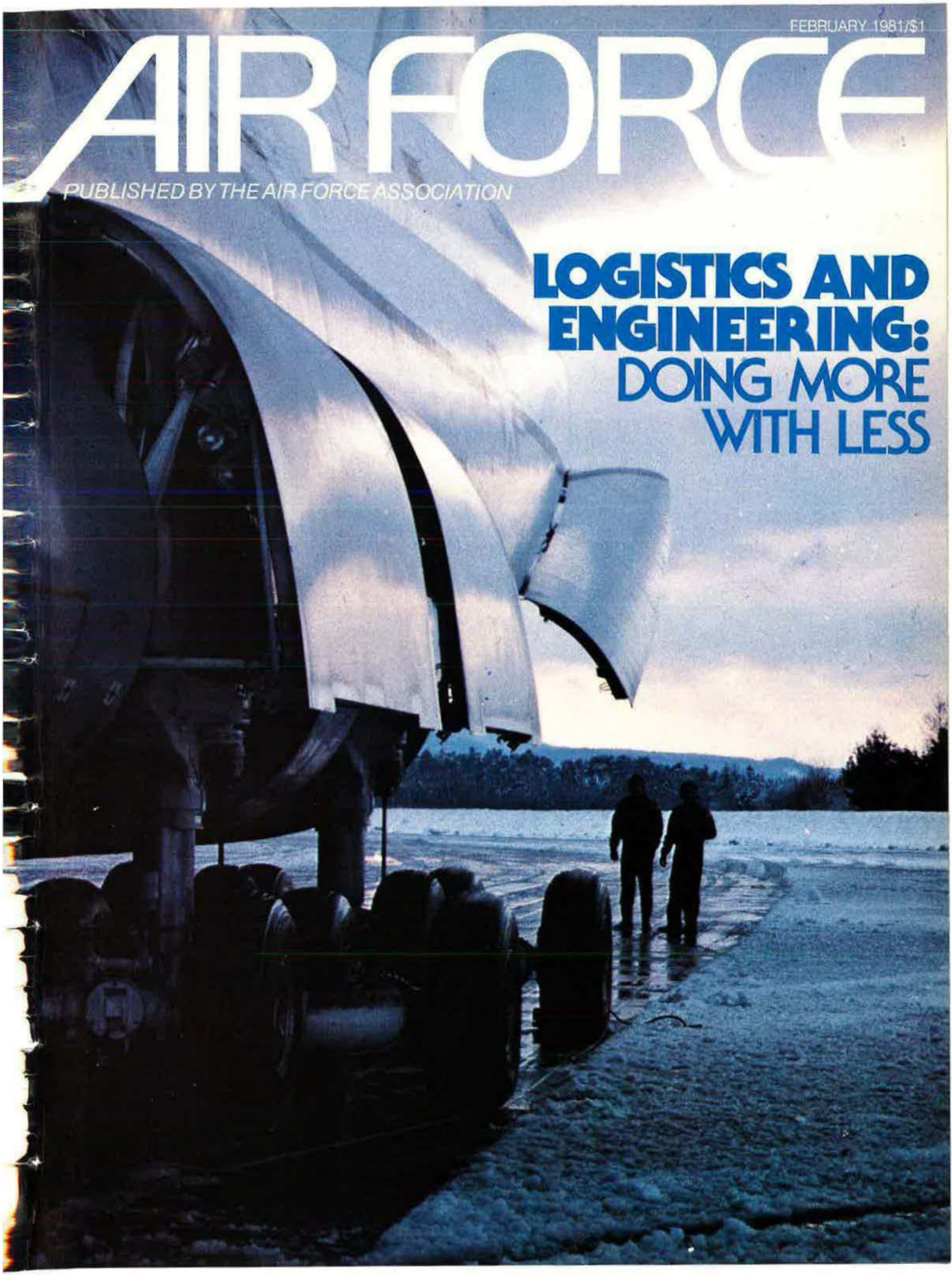
FEBRUARY 1981/$1

AIR FORCE

PUBLISHED BY THE AIR FORCE ASSOCIATION



LOGISTICS AND ENGINEERING: DOING MORE WITH LESS

AIRCRAFT EQUIPMENT DIVISION

F-15 flight control system... Doing its job.

GENERAL ELECTRIC

AIR FORCE
PUBLISHED BY THE AIR FORCE ASSOCIATION MAGAZINE

AIR FORCE Magazine (including SPACE DIGEST) is published monthly by the Air Force Association, Suite 400, 1750 Pennsylvania Ave., N.W., Washington, D.C. 20006. **Phone:** (202) 637-3300. Second-class postage paid at Washington, D.C., and additional mailing offices. **Membership rate:** $13 per year (includes $9 for one-year subscription); $36 for three-year membership (includes $24 for subscription). **Life Membership:** $200. **Subscription rate:** $13 per year; $25 additional for foreign postage (foreign postage has been increased 50% due to increased costs of international mail rates). Regular issues $1 each. Special issues (Soviet Aerospace Almanac, USAF Almanac issue, Anniversary issue, and "Military Balance" issue) $3 each. **Change of address** requires four weeks' notice. Please include mailing label. Publisher assumes no responsibility for unsolicited material.

(USPS 010-280)
BPA Circulation audited by Business Publication Audit

This Month

FEBRUARY 1981 • VOLUME 64, NUMBER 2

ABOUT THE COVER

C-5 90005 of the 436th Military Airlift Wing has landed and is ready to disgorge its cargo on a winter afternoon at Ramstein AB, Germany. Military Airlift Command's airlift is a key element in USAF logistics and engineering responsiveness, and the ability to manage shortages. (See p. 42.) (Photo by William A. Ford)

Departments

Home, Sw

eet Home, for the AV-8B.

It is a fact that tactics in wartime will increasingly be to immobilize air bases, and in one fell swoop to eliminate the enemy's capacity to retaliate.

Because when you wreck a runway, you virtually disable a nation's tactical, conventional airplanes. If they're on the ground, they can't get off. If they're in the air, they can't get home.

The vertical/short take-off AV-8B, however, is no conventional airplane. It is powered by a Rolls-Royce Pegasus vectored-thrust engine. And has a higher survival rate than most. It can take off quickly, and land on a space just 75 feet square. It can operate from a flight deck, a road, a grassy field . . . and a bombed-out air base.

So, in a war, the AV-8B could be your only military 'plane left operational at air bases in the combat zone.

ROLLS-ROYCE INC, 375 PARK AVENUE, NEW YORK, NEW YORK 10152.

ROLLS RR ROYCE

AN EDITORIAL

Doing Everything With Nothing

AT THE height of the strategic bombing offensive against Germany in the winter of 1943–44, the number of Eighth Air Force aircraft that could be committed to a given day's raids was limited by a quite unexpected factor. The experience is instructive for today's considerations of Air Force readiness.

The limiting factor was not the number of bombers. They arrived from Stateside production in sufficient numbers. (In 1943 and 1944, bomber production was 29,355 and 35,003 items respectively, most of them heavies.) Lack of trained aircrews was not the limiter at this time either; they were mass-produced on a scale matching aircraft production. Bombs and fuel did not limit sorties, either. So what was the limiter?

The unexpected limiting factor was a shortage of combat aircrew clothing. That's right; dictating the numbers of aircraft that could be dispatched were the shortages of the jackets, boots, gloves, helmets, and masks that allowed men to function in unpressurized, unheated aircraft four and five miles high where temperatures were always subzero and unprotected flesh froze in seconds.

The shortages were overcome. Other factors succeeded aircrew combat clothing in placing a ceiling on bomber sorties. But the experience indicates the underlying validity of the "horseshoe nail effect."

Of course, at least one factor will always impose limits on a military force. It may be fuel, as with Patton's Third Army racing for Germany in 1944; or port capacity, as the need to seize Antwerp; or political, as during Vietnam with the decision to avoid calling up reservists. But major limiting factors can be planned for and measures taken to operate within them, however difficult that may seem. It is the unexpected limiters—the horseshoe nails or electric flying boots—that damage military effectiveness unnecessarily.

Just now, for the Air Force a major limiting factor on peacetime readiness and wartime sustained fighting capability is a host of "horseshoe nails"—shortages of aircraft replenishment spares. The situation is not unexpected within the Air Force, as was the combat clothing. Aircrews and maintenance specialists have known it for years. They were the first to feel its impact, and have pointed out its damages.

But, thanks to a variety of reasons and excuses, the people who have to fly and fight have had to function despite the shortages. In the current cliché, they have had to "do more with less." The missions have been flown and the Air Force kept ready. That is more a tribute to the spirit, skill, and dedication of logisticians and line crews than to the political and budgeting systems that created the shortages.

Coping has in some degree made the situation worse. Because so many people have done more with less, the politicians and budgeteers seem to have gotten the erroneous impression that eventually everything can be done with nothing.

That is false, of course. The effects of such thinking are not. As flying hours were cut, pilots flew less and eventually left. As experienced maintenance NCOs had to work eighty-hour weeks to make up for shortages in parts and junior airmen's knowledge, they got fed up and left also. When wings were permitted to dip into war readiness spares kits for sortie surges, the results were hailed far and wide. Then outsiders seemed surprised that up to fifty percent of the fighting aircraft were not mission capable due to parts shortages.

Why should spares be so short? Aren't the needs obvious? Several answers can be put forward.

First reason is that the fleet is aging. Old airplanes break down more often than younger ones. At the end of FY '81, the supported aircraft force will average fourteen years of age. Although younger planes may fail less, if the failures occur differently than estimated on paper, parts shortages occur.

Fiscal constraints have held down spares purchases. In recent years they forced difficult decisions to emphasize force modernization at the expense of readiness. That meant developing and purchasing new aircraft, but giving up the money to buy enough spares.

Inflation got out of hand, slashing the buying power of the curtailed funds appropriated. The defense industrial base declined at the same time. That meant shortages of critical materials, doubled and tripled lead times for parts, and fewer producers willing to take the military business.

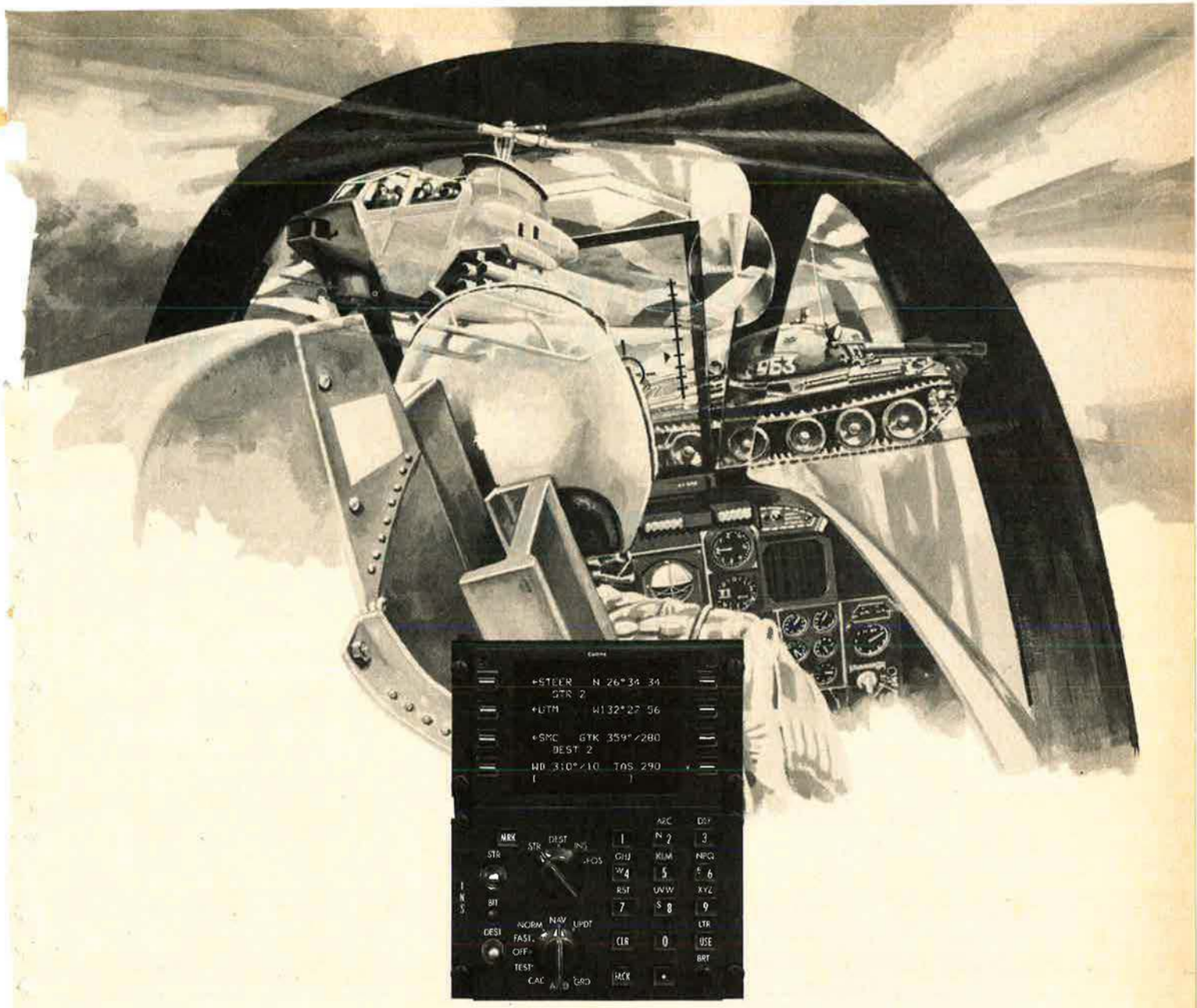
What is to be done? The Air Force leadership has taken the required first steps by focusing attention on the needs. That was done first within the Air Force, then externally to get the attention of the White House, Congress, industry, and the public as well.

Next steps are to authorize and appropriate money enough to meet the needs. That may not be impossible, but it will not be easy. The FY '81 USAF spares budget at $1.6 billion is an increase of 100 percent over FY '80. But that falls woefully short of requirements. They total $4.6 billion right now. The impact? If the USAF flying-hour program is to be supported in FY '81 at bare minimum readiness and mission needs, the operating commands will have to dip into their war readiness spares stocks in order to meet peacetime needs. That sounds very much like running in place, and it is.

To meet the real needs for aircraft spares, Congress should appropriate about $3 billion per year for the next several years, just to catch up. Even if that is done, the materials and production lead times mean that "get well" stocks will not reach wing parts bins until 1985 or 1986.

That means five more years of "doing more with less." It means that dedicated men and women in and out of uniform must continue their superhuman efforts to keep up the readiness needed for national interests. But it should not mean that they are forced to "do everything with nothing." That trend must be reversed, right now.

—F. CLIFTON BERRY, JR.



Think fast. Collins avionics management products let pilots do exactly that.

Pilot attention to the battle environment is one thing. Attention to the cockpit is another. Careful utilization of inherently compact panel space in attack aircraft facilitates both. And that's where Collins Avionics Management Systems can help.

These versatile systems provide compact control display units for helping busy pilots manage mission information. Radio, navigation, stores management — it's all there in a way that's easy to understand, easy to control, and therefore, easy to manage.

And it isn't just integrated control and display. It's integrated processing, too. TACAN talks to inertial. Laser talks to Doppler. Navigation talks to fire control — all in MIL-STD-1553 — in microseconds.

Collins avionics management products. Versatile enough to do the managing and integrating so pilots can do the thinking.

For more information, contact Collins Government Avionics Division, Rockwell International, Cedar Rapids, Iowa 52406. Or call (319) 395-4412.

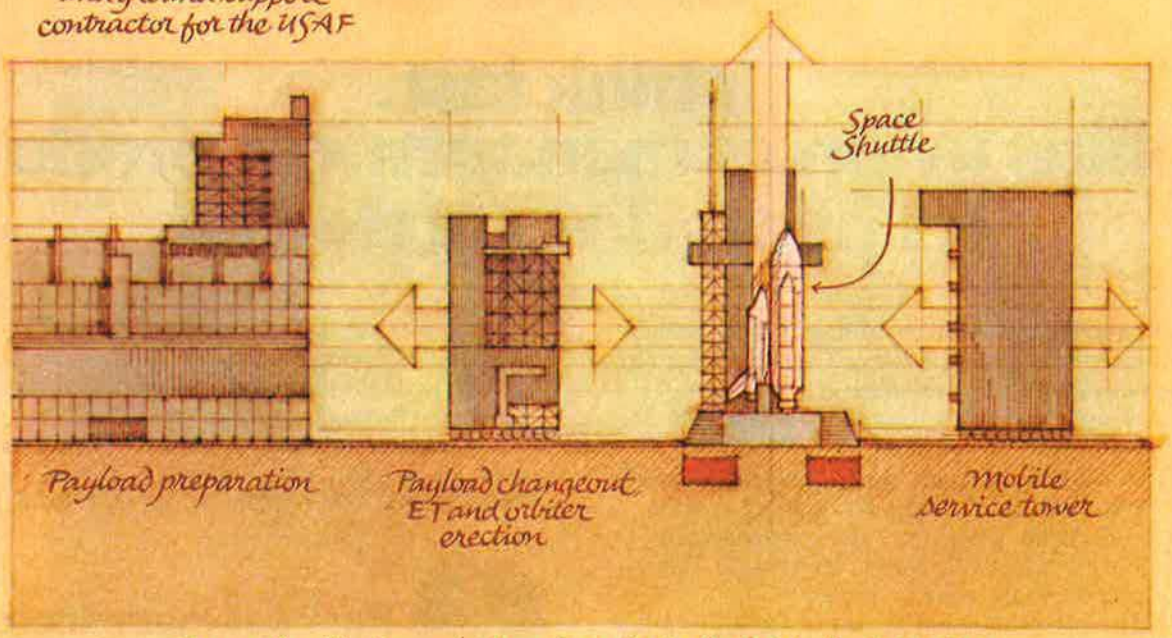
Rockwell International

...where science gets down to business

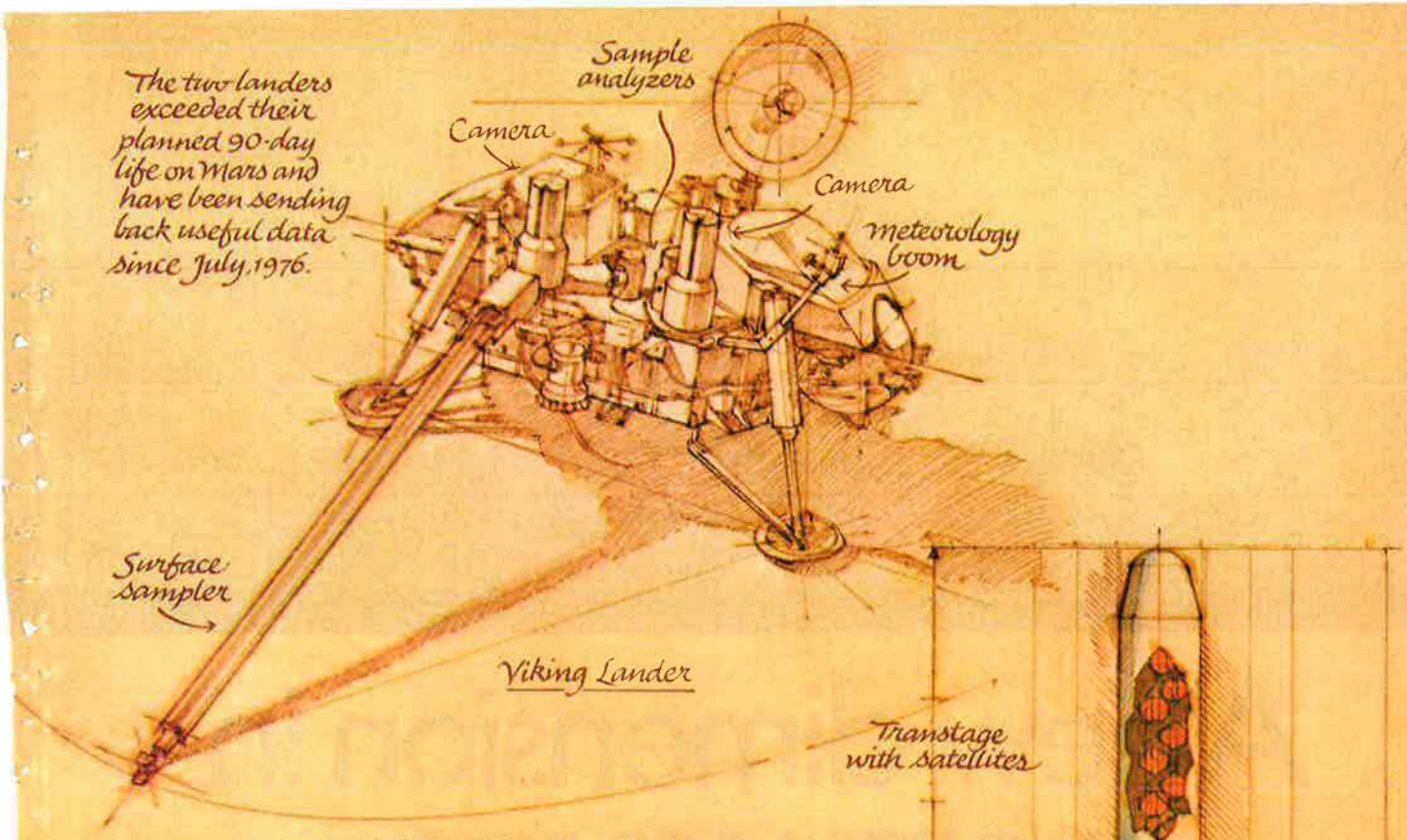
What does it take to be a successful systems integrator?

