: (505) 884-4398.

360th TEWS
Members of the 360th Tactical Electronic Warfare Squadron who served in Southeast Asia (1963–73) will hold a reunion on the weekend of October 15, 1988, in San Antonio, Tex. **Contact:** Col. Joe Steingasser, USAF (Ret.), 6008 Ivy Hills Dr., Austin, Tex. 78759.

384th Air Refueling Squadron
Members of the 384th Air Refueling Squadron who were stationed at Westover AFB, Mass. (1954–65), will hold a reunion on September 29–October 2, 1988, at the Quality Inn in Chicopee, Mass. **Contact:** John Garrison, 416 Village View Lane, Longwood, Fla. 32750. Phone: (407) 788-8383.

401st Fighter-Bomber Group
Members of the 401st Fighter-Bomber Group (612th, 613th, 614th, and 615th Fighter-Bomber Squadrons) who were stationed at England AFB, La., between 1955 through 1960 are planning to hold a reunion in late 1988. Please send a legal-size, self-addressed, stamped envelope for information. **Contact:** Anthony J. Gagliano, 300 Holcomb Blvd., Ocean Springs, Miss. 39564.

438th Troop Carrier Group
Members of the 438th Troop Carrier Group (World War II) will hold a reunion on September 30–October 2, 1988, in Monterey, Calif. **Contact:** Ronald H. Worrell, 419 S. 4th St., DeKalb, Ill. 60115. Phone: (815) 756-6582.

486th Bomb Group (H)
The 486th Bomb Group (H) will hold a reunion on October 12–16, 1988, in Des Moines, Iowa. **Contact:** Robert H. Nolan, 2676 Augusta Dr., N., Clearwater, Fla. 34677.

733d Troop Carrier Squadron
Members of the 733d Troop Carrier Squadron and the 945th Military Airlift Group will hold a reunion on September 10, 1988, in Layton, Utah. **Contact:** Richard Flackman, 410 Park St., Layton, Utah 84041. Phone: (801) 546-3924 or (801) 966-2642 (John Brownell).

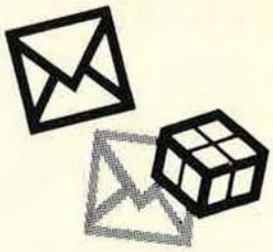
751st AC&W Squadron
Members of the 751st Aircraft Control and Warning Squadron will hold a reunion on October 27–30, 1988, in Panama City, Fla. **Contact:** Art W. Albrecht, 4917 Ravenswood, Apt. 801, San Antonio, Tex. 78227. Phone: (512) 674-3287.

868th Bomb Squadron
The 868th Bomb Squadron, Thirteenth Air Force, will hold a reunion on September 22–25, 1988, at the Williamsburg Hilton and National Conference Center in Williamsburg, Va. **Contact:** Dr. Vince Splane, 2676 Blanding Blvd., Middleburg, Fla. 32068. Phone: (904) 282-4620.

1708th Ferrying Wing
Members of the 1708th Ferrying Wing will hold a reunion on October 6–9, 1988, at the Holiday Inn Pyramid Plaza Hotel in Albuquerque, N. M. **Contact:** Ernie Davis, 17881 S. W. 113th Ct., Miami, Fla. 33157-4931. Phone: (305) 238-3792.

71st Fighter Interceptor Squadron
I would like to hear from members of the 71st Fighter Interceptor Squadron who were stationed at Malmstrom AFB, Mont., from July 1968 through April 1972.
Please contact the address below.
Jerry E. Santy
2409 6th St., N. W.
Great Falls, Mont. 59404
Phone: (406) 761-6543

100th Service Squadron
I would like to hear from members of the 100th Service Squadron, Fifth Air Force, for the purpose of planning a reunion.
Please contact the address below.
Chuck Blumenthal
8046 Via Del Desierto
Scottsdale, Ariz. 85258



Mailing Lists

AFA occasionally makes its list of member names and addresses available to carefully screened companies and organizations whose products, activities, or services might be of interest to you. If you prefer **not** to receive such mailings, please copy your mailing label **exactly** and send it to:

Air Force Association
Mail Preference Service
1501 Lee Highway
Arlington, Va. 22209-1198

MOVING?

Let us know your new address six weeks in advance so that you don't miss any copies of AIR FORCE.