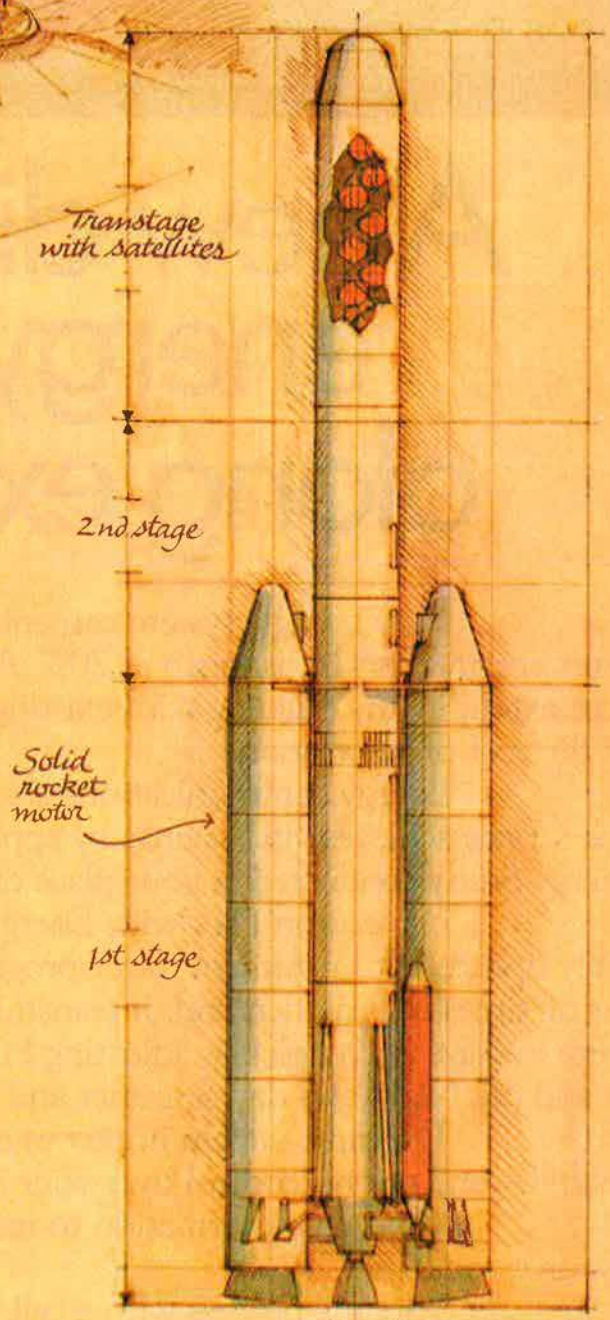
Know-how.

Martin Marietta is the Shuttle payload integrator and ground support contractor for the USAF



Space Shuttle Launch Complex at Vandenberg Air Force Base





Titan IIIC

Basic vehicle for launching spacecraft and satellites.

For over thirty years, Martin Marietta has developed and engineered systems for many of our nation's most successful launch vehicles, spacecraft and defense systems.

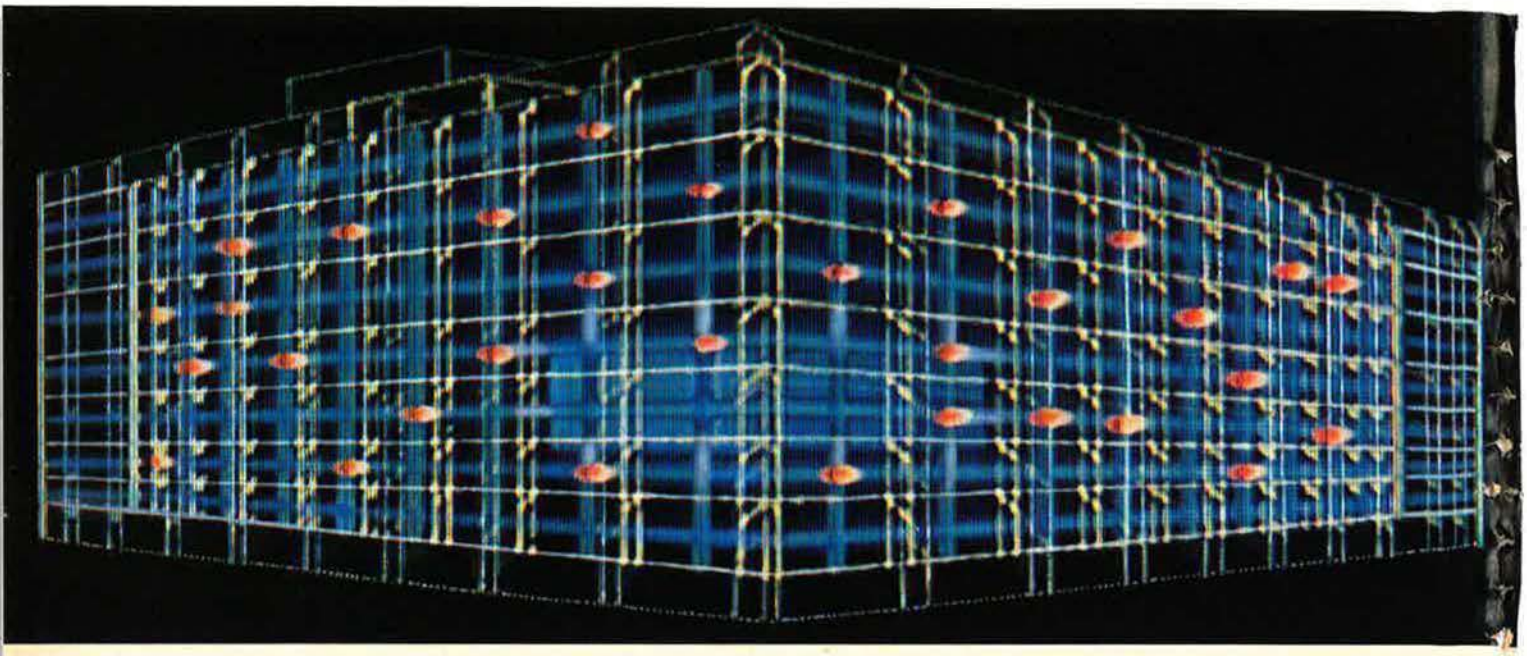
They range from the family of Titan launch vehicles and the historic Viking landings on Mars to the Pershing tactical missile and the revolutionary Copperhead, a laser-guided artillery projectile.

As integrating contractor we perform a tightly structured set of interlocking activities for the development and deployment of these complex systems. Our role encompasses defining all system requirements, interfacing procedures and operations, facilities, software, airborne and ground equipment. It also involves working with numerous government agencies and coordinating associate contractors. In addition, we also design, engineer and build much of the major hardware.

Today we're involved in hundreds of significant programs for DOD and NASA. And we are ready to continue in the development and management of other systems required for space exploration and defense in the years ahead.

MARTIN MARIETTA

Martin Marietta Aerospace
6801 Rockledge Drive, Bethesda, Maryland 20034



A new dimension in energy savings along existing lines.

Now a single system can enhance your communications capabilities and lower energy costs by as much as 20%. And that single system is already wired to a large extent in any building with existing telephone lines, so you also save considerably on the cost of installation.

Energy communications is an innovative offering from the Bell System. The service achieves vital savings by applying the specific strategies of a Bell System Energy Study conducted at your place of business.

Dimension® PBX with Energy Communications is easy to operate and easily updated. It implements your programmed "on-off" cycles and load-shedding during times of peak demand. It transmits signals to units that help prevent energy waste in ways as complex as adjusting HVAC systems and as simple as turning lights on and off. Night and day. Summer and winter.

The same system improves overall productivity by providing more flexibility and greater control over your internal and external communications.

Managing information to manage energy means getting the most from the resources on hand.

Start the process with a call to your Bell System Account Executive.

The knowledge business

AIRMAIL

UPT for Engineering Students?

I was very interested in your article, "Engineering a Response to the S&T Shortfall," p. 69 of the October '80 issue.

I was a graduate of AFIT and worked in the 28XX career field at the Fighter Weapons School, Nellis AFB, Nev., and at Hq. TAC. Both assignments demanded more than the normal eight-hour-day routine. It was not uncommon to be at the office late or flying a test mission on a weekend because of the urgency to complete a project or prepare a briefing for a visiting higher headquarters type.

But the self-satisfaction of knowing that you helped to accomplish a project that contributed to the Air Force mission made it all worthwhile. The "icing on the cake" was being able to fly on the test mission or, while at Hq. TAC, being able to recommend alternatives to proposals based on personal flying experience.

Currently, my son is a first-year engineering student at the University of South Carolina, enrolled in the AFROTC program and an alternate on the AFROTC scholarship program. He wants to be an Air Force fighter pilot. However, he has been told that he will not be eligible for a pilot training slot if he accepts a scholarship as an engineering student.

Does the Air Force really believe it can keep an engineer in the service, as a career, if nonrated and otherwise underpaid as compared to his civilian counterpart? A special bonus (temporary, depending on availability of funds) for "selected S&T officers" will work about as well as it does for the Air Force medical doctors—still a shortage. Using civil servants in S&T positions will help fill shortages, but I'll guarantee you that it will be nearly impossible to get them out on a weekend or stay in the office after 5:00 p.m. to finish a project.

I suggest that the Air Force put qualified AFROTC engineers in the pilot training program and let them fulfill the required cockpit duty. Then screen them for assignment to continued education or refresher training at AFIT. Also, the Education With Industry (EWI) program could be pumped up.

As a taxpayer, I would rather see my money go toward a long-range solution to the S&T and pilot shortage rather than to the "quick-fix" fill-the-slot program being considered.

Col. Karl S. Park,
USAF (Ret.)
Ligonier, Pa.

• *The Air Staff responds: "The Air Force has no need to spend scarce funds to attract would-be pilots; it has more than enough well-qualified pilot applicants. Not so with potential engineers—it is having a terrible time attracting enough of them. So it is using nearly all its scholarship money as bait for them. There is only so much scholarship money and the Air Force feels this course is the way to go. Also, DoD insists on this route.*

"The Air Force welcomes people who are both pilots and engineers, and the young man can become both if he forgets about the scholarship.

"As for more AFIT and EWI training—Congress has drastically curbed such funds in recent years. The House Appropriations Committee is not likely to approve of the Air Force giving scholarship money to pilot trainees when, in fact, they are knocking down the doors to get in the Air Force."—THE EDITORS

Expeditionary War?

I am a taxpayer and am engaged in the defense industry. I believe the paramount responsibility of the Air Force is to preserve this nation from armed aggression, to which all other concerns must be secondary. I, therefore, am voicing my objection to the statements of Gen. Lew Allen, Jr., who, in his address to AFA, advocates an expeditionary war in Southwest Asia as a way of checking Soviet aggression.

On the face of it, this tactic is untenable. General Allen himself admits that such adventures must be postponed until the United States has redressed the strategic balance by deployment of the MX system. Currently, IOC for MX is scheduled for 1986 or possibly later, depending on delays. This schedule gives the Soviet Union most of a decade to (a) execute a *fait accompli* in the Gulf region, (b) develop strategic countermeasures of a destabilizing nature, or (c) interdict all shipping to and from the Gulf by forward deployment of Backfire bombers in Afghanistan, the Horn of Africa, Mozambique, and Vietnam. Under these conditions, the mounting of an expeditionary campaign would be nothing short of suicide, an empty gesture of enormous cost.

Furthermore, the alleged "national interest" motivation is unconvincing. The Gulf region represents a minor fraction of the petroleum that we import. Interruptions in the petroleum supply, *for whatever reason*, do not mandate a military response. The petroleum production of Iran and Iraq is already largely destroyed. The production from other Gulf nations could easily be interrupted in the next six years as a result of possible domestic upheaval or border warfare. In some cases, production may dwindle from depletion of oil reserves. Or, lastly, OPEC could impose an embargo against the West to promote resolution of the Palestinian issue. These events are distinct possibilities in the near term, and we would be powerless to intervene before our strategic shield is repaired.

General Allen is advancing a possessive view of other nations' resources that is disturbingly similar to the doctrines that Japan used to rationalize conquest of Asia in the 1930s. If an interruption of these resources is conceived as a problem, then it follows that a direct answer would be for the United States to rapidly develop domestic energy resources for home use and export. This approach would totally negate any Soviet hegemony over the Gulf region by realigning the West toward a self-sufficient energy market. The military solution that General Allen envisions is not only ineffective and inappropriate—it is inimical to the tradition of US neutrality in the affairs of other nations.

While it is obviously necessary for

the Air Force to enhance its air-superiority assets and strategic response capability in order to defend the nation, it is totally inadvisable to engage in a massive materiel buildup for the sole object of being needlessly expended in a fight for territoriality with the Soviet Union.

As a loyal citizen, I object to such thoughtless and wasteful bellicosity.

Michael J. Dunn
Federal Way, Wash.

Airship Author Reply

I would like to reply to Mr. Gibbens's letter, "Airships in Our Future?" [p. 16, December '80], concerning my paper "Lighter-Than-Air Craft for Strategic Mobility."

Some of your readers may have incorrectly assumed that I advocated airships as an alternative or adjunct to the CX; however, that is not the case. The paper I presented explored the characteristics of airships and examined their potential contribution to strategic mobility. I concluded that the cost and risk inherent in an airship program would be excessive for the military to pursue unilaterally; however, a development program might be feasible if a commercial airship transportation industry were to evolve. This could permit a sharing of R&D costs and the possibility of a CRAF arrangement.

I also concluded that there are many unanswered questions concerning the use of airships for strategic mobility that would need to be answered before they could compete successfully with more conventional programs for funding.

However, airships do provide some interesting far-term possibilities that should not be overlooked.

Lt. Col. George A. Pasquet, USAF
Belleville, Ill.

Irrational Money Management

The "Capitol Hill" section of your November 1980 issue had a lead article titled "MX Hit," which covered a possible funding cut for the MX R&D program in FY '81. One reason given by the House Appropriations Committee (HAC) for the recommended reduction was that the Air Force "had leftover funds from FY '80." The Air Force's counter to that statement was that it was "misleading" since all FY '80 money would be "obligated by the end of the fiscal year." Something is wrong!

Let us take a simple example based on the reasoning contained in the two positions. I get paid $100 a week. What if someone told me that I had to spend every cent of that $100 or I would get less the next month? What if any raise was predicated on my spending all of my previous earnings? Seems like a pretty stupid situation, doesn't it? No incentive to save or manage money wisely! Well, that is exactly the position in which the HAC has put the Air Force, and the Air Force continues to play by those rules.

I was first exposed to this irrational money management scheme as a second lieutenant in 1970 when our organization "saved" $2,000, but was told one week prior to the end of the fiscal year to obligate $5,000. Most recently, I witnessed the repaving of perfectly serviceable roads for the apparent reason of obligating all FY '80 funds.

What happened to zero-based budgeting? . . . I just cannot understand a system that forces spending to a predetermined level and carries with it a negative connotation if, for whatever reason, the total funds obligated are less than the funds requested.

Maj. L. E. Kalinowski, Jr., USAF
Gunter AFS, Ala.

AIRMAIL

General Andrews

About Lt. Gen. Frank M. Andrews ["Airpower Pioneer: Lt. Gen. Frank M. Andrews," p. 102, September '80 issue]: [I have] an aeronautical RAF (WAR) map of Great Britain that shows RAF station 280 as Andrews Field (forty-four statute miles and 057° from Northolt). An Air Force general once told me that the British named the base for General Andrews, and that it was the only RAF station designated "Field".

Lt. Col. Thomas F. Corrigan, USAF (Ret.)
Colorado Springs, Colo.

While doing duty as a B-29 left gunner in the 39th Bomb Group based on Guam from April to August 1945, I remember clearly that our intelligence briefing officer informed all the assembled crews that "the mission would be named and flown in honor of General Frank Andrews who had been killed in line of duty in Iceland."

His accomplishments and sacrifice were told to us and later as we climbed aboard our aircraft I know every crewman was quite impressed and determined to do his very best.

As I write this I have in front of me my Record of Combat Duty but, after so much time, I cannot recall the exact date of the mission that was flown in the General's honor. I believe that it was a "maximum-effort" mission flown during daylight hours. Perhaps a military historian might know more. It took place in late April or early May of 1945.

Lt. Col. Richard B. Vogenitz, USAFR (Ret.)
Oceanside, Calif.

Restoring Dignity

General Milton's essay about restoring dignity to military careers was well taken [p. 44, October '80]. The paragraph with the words, "familiarity breeds" sort of jumped at me, for he had failed, for some reason or another, to complete the old adage which is: "familiarity breeds contempt."

This ancient advisory awakened a memory that took me back across many years and social changes (from which the Air Force was not exempt) to just after the war. The executive officer of a fighter squadron that I was assigned to seemed friendly enough but aloof on most occasions. One day in the orderly room I asked why he didn't socialize with the rest of us fighter jocks, to which he replied "familiarity breeds contempt." I was stunned by this rather abrasive retort, which was said, incidently, loud enough for the first sergeant to hear. It has stayed with me through the years, and the major was absolutely right.

Of course, you're not going to win many friends practicing this sort of thing unless it's done right. In the early years of World War II, President Roosevelt said to General Marshall during a quiet session in the executive office, "Why don't you call me Franklin?" General Marshall replied, "Yes, Mr. President."

There was no question in the General's mind where the line should be drawn in regard to rank.

James L. Brooks
Los Angeles, Calif.

Backing Up the B-32

The various letters appearing in the "Airmail" department of the November issue concerning the B-32 reminded me of my first acquaintance with that bird.

While an instructor in B-29s at Biggs Field, El Paso, Tex., I was pulling duty as Tower Officer one quiet Sunday afternoon in August 1945 when the drowsy silence of the tower was interrupted by some aircraft requesting permission to back up on the ramp.

ON-THE-GROUND TESTING FOR IN-THE-AIR EFFICIENCY.

The MIL-STD-1553 A/B Data Bus Monitor/Controller (DBMC™)

Fairchild goes a long way to maintain confidence in the performance of today's aircraft. Our DBMC is the most sophisticated portable tester of MIL-STD-1553 bus activity. It combines the functions of monitor, controller, and remote terminal to quickly isolate and analyze hard-to-find errors. Its standard features include RS-232 interface, high-speed data port, message format generator, and error time analyzer. It is flexible, easy to operate and available now. For more information, contact Director, Avionics Marketing, Fairchild Space & Electronics Company, Germantown, MD 20767. Tel: 301/428-6477. TWX: 710/828-9700.

FAIRCHILD
SPACE & ELECTRONICS COMPANY
WHERE THE SKY IS NOT THE LIMIT

Plane talker.

Safety...mobility...safety.

The AN/ARC-188... A wireless intercom system based on a lightweight transceiver that's as easy to handle as a flashlight. With no cables to get tangled. For mobility that cuts flight line logistics and aircraft launch time . . . safely.

Use any one of 3 preset channels selected from 400 fully synthesized UHF/FM channels. Inside or outside the aircraft with a range up to 300 feet.

Developed under contract to the U.S. Air Force Systems Command, the AN/ARC-188 is currently undergoing IOT&E.

Modular design and worldwide parts availability mean cost-effective intercom operation. Use it anywhere. Loading or unloading cargo. Aircraft towing. Or monitoring takeoffs and landings.

For more information call 602/949-2798 or write to Motorola's Government Electronics Division, P.O. Box 2606, Scottsdale, AZ 85252. And make sure to ask about in-flight refueling applications.

Holstered for ease of operation.

Other offices: Kuala Lumpur • London • Paris • Rome • Rolandseck • Tokyo • Toronto • Utrecht.

MOTOROLA

Making electronics history.

After a moment of looking at each other searching for an appropriate answer, the controller picked up the mike and announced that "any ship on the ramp that can back up has the tower's permission to do so."