Clip this form and attach your mailing label (from the plastic bag that contained this copy of your magazine), and send to:

Air Force Association
Attn: Change
of Address
1501 Lee Highway
Arlington, VA
22209-1198

Please print your NEW address here:

Please fasten your mailing label here

NAME

ADDRESS

CITY, STATE, ZIP CODE

AFA's NEW EAGLE SERIES Group Life Insurance

Up to $400,000 Protection for Your Family!

CHOOSE FROM:

- The High Option *PLUS* Plan now pays benefits up to **$400,000.00**
- The High Option Plan now pays benefits up to **$300,000.00**
- The Standard Plan now pays benefits up to **$200,000.00**

Important Benefits and Features

Eligibility—All members of the Air Force Association under age 65 are eligible to apply for this coverage . . . and, once insured, to apply for higher levels of coverage.

Flying and Non-Flying Personnel—All insured members of the same age are provided the same amount of coverage regardless of whether or not they are on flying status and regardless of whether or not they are killed in an aviation accident! There is no age restriction for full benefits and there is no benefit or cost difference for those on flyng status. AFA's new Eagle Series Life Insurance program eliminates all these differences and provides strong, reliable coverage for *all* members at the *same* cost.

Coverage to Age 75—Insurance provided under this group program may be retained at the same low group rate to age 75.

War Related Death Benefits—Unlike many programs that severely restrict coverage in the event of war or act of war, AFA's program provides full benefits for war related deaths except for aircraft crew members who are killed in aviation accidents. In such circumstances the death benefit is 50% of the scheduled benefit amount.

Guaranteed Conversion Provision—At age 75 (or if you wish, upon termination of AFA membership) your coverage is convertible, within 31 days of the date you become eligible, to any permanent plan of insurance then being offered by United of Omaha, regardless of your health at that time. The maximum amount convertible is the amount of your group coverage at the time of conversion.

Under the Family Plan, the spouse's coverage is also convertible to permanent insurance in the event the member dies. The application for such coverage must be made within 31 days of the member's death. Children's coverage under the Family Plan, however is not convertible, but upon attaining age 21, each insured child is automatically eligible to apply for a $10,000 Whole Life Insurance policy. This policy includes a guaranteed issue benefit which provides the insured the right to purchase additional coverage at standard rates on future dates specified in the policy.

Schedule of Benefits

Choose the Plan that Fits Your Family's Needs for Security

Member's Attained Age	High Option *PLUS* Plan Premium $20 Per Month COVERAGE	High Option Plan Premium $15 Per Month COVERAGE	Standard Plan Premium $10 Per Month COVERAGE
20-24	$400,000	$300,000	$200,000
25-29	350,000	262,500	175,000
30-34	250,000	187,500	125,000
35-39	180,000	135,000	90,000
40-44	100,000	75,000	50,000
45-49	60,000	45,000	30,000
50-54	40,000	30,000	20,000
55-59	28,000	21,000	14,000
60-64	18,000	13,500	9,000
65-69	8,000	6,000	4,000
70-74	5,000	3,750	2,500

The above schedule of benefits will be paid in the event of any death except one half (50%) of the benefit will be paid in the event of a war related aviation accident.

Disability Waiver of Premium—If you become totally disabled at any time prior to age 60 for a period of at least nine months while your coverage remains in force, you may apply for the Disability Waiver of Premium Benefit. Upon approval, your Eagle Series insurance will remain in force without further payment of premiums for as long as you continue to be totally disabled.

Dividend Policy—AFA has continuously provided program improvements in addition to paying substantial year end dividends based on actual program experience.

Effective Date of Coverage—All certificates are dated and take effect on the last day of the month in which your application for coverage is approved and coverage runs concurrently with AFA membership.

Termination of Coverage—Your coverage can be terminated only if you are no longer an Air Force Association member in good standing, if you do not pay your premium, if the AFA Master Policy is discontinued, or on the first renewal date following your 75th birthday.

Professionally Administered—AFA's Eagle Series Insurance program is administered by the Association's staff of professionally trained insurance personnel with extensive experience in group insurance programs and requirements.

Convenient Payment Plan—Premium payments may be made directly to AFA in quarterly, semi-annual, or annual installments, or by monthly government allotment. If you make payments directly to AFA, the Association will mail renewal statements approximately 30 days in advance of each premium due date. For active duty and retired personnel, however, AFA recommends that payments be made automatically by monthly government allotment (payable to the Air Force Association) so as to prevent any possible lapse in coverage.