Sure enough—a B-32 backed out of its parking place on the ramp in the first display of reversible pitch props we had ever seen.

Biggs Field must have been a haven for such oddities because it was either later that same day, or another such otherwise peaceful Sunday, that some Marine jockey taxied to the takeoff end of the runway in a Ryan "Fireball."

As you may remember, the Fireball was a fighter furnished with a jet engine in the tail and a conventional engine with prop up front. Not many were built.

The Fireball had been sitting there long enough to be forgotten and finally noticed again, whereupon the tower inquired as to whether the aircraft was experiencing any difficulty. The answer was considerably garbled, but since there appeared to be no emergency in progress, we could only conclude that the pilot was exceptionally busy in the cockpit.

Shortly thereafter there issued from the tail of the aircraft a large billow of black smoke followed by a shaft of flame twice as long as the airplane. This could be a matter for concern. However, this event only led to the Fireball's pilot cheerfully announcing to the tower, "Hot dog—I'm cookin' now! Give me the word and I'll make like a bird!"

Naturally, the tower responded with "Roger. You've got the nod. Get off the sod!"

Lt. Col. Forrest L. Bishop, USAF (Ret.)
Silver Spring, Md.

I enjoyed the story about the B-32 *Hobo Queen II,* ["About That B-32 on Our Front Cover," p. 37, September '80], although until I read it, I had thought the last official bombing mission of World War II was a strike by the 40th Bomb Group (VH) against Hikari Naval Arsenal on August 14, 1945. Coincidentally, the mission also was one of the most accurate bombing missions of the war.

I flew the strike as the bombardier aboard *Sleepy Time Gal,* a B-29 of the 44th Squadron. The 40th was part of the famous 58th Bomb Wing, which also flew the first B-29 strike against mainland Japan (an attack on the Imperial Iron and Steel Works at Yawata) that left a lot to be desired.

Bob Brumfield
Cincinnati, Ohio

AIRMAIL

Schweinfurt-Regensburg Raids

I am writing a book on the famous Eighth Air Force missions to Schweinfurt and Regensburg flown on August 17, 1943. This new book will be part of my series of air operations studied in great depth from the Allied and German sides, and it will be published on the fortieth anniversary of the missions.

I shall be carrying out an extensive interviewing tour of the United States some time in 1981 and I would like to make contact before then with as many as possible of those B-17 and P-47 crews who flew on these missions. If any readers can help me, could they please write to me giving, initially, just their name and present address, their unit in 1943, and their aircraft captain's name. I would be particularly grateful if surviving members of those B-17s shot down that day would write to me. I also hope to hear from officers who helped plan the missions, even though they did not fly on them.

I would like to say that I will only be asking for a limited amount of information from each person.

Martin Middlebrook
48 Linden Way
Boston
Lincs. PE21 9DS
England

Allison T38/T40 Turboprop Engines

"Yesterday's Dreams" is the intended title for the documented history of the Allison T38/T40 turboprop engine and the aircraft they powered. The Air Force aircraft that utilized these powerplants were experimental in nature, and material and data, as well as photographs, on the test programs and their results are scarce. If anyone has any material, photographs, anecdotes, or knows of anyone associated with these projects, would you please contact me? All material will be promptly copied and returned with credit given.

The T38 aircraft were the Piasecki YH-16A Turbo-Transporter and the McDonnell XF-88B. The T40-powered aircraft that I am sorely in need of material for are the Hiller X-18 and the Republic XF-84H, unofficially nicknamed the "Thunderscreech."

Two individuals I would particularly like to make contact with are R. K. Ransone, believed to be the XF-84H project officer, and then-Maj. Robert Baldwin, who test-flew the Curtiss-Wright X-19.

Thank you for your assistance.

Richard C. Koehnen
1138 102d St. W.
Inver Grove Heights, Minn. 55075

Air Transport History

As Secretary of the Modern Transport Technical and Historical Society and Editor of the *Military Transport Section,* I am researching US military air transport, mainly MATS and MAC, for an upcoming article in our journal, and eventually a book.

What I would like to ask of readers is data concerning personal experiences and technical and historical aspects of this subject. Photos of aircraft, crews, and quarters would also be appreciated. With the help of the dedicated men who flew these noncombat aircraft in very hazardous conditions, I hope to show the full spectrum of this unsung service.

Please forward all information to:

Jerry L. Eden
232 S. Azusa Ave.
Azusa, Calif. 91702

P-51 Mustang Directory

I have recently been appointed Official Rockwell International Historian on the North American Mustang.

I am currently trying to compile a "Mustang Directory"—a list of the units that individual aircraft served with. Although official individual aircraft record cards are available, much information is missing from them.

I would very much like to hear from pilots with information on their personal aircraft. I need to know the USAAF serial, any names/codes where possible, and the fate of the aircraft if known. Photographs would be welcome and promptly returned.

I should also like to hear from ground crew who worked on P-51s—any variant from A-36 through to the F-82 Twin Mustang—and any Theater of Operation.

If you want your Mustang to be recorded in the History books, please contact me at the address below:

Paul A. Coggan
55 Akrotiri Square
RAF Watton
Thetford
Norfolk IP25 6HZ
England

Raids on Dresden

I have been commissioned by my London publishers to write a book about the raids on Dresden on February 13–14, 1945.

To complete the testimony of many eyewitnesses who were either on or

near the target, or in the air with the RAF, I am seeking evidence of the American participation in these operations, particularly from the bomber crews and the fighter groups.

I should like to contact anyone with a good memory of the event. Any documents or photographs lent would be copied and returned, and of course all assistance will be acknowledged in the book.

Alexander McKee
26 Meath Close
Hayling Island
Hants. PO11 9QN
England

American-Occupied London

Currently, I am under contract to write a nonfiction account of "American-Occupied" London during the Second World War, between 1942 and 1945. When I return to England, I shall get in touch with the "Friends of the Eighth" to inquire about the English point of view of the Yanks, but right now I am interested in the American point of view of London.

I would appreciate hearing from any readers who were stationed at airfields such as Horsham, Thorpe Abbotts, Steeple Morden, Great Ashfield, or Hq. at High Wycombe or Bushey Hall. Comments on the climate, recollections of any air raids while on leave in London, memories of any memorable fighter or bomber missions over enemy territory, and anything—pro or con—about England in general and London in particular are what I am looking for.

Personal details such as unit, duty station, and rank held at the time would also be a great help.

David Johnson
2164 Stecher Ave.
Union, N. J. 07083

USAF in France

I am a contributing editor of the French military aviation review *Air Fan*. At the beginning of last year, I published a story on Phalsbourg AB, which used to be one of the numerous USAF air bases in France. The story was appreciated and we received many letters from readers asking for more stories of this kind.

I now plan a story on another ex-USAF base in France known as Toul-Rosieres AB. The base was opened in 1954 and closed in 1966, but through these years it saw many units and aircraft. I would like to ask for the help of any readers who have been stationed there and who could tell me something about the air base. I am looking for material suitable for publishing: slides or photos of aircraft, people, or the base itself. All published pictures will be properly credited and returned.

Many thanks to all AIR FORCE Magazine readers. The USAF in France is an untold story, and something has to be done about it. We are working hard to make it known!

Jean Pierre Hoehn
92, avenue Jean Jaurès
67100 Strasbourg, France

AIRMAIL

Convair Deltas

I invite anyone who flew, maintained, or otherwise served with Convair YF-102s, F-102As, B-58s, and F-106As to contact me if they have any anecdotes, reminiscences, or photographs they would care to share.

I am currently writing a book entitled "The Delta Dazzlers," that will cover those aircraft in depth from a historical, operational, as well as a technological standpoint. Also included in the book will be the other Convair Deltas, the XF-92A and the Navy's XF2Y-1 Seadart and XFY-1 Pogo.

Suppliers of information used will receive full credit in the book, of course. Also, any photographs or other material will be promptly copied and returned along with repayment for postage used for their submission.

I sincerely hope to hear from readers to assure that the Convair Deltas are presented in an accurate and interesting manner.

Charles A. Mendenhall
P. O. Box 2726
Rochester, N. Y. 14626

Air War College Alumni

The Air War College classes of 1974, 1979, 1980, and 1981, and current faculty, have formed an Alumni Association of the Air War College.

The Alumni Association is to foster and strengthen a spirit of loyalty and fraternity among AWC resident and nonresident graduates and promote continued interest in, as well as support for, the activities of the Air War College.

Initial programs to be undertaken by the Alumni Association include a graduate address directory, newsletter, and Founders Day luncheons.

Founding memberships are available now through March 12, 1981, which is Founders Day, when the Air War College will celebrate the thirty-fifth anniversary of its existence.

Graduates of the Air War College resident or nonresident programs may obtain membership information by writing to:

Alumni Association of the
Air War College
AWC/AAF
Maxwell AFB, Ala. 36112

Weaponry Exhibition

The International Costume Exhibition is presently requesting donated weaponry that has been used from the American Revolution through the Vietnam era. These items will be displayed along with uniforms in a separate twelve-foot-long, glass-enclosed showcase. The weaponry will become the property of the South San Francisco Unified School District, thereby preserving these items for present and future generations.

We would also be appreciative of receiving any weaponry that was captured from the enemy during these times of hostilities. Along with these items I would appreciate a history of the weaponry if available and a photograph of the donor, which will be included with the exhibition.

Our 17,000 school children and approximately one-half million students enrolled in the San Francisco Bay Region school system will have the opportunity to view these items during the academic year. During the summer months the weaponry and uniforms will be on display at the San Mateo County Fair and the California State Fair in Sacramento, Calif.

Patriotism is indeed alive and well. We are honoring all our service personnel who have served their nation with honor and distinction, at times with the supreme sacrifice.

Dr. Ray L. Ferguson
Project Director
International Costume Exhibition
400 B St., S.
San Francisco, Calif. 94080

CAF B-26 Restoration

The Confederate Air Force Ghost Squadron is a collection of WW II vintage aircraft that have been restored to flying condition. This is no small feat considering the planes had not flown in more than thirty years. Restoration is an on-going project for a number of CAF warbirds.

One of the most difficult problems encountered on the restoration projects is locating parts. The CAF is currently restoring a Martin B-26 and is in dire need of items for completion of this project. The CAF would be most grateful if anyone could assist us in locating these items.

SCIENCE/SCOPE

The F-15, the most capable air force fighter in the world, will be further improved with an advanced long-range AN/APG-63 radar with SAR (synthetic array radar) modifications. With SAR the F-15 Strike Eagle becomes an even more capable weapons system which can fly attack missions against ground targets in all weather, such as the notoriously inclement weather of Europe. Using SAR to analyze radar signals reflected from the ground -- at distances of over a hundred kilometers -- the system can display extremely high resolution images, providing designation of objects and/or features down to 10 feet in size. The images are shown to the operator as if seen from directly overhead, in contrast to the perspective distortion of the view from the cockpit or electro-optical sensors.

The Strike Eagle's radar can designate moving objects, such as tanks and trucks, as blinking symbols; and provide terrain following and avoidance information to the autopilot so the aircraft can fly safely at very low altitudes. A Strike Eagle could operate about 95 percent of the time in Central Europe in winter, compared with about 59 percent for an aircraft equipped with an infrared visual system, and only about 20 percent with daytime visual. Hughes supplies the APG-63 radar to McDonnell Douglas Corp., builder of the F-15.

For the first time, a new battlefield data distribution system will provide an integrated capability for data communications, position location reporting, and identification for ground and air units. The secure, jam-resistant system, being developed for the U.S. Army, is called PLRS/JTIDS Hybrid. It combines and expands the proven capabilities of two high-technology systems -- PLRS, the Army/Marine Corps Position Location and Reporting System, and JTIDS, the Joint Tactical Information Distribution System. Hughes has entered the second phase of a five-phase accelerated development plan designed to meet the Army's critical need for reliable battlefield data communication by the mid-1980s.

In the first firings of TOW antitank missiles from a British Army Lynx helicopter, a gunner using a new roof-mounted telescopic sight scored all hits. The firings were part of a joint test program conducted by Westland Helicopters and British Aerospace Dynamics Group prior to installing airborne TOW systems on Lynxes now in service. The TOW system, including the roof-mounted sight, is produced in the United Kingdom by British Aerospace under license from Hughes. Westland builds the helicopters. TOW (Tube-launched, Optically-tracked, Wire-guided) systems have been selected by air and ground forces of 30 nations.

Transmitting the entire Encyclopaedia Britannica in just two seconds would be possible with technologies being perfected at Hughes for increasing data rates of communications satellites. Experimental hardware -- including signal processors, switches, and logic circuits -- has demonstrated rates up to 4 billion bits per second while using but a fraction of the power of conventional equipment. Satellites carrying these components and using time-sharing techniques would need only one transponder to carry thousands of telephone conversations, computer data links, and TV channels among scores of cities simultaneously.

PHANTOMS

& BEDEK

A Partnership of Long Standing

Bedek knows the F-4 Phantom. Total Phantom support at a single site: Bedek Aviation is the best-equipped, most knowledgeable maintenance facility in Europe and the Middle East.
For more than a decade, Bedek has been supporting the F-4 Phantoms of the Israel Air Force in depot-level maintenance, overhauling J-79 engines, components and avionics. Bedek has a skilled workforce of 4,000 engineers and technicians—and decades of experience serving the world's air carriers as well as the Air Forces of Israel and other countries, including the U.S.A.

Bedek is approved by many of the world's National Aviation Authorities: Israel's CAA, the United States' FAA, Federal Republic of Germany's LBA, United Kingdom's CAA.
Working with the USAF for many years, we understand the USAF contracting process and are familiar with the Engineering Change Proposal (ECP) and Technical Order (TO) Implementation procedures. Our Quality Assurance fully conforms to MIL-Q-9858A.
For the US Air Force, working with Bedek makes good sense. Bedek's convincing performance on previous USAF contracts, its proximity to US bases in Europe and the Mideast, and an on-site USAF-Office are advantages not to be ignored.

Bedek knows Phantoms.

IAI

ISRAEL AIRCRAFT INDUSTRIES LTD
BEDEK AVIATION DIVISION

Qualified by McDonnell Douglas and General Electric.

Ben Gurion International Airport, Israel.
Tel. 973111. Telex: ISRAVIA 031102, 031114.
Cables: ISRAELAVIA.
New York:
Israel Aircraft Industries International Inc.
50 West 23rd Street. N.Y. 10010.
Tel: (212) 6204400. Telex: ISRAIR 125180.
Brussels:
c/o Israel Embassy, 50 Ave. des Arts.
Tel: 5131455. Telex: 62718 ISRAVI b.

AIRMAIL

They are: two engine mounts, a pilot's handbook (01-35EB-1), an erection and maintenance handbook (01-35EB-2), a structural repair handbook (01-35EB-3), and a parts list handbook (01-35EB-4).

We would appreciate any assistance you may be able to provide. The CAF is a nonprofit organization and all donations are tax-deductible.

Confederate Air Force
P. O. Box CAF
Harlingen, Tex. 78550

Bomber Restoration

We are looking for three of the following aircraft for restoration by the 90th Bombardment Group. They will be for our wing's past history, and placed on public display.

Upon receiving permission to revamp a B-24, B-29, and RB-47, our search for a B-24 has led us to two possible crash sites. One is in Australia and the other is in New Guinea. Our search for a B-29 has been a difficult one. The only flyable B-29 in existence is owned by the Confederate Air Force. Their B-29 was rebuilt using parts from three other B-29 aircraft.

Last in line is a RB-47. This model is not too scarce since they were pulled from the inventory in 1967.

The restoration of these planes will add to the past history of our base, the 90th Bombardment Group, and the 90th Reconnaissance Wing. Anyone with information on the possible whereabouts of any of the two models, B-24 and B-29, would be greatly appreciated. Any additional information can be sent to the following address:

A1C Robert A. Zyonse
PSC 1, Box 7284
F. E. Warren AFB, Wyo. 82001

Project William Tell

I am currently working on an American Aviation Historical Society project covering the history of Project William Tell, the Air Force's biennial interceptor meet. I am particularly interested in talking with persons who have served on any of the teams, judging panels, or planning staffs, with my greatest need being information (final reports, press releases, photos, etc.) on the meets held prior to 1972.

If you have any information, please contact me.

John Deur
606 North 28th St.
Lafayette, Ind. 47904

731st Bomb Sqdn. Night Intruders

My project is a book on the 731st Bomb Squadron Night Intruders, in action with the 3d Bomb Group during the Korean conflict. The period covered will be from September 1950 to June 1951.

I would like to urge all my former squadron mates to contact me as soon as possible with their recollections of an outstanding mission, or any personal anecdote that might be book material. In particular, I need information from crew members who flew in *Black Magic, Black Knight, Fly By Night,* and *Noopgnat II.* Any photographs will be carefully handled and returned.

Lt. Col. Chester L. Blunk,
USAF (Ret.)
14 Coachlight Dr.
Little Rock, Ark. 72207

SAC History

I am presently doing research for a major book on the history of the Strategic Air Command, and need the assistance of ex-SAC personnel for this work. The history will cover the first thirty-five years of SAC's existence.

Can any interested ex-SAC people please send me any impressions, stories, photographs, or any other material that could be used in the book? I want to present a living chronology of events and to bring before the wider public audience a dynamic history of the world's greatest strategic fighting force.

Please send contributions to:

David Baker
10 Rose Grove
Skegness, Lincolnshire
England

SA-16A Crash in California

I am presently researching a crash of a Grumman-built US Air Force (Albatross) SA-16A airplane, serial number 51-1, that crashed January 24, 1952, in the Panamint Mountain Range, Inyo County, Calif. Location is 36° 15′ latitude, 117° 21′ longitude.

I would like to obtain any material on this airplane or names of organizations that may assist my research.

James A. O'Neill
1223 N. Walnut St., Apt. B-45
Napa, Calif. 94558

AFROTC Det. 535

The AFROTC Detachment 535 at Syracuse University, Syracuse, N. Y., will celebrate its thirty-fifth anniversary of operation in September 1981. We would like to hear from previous staff members and commissionees of each year. Any reminiscences, old pictures, class rosters, etc., would be greatly appreciated. We intend to publish a unit history. Please provide us with your current mailing address if you desire a copy of the unit history.

Col. Ivy J. McCoy, USAF
AFROTC Det. 535
Syracuse University
Syracuse, N. Y. 13210

Memphis State AFROTC

All former staff and alumni of Memphis State University AFROTC are urged to contact us to help celebrate the program's thirtieth anniversary. Since its establishment in 1951, 800 Air Force officers have been commissioned.

We plan on publishing a 300-page, hardcover anniversary book. The book will include the unit's history, significant achievements by commissionees, plus a comprehensive alumni directory.

All AFROTC Det. 785 commissionees, former faculty, and staff members are urged to contact Capt. Vern Tabor, project officer, to update their current status for inclusion in the yearbook.

A reunion ball is planned for May 8, 1981, in conjunction with the unit's annual Commissioning Ball. For further information contact:

AFROTC Det. 785
Memphis State University
Memphis, Tenn. 38152
Phone: (901) 454-2681
AUTOVON: 966-9638

44th BG/BW/SMW

I am writing a book about the first forty years of the 44th Bomb Group/Bomb Wing/Strategic Missile Wing—1941–81. I would like to correspond with former members of the 44th and her component squadrons, especially the 44th Air Refueling Squadron and 850th SMS (Titan I), concerning their favorite anecdotes about the 44th.

I'd also like to hear from anyone who has photos or historical documents concerning the 44th's aircraft, missiles, people, bases, and activities, particularly from the 1951–65 period, that they would be willing to lend me long enough to copy.

Capt. David H. Klaus, USAF
1633 38th St.
Rapid City, S. D. 57701

Lt. Buck Buchanan

While serving in Korea in 1952–53, I had the privilege of meeting a Lt. Buck Buchanan. He was one of the best fighter pilots of my time. I wit-

nessed him in battle with three MiGs. I heard later that he downed all three before being shot down.

I would like to hear from him if he is still around. I heard he bailed out and was OK. I also know he was a Texan. Would like to hear from him.

P. L. Petrona
Rt. 7
Shidler, Okla. 74115

AAS Skyscraper Squadron
The Skyscraper Squadron of the Arnold Air Society is trying to locate alumni. We ask that they respond with current addresses.

Capt. Renee C. Mazaheri, AAS
Deputy Commander
Skyscraper Squadron
AFROTC Det. 730
University of Pittsburgh
Pittsburgh, Pa. 15260

AIRMAIL

Punta Gorda AAB History
I am compiling a history of the Punta Gorda Army Air Base, Punta Gorda, Fla. The base was active as a fighter training field between 1943 and 1946. Would appreciate corresponding with any former members of the cadre that operated the base during that period.

Col. Frank J. Toolan
USAF (Ret.)
c/o Charlotte County Airport
4830 Airport Rd.
Punta Gorda, Fla. 33950

OTS History Display
The Air Force Officer Training School (OTS) is putting together an OTS History Display. We need OTS memorabilia (pictures, emblems, patches, etc.) of the 1960s. If you have such items or know someone who does, please contact us.

2d Lt. Jose Hernandez, USAF
OTS/MTA
Lackland AFB, Tex. 78236

USAF Souvenirs Needed
I am writing on behalf of a very sick young American friend of mine who must use a kidney machine. He is utterly without pity, and his main leisure happiness is reading about the US Air Force.

I am continually scouting around to try to get him little souvenirs like badges, flashes, photographs, etc., but obviously in Britain this is very difficult.

I am hoping that readers might have some little souvenirs tucked away in a drawer. Anything to do with USAF seems to give this very brave young man a tremendous lift, and would be greatly appreciated.

F. G. Williamson
4 Dorothy Rd.
Hillsborough
Sheffield S6 4F.P
England

I am an Army vet disabled with muscular dystrophy, but can use my arms and hands and am a military aircraft enthusiast. I spend most of my day building plastic model planes.

I want to start a collection of Air Force items, such as squadron patches, pictures, or any parts of an aircraft, such as strips of fabric or pieces of metal.

I would appreciate any help in beginning my collection.

Philip S. Barnes
4 Looking Glass Lane
Asheville, N. C. 28805

69th Bomb Squadron
I am compiling a history of the 69th Bomb Squadron and would appreciate hearing from former squadron members. I would also like to hear from former members of other units, both flying and support, that served with the 69th as part of the 38th and 42d Bomb Groups and the present 42d Bomb Wing.

Personal anecdotes, photographs, or any other type of information would be greatly appreciated. All loaned material will be handled carefully and returned promptly.

Capt. Thomas A. Gaj, USAF
69 BS/DOTC
Loring AFB, Me. 04751

UNIT REUNIONS

AFROTC Det. 900, University of Puget Sound
Det. 900 will celebrate its thirtieth anniversary in April 1981 and wishes to compile an alumni roster. **Contact:** Capt. John Church, AFROTC Det. 900, University of Puget Sound, Tacoma, Wash. 98416.

American Defenders of Bataan and Corregidor
April 26–May 1, 1981, 36th annual convention, Las Vegas, Nev. For reservations write: Sands Hotel, P. O. Box 14277 (Attn: Reservations), Las Vegas, Nev. 89114. Indicate ADBC attendee. For further information, **contact:** Ralph Levenberg, P. O. Box 337, Henderson, Nev. 89015. Phone: (702) 565-7130.

Blackbirds
Reunion for all associated with SR-71 and U-2 programs, May 15–17, 1981. **Contact:** Blackbird Reunion, c/o 9th SRW/CCE, Beale AFB, Calif. 95903. Phone: (916) 634-2692.

Old Crows
1981 Western Region Old Crows EW Symposium and Electronic Defense Exhibits, April 19–22, 1981, San Antonio, Tex. **Contact:** Rich Curtin (512) 684-5111, ext. 2714; or P. K. Weir (512) 434-8241.

Santa Ana Army Air Base
Santa Ana Army Air Base sixth annual reunion, hosted by the Costa Mesa Historical Society, April 4, 1981, on the Orange Coast College Campus. **Contact:** Mildred Fisher, Costa Mesa Historical Society, P. O. Box 1764, Costa Mesa, Calif. 92626. Phone: (714) 548-4442.

25th Bombardment Group (M)
"Vienticinco Bom Bom." Officers and officers stationed at Borinquen Field, P. R., during WW II, April 1981, Washington, D. C. **Contact:** Col. Jim Twitty, USAF (Ret.), 1600 S. Eads St., Apt. 1234 S, Arlington, Va. 22202.

44th Fighter Sqdn.
Reunion for those who flew P-40s and P-38s from Guadalcanal to the Philippines, WW II, March 5–8, 1981, Coronado Island. **Contact:** Lt. Col. Jack Laurie, USAF (Ret.), 3885 Oak Trail Ranch, Santa Ynez, Calif. 93460. Phone: (805) 688-6508.

79th Airdrome Sqdn., 5th AF
May 1–3, 1981, Sheraton Convention Center Hotel, Memphis, Tenn. **Contact:** Fred Hitchcock, 29 Blueberry Hill Lane, Sudbury, Mass. 01776. Phone: (617) 443-6679.

119th Fighter Sqdn., NJANG
Reunion for all present and former 119th pilots, April 11, 1981, Atlantic City, N. J. **Contact:** Maj. Craig Cosgrave, 119th FIS, FAA Technical Center (NAFEC), Atlantic City, N. J. 08405. Phone: (609) 645-6020.

323d FTW/3535th NTW
May 1981, Central England. **Contact:** Capt. John R. Dervaes, USAF/RAF Exchange Program, APO New York 09238.

406th Fighter Gp.
Including 512th, 513th, and 514th Fighter Sqdns. and Gp. Hq., World War II, May 7–9, 1981, Arlington, Tex. **Contact:** Jack Robinson, 3104 Cambridge Dr., Arlington, Tex. 76013. Phone: (817) 275-1296.

490th Bomb Gp., 8th AF
April 23, 1981, Orlando, Fla. **Contact:** Maj. William Andrews, USAF (Ret.), 2851 Middlesex Rd., Orlando, Fla. 32803. Phone: (305) 896-2396.

1735th Air Evacuation Sqdn.
Late March 1981, Mobile, Ala. **Contact:** Frank Thompson, 2869 Palmer Dr., Charleston, S. C. 29407. Phone: (803) 571-0778.

HARRIS

RF COMMUNICATIONS

Upgrade to the new U.S. Army HF Eucom 1 KW Transceiver: The RF-270-5A.

Harris is proud that this transceiver has been selected by the Army for its HF upgrade program. It's one of a family of 1000 watt SSB transceivers (2-30 MHz) designed to the exacting standards for which Harris is known.

Automatic tuning minimizes operator errors and training.
Rapid tuning permits reliable high performance and fast communications.

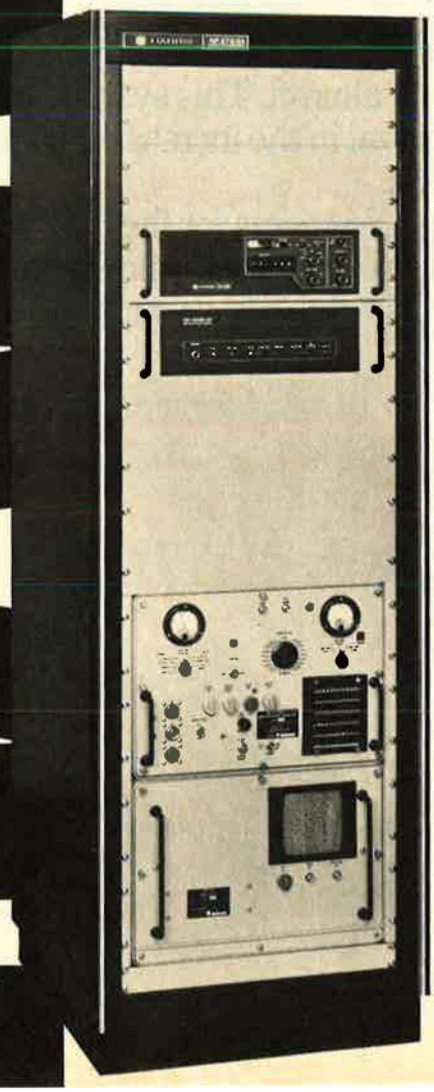
It's synthesized to give you full field flexibility.
New frequency assignments are programmable immediately.

Parts are available now!
Spare parts and support are in the DOD logistic pipeline.
Or available off-the-shelf directly from Harris.

It's designed for both fixed and transportable operations.

Built-in growth potential for tomorrow.
Select from a wide range of options.

- Receiver scan
- Preselect
- Postselect
- Digital remote control for single or multiple transceivers
- FEC, ARQ and selective call in a single modem
- And more to come!



For complete details, please contact:
HARRIS CORPORATION,
RF Communications Division,
Government Marketing Department,
1680 University Avenue,
Rochester, New York 14610.
Phone: 716-244-5830. Telex 978464

HARRIS
COMMUNICATION AND INFORMATION PROCESSING

Delivered on time and per schedule.

When it comes ECM experience, our ASPJ team.

Sanders Associates Inc. and Northrop Corporation form one of two teams selecte to compete in the first phase of full-scale engineering development of the Airborne Self-Protection Jammer (ASPJ).

ASPJ is an internal tactical ECM system designed to protect the new generation of U.S. Navy, Air Force, and Army aircraft. This system is essential for mission success and for aircraft and air crew survival in the increasingly dense and sophisticated comb environment of the 1980s and 90s.

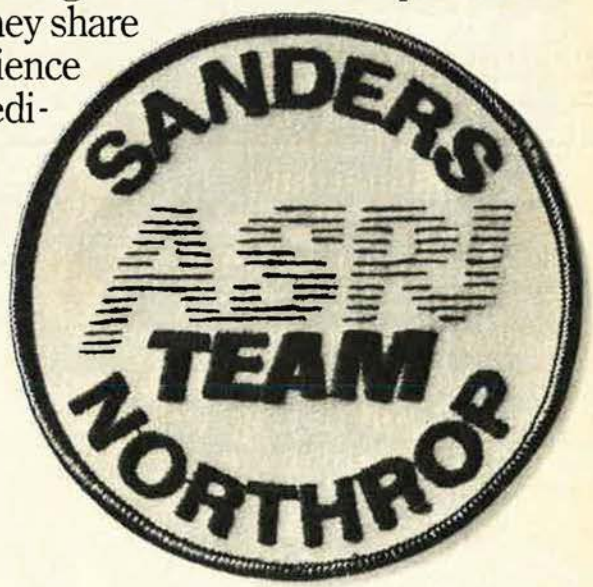
In fulfilling the rigorous requirements for the ASPJ program, team experience is of vital importance. Sanders and Northrop are uniquely qualified with a record of prove performance. Only Sanders and Northrop have supplied internal tactical ECM system in quantity.

to internal tactical score 6,000 for

The two companies have, in fact, designed, produced, and supported in the field nore than 6,000 internal tactical ECM units for the following front-line aircraft: A-3, A-4, A-6, A-7, EA-6B, F-4, F-14, F-15, F-104, F-111, FB-111, and EF-111.

In addition, Sanders and Northrop have extensive experience with other types of ECM systems. Between them, the team members have developed and produced nore than 20,000 ECM systems for the U.S. Navy, Air Force, and Army.

And the Sanders/Northrop team offers something more. The two companies place high value on the importance of teamwork. They share a mutual commitment to bring together their experience and expertise to assure a unified, single-minded dedication to ASPJ.



Sperry's improving the F-15 Eagle because you can't rest on your laurels in the air superiority business.

Sperry produces the digital air data computer, attitude and heading reference system, and vertical situation display for the McDonnell-Douglas F-15 Eagle.

On later versions, Sperry's programmable signal data processor will give Eagle pilots even more precise radar presentations. The PSDP also includes an overload warning system and the capacity to drive additional displays.

On the latest F-15 variant, the Strike Eagle, Sperry has provided an advanced system for clear, accurate presentations of navigation and weapons-aiming information.

How can we help *you?* Write Sperry Flight Systems, Defense and Space Systems Division, Box 29222, Phoenix, AZ, 85038 or phone (602) 869-2780. *We understand how important it is to listen.*

SPERRY
FLIGHT SYSTEMS

SPERRY FLIGHT SYSTEMS IS A DIVISION OF SPERRY CORPORATION

IN FOCUS...

By Edgar Ulsamer, SENIOR EDITOR (POLICY & TECHNOLOGY)

Washington, D. C., Jan. 5

A Bold Look at National Strategic Options

The Air Force is responding to shifts in national strategic policy—which were accelerated in the waning days of the Carter Administration and presumably will gain further momentum and support under President Ronald Reagan—with a bold, panoramic look at ballistic missile technologies beyond the era of MX. The no-holds-barred study project that involves relevant elements of the Air Force, as well as of other Defense Department components, probes America's options and needs in the offensive strategic sector in the next century and is known as Strategic Missile System (SMS)-2000.

The project represents a long—and probably a long overdue—step beyond ABRES (the advanced ballistic reentry system program of AFSC's Ballistic Missile Division) to break new ground in how the nation could and should meet long-term strategic requirements for a follow-on to MX.

Spawned by a series of pragmatic, evolutionary US policy responses to mushrooming and ever more sophisticated Soviet strategic threats, SMS-2000 is to provide a road map to levels of survivability, responsiveness, and operational flexibility well above those of MX. At the same time, SMS-2000 is meant to revitalize the somewhat moribund ABRES program by widening its scope and bringing it into closer harmony with national policy in general and USAF's strategic mission in particular.

Quintessentially, SMS-2000 projects the mandate and legacy of such national policy documents as NSDM (National Security Decision Memorandum) 442 of the Nixon period and PD (Presidential Directive) -18 and PD-59 of the Carter era into the next century. The thrust of the three policy papers is the need for flexible, limited, and sustainable nuclear-war-fighting capabilities, superimposed on the all-or-nothing mutual assured destruction (MAD) posture. Impetus for coupling MAD with flexible options and the capacity to fight on a protracted basis has been building over the past several years, fostered by clear trends in how the Soviets are shaping their strategic doctrine and capabilities.

SMS-2000, which formally got under way in December 1980 with a kickoff session sponsored by the Ballistic Missile Office and attended by senior Air Force personnel, has been given the central task of boosting future strategic force effectiveness by fostering advanced developments in specific areas. The key concern is to identify technology areas potentially capable of meeting long-term strategic threats in consonance with the postulates of US policy.

SMS-2000's charter provides for broad latitude. Nothing is precluded from consideration and all the traditionally sacrosanct "givens" are subject to challenge.

To promote a broad and eclectic approach, SMS-2000 consists of several panels. The starting point is the threat panel, responsible for forecasting and defining Soviet capabilities that could affect US offensive and defensive strategic capabilities in the year 2000 and beyond. Matching the threat forecasts to what it will take to carry out national policy as defined by PD-59 and similar policy documents is the task of SMS-2000's Mission Needs panel.

Correlating and matching potential Soviet capabilities and force levels with the key traits demanded by this country's policy guidance, this panel is expected to weigh and define such specific requirements as endurance and war-fighting factors in terms of LNOs (limited nuclear options) down to the level of launching single missiles.

The third panel assimilates the findings of the first two and assesses them in the context of systems alternatives. This panel is concerned principally with probing the capabilities attainable from current systems, the enhancement of present-generation systems, and building completely new systems.

The fourth panel, the technology panel, serves largely as a counterweight to the Systems Alternatives component of SMS-2000 by establishing specific technical needs and feasibilities. This panel is to work closely with USAF's laboratories and such other federal laboratories and research facilities as the Defense Advanced Research Projects Agency (DARPA).

Freed from the burdens of orthodoxy, SMS-2000 is meant to roam across the landscape of advanced technology to exploit a host of daring new concepts, extending from using ballistic missiles for chemical warfare missions in support of theater operations—thus reducing the effectiveness of hostile forces because of their need to don bulky and fatiguing protective suits—to "parking" ballistic missiles on ground-launchable air- and space-borne platforms. Included here are cruise missiles—possibly even of a manned type—that carry a ballistic stage. Such weapons, according to initial assessments, could be launched, recalled, and recovered intact in the manner of current strategic aircraft.

On the other hand, a hybrid cruise missile/ballistic missile system could loiter while operating in the air-breathing mode to assure survivability over protracted periods. Upon receipt of the "go-code," the weapon transitions to ballistic missile operation to provide for a rapid and reliable penetration capability.

By grafting sophisticated microelectronics onto future generations of land-based ballistic missiles the potential for onboard data processing and, hence, precision guidance, becomes nearly boundless. The upshot might thus be strategic missiles serving in such theater warfare roles as minelaying and the use of conventional warheads against certain types of hard targets.

SMS-2000's analyses and options will be premised on two divergent assumptions, the *presence* or *absence* of arms-control restraints on the assumed Soviet threat and concomitant US requirements. Obviously, unbridled pursuit of technological options is likely to lead to nu-

clear weapon systems that can be launched by ICBMs into space to lie in wait there until a decision is made to either attack or to de-orbit. Conversely, if current treaties remain in effect, the use of space-based weapons of mass destruction will remain outlawed.

Another possibility to be probed by SMS-2000 hinges on the use of ICBMs, especially the large-throw-weight MX, to reconstitute military satellite systems in the postattack phase of nuclear war. Presumably some vital US space-based sensors could be destroyed preemptively by the Soviets. Thus, it becomes necessary to provide the means for reconstituting essential command control communications and intelligence (C^3I) capabilities in the later phases of nuclear war.

In a similar vein, SMS-2000 can be expected also to recommend modifications to Minuteman ICBMs, beginning with Minuteman IIs, to permit their use as ballistic missile defense (BMD) interceptors. The underlying assumption is that these missiles would be lost to a preemptive Soviet strike if they are kept in their current role.

Hence, it becomes attractive to convert these weapons to BMD interceptors that can be used to defend more survivably-based ICBMs, such as MX. Thought is being given also to equipping Minuteman with single conventional warheads of extreme accuracy—derived from precision-guided munitions (PGMs)—suitable for theater warfare support missions. Such systems become feasible, in the view of some analysts, by combining maneuvering and terminal guidance technologies.

One of ABRES's abiding concerns —the assured penetration capabilities of ICBM warheads, even in the face of advanced Soviet ballistic missile defenses—is likely to be retained and broadened by SMS-2000. Research in the field of penetration aids and ECM, by all odds, will be intensified. Similarly, there will be renewed emphasis on flight testing of existing and new reentry vehicles. Also, SMS-2000 is to explore means for broadening the industrial base as it supports all aspects of ICBM and related BMD technology.

This includes a mechanism for maintaining a "warm production base" and sustaining technology programs. The latter is deemed vital since, at best, the US tends to work on a single ballistic missile system, as compared to several concurrent aircraft programs. Yet without a US continuum in ballistic missile production and research, the constant, multiple efforts by the Soviets in the ICBM field are bound to provide them with major technological advantages.

IN FOCUS...

Is DoD's POL Pipeline Going Dry?

One of the Defense community's staunchest supporters on Capitol Hill, Rep. Samuel S. Stratton (D-N. Y.), recently bared alarming shortfalls and deficiencies in petroleum and petroleum product stocks required by the military forces of the United States.

Reporting on a series of hearings by a special panel of the House Armed Services Committee in 1979 and 1980, Representative Stratton said the Pentagon is "absolutely" unprepared to cope with a cutoff of POL from overseas sources, on which the US depends for about one half of its needs.

Tipped off in mid-1979 that there wasn't enough JP-4 and JP-5 aviation fuel available to the services to enable them to perform "even their bare-bones, peacetime missions," the special panel found that the Defense Department could not persuade enough oil producers to bid on supplying or to make any military aviation fuel because producing unleaded gasoline for civilian consumers is far more lucrative.

Similar conditions obtain in the case of other petroleum products required by the military services. This problem of supplier disinterest is being compounded, according to the House Armed Services Committee's panel, because of the web of red tape and ancillary certifications imposed by federal procurement regulations. The standard DoD fuel contract, for instance, is 100 pages, compared to about seven pages for commercial airlines, the congressional study found.

The panel found further that imprudent actions by both the Congress and the Administration contribute to making a bad situation worse. Even though the Defense Department has its own oil field at Elk Hills, Calif.—known as NPR #1 and theoretically capable of meeting about half of the military services's normal peacetime requirements—its oil is being sold to private oil companies in order to produce revenue for the Treasury Department.

Equally ironic, the largest and most promising petroleum reserve, PET-4 in Alaska, was transferred from Defense Department purview to the Department of Interior by what the panel termed an "ill-considered" congressional action. The Interior Department, the report found, has explored PET-4 only "very desultorily and today none of its . . . very extensive reserves have been placed in production at all—and probably never will [be]."

The panel, according to Representative Stratton, was dumbfounded that neither the civilian hierarchy of the Defense Department nor the Joint Chiefs of Staff were concerned over the gravity of the situation. A member of the Joint Staff, Mr. Stratton reported, told the congressional panel that none of the shortfalls that curtailed steaming time for ships and flying hours for military aircraft "had had any adverse impact whatever on combat readiness—a conclusion which any civilian reservist who has spent a tour of duty with the Sixth Fleet in the Med knows is manifestly untrue."

Even though the panel's investigations led to a series of specific recommendations to ameliorate the shortages and problems, Mr. Stratton believes that little has actually changed and that the insouciant attitude concerning the criticality of military POL supplies continues. While petroleum from Elk Hills now goes into the so-called national strategic reserve, those resources still are not earmarked for defense. Moreover, Mr. Stratton complained, during the time that relevant corrective legislation was under active consideration in the closing days of the Ninety-sixth Congress, both the House Commerce Committee and the Defense Department "testified and lobbied openly against it."