Exceptions—Group Life Insurance: Benefits for suicide or death from injuries intentionally self-inflicted while sane or insane shall not be effective until coverage has been in force 12 months. Benefits for a war related aviation accident in which the Insured was serving as pilot or crew member of the aircraft involved are 50% of the scheduled amount of coverage.

The insurance coverage described in this plan is provided under a group insurance policy issued by United of Omaha Life Insurance Company to the First National Bank of Minneapolis as trustee of the Air Force Association Group Insurance Trust.

Optional Family Coverage

(May be added to Standard, High Option, or High Option PLUS Plan)
PREMIUM: $2.50 Per Month

Member's Attained Age	Life Insurance Coverage for Spouse	Life Insurance Coverage for Each Child
20-24	$50,000	$5,000
25-29	50,000	5,000
30-34	40,000	5,000
35-39	30,000	5,000
40-44	20,000	5,000
45-49	10,000	5,000
50-54	7,500	5,000
55-59	5,000	5,000
60-64	3,000	5,000
65-69	2,000	5,000
70-74	1,000	5,000

Between the ages of six months and 21 years, each child is provided $5,000 coverage. Children under 6 months are provided with $250 coverage once they are 15 days old and discharged from the hospital.

Upon attaining age 21, children covered under this group insurance program may, provided satisfactory evidence of insurability is submitted, request coverage (in most states) under a $10,000 permanent individual life insurance policy with guaranteed purchase options.

PLEASE RETAIN THIS MEDICAL INFORMATION BUREAU PRENOTIFICATION FOR YOUR RECORDS

Information regarding your insurability will be treated as confidential. United of Omaha Life Insurance Company may, however, make a brief report thereon to the Medical Information Bureau, a nonprofit membership organization of life insurance companies, which operates an information exchange on behalf of its members. If you apply to another Bureau member company for life or health insurance coverage, or a claim for benefits is submitted to such a company, the Bureau, upon request, will supply such company with information in its file.

Upon receipt of a request from you, the Bureau will arrange disclosure of any information it may have in your file. (Medical information will be disclosed only to your attending physician.) If you question the accuracy of information in the Bureau's file, you may contact the Bureau and seek a correction in accordance with the procedures set forth in the Federal Fair Credit Reporting Act. The address of the Bureau's information office is P.O. Box 105, Essex Station, Boston, Mass. 02112, Phone (617) 426-3660.

United of Omaha Life Insurance Company may release information in its file to other life insurance companies to whom you may apply for life or health insurance, or to whom a claim for benefits may be submitted.

APPLICATION FOR AFA
GROUP LIFE INSURANCE

Full name of member _____
Rank Last First Middle

Address _____
Number and Street City State ZIP Code

Date of Birth (Mo. Day Yr.)	Height	Weight	Social Security Number	Flying Status
				☐ Yes ☐ No

This insurance is available only to AFA members

☐ I enclose $21 for annual AFA membership dues (includes subscription ($18) to AIR FORCE Magazine).

☐ I am an AFA member.

Name and relationship of primary beneficiary _____

Name and relationship of contingent beneficiary _____

Please indicate below the Mode of Payment and the Plan you elect:

Mode of Payment	Plan of Insurance: Standard Plan		High Option Plan		High Option PLUS Plan	
	Member Only	Member and Dependents	Member Only	Member and Dependents	Member Only	Member and Dependents
Monthly government allotment (only for military personnel). I enclose 2 months premium to cover the necessary period for my allotment (payable to Air Force Association) to be established.	☐ $ 10.00	☐ $ 12.50	☐ $ 15.00	☐ $ 17.50	☐ $ 20.00	☐ $ 22.50
Quarterly. I enclose amount checked.	☐ $ 30.00	☐ $ 37.50	☐ $ 45.00	☐ $ 52.50	☐ $ 60.00	☐ $ 67.50
Semi-Annually. I enclose amount checked.	☐ $ 60.00	☐ $ 75.00	☐ $ 90.00	☐ $105.00	☐ $120.00	☐ $135.00
Annually. I enclose amount checked.	☐ $120.00	☐ $150.00	☐ $180.00	☐ $210.00	☐ $240.00	☐ $270.00

Names of Dependents To Be Insured	Relationship to Member	Dates of Birth (Mo. Day Yr.)	Height	Weight

Have you or any dependents for whom you are requesting insurance ever had or received advice or treatment for: kidney disease, cancer, diabetes, respiratory disease, epilepsy, arteriosclerosis, high blood pressure, heart disease or disorder, stroke, venereal disease or tuberculosis? Yes ☐ No ☐

Have you or any dependents for whom you are requesting insurance been confined to any hospital, sanatorium, asylum or similar institution in the past 5 years? Yes ☐ No ☐

Have you or any dependents for whom you are requesting insurance received medical attention or surgical advice or treatment in the past 5 years or are now under treatment or using medications for any disease or disorder? Yes ☐ No ☐

If YOU ANSWERED "YES" TO ANY OF THE ABOVE QUESTIONS, EXPLAIN FULLY including date, name, degree of recovery and name and address of doctor. (Use additional sheet of paper if necessary.)