Perhaps most alarming in Mr. Stratton's report on the panel's findings is that overseas fuel storage remains at woefully inadequate levels: "Months after an agreement was signed for operating facilities in Berbera, Somalia, to meet our Persian Gulf and Indian Ocean needs, nothing has been done to take over these facilities, despite the fact that Berbera would give us some very rare petroleum storage capability in that crucial area of the world."

Meanwhile, in a related congressional study, a report on the geopolitics of oil by the Senate Committee on Energy and Natural Resources, concluded that the United States is "now

It's good to be single-minded.

Good for you, and good for us.

Being single-minded makes it easier to concentrate on the things we do best... providing you with advanced systems and components for guidance, navigation and control. Products that offer cost-effective performance and high reliability.

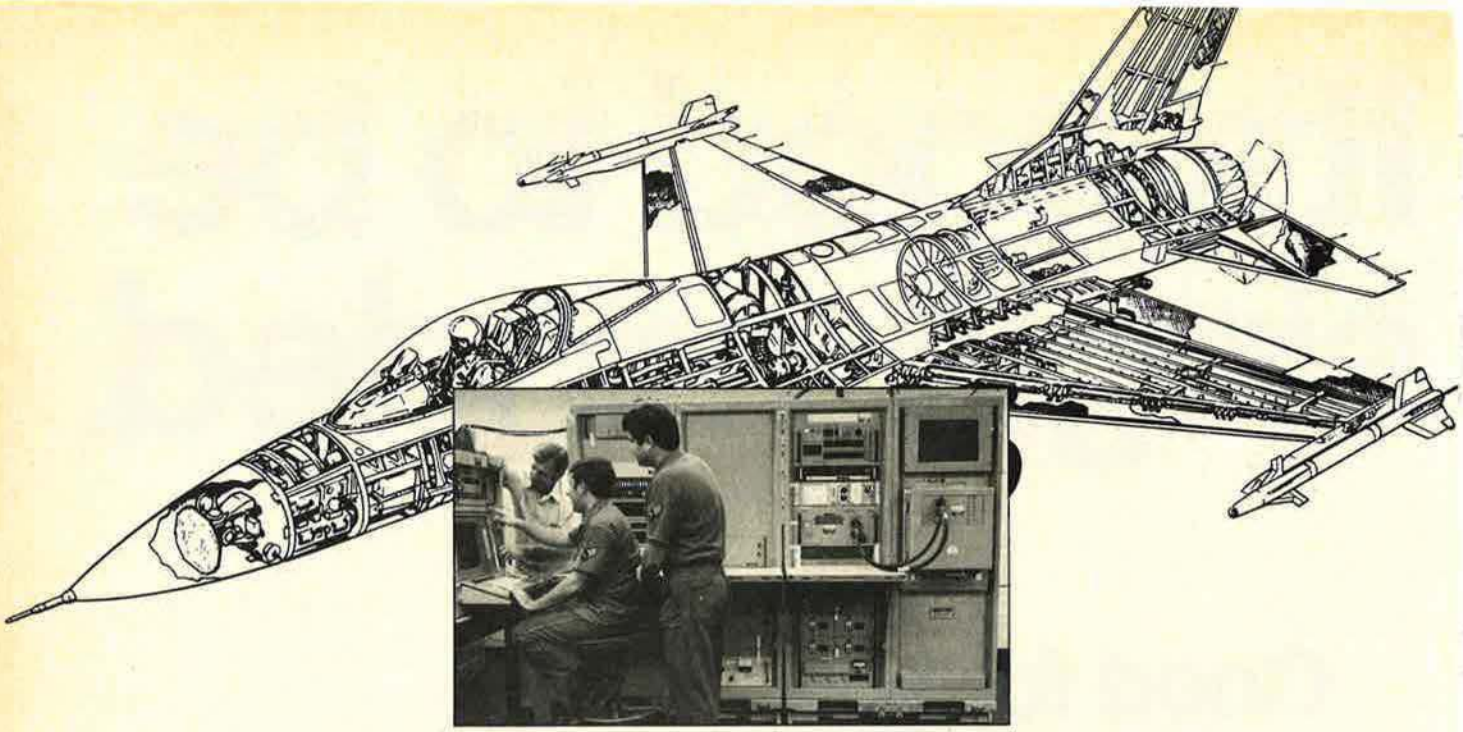
This single-mindedness has made it possible for us to contribute to a wide range of significant programs that put us in the best of company... yours.

- ☐ INERTIAL NAVIGATION/WEAPON DELIVERY SYSTEMS–Super Etendard
- ☐ INERTIAL NAVIGATION SYSTEMS–F-16, JA-37 Viggen
- ☐ INERTIAL MEASUREMENT UNITS–F-4E/RF-4C, J-35 Draken, Pershing II
- ☐ STELLAR-INERTIAL GUIDANCE SYSTEMS–Trident Missile, Assault Breaker
- ☐ DOPPLER RADAR NAVIGATION SYSTEMS–AAH, BO-105, PAH-1 Helicopters
- ☐ ATTITUDE AND HEADING REFERENCE SYSTEMS–Aquila Army RPV
- ☐ STABILIZED GUN SIGHT SYSTEM–XM-1 Abrams Tank
- ☐ ACTUATORS–Harpoon, Pershing

For additional information write to: The Singer Company, Kearfott Division, 1150 McBride Ave., Little Falls, NJ 07424.

Kearfott

a division of The **SINGER** Company



F-16 Avionics Intermediate Shop (AIS): We designed it to automatically test advanced aircraft avionics LRUs across the spectrum from DC to Light.

"Testing Line Replaceable Units (LRUs) from DC to Light means literally what it says. The F-16 AIS tests aircraft avionics encompassing the spectrum of DC, audio-frequency, RF, microwave and the visible light spectrum."

H.E. Jordan, Vice President and Program Director, AIS

The General Dynamics Electronics Division AIS is providing reliable and rapid avionics checkout of F-16 multirole fighters at air bases in the U.S. and Europe. This flight-line, fault-isolation system is helping the USAF Tactical Air Command to significantly exceed its projected sortie rate for this high-performance aircraft.

The AIS was engineered to meet prescribed intermediate shop test requirements for primary and secondary LRUs aboard the General Dynamics-built F-16. Program Director Jordan says: "AIS represents the third generation in test technology. It involves the computer in stimulus and measurement generation and eliminates the need for a large quantity of conventional test equipment."

To perform its wide-ranging test tasks, AIS combines state-of-the-art elements. With computer participation, an Arbitrary Function Generator (AFG), under the control of specialized software, synthesizes literally any waveshape from simple pulses to complex signals. For measurement, digital-processing and sampling techniques are used to extract voltage and time samples of LRU signals. A versatile software operating system featuring an on-line ATLAS interpreter supports the hardware and simplifies the overall testing task.

Jordan points out, "AIS also performs automatic photometric analysis of current-generation, head-up avionic displays. Our engineers achieved this by bringing a newly discovered technology into practical, everyday application.

"In AIS," Jordan adds, "we have designed a system not only for the worldwide support of the high-performance F-16, but with the adaptability to support other aircraft as well."

If you have engineering skills in RF, mechanical, optics, analog, digital or software architecture, you may be interested to know that we are planning now to take the third generation AIS into the fourth generation. To discuss engineering career specifics, write:
R.H. Widmer, Vice President
Science and Engineering
1519 Pierre Laclede Center
St. Louis, MO 63105

Aerospace Group

Electronics Division
San Diego, CA 92123
Test and Training Range Instrumentation, Automatic Test Systems, AN/PPS-15 Radar

Convair Division
San Diego, CA 92123
Tomahawk Sea and Ground-Launched Cruise Missiles, Medium Range Air-to-Surface Missile (MRASM); Atlas/Centaur, Deep Space Systems, DC-10 Fuselage

Pomona Division
Pomona, CA 91766
Phalanx, Standard Missile, Stinger, Sparrow AIM-7F, DIVAD, Viper, RAM

Fort Worth Division
Fort Worth, TX 76108
F-16, F-111, Replica Radar Systems, Advanced Tactical Aircraft

GENERAL DYNAMICS

in the extraordinary situation where the success of our foreign policies will determine whether or not we get enough oil to keep our economy going," according to the committee's chairman, Sen. Henry M. Jackson (D-Wash.).

Other major conclusions by the special report suggest that a major oil supply interruption within the next ten years is a "virtual certainty." Predicting that oil will be used with increasing frequency as a political weapon by the major oil-producing countries, the committee report warned that the United States and most of its allies "do not have effective plans in place to mitigate the impact of an oil supply interruption or to resist the efforts of those who would use oil for political, diplomatic, and military purposes."

While recommending that wherever possible the US should leave it up to local governments to provide local security in the oil-producing areas of the world, the committee urged that "to further this end, we should develop a coordinated program with our allies to increase military assistance and training for friendly states in the Middle East, so that they can deal with internal disruptions and defend themselves in regional conflicts." Yet the committee also pointed out that overt threats from the Soviet Union "may require a stronger response than any individual Middle East country or groups of countries can provide. To deal with these threats, we should enhance our ability to project military power in that region, through facilities agreements and an effective rapid deployment force. We should also work with our allies to develop a common strategy for deterring Soviet advances."

The report asserted that "the inauguration of a new President and a new Congress will give this country an opportunity to embark on a new program that can address the national security dangers implicit in the free world's dependence on imported oil. Time is of the essence. The day is already far gone. We must take necessary actions before the night is at hand."

From "Schornsteinfeger" to "Stealth"

In June of 1943, the German Navy launched a massive program to fight the plight that Allied radar was bringing to Hitler's U-boats. The top-secret program was code-named "Schornsteinfeger," or "Chimney Sweep." Its purpose was to make the snorkels of submerged submarines largely invisible to radar. The means to achieve this objective were developed by German scientists before the end of World War II and included several innovative schemes for reducing radar reflectivity.

The United States Naval Technical Mission in Europe reported to the Chief of Naval Operations in May 1945 that one technique, the "I. G.-Jauman absorber" is "about three inches thick and consists of seven laminations of a conductive paper with carbon-black content spaced about seven to nine millimeters apart by layers of a synthetic dielectric substance known as 'IGELIT.' "

The other German technique, the US Navy reported, involved a "Tarnmatte," or camouflage mat, consisting of a material known as Buna-3 combined with an admixture of iron-oxide particles. While neither approach was totally successful, both proved the feasibility of radar absorption and laid the groundwork for today's "Stealth" technology.

IN FOCUS...

Washington Observations

★ The United States and France plan to cooperate in a joint reengining program involving their aerial tanker forces. Both countries agreed on a memorandum of understanding (MOU) aimed at a cooperative program "for the development engineering to integrate the CFM-56 turbofan engine (GE-SNECMA) with KC-135 and French C-135F aircraft. The USAF will administer the development efforts as an international cooperative program."

France, which plans to reengine its fleet of eleven C-135F tanker aircraft at an estimated cost of $220 million (FY '80 US $), "will contribute to all common development engineering and nonrecurring production cost for the integration of the CFM-56 engine."

★ Dr. William S. Perry, outgoing Under Secretary of Defense for Research and Engineering, told a special panel of the House Armed Services Committee that the issue of a new strategic bomber is not a question of "whether we need one, but when. I do believe we need one, and I believe that it is just a matter of time, the proper timing and the proper design for the system. . . . Any bomber we would build in the next five or ten years should have significant changes over the original B-1 design. I think first of all, it should incorporate low observable [or Stealth] features. . . . Secondly, I would not incorporate the variable-sweptwing feature in the B-1. . . . I would design the B-1 so it was capable of carrying large numbers of cruise missiles in addition to its capability to carry a bomb load. . . . Finally, I would look to introducing aerodynamic improvements in the wing, probably a supercritical design. Those changes are sufficient that you would probably call this a B-1A or a B-1B, but not . . . a B-2."

★ The incoming Chairman of the Senate Budget Committee, Sen. Pete V. Domenici (R-N. M.), recently observed that "although there is general optimism that a Republican administration and a Republican Senate are good omens for defense spending, I would still caution somewhat against unbridled expectations. . . . While the desire to do more is certainly evident, the budgetary resources of the nation will not increase.

"To the degree that the Administration and the Congress are successful in cutting taxes, reducing overall federal spending, and balancing the budget, significant defense increases will require really remarkable success in curbing non-defense spending. . . . Secondly, one still has a Democratic House, which should feel honor bound to play the role of the loyal opposition. I suspect this fact will complicate any attempt to increase defense spending. . . . "

★ Momentum is building up at a considerable rate in influential quarters to name newly retired Gen. Alton D. Slay, the former Commander of the Air Force Systems Command, head of a blue-ribbon panel, which, at the White House level, would recommend policies for restoring the vitality and productivity of US industry, especially in the defense and high technology fields.

★ The informal view among senior USAF and other military officials is that Air Force Secretary Dr. Hans Mark is extremely qualified to head the National Aeronautics and Space Administration in the Reagan Administration. Dr. Mark is credited with courageous resistance to attempts by the Carter Administration to ballyhoo the so-called Stealth technology beyond realistic bounds, as well as for his "high intellectual integrity." ■

AEROSPACE WORLD
News, Views & Comments

By William P. Schlitz, SENIOR EDITOR

Washington, D. C., Jan. 9

★ Air Force pararescuemen and Navy Underwater Demolition Team (UDT) members have literally teamed up to practice rescue procedures that could come into play following a Space Shuttle Orbiter mishap.

The training is sponsored by the DoD Manager's Space Shuttle Support Office (DDMS) at Patrick AFB, Fla. The team is composed of two pararescuemen and three UDT members. The pararescuemen are TSgt. Joseph S. Stanaland and SSgt. John A. Smith of Det. 15, 38th Aerospace Rescue and Recovery Squadron at Patrick. The team is to train there and at the Kennedy Space Center (KSC).

Training entails various contingencies, including an Orbiter coming down in a swampy KSC area, a launch pad emergency, a land crash, and crew ejections over both land and water.

The rescue procedures being worked out are under the control of the Contingency Support Center located at the Cape Canaveral AFS and operated by DDMS.

In training, the team will descend from a Det. 15 CH-3 twin-engine amphibious transport helicopter onto a special fiberglass and plywood Orbiter mockup that is an exact replica of the spacecraft's front end. It is equipped with ejection seats, escape hatches, and other realistic devices including mannequin astronauts dressed in actual spacesuits.

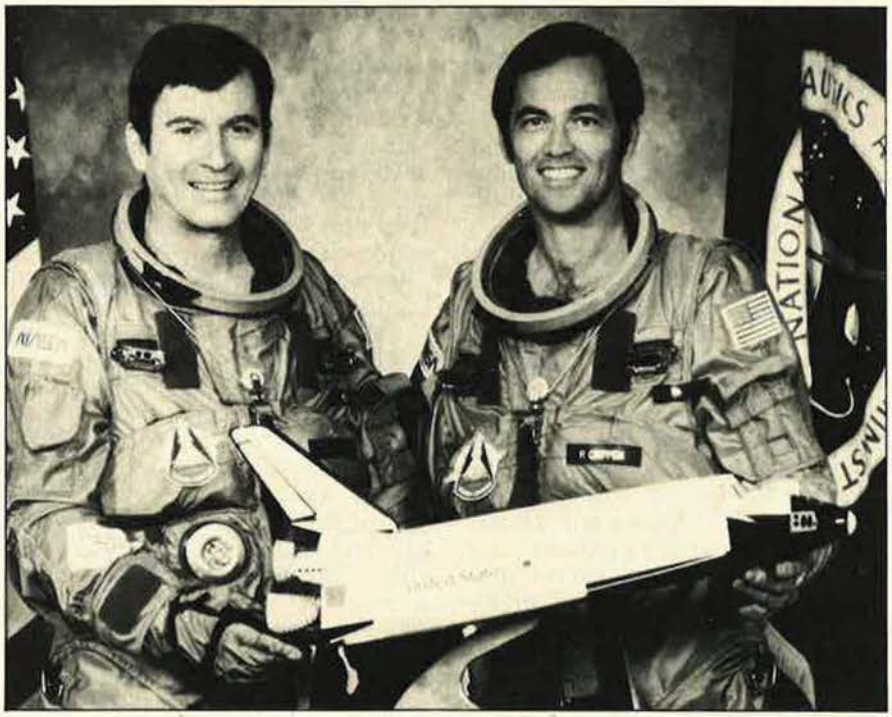
The sergeants will also be available to help in space coast rescue missions since both are qualified in scuba diving, mountain climbing, and parachuting.

Prior to coming to Patrick, Sergeant Stanaland was assigned to Hq., Aerospace Rescue and Recovery Service, Scott AFB, Ill. While serving five combat tours in Southeast Asia, he was credited with thirty-one combat saves. In addition, he participated in the *Mayaguez* rescue mission, and was a member of the Prime Rescue Team for the evacuation of Saigon, Phnom Penh, and the Apollo-11, -12, -13, and -14 missions.

Sergeant Stanaland, the noncommissioned officer in charge of the pararescue team at Patrick, has been awarded two Silver Stars, four Distinguished Flying Crosses, eleven Air Medals, and a Bronze Star for Valor.

Sergeant Smith participated in "Valiant Vault," the record-breaking transatlantic flight of three HH-53s. In addition, he was part of the rescue team that assisted during the Guyana incident and the Nicaragua revolution.

(As of this writing, the Space Shuttle Orbiter *Columbia,* assembled with its external tank and solid-rocket boosters, had been rolled out to its launch pad at the Kennedy Space Center. Final preparations were being made for the Space Transportation System's first test launch scheduled for March 14. See adjacent photo of its crew.)



Barring further setbacks, Astronauts John W. Young, left, crew commander, and Robert L. Crippen, pilot, will man the Space Shuttle Orbiter Columbia *for the first orbital test flight of the Space Transportation System in mid-March.*

★ Two Air Force officers have been named by the US Jaycees as among America's Ten Outstanding Young Men for 1981.

Maj. Willie C. Register, thirty-four, a navigator stationed at Osan AB, Korea, flew some 200 combat missions over Southeast Asia for which he was awarded nine air medals and the Distinguished Flying Cross. During a previous tour in Korea, he founded an orphanage council to provide food, clothing, medicine, and shelter for needy children. Twice in 1973, he delivered aircraft to Israel during the Mideast war. He was the first black student to receive a degree in physics from Memphis State University and the first black cadet elected to office in MSU's Arnold Air Society chapter. He and his wife, Pearl, have three children.

Capt. Jonathan S. Gration, twenty-nine, an F-5 instructor pilot stationed in Kenya, Africa, where he spent part of his youth as the son of missionaries. In 1979, following the

overthrow of Idi Amin, Captain Gration took a one-month leave and at his own expense traveled to Uganda where he made vital repairs to equipment at Kampala's Mengo Hospital and risked his life delivering medical supplies to remote areas. Earlier in Kenya, the Rutgers University graduate helped construct airstrips and clinics for Africa Inland Mission, also a volunteer project. He and his wife, Judith, have a son.

★ No sooner had American balloonist Maxie L. Anderson announced that he and a crewmate, Don Ida, would attempt a global circumnavigation this February or March than he was challenged by a British team, headed by balloon manufacturer Donald Cameron.

It might be a grudge match. Anderson was one of three Americans first to complete a transatlantic balloon crossing; just a month prior in that same year, 1978, Cameron and a co-pilot were forced to ditch 110 miles short of their goal.

Anderson and Ida plan to launch from Egypt in the helium-filled *Jules Verne* "and circle the globe nonstop, but we'll complete the voyage even if forced to land a time or two," vowed the intrepid balloonist. *Jules Verne* has a volume of 390,000 cubic feet. Anderson, whose most recent feat was the first successful transcontinental crossing of North America, intends to make use of the jet stream at altitudes of from 25,000 to 30,000 feet and, barring mishaps, complete the venture in about ten days.

On the other hand, the British balloon, *Innovation,* has a maximum volume of 1,000,000 cubic feet and will be flown by a crew of four. Lift for *Innovation* is to be provided by a helium and hot-air mixture. Liftoff point has not been announced, but is rumored to be Hong Kong. The British team plans a twenty-day journey.

In a related matter, helium-filled *Super Chicken II* in early December ran into weather over Kansas during a trans-US balloon crossing attempt and was forced down. Its crew, John Shoecraft and Ron Ripps, was unhurt.

Maj. Willie Register, above left, and Capt. Jonathan S. Gration reflect credit on the Air Force by having been named two of America's Ten Outstanding Young Men for 1981 by the US Jaycees. (See adjacent item for details.)

From left, former Spad pilots Roland W. Richardson, Louis L. Carruthers, Ira Milton Jones, and DeGraaf Woodman pose with the type of aircraft they flew during World War I. The occasion was the eleventh World War I Overseas Flyers reunion, at the Air Force Museum, Wright-Patterson AFB, Ohio, in November. More than sixty years after flying their last mission, twenty-two Overseas Flyers attended the reunion, which they say will be their final get-together.

★ The results of a worldwide survey conducted by the Defense Department indicate that all categories of drug use, except cannabis, have declined among the US military since 1975. Drug abuse in the military parallels that of the civilian population.

The drug most used, the survey determined, was alcohol, followed by marijuana, amphetamines, and cocaine. Drugs least used were heroin and phencyclidine (PCP).

The survey was undertaken from February through April 1980 and involved more than 15,000 randomly selected personnel at eighty-one military installations. Respondents included both officers and enlisted.

The last similar survey was conducted in 1974.

According to Assistant Secretary of Defense (Health Affairs) Dr. John Moxley III, "We have been making progress in providing medical and advisory attention to users of alcohol and drugs. However, I am concerned about this continuing problem, and we will take additional measures to help those in need . . . to reduce drug and alcohol abuse among our military population."

Since 1974, more than 500,000 military personnel have been treated or rehabilitated, with more than 325,000 returned to productive duty.

Currently, some 400 treatment and rehabilitation facilities are in operation.

★ USAF has awarded Martin Marietta Aerospace, Denver, Colo., a $62 million contract for full-scale development of the launcher for the new mobile MX missile system.

The contract is for work through June 1981, with future supplements expected to fund the remainder of the weapon's development into 1984.

Martin Marietta has been performing design studies of the launcher as part of assembly, test, and system-support contract work begun in September 1979, when full-scale engineering development of the missile system was authorized. During the next three years, the company will design and assemble several preproduction launchers at its Denver space center, at which existing facilities are currently being refurbished.

Major subcontractor Western Electric Corp., Sunnyvale, Calif., will design and build the launcher canisters.

Following assembly in Denver, the launchers will be used in ground and flight tests beginning in 1983 at Vandenberg AFB, Calif., and other test sites.

A transportable structure designed to carry, protect, and launch the solid-fuel MX, the launcher and missile combined will weigh half a million pounds.

The launcher will consist of the graphite/epoxy canister, mechanisms to elevate the canister, a power drive train to move the launcher in and out of the shelter, a mobile power supply system, and a shock and vibration absorption system.

The planned 200 launchers are to be deployed among 4,600 shelters and moved among the shelters by enclosed transporter. If it should come to it, launch of an MX missile would take ninety seconds.

AEROSPACE WORLD

★ In an organizational realignment, Air Force Communications Command plans to eliminate more than 200 personnel spaces and save about $5.3 million a year in operating costs. The action also calls for the shift of AFCC people to MAC bases.

The objective is to create rapid deployment communications units that will deploy with MAC by air in wartime or contingency airlift missions.

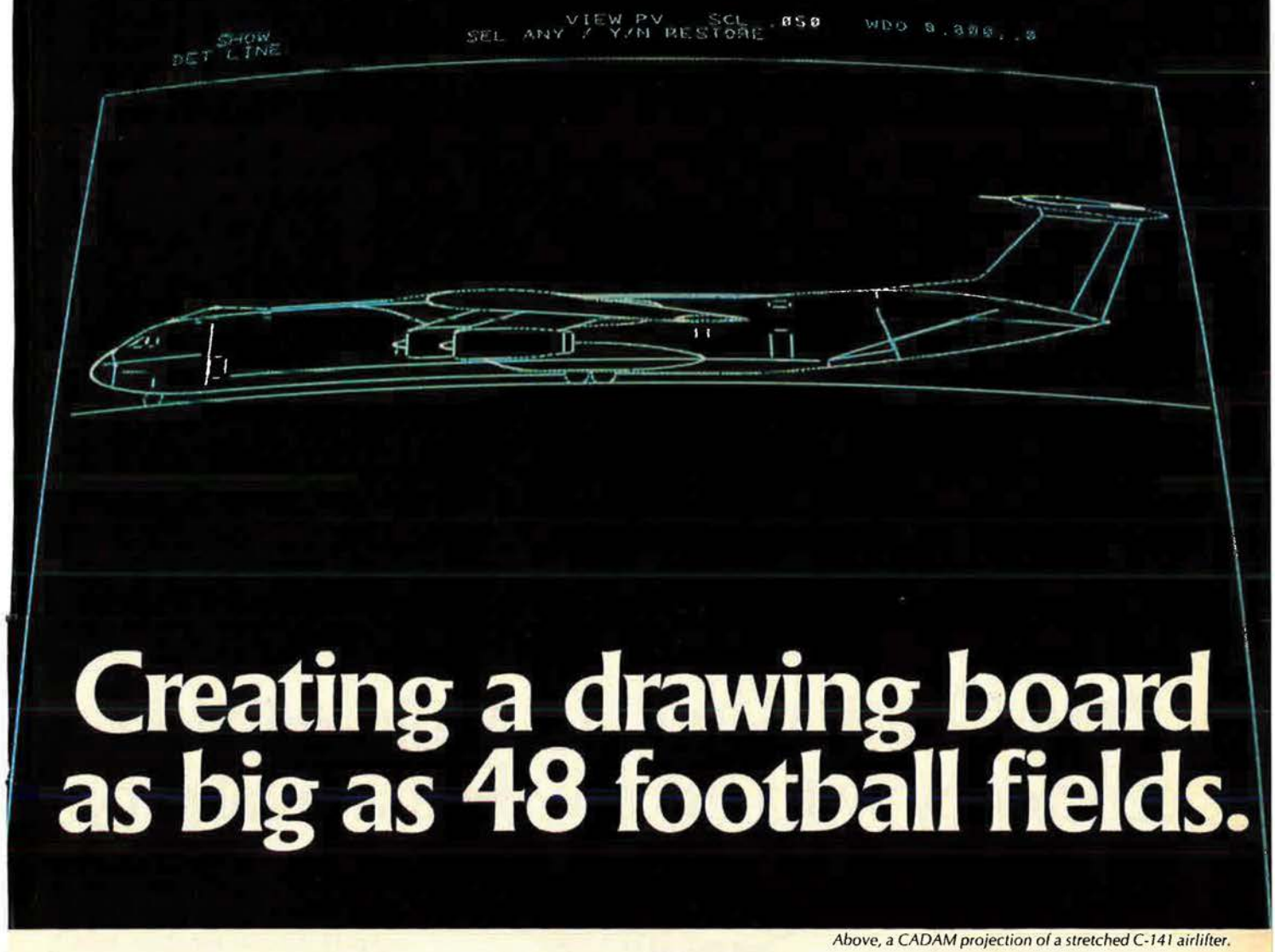
Part of the realignment is AFCC's establishment of a subordinate unit, the Airlift Communications Division, to be located at Scott AFB, Ill., site of Hq. MAC. ACD is to provide operational management of about 3,700 communicators and air traffic controllers at fifteen MAC bases and a like number of other sites in the US.

NOERR JOINS AFA STAFF

CMSgt. Dave C. Noerr, USAF (Ret.), has joined AFA as Assistant Executive Director for Field Organizations, replacing Vic Powell who has been named Assistant Executive Director for Staff Operations. Noerr, a twenty-one-year Air Force veteran, last served in the Office of the Air Force Inspector General. President of AFA's San Bernardino Area Chapter 1978–80, he was named AFA's Man of the Year for 1980.

Attending an International Order of Characters symposium on aviation history in November in Stamford, Conn., were, from left standing, Sergei Sikorsky, IOC President; Dr. Herbert O. Fisher, AFA Iron Gate Chapter Past President; and IOC founder Dr. James C. Crane. Seated from left, former RAF Group Captain Sir Douglas Bader; former RAF Wing Commander Robert Stanford-Tuck; World War II ace Lt. Col. Robert S. Johnson, Charter and Former President of the P-47 Association; and former Luftwaffe Col. Karlfried Nordmann, 800 missions.

Shaping Airlifter Technology



Creating a drawing board as big as 48 football fields.

Above, a CADAM projection of a stretched C-141 airlifter.

A revolution in the design and manufacture of airlifters has been taking place at Lockheed-Georgia Company. In semi-darkened scope rooms, engineers are designing advanced airlifters, using a copyrighted Lockheed software system that has freed them from the confines of drawing boards.

CADAM projection of a complex aileron hinge fitting.

The system is CADAM—Computer-Graphics Augmented Design and Manufacturing. Using electronic pencils, engineers design airlifters on computer screens—the parts, the systems, the tooling.

In effect, the CADAM system gives them a drawing board 20,000 inches by 20,000 inches in size, more than enough to accommodate any airlifter ever built. The engineers no longer have to design to a small 1/8 or 1/4 scale with all the problems that go with reduced scale designs. They can blow up designs 100 or more times with the CADAM system. In an instant, they can see the smallest detail—or the whole airlifter.

Just as important, the CADAM system helps link airframe technologies together. It provides a huge and common data base instantly available to engineers in all the myriad disciplines involved in design and production of an airlifter. The production designer can call up on the screen the work of those in advanced design. Tool designers have instant access to the work of design engineers. Numerical control programmers, quality assurance engineers, facility engineers—they all use the CADAM system to speed their work, eliminate mistakes, design parts and tools with an accuracy impossible under old methods.

All theoretical benefits? Not at all. The CADAM system played an important role in the highly successful stretch of the C-141 airlifter, in which the cargo compartment has been increased 33% in length. That program is running under budget and ahead of schedule, and the CADAM system has been used in it from the start.

When it comes to airlifters, the engineers at Lockheed-Georgia know how. They have more experience, by far, in designing and building airlifters than anyone else in the world.

Lockheed-Georgia

The Beechcraft C-12. Multi-mission efficiency with off the shelf availability.

The natural step into multi-engine training.

The Beechcraft C-12 is the ideal trainer for the TTB role. And the ideal trainer for the Air Force.

Why?

After training in a C-12, a pilot transitions quickly into a C-141, B-52, or other multi-engine airplane.

And the C-12 is one airplane the Air Force can buy off-the-shelf. It's designed, tested, proven and available. Right now.

It's the only 100 gallon per hour airplane ever used by all four services with a 97% operational readiness factor.

And Beech's contract maintenance program assures worldwide maintenance and parts support for the C-12, with no additional personnel requirement for the Air Force.

Air Force proven efficiency.

As a part of the Air Force inventory, the C-12 has proven itself over and over, for fuel efficiency and dependability.

Multi-mission versatility.

The C-12 is not a single mission aircraft. The same efficiency and reliability that make it ideal for TTB training, make the C-12 the right choice for a Companion Trainer Aircraft, as well as an Operational Support Aircraft for short haul missions.

The Beechcraft C-12. The most versatile airplane in the Air Force inventory.

For more information, write to Beech Aircraft Corp., Aerospace Programs, Wichita, KS 67201.

Beechcraft

A Raytheon Company

AEROSPACE WORLD

★ New digital radio terminals to improve battlefield communications were successfully tested by AFSC's Electronic Systems Division in a sixteen-month field demonstration recently concluded at Fort Huachuca, Ariz.

"Compared to the radios we have been using, the new transportable equipment has thirty percent greater range, provides clearer telephone communications, and uses less network electrical power," said project manager Capt. Marvin W. Misturak. "We have also tripled the number of channels and provided a coding capability for secure communications."

During the test period, six of the radio terminals, with their tripod-mounted, dish-shaped antennas, were set up to simulate a battlefield communications net, including a control center. Other equipment included three types of Army field radios and an Army circuit switching unit.

In combat, the terminals would link small tactical headquarters just behind battle lines to theater headquarters further back and with tactical air bases to order aircraft strikes, for example.

During the tests, the terminals exchanged voice and teletype messages night and day and in all weather. Lightning struck one of the terminals and it continued to operate, said Captain Misturak. "The lightning protection kit worked perfectly," he said.

The AN/TRC-170, or "Track-170" terminal, built by Raytheon Co.'s Equipment Division, Sudbury, Mass., can be equipped with three sizes of dish antenna that can receive signals at 200-mile (322 km), 150-mile (241 km), and 100-mile (161 km) ranges, respectively.

According to Captain Misturak, the terminal's digital processing devices allow higher-speed signals and easier coding of classified data, and increase jam resistance. "We bounce signals off a layer of the earth's atmosphere to send messages beyond line-of-sight . . . especially important in hilly or mountainous terrain."

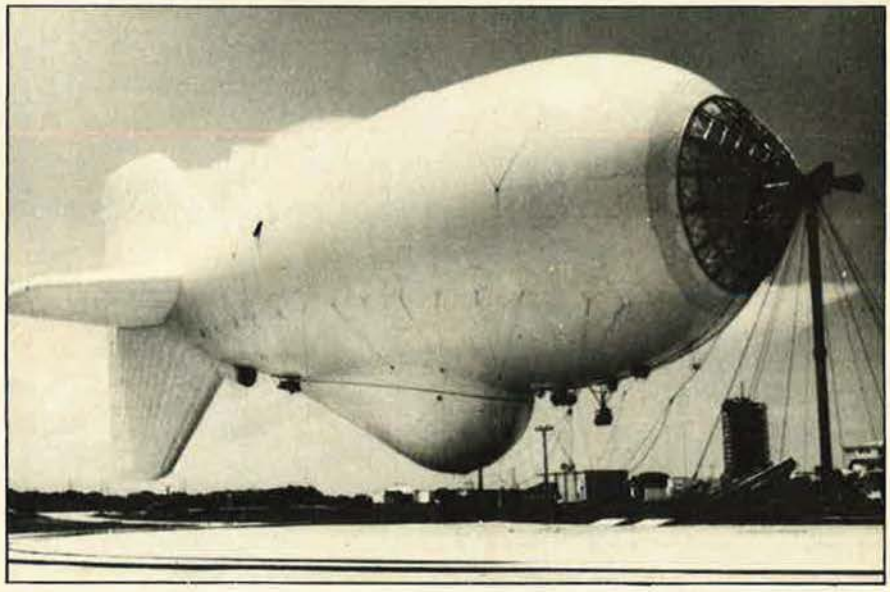
All DoD permanent communications networks in the US and Europe are being converted to digital systems, so the new, portable Track-170s will be compatible. USAF plans to award a production contract for 110 of the terminals next June, with first delivery of operational units in late 1983.

Following the final acceptance flight of the 300th F-16 built by General Dynamics, the single-seat fighter was flown to McDill AFB, Fla. Fighting Falcons at last count have logged some 60,000 flying hours during 35,500 missions in the US, Europe, and Middle East. The Air Force plans to procure 1,388 F-16s.

★ Scientists have combined computer technology with data derived from satellites in geosynchronous orbits to pioneer a stereo-imaging technique for the study of hurricanes.

Essentially, a team headed by Dr. A. F. Hasler and E. B. Rodgers of the Goddard Space Flight Center, Greenbelt, Md., used cloud cover photos taken simultaneously over several hours by two weather satellites on station along the equator to create a sort of computer profile of the storm in a time-lapse sequence. The storm's evolution can then be studied.

Further, estimates of the storm's intensity can be made from the three-dimensional stereo height observa-



The balloon-borne radar system dubbed SEEK SKYHOOK is being operated by TAC's 20th Air Division at Cudjoe Key AFS, Fla. The mission is to provide continuous low-cost radar surveillance of low-flying aircraft and surface targets. Two balloons rotate in surveillance shifts.

tions combined with the infrared measurements of the cloud top temperature taken by other instruments aboard the spacecraft.

The technique, which takes only a few hours, "can be readily transferred to operational weather forecasters for routine use," its developers believe.

★ The first launch in early December of USAF's new AGM-65D Imaging Infrared Maverick missile successfully sought out and hit its intended target, Aeronautical Systems Division officials said.

The night firing at Eglin AFB, Fla., from an F-4 Phantom initiated a series of development, test, and evaluation launches to verify engineering specifications and test the weapon under realistic conditions. Hughes Aircraft Co., Canoga Park, Calif., is developing the AGM-65D.

The test phase is to include about thirty launches and should run through next September. Ultimate tests will pit the missile against a target-rich combat environment of simulated massed armor.

The AGM-65D is operable in weather or at night. Its target-acquisition system converts infrared energy to a standard TV image on a screen in the cockpit. The new guidance system is the fourth and most sophisticated in the Maverick series and is being adapted to such longer-range glide weapons as USAF's GBU-15 and the Navy infrared Maverick.

AEROSPACE WORLD

★ The initial live firing of the Air Force's first new air-to-air missile in fifteen years took place recently at the White Sands Missile Range in New Mexico.

The test was part of the validation phase in the development of the Advanced Medium Range Air-to-Air Missile (AMRAAM), a weapon with beyond-visual range to arm aircraft between 1985 and 2005.

The first test firing involved an AMRAAM designed by Hughes Aircraft Co., in competition with Raytheon Co. for full-scale development of the weapon. It demonstrated safe separation characteristics from the launching F-15 aircraft.

Along with live firings, other objectives of the validation phase are to include missile systems integration, aircraft interface, fabrication, and laboratory and environmental testing.

ARO, Inc., engineering supervisor Jack Marshall checks model of Boeing AGM-86B ALCM prior to wind tunnel test aboard model of Rockwell International ALCM launcher aircraft.

The AMRAAM program, jointly funded by US Navy, is managed by AFSC's Armament Division, Eglin AFB, Fla.

★ The Air Force has awarded Boeing Aerospace Co. a contract for the first follow-on acquisition of 480 air-launched cruise missiles (ALCM).

The award for more than $172 million is the first of an expected several that will equip SAC with more than 3,400 ALCMs. It follows the purchase of 225 production missiles, announced last May.

Boeing is to produce forty ALCMs per month from November 1982 through December 1983. The latest award brings the total buy of missiles to more than $318 million. The company is also to provide supplies, services, and data in support of the missile program.

First deployment of the ALCM is expected at Griffiss AFB, N. Y., next September.

★ NASA has agreed to launch two satellites each for India and Indonesia.

India's two communications/meteorological satellites, once in geosynchronous orbit, will provide the country with point-to-point voice and television communications, community broadcasting, and weather data. The spacecraft will be built by Ford Aerospace Corp.

The two satellites are to be orbited by the Space Shuttle or, at India's option, by Delta expendable launch vehicle. The schedule calls for INSAT 1A to be launched by Shuttle in August 1983 or by Delta in February 1982. INSAT 1B is to be launched by Shuttle in December 1983 or Delta in July 1983.

The Indonesian communications satellites in geosynchronous orbit will provide voice, video, telephone, and high-speed data services to Indonesia and other members of the Association of Southeast Asian Nations—the Philippines, Thailand, Malaysia, and Singapore. Hughes Aircraft Co. will build the satellites.

Lockheed-Georgia Co. employees welcome the 100th C-141A StarLifter to the company facility at Marietta, where it will enter the "stretch" program. MAC's entire fleet of some 270 C-141s should be stretched and back in service by mid-1982.

Indonesia has retained the option of either a Shuttle or Delta launch. Its Palapa B-1 is to be orbited by Shuttle in January 1984 or by Delta in January 1983. Palapa B-2 by Shuttle in March 1984 or Delta in January 1984. Two earlier Palapa craft were launched by NASA in 1976 and 1977.

★ USAF is not the only organization turning to aircraft simulators to economize on fuel and save wear and tear on airplanes. US airlines are heavily into simulators.

Pan American World Airways, for instance, conducted some 35,000 hours of simulator time for its aircrews over this past year at the airline's International Flight Academy in Miami. The facility houses a fleet of nine simulators used in training pilots and flight engineers in the intricacies of such aircraft as the Boeing 747 jumbo jet and the advanced-technology Lockheed L1011-500 airliner.

A 747 burns about 3,000 gallons of fuel an hour at a cost of $3,150, compared to a simulator's expenditure of $15 in electricity.

About one-third of Pan Am's simulator time is used by aircrews from forty-five other airlines, sent to the Flight Academy on a contract basis. There, they can practice emergency and other procedures not possible aboard actual flights.

Besides the huge amount of fuel saved flying simulators instead of aircraft, Pan Am in 1980 conserved an additional 18,600,000 gallons by replacing its less-efficient aircraft with L1011-500 trijets; modifying 747s to achieve 2.5 to four percent more fuel efficiency; refining flight dispatch and operating procedures including increased use of computers to create optimum flight profiles.

AEROSPACE WORLD

Working with the FAA, Mitchell Aircraft Corp., Porterville, Calif., recently completed Phase II testing of its newest flying funster, the "P-38 Lightning," an easy-to-build, single-place aircraft that is trailerable.

★ **NEWS NOTES**—SAC is seeking **captains with at least 1,500 flying hours** (1,000 in jets, preferably centerline thrust) **as a new contingent of U-2/TR-1 reconnaissance pilots.** Training will take place at Beale AFB, Calif., home base for the high-flying aircraft. Applicants, who must have eighteen months of experience as pilot in command, may refer to AFR 36-20, paragraph 8-20, or call the U-2/TR-1 Manning Liaison Officer at Beale: AUTOVON 368-2927 or (916) 634-2927.