I apply to United of Omaha Life Insurance Company for insurance under the group plan issued to the First National Bank of Minneapolis as Trustee of the Air Force Association Group Insurance Trust. Information in this application, a copy of which shall be attached to and made a part of my certificate when issued, is given to obtain the plan requested and is true and complete to the best of my knowledge and belief. I agree that no insurance will be effective until a certificate has been issued and the initial premium paid.

I hereby authorize any licensed physician, medical practitioner, hospital, clinic or other medically related facility, insurance company, the Medical Information Bureau or other organization, institution or person, that has any records or knowledge of me or my health, to give to the United of Omaha Life Insurance Company any such information. A photographic copy of this authorization shall be as valid as the original. I hereby acknowledge that I have a copy of the Medical Information Bureau's prenotification information.

Date _____, 19 ____ _____
Member's Signature

Application must be accompanied by a check or money order. Send remittance to:
Insurance Division, AFA, 1501 Lee Highway, Arlington, Virginia 22209-1198.

AFA Air Force Association

United of Omaha

Group Policy GLG-2625
United of Omaha Life Insurance Company
Home Office Omaha Nebraska

8-88

FORM 3767GL App REV. 10-79

Apply Today! If You Have Questions, Call TOLL FREE: 1-800-858-2003.

Bob Stevens'

"There I was..."

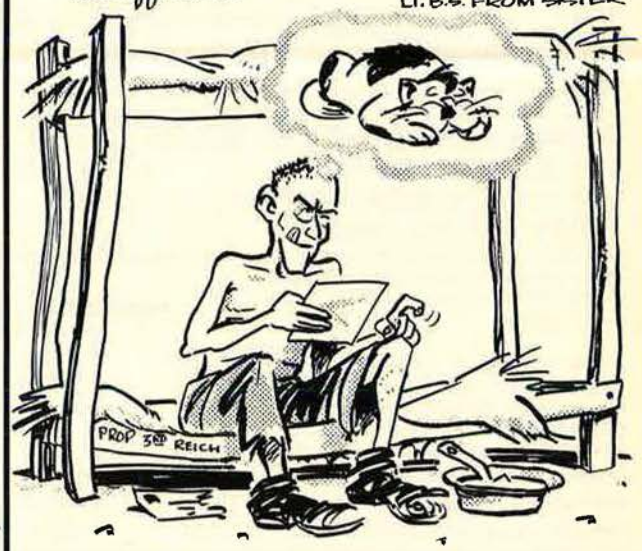
THE DOD HAS ANNOUNCED AVAILABILITY OF THE PRISONER OF WAR (POW) MEDAL. THERE ARE AN ESTIMATED 42,000 AF and FORMER AAF PERSONNEL ELIGIBLE FOR THIS HIGHEST OF ALL SERVICE AWARDS. IN WW II, MANY FOLKS AT HOME HAD NO IDEA OF THE DEPLORABLE CONDITIONS OUR POWs SUFFERED. SOUND LIKE 'NAM and THE POW/MIA SITUATION?

BELIEVE IT OR NOT, THESE ARE *ACTUAL* EXCERPTS TAKEN FROM A POW's "A WARTIME LOG"* (STALAG LUFT I) 24 FEB 44 - 8 MAY 45.