Bob Hope will be the featured attraction at the Virginia Beach, Va., Pavilion on April 8, 1981, when he'll stage **two USO-type shows to honor World War II veterans.** His appearance will highlight an April 1–12 event dubbed "Sentimental Journey" that area businessmen hope will become an annual affair drawing servicemen from nearby military installations and veterans from around the country.

Chosen Wing Commander of the Cadet Wing at the Air Force Academy for the current winter period was **C1C Michelle Johnson,** the **first woman to hold the post.** Cadet Johnson, "a strong leader, scholar, and athlete" is an Academic All-American in basket-

INDEX TO ADVERTISERS

Caspar Weinberger—New Secretary of Defense

Caspar Willard Weinberger, President Reagan's Secretary of Defense, has moved into Room 2E880 at the Pentagon and is now the fifteenth person to assume the top civilian leadership job since it was created in 1947.

Secretary Weinberger entered the US Army as a private in 1941, earned a commission through Officer Candidate School, and then served in the Pacific Theater in the 41st Infantry Division and on the intelligence staff of General Douglas MacArthur. He was awarded the Bronze Star medal, and was honorably discharged in 1945.

Mr. Weinberger was born on August 18, 1917, graduated *magna cum laude* with an A. B. degree from Harvard University in 1938 and in 1941 received an LL.B. degree from Harvard Law School. Following his admission to the California Bar, he served as law clerk to United States Judge William E. Orr from 1945 to 1947. He practiced law with the California firm of Heller, Ehrman, White and McAuliffe from 1947 to 1969, and was a partner in the firm from 1959 to 1969.

Defense Secretary Caspar Weinberger during hearings. (Wide World Photos)

His public service began with election to the California State Legisiature in 1952, where he served three two-year terms. He served as Vice Chairman of the California Republican Central Committee from 1960 to 1962, and as Chairman from 1962 to 1964.

During part of President Reagan's tenure as Governor of California, Mr. Weinberger was the state's Director of Finance (1968–70). In the Nixon Administration, he went to Washington first as Chairman of the Federal Trade Commission and Deputy Director of the Office of Management and Budget (1970–72), before becoming Director of the Office of Management and Budget from 1972 to 1973. In 1973, he served for a time as Counselor to the President before appointment as Secretary of Health, Education and Welfare, where he served until 1975.

After leaving government, Mr. Weinberger returned to San Francisco to become General Counsel, Vice President, and Director of the Bechtel Power Corp., a position he held when nominated for the top Defense post.

Mr. Weinberger is married to the former Jane Dalton. They have two children, Arlin Cerise and Caspar Willard, Jr.

—F. C. B., Jr.

C1C Michelle Johnson, first woman Commander of Air Force Academy's Cadet Wing. See "News Notes."

ball and hails from Spencer, Iowa. She had the highest military performance and grade-point averages of any of the cadets nominated for the post. She and **C1C John W. McLendon,** son of MSgt. J. M. McLendon, USAF (Ret.), of North Biloxi, Miss., were recently named Rhodes Scholars; the Academy total is now twenty-three.

Some statistics on **USAF's Thunderbirds aerial demonstration team:** with the last show of the 1980 season in November an estimated **150,000,000 have seen them perform** in 2,395 shows in fifty states and forty-nine countries and protectorates since their formation in 1953. Team members fly four or five times a day up to six days a week during their winter training period.

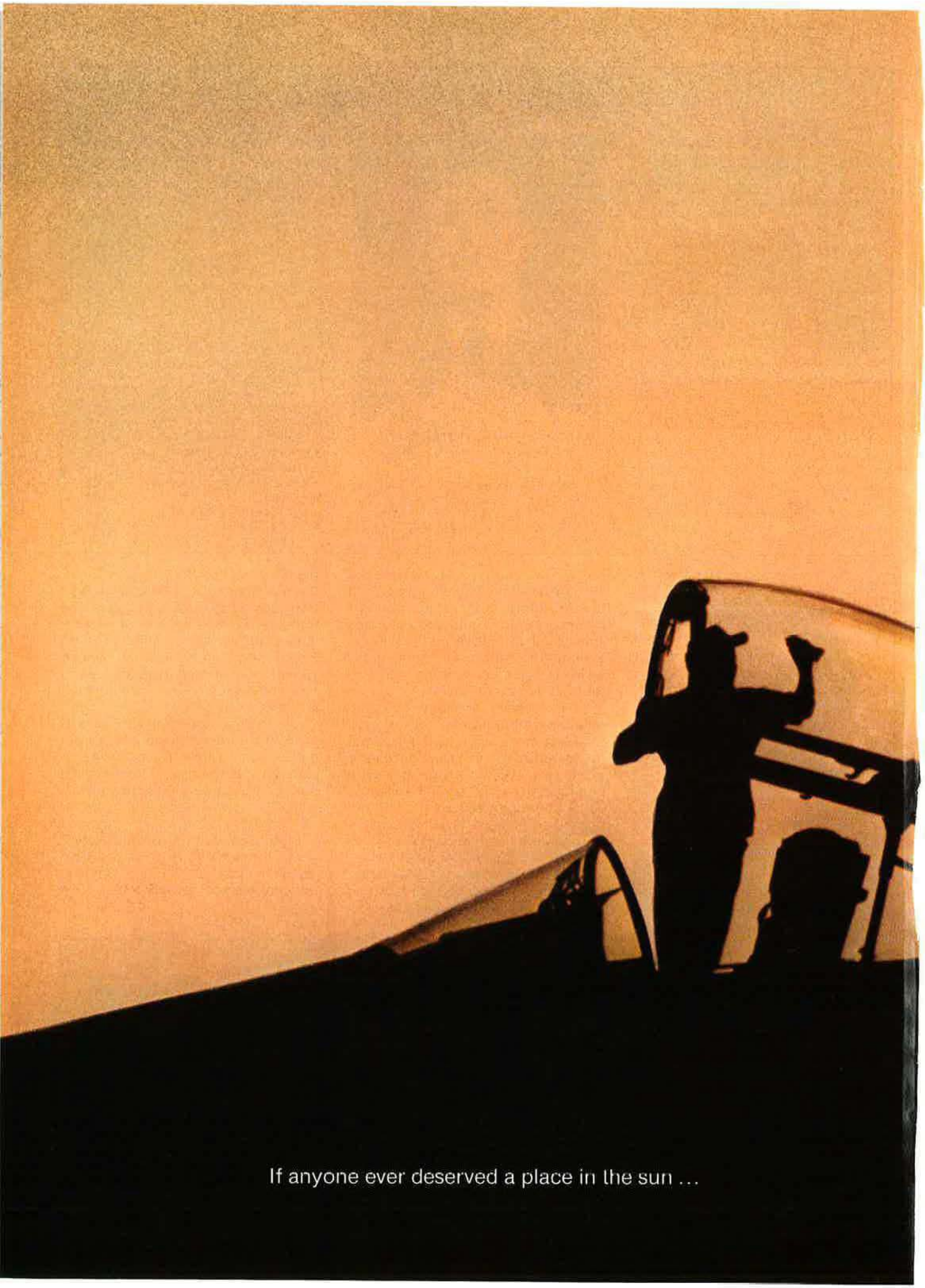
Late last year, the **Spacelab engineering model** arrived at Kennedy Space Center in Florida, the **first major transfer of program hardware** under the NASA/European Space Agency agreement. It will be used to verify interface between the lab and ground equipment. First flight of the European-built lab aboard the Space Shuttle is scheduled for June 1983.

In early December, the **first three-man Soyuz crew since 1971** returned to earth after making repairs to orbiting space station Salyut-6. The three, **Leonid Kizim, Oleg Makarov, and Gennady Strekalov,** completed the thirteen-day mission and were welcomed home by Cosmonauts Leonid Popov and Valery Ryumin, whose 185-day stint aboard the station **set a new endurance record** for a manned space mission.

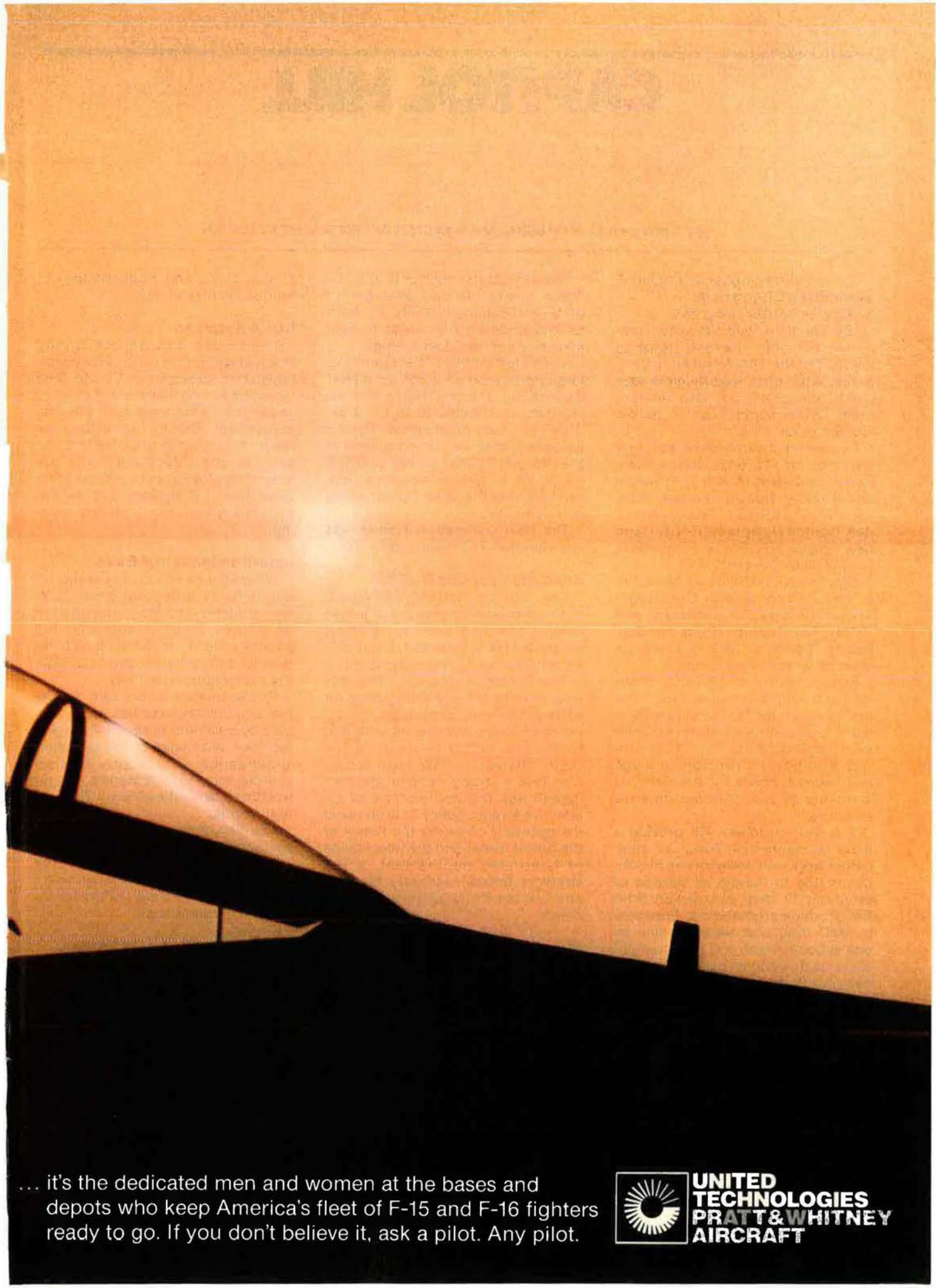
Also in December, **four Air Force E-3A AWACS surveillance aircraft** began operating from Ramstein AB in Germany to monitor Soviet moves during the continuing crisis in Poland.

Died: Gen. John K. Gerhart, USAF (Ret.), former CINC NORAD, of a heart attack in Colorado Springs, Colo., in January. He was seventy-four. ■

The 200th production Alpha Jet developed jointly by France and Germany. Nearly 500 of the two-seat, twin-engine aircraft have been ordered by eight countries.



If anyone ever deserved a place in the sun ...


... it's the dedicated men and women at the bases and depots who keep America's fleet of F-15 and F-16 fighters ready to go. If you don't believe it, ask a pilot. Any pilot.
UNITED TECHNOLOGIES
PRATT&WHITNEY
AIRCRAFT

CAPITOL HILL

By Kathleen G. McAuliffe, AFA DIRECTOR OF LEGISLATIVE RESEARCH

Washington, D. C., Jan. 5

Committee Changes in Ninety-seventh Congress

The Senate Armed Services Committee not only changed its party lineup for the Ninety-seventh Congress, with nine Republicans and eight Democrats, but also restructured its subcommittees to reflect mission orientation.

Four new subcommittees and their chairmen are: Tactical Warfare, Sen. Barry Goldwater (R-Ariz.); Strategic and Theater Nuclear Forces, Sen. John Warner (R-Va.); Preparedness, Sen. Gordon Humphrey (R-N. H.); and Sea Power and Force Projection, Sen. William Cohen (R-Me.).

Only two subcommittees, Manpower and Personnel with Sen. Roger Jepsen (R-Iowa) as chairman, and Military Construction chaired by Sen. Strom Thurmond (R-S. C.), will remain as currently constituted.

Sen. John Tower (R-Tex.), chairman of the full committee, said, "The new subcommittee structure is a more logical division of the committee's responsibilities. . . . It will provide a context for senators to judge and balance needs for the different elements of our national defense structure."

The new structure will provide a more equitable distribution of committee work and will allow each subcommittee to handle all phases of programs in their jurisdiction from R&D through procurement. Previously, R&D programs were handled by one subcommittee and procurement of the same systems by another. This new cradle-to-grave approach will enable each committee member to become more knowledgeable in very specific areas.

Trainer Aircraft

The final version of the FY '81 DoD Appropriations Bill targeted $12.5 million for the B-52 Companion Trainer Aircraft (CTA) program. The bill's restrictive compromise language paralleled that of the House by stating that the funds do not represent a commitment to a long-range program or full-scale development.

The legislation instructs the Air Force to explore and evaluate all USAF and commercial aircraft, both jet and turboprop, in order to best maximize cost and fuel savings.

In related action, the spending measure deleted all funds for a Next Generation Trainer (NGT) aircraft program as a follow-on to the T-37, USAF's primary pilot trainer. The Air Force is further instructed to look at the Navy's T-34C, using existing funds, as an alternative since both services have the same flight training requirements.

The Next Generation Trainer was appropriated $1.9 million in FY '80.

Kennedy Supports DoD Bill

Sen. Edward Kennedy (D-Mass.), not best known for support of added defense spending, came out in strong support of the substantially increased FY '81 Defense Appropriations Bill.

The Senator recognized the '80s as a time to focus public policy on national defense and stated, ". . . we need to protect the security and further the global interests of the United States. . . . We must recognize that a strong national defense constitutes the cornerstone of an effective foreign policy." He stressed the necessity of facing the reality of the Soviet threat and the importance of continued deployment of the strategic forces necessary to deter and successfully respond to any attack.

More Titan Crew Honors

Sen. Dale Bumpers (D-Ark.) sponsored a resolution honoring the Titan II missile hazard team on the scene during the September explosion of one of the aging missiles in Damascus, Ark. *(See full text in* AIR FORCE, *December '80, p. 41.)*

The unanimously adopted resolution inadvertently omitted the names of four USAF crew members who also risked their lives during the crisis. Senator Bumpers recently resubmitted his resolution adding the names: TSgt. Thomas A. Brocksmith, Vincennes, Ind.; 1st Lt. Allan D. Childers, Charleroi, Pa.; SSgt. Ronald O. Fuller, Elmira, N. Y.; and SSgt. Rodney L. Holder, Glenwood, Ark.

COLA Retained

The House and Senate finally reached agreement on the $8.3 billion legislative savings for FY '81. The Omnibus Reconciliation Act of 1980 keeps the semiannual cost-of-living adjustment (COLA) for military retirees. Also, the bill provides that Reservists and Guardsmen who are federal employees will continue to receive their full military and civilian pay during periods of military training.

Ichord on Industrial Base

Winding up a series of hearings on our defense industrial base, Rep. Richard Ichord (D-Mo.), chairman of an *ad hoc* panel, stated that the panel's actions proved the lack of industrial capability needed to sustain the military during a crisis.

Representative Ichord said our defense industrial base has been crippled by declining productivity, aging facilities, shortages of skilled labor, dependence on unstable foreign sources for critical materials, longer lead times, and inflexible government regulations.

The Congressman recommended solutions along the lines of increasing equipment and war reserve stocks, and Pentagon establishment of long-range strategic plans for industrial preparedness.

Military and Social Welfare

Sen. Sam Nunn (D-Ga.) has released a General Accounting Office (GAO) report on military personnel eligible for food stamps.

Reports had estimated as many as 275,000 military families eligible for the welfare program. The GAO report, however, stated that approximately 20,000 is a more accurate figure based on their studies. Previous estimates were based solely on basic pay and did not take into account allowances for subsistence and housing, nor any special pays. All cash income must be included in determining eligibility for food stamps. ■

Staying in fighting shape takes an effective manager.

A major goal of today's Air Force is to improve operational readiness while reducing life-cycle costs. To help accomplish this goal, the Air Force — with assistance from Westinghouse — is developing the MATE (Modular Automatic Test Equipment) concept.

MATE will determine the ATE needed for individual Air Force programs, ranging from non-application to use at all maintenance levels. Test systems will then be configured using qualified common modules from both commercial and mil-spec suppliers. This will eliminate the need to design different hardware/software modules for each new MATE application. When special testing needs exist, MATE will provide the criteria for new module acquisition. MATE will emphasize human resource considerations for manpower, training, and skill levels, thereby linking man and machine in a total system approach. ATE proliferation will be reduced, its misapplication eliminated, and the overall performance improved.

Westinghouse is developing a MATE approach that is sensitive to the participation of industry in a competitive marketplace while remaining

mission-oriented. Our "bottoms up" approach will take full advantage of Westinghouse ILS experience with the U.S. Air Force and the air forces of foreign nations. Westinghouse has designed a MATE System that is flexible, derived from extensive survey and analysis, and encourages industry involvement.

To stay in fighting shape, the U.S. Air Force needs experienced management in its corner. That's where we come in... the most knowledgeable people, the most ILS experience. All from Westinghouse.

Westinghouse Integrated Logistics Support Division
Hunt Valley, Maryland

The ILS MATE Manager.

The MATE Program is sponsored by:
United States Air Force, Air Force Systems Command, Aeronautical Systems Division, Wright Patterson Air Force Base

THE Secretary of the Air Force, Dr. Hans Mark, when asked recently what the biggest problem for the country would be if we were faced with a serious threat of war, said:

"The main problem is to decide when to fight. How do you reach the political decision to go in somewhere? That's the thing that takes care and thinking through what you're doing—care in understanding the world situation, care in anticipating the opponent's moves."

Logistics, he said, "obviously ranks right up there. But I would probably rank No. 2 as being the category of having friends around the world who agree with your policy. If you go fight somewhere and are isolated, then all the logistics in the world aren't going to help you. You need both the understanding as to when you're going to go in and a political structure that assures you don't do it alone. That was one of the problems in Vietnam. At the end there we were pretty much alone."

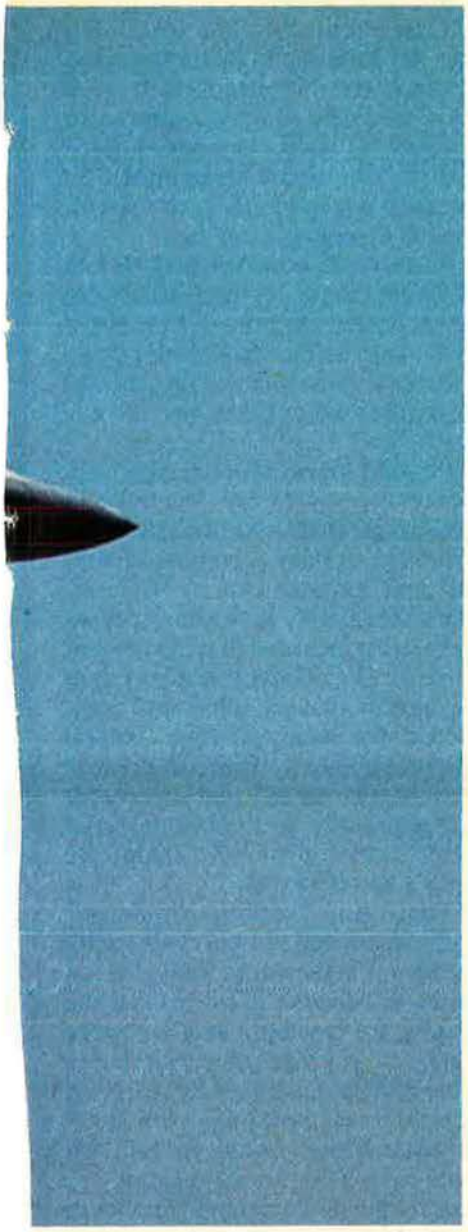
If the US does go to war, it's likely to be a come-as-you-are situation, so the logistics end of things will have to be ready to go. Today, top Air Force officers say, it's questionable whether or not USAF could prosecute a sustained battle.