"LETTERS FROM HOME"

"I'm so glad to know that you can get sufficient college credits so you won't have to go back to school to get your degree"
LT. C.A.Z. FROM WIFE

"I am really worried about Adolph the cat. I took him to the vet yesterday and he said the cat's diet was insufficient"
LT. B.S. FROM SISTER



"Do you get to town often?"
LT M.C.L. FROM WIFE

"It must be nice to be able to play golf again"
CAPT. S.W.C. FROM WIFE

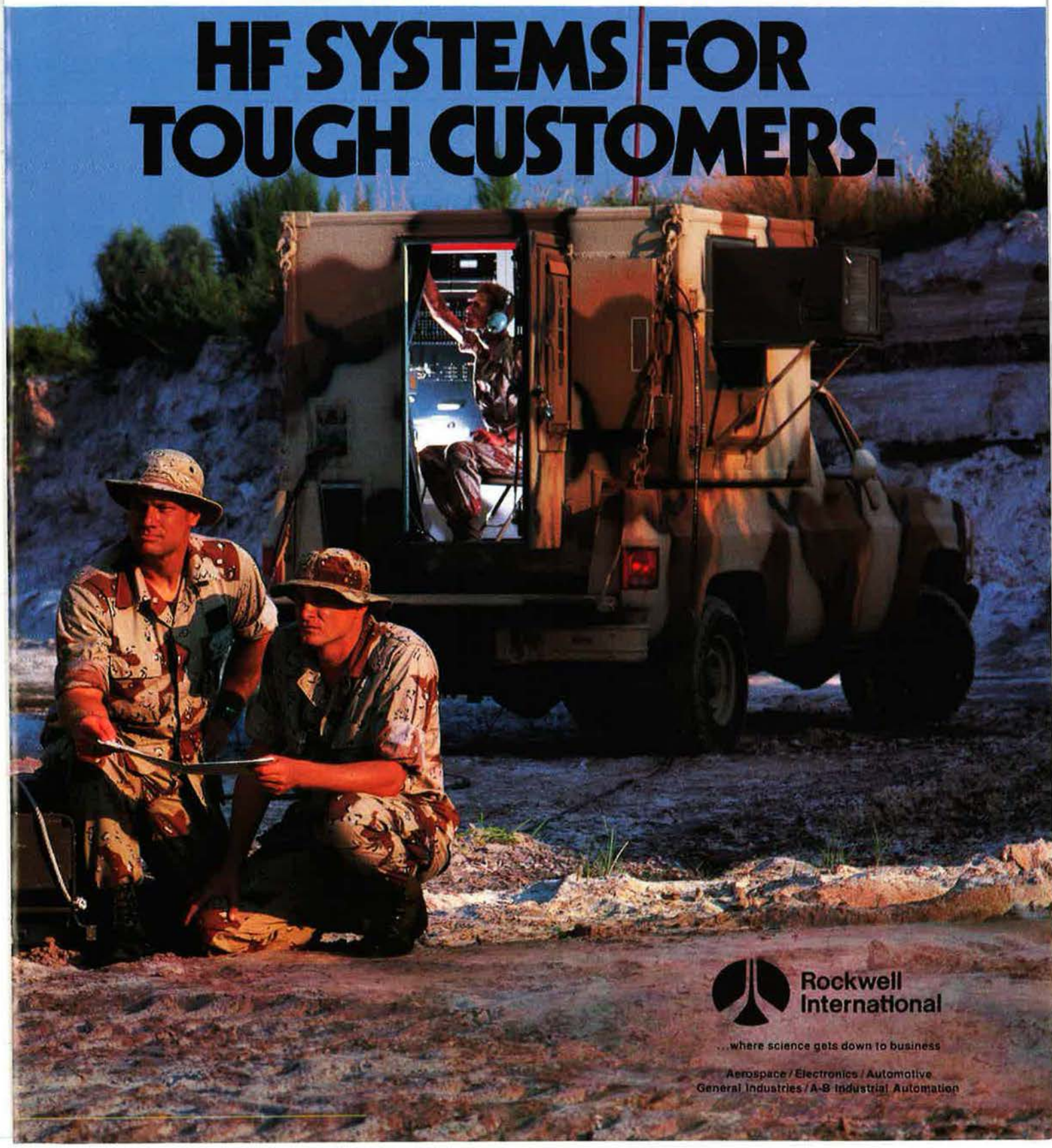
* ORIGINALLY, A 150 pp. BLANK, BOUND BOOK (TO BE FILLED IN BY THE RECIPIENT) AS A "PERMANENT SOUVENIR OF THE PRESENT UNPLEASANTNESS", COURTESY YMCA, GENEVA.

MANY THANKS TO MY OL' CLASSMATE AL BYRNE, LAWRENCE, IND., FOR THIS & MORE!

Bob Stevens

COLLINS HF SYSTEMS: The AN/TSC-60(V)7 is a field-proven, non-developmental item (NDI) HF radio system with rapid-response transportability ■ Currently deployed with the U.S. Rapid Deployment Forces, the rugged TSC-60 consists of the standard S-250 shelter and Collins high performance HF radios. ■ It provides a reliable, multi-channel, full duplex communication link for voice, teletype and data transmission, allowing direct access into the global Defense Communication System. ■ The TSC-60 can be set up and operated by one person in 30 minutes. And it can be transported by land, sea or air. ■ Tri-Service interoperable and designed with P³I, the TSC-60 is designed to meet the communication demands in some of the toughest tactical environments. For information contact: Collins Defense Communications, Rockwell International, 3200 E. Renner Road, Richardson, Texas 75081. U.S.A. (214) 705-3950. Telex 795-530. ■ **Collins Defense Communications: The Integration Specialists.**

HF SYSTEMS FOR TOUGH CUSTOMERS.



Rockwell International

...where science gets down to business

Aerospace / Electronics / Automotive
General Industries / A-B Industrial Automation

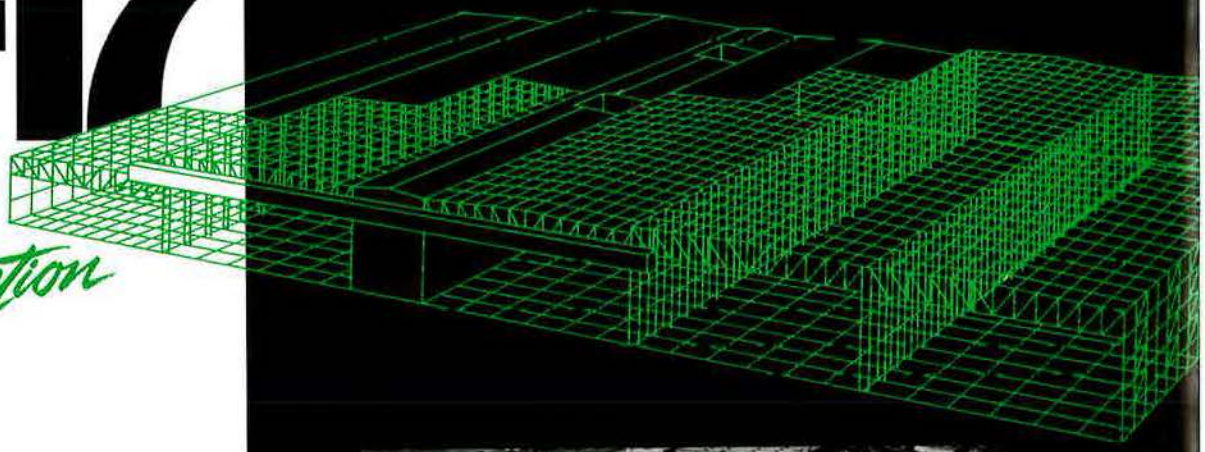
NEW FACTORIES FOR C-17 PRODUCTION ALSO WILL ADD TO NATION'S INDUSTRIAL MOBILIZATION BASE.

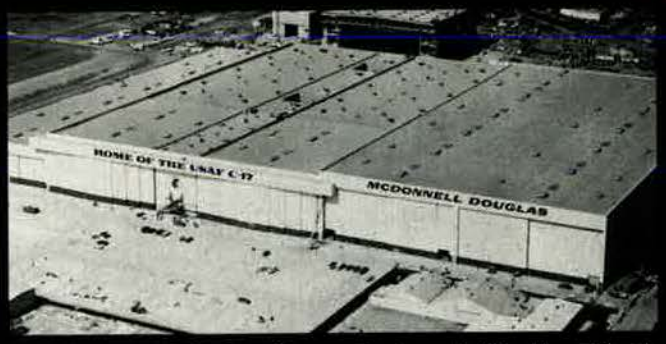
At Long Beach alone, we've added more than one million square feet of factory floor space—equal to 17 football fields—for C-17 airlifter production. While this plant capacity is needed for the C-17, it also serves as standby capacity if world conditions ever dictate a shift to massive, high-speed production of aircraft. McDonnell Douglas has committed $370 million in company funds for these modern facilities. That's construction—and commitment—with a capital "C."

MCDONNELL DOUGLAS

C-17

"C" as in construction





The eight-story, 700,000 sq. ft. expansion to our facility at Long Beach makes this one of the largest buildings in the western United States. It will house final assembly operations for the new airlifter.