A big problem has been that the Air Force's stress on modernization over the last several years—bringing in the F-15, F-16, A-10, and E-3A—has coincided with tight budgets to force deferral of spare-parts buying. The result is that the Air Force is acquiring a very ca-

Having digested modernization for the moment, and having "done more with less" for a decade or so, the Air Force logistics and engineering challenges in the 1980s are formidable. In this interview, Lt. Gen. Billy Minter highlights the . . .

LOGISTICS CHALLENGES AHEAD

BY RICHARD TUTTLE



ABOVE LEFT: F-15 assigned to the Combined Task Force, Edwards AFB, Calif. LEFT: An A-10 delivery from Fairchild's Hagerstown, Md., plant. (Photos by William Ford) ABOVE: Lt. Gen. Billy M. Minter.

pable force but one that could fight for only a relatively short period of time, according to the Air Force's Deputy Chief of Staff for Logistics and Engineering, Lt. Gen. Billy M. Minter.

Spares Level Recovery

General Minter, who along with the rest of the Air Staff has the job of determining USAF's logistics policy and defending it on Capitol Hill, says, "Our prime concern is getting the spares levels up to meet the requirement. We are woefully short of spares pretty much across the board."

That conclusion is supported by various deployments to Europe, in which tactical units are "exercised and flown at wartime sortie rates," General Minter says. For instance, the A-10, even though it is a relatively easy aircraft to maintain, "needs large amounts of spares," as do the other new planes. The problem is less severe with older types such as the F-4 and C-130 because their logistics infrastructure is better established, General Minter says. Still, the Air Force has told Congress that none of the Air Force weapon systems has the capability to fight for a full thirty days with the present stockpile of spares.

Deployments to the Middle East—such as Proud Phantom, which saw a squadron of F-4s sent to Egypt, and the joint US-Egyptian exercise Bright Star, which included the flight to Cairo-West airfield of Air National Guard A-7s—confirm what the European deployments show, General Minter says, but also demonstrate that USAF "will need a lot more bare-base equipment for operations in Southwest Asia." The lack of water alone is a major problem.

Finally, exercises in the US such as Red Flag, in which thirty-day "wars" are fought from Nellis AFB, Nev., "verify the value of spares and reemphasize the shortfalls we know we have," General Minter says. Red Flag, incidentally,

"is probably one of the best things the Air Force has ever done to train" not only tactical aircrews, but the ground crewmen who must maintain aircraft during high levels of activity, General Minter says. "The training value is unquestionable," since it "uncovers deficiencies in . . . maintenance and supply procedures and support equipments."

Asked if the Air Force has learned anything new about logistics from the war between Iran and Iraq, General Minter replied, "It's a lesson we learned a long time ago," namely that in wartime people and machines do things they wouldn't do in peacetime. "There's nothing new there."

Another Air Force general, asked about the same thing, says that while the sorties generated by Iran "may be high compared to what some people think they should be, they are not high compared with the facilities and aircraft and parts that we know they have in the country. Beyond that, I'm afraid to go" for security reasons. Still, "when we had our backs to the wall in Korea, we flew aircraft on missions they were never designed for. I can remember flying reconnaissance airplanes on strike missions with no gunsight or bombsight at all. . . ."

Would things be that desperate in a new war, say in the Middle East? No one knows, but General Minter is dedicated to making sure they won't be.

History Repeating Itself

One of his frustrations, though, is that there is a certain repetitiveness to history. Last October, he told the 40th Bomb Group in New Orleans about a document put together shortly after the end of World War II. Prepared by the Office of Statistical Control, the December 1945 paper said that as the Army Air Forces expanded from peacetime to wartime strength after Pearl Harbor, two material management problems came to the fore: "The determination of advance requirements and the effective distribution of equipment on hand." It said that "requirements for aircraft, for spare parts, and for expendable supplies had to be gauged for long periods ahead, because the production cycle was as long as two years for some items."

General Minter told the 40th Bomb Group that "in almost every respect," the logistics task is the same as it was in World War II, and that "the biggest job for Air Force logisticians and engineers today is to identify the support requirements and program for the necessary funding."

This is a big business, General Minter said, because of competition with other Air Force programs such as R&D and training—"not to mention the requirements of the Army, Navy, and other needs of our society."

The "absolute minimum of what is needed to ensure support of existing and new aircraft entering the inventory, modifying our older aircraft, and providing for new military construction and maintenance of our existing physical plant," General Minter said in New Orleans, is $14 billion—about one-third of the Air Force budget. "This money supports our ICBMs, over 9,000 aircraft including our Air Reserve forces, 134 major installations, and the maintenance for over 90,000 vehicles."

To get the job done, he said, "nearly sixty percent of the Air Force civilian and military force is involved in logistics and engineering, with nearly half of the Air Force enlisted personnel in . . . related jobs."

Managing the Inventory

One way to help manage the funding for spares—and to deal more effectively with the fact that there aren't enough—is to know precisely the inventory of spares available now, what condition they're in, and exactly where the thousands of parts are located. The current system works, but it might not be up to the fast-paced, dynamic action of a war. Information systems must also be highly reliable because if they fail there won't be enough people to do the job by hand. Besides, logisticians say, automatic systems will be the only ones able to keep up with rapidly changing situations.

A constant, however, will be lots of flying. Precisely how much depends on the scenario—and is classified—but, as General Minter says, "we have war plans that call for high rates of activity for all aircraft."

Beyond knowing more precisely where the spares are located and what shape they're in, the Air Force will have to have a command control and communications (C^3) network specifically for logistics. Managers are concerned that the present Defense Department system might be overloaded or even cut completely by enemy action. General Minter says that, "from the point of view of redundancy and survivability, especially to control material assets and redistribute them, we need a better system."

There are "serious problems" with the current system of C^3 for intratheater logistics, he says. "It's a problem because if we had all the spares we needed, and we were ready to go, and then our bases were attacked, we couldn't forecast at what level [the damage would be] or what bases would be hit. We need to be able to communicate" to control the movement of supplies in the theater during or after an enemy strike.

Logistics Challenges

The amount of supplies to be moved, logisticians say, could be reduced in a number of ways. The recent swing to precision-guided munitions is seen as a good thing, for instance, because fewer weapons would be needed to kill a target. "It's a consideration," says General Minter, since with fewer sorties there are also fewer spares and less fuel, and a cut in the requirement for engines and maintenance people.

For the same reasons, logisticians would like to see some R&D on the general-purpose bomb, which has been around since the early 1950s in a number of varieties and which makes up most of USAF's inventory of conventional

---

Richard Tuttle has a master's degree in journalism from Ohio State University. He has been with Aerospace Daily *since 1967, rising to Managing Editor. He has visited the Soviet Union and Israel on aerospace reporting trips, and also regularly covers the Farnborough and Paris Air Shows. Tuttle is an active sailplane pilot. He has flown in the F-14, F-15, F-5F, two-seat A-7 and A-10, the Harrier, and the Hawk.*

John Carranza, of the Warner Robins Air Logistics Center, Ga., bins materials awaiting requests from Air Force customers around the world. (USAF photo by Mike Malone)

weapons, but which could at the same time be made lighter and more effective.

And, they say, weapon systems coming into the inventory must be designed with logistics in mind, especially considering that fewer people will be coming into the Air Force, and that they will not be as well educated. The logisticians stress the importance of reliability, maintainability, and availability, as well as some thought on the part of the designers about modifications. The more mods required to keep a weapon up to date, the more difficult and expensive is the logistics process to support it, they say. Realistically, however, they see a trend to even more modification of in-service weapons, rather than the buying of new ones.

Another difficulty is the relative vulnerability of logistics facilities and equipment. This wasn't a particular problem in Vietnam, but future operations may have to be carried out from places where air superiority is not assured and where enemy ground forces might be able to overrun an airfield. Hardening and dispersal to fend off nuclear, chemical, and biological attacks are seen as prudent steps.

Getting supplies and munitions to the battle area in the first place is an even more basic problem. Former Secretary Mark, General Minter points out, "identified our current airlift deficiency to be the greatest problem the Air Force faces in executing our national military strategy."

General Minter says that "as we are witnessing today, projecting the military power of the United States to areas where our vital interests are at stake is of paramount importance." Among things that need to be done in the near term, say Air Force leaders, are rewinging of the C-5, stretching of the C-141, and building up the Civil Reserve Air Fleet (CRAF) program. After that, a major Air Force goal is to procure the CX transport so that outsized cargo can be delivered directly to austere airfields. But even if all these programs come to fruition, things will be tight, logisticians indicate, stressing that it will be vital to have dedicated airlift for the rapid and efficient movement around the theater of munitions, spares, engines, and maintenance people.

To help offset the airlift—and sealift—shortfall, the US has been planning to preposition much of its war-fighting material. Sen. John Glenn (D-Ohio), among others, is skeptical about this idea, noting that such supplies might be destroyed before US forces ever got to them. Logisticians acknowledge that not much is known about prepositioning, and that there will probably be cases of putting equipment in the wrong places. General Minter says, "There's a question of how much of what" should be prepositioned, and agrees with Senator Glenn that "there's a real risk it'll be destroyed before we arrive." There's also a "political risk," he says. "There are cases where it may not be politically feasible to extract it . . . and that presents a problem. Even so, if the nation has a stated vital interest [in a particular area], it's probably acceptable to put [things] at risk by prepositioning. . . . Like most everything else" in logistics, it's a balancing act.

Fuel and raw materials are other challenges for the Air Force logistician. "Fuel will be a major problem for the Air Force from this point forward because of price and availability," General Minter says. Of the 6,800,000,000-barrel annual US demand for petroleum, the Defense Department takes 2.5 percent or 170,000,000 barrels, of which fifty-six percent, or 95,000,000 barrels goes to the Air Force. Of this, in turn, ninety-one percent is aviation fuel.

The cost keeps going up, and to offset it, Air Force Systems Command and Logistics Command have been working on such things as drag-reducing, range-extending winglets for the KC-135 aircraft, and fuel management systems for engines. They object to cutting peacetime flying hours because of the negative impact this would have on training. They also say there is no good way to simulate the logistics functions needed to support modern weapon systems, and that cutting down on their use to save fuel would eliminate much of the training that would be required to keep them operating in battle.

Raw materials in Air Force weapons—titanium, cobalt, aluminum, and chromium, for instance—are subject to much the same pressures as oil. Many can be found only in distant countries not always in political agreement with the US, and the lines of communication to these countries are sometimes vulnerable. Further, the US stockpile of some materials has been allowed to dwindle. Logisticians worry that it would be difficult, if not impossible, to get along without some raw materials. If substitutes could be made, they point out, there might be resulting degradations in weapon sys-

FB-111 maintenance specialists at Plattsburgh AFB, N. Y. In the future, the work force may not be able to react as fast. (Photo by William Ford)

tem performance and maintainability, and training in the use of special tools that substitute materials might require would take a long time and be costly.

The declining number of military personnel—another factor over which the Air Force has little control—is also a headache for logistics planners. "We're worried about the [manpower] resources," General Minter says. "The people the Air Force gets are good people, intelligent and well educated. Our main concern is to retain them. The thrust behind that is compensation." But this won't offset the fact that "in the coming years the resource base will be declining because the eligible male population is forecast to be smaller."

Logistics Command, he says, has a continuing need for engineers, and to get them it has to compete with industry. "The ALCs [Air Logistics Centers] are constantly on the road trying to recruit," but "they're head-to-head" with industry. Asked how they come out, General Minter says "only fair," because the Air Force can't compete with industry's pay scales.

For the Air Force generally, a decline over the next twenty years of seventeen- to nineteen-year-old males eligible for military service—along with an anticipated decline in scholastic aptitude and the increasing complexity of weapon systems and related equipment —means a work force that may not be able to react as fast in wartime, and one that will probably be more expensive to maintain.

Logisticians are also aware that the number of women coming into the Air Force may increase significantly, and say that equipment and tools originally designed for men may have to be changed. But General Minter says that while "we will design equipment to do a better job, we won't design it just for women."

One possible answer to the decline in male population, officials say, is to use civilians in logistics jobs. This, however, might lead to problems in wartime, they say.

The Declining Industrial Base

Still another area of concern for the logistician is the industrial capacity of the US. A general shortage of skilled manpower, the raw materials problem, competition from commercial aviation, inflation, and an ever-declining number of second- and third-tier subcontractors are all making it harder and harder for the Air Force to be able to look to industry for a rapid reaction to an international crisis. It would take anywhere from twelve to twenty-four months for industry to mobilize today, and by the end of the century, if trends continue, it may not be able to react at all, students of the phenomenon say.

"One of our bottlenecks," says a logistics expert, "is castings and forgings. What happened there is that environmental controls drove many of the small concerns out of business. I don't quarrel with the requirements for controls of that nature, but it's just a pity they didn't include in the same legislation low interest loans to allow these people to stay in business." With fewer companies, work loads have increased and "lead times that were on the order of, say, ten to twenty weeks are now sometimes more than 100 weeks." At the same time, this expert says, "an engine part that cost something under $900 the last time we bought it in 1970 now will cost on the order of $10,000 because that part has not been made and the machinery, workers, and all the rest of it have to be assembled to do it again. . . ."

One way to offset the problems of a declining industrial base, logisticians say, might be to reduce the number of different parts it has to make for the defense establishment—in other words, increase the level of commonality between the Army, Navy, and Air Force. This could also be done with civilian systems, but there would have to be ways of simultaneously eliminating military specifications from items built for commercial use.

Another problem, ironically, may be the logisticians themselves.

"In some ways, they've been their own worst enemies," one USAF official says, "because under absolutely terrible circumstances, with no notice and nobody taking them into the planning process . . . year after year . . . the bombs have been there, and the fuel's been there, and the airplanes have been ready to fly, and these guys have made do with less than required for so long that they've been taken for granted" and haven't made their own case strongly enough. "We can't allow that to happen anymore."

General Minter quotes an anonymous logistician, said to be a member of Caesar's legions, who apparently felt taken for granted:

"Logisticians are a sad and embittered race of men who are very much in demand in war and who sink resentfully into obscurity in peace. They deal only in facts, but must work for men who merchant in theories. They emerge during war because war is very much a fact. They disappear in peace because peace is mostly theory. . . ."

General Minter says, "I'm neither sad nor embittered—but I'm also glad I'm not in demand. But with regard to the latter, it is a matter of degree. I am gratified that the Air Force leadership has fully recognized the need to support the force and is allocating the resources necessary to correct this imbalance." ■

LOGAIR: The Unsung Essential Airlift

Hauler of high-priority and sometimes hazardous cargo on routes not always served by commercial air carriers, LOGAIR is a moderate-cost means of coping with spares shortages in a period of tight budgets.

No matter where one plugs into the Air Force logistics system, sooner or later the name "LOGAIR" enters the conversation. It is the supplemental commercial hardware-hauling subsidiary that moves priority cargo within the continental US.

LOGAIR was founded in 1954 by then-Air Materiel Command (now AFLC). The purpose was twofold: to move spares quickly to CONUS-based operational units, and to shuttle materials between each of the air depots. The first aircraft contractors used were WW II-vintage C-46s.

With today's logistic system operating with critical shortages across the board, LOGAIR's primary purpose is to provide priority weapons system support and to speed the return of expensive repairable equipment to the AFLC depot system. In effect, LOGAIR's trunk lines keep the depot repair lines open. LOGAIR is contracted by Military Airlift Command and operated by Air Force Logistics Command. The current contractors include TransAmerica, Evergreen, and Zantop. The aircraft used today are Lockheed L-100 Hercules and L-188 Electras.

How LOGAIR Works

With a nationwide route structure, LOGAIR aircraft daily sweep through MAC's aerial ports, bringing in action-ready repairables for overseas shipment and picking up items for distribution among the logistics centers for repair. They also sweep through key bases of SAC, TAC, AFSC, MAC, and Air National Guard with delivery of time-sensitive spares. It also moves hazardous or restricted cargo such as explosives and munitions.

Two examples serve to illustrate LOGAIR support. If a black box is needed immediately on an F-15 at Bitburg, logistics priorities put the package aboard the regular LOGAIR flight from Warner Robins to the aerial port at Tinker AFB, Okla. There it goes immediately aboard a MAC C-141 or C-5. When the aircraft lands in Germany at Rhein-Main or Ramstein, the box is expedited right into the 36th TFW's waiting truck, and on to Bitburg and the aircraft. Or, in a different type of use, say a B-52H in depot maintenance at San Antonio ALC needs landing gear components not in stock. The LOGAIR system may bring in the components from Ogden ALC (landing gear manager). Or the component may fly via the LOGAIR feeder route that includes Davis-Monthan AFB, Ariz. There, the gear component may come from stored B-52s, which have become a major resource for readiness. In any case, the expedited movement was possible through use of LOGAIR.

Effects of Cuts; Pound-Foolish?

LOGAIR's annual cost is about $75 million. The FY '81 appropriation cut $6.5 million from the requested amount, forcing AFLC to adjust its route patterns. This followed reductions of nineteen percent in 1979 and twelve percent in 1980. These adjustments (eliminating two trunk routes) will have a direct impact on readiness. The loss of the routes will extend transit times for shipments going to first-line weapon systems, affecting F-15, F-16, A-10, F-4, and B-52 aircraft as well as strategic missile systems. As one person puts it, "The true impact [of the LOGAIR cuts] will fall on those already overburdened combat wings who will find yet another rung added to the ladder they must climb daily to meet our commitments. . . ."

Critics of LOGAIR say the Air Force should use commercial air carriers or other modes such as truck and rail to meet its needs. However, those alternatives fall short of readiness priority requirements. Consider SAC bomb wings at bases such as Wurtsmith and K. I. Sawyer in Michigan, served via LOGAIR routes feeding into the Ogden and Dayton air logistics centers. Commercial air service does not exist among those points. The same is true of shipping between the bomb wings at Blytheville, Ark., and San Antonio; no commercial air service, but regular LOGAIR flights. More examples of pairs served by LOGAIR but not commercial air: Macon to Oklahoma City; Dayton to Dover, Del.; or Macon, Ga., to Dover. Using trucks or rail for priority or hazardous cargoes will add days, not hours, to their transit time in the system. That means aggravating the already-critical shortages.

Nonexistent or unresponsive alternatives aside, there is a cost element. LOGAIR moves 130,500 tons of critical cargo for $75 million, or less than $600 per ton. AFLC experts doubt that commercial airlift could be obtained at that price and that fast.

Thus, given the existing critical shortages, and given the fact that LOGAIR compensates for shortages by accelerating movement of critical items, cuts in its service seem a "pound-foolish" sort of fiscal micromanagement that aggravates the problem instead of helping to solve it.

—F. C. B., Jr.

Shown is the ramp area of the new air freight terminal at Robins AFB, Ga. (USAF photo by Mike Malone)

In this interview with AIR FORCE Magazine, Gen. Bryce Poe II tells how Air Force Logistics Command meets—and overcomes—the challenges of managing shortages, doing more with less, and increasing productivity.

THE LOGISTICS OPERATORS MEET THE CHALLENGES

BY RICHARD TUTTLE

AFLC Commander Gen. Bryce Poe II is a 1946 graduate of West Point. He flew USAF's first jet reconnaissance sortie of the Korean conflict.

AIR Force Logistics Command (AFLC) faces some problems keeping USAF stocked with enough spare parts, but there is no question in the mind of AFLC's Gen. Bryce Poe II that operational units would still be able to give an outstanding account of themselves if conflict comes.

Innovation and ingenuity in the command itself and in the field, says General Poe, go a long way toward making up for shortages that are often beyond the control of the Air Force.

General Poe—who oversees an organization that manages $20 billion and has ten major activities at eight locations that would rank No. 11 on *Fortune Magazine's* list of the 500 top US companies—is candid about the spare-parts problem, but he also makes these other points about his command, based at Wright-Patterson AFB, Ohio, and charged with providing worldwide logistics support to assure that all USAF weapon systems are in a constant state of combat readiness:

- **People:** "The best thing I have going for me is a very bright and well-experienced work force" of 89,000, most of whom are civilians. "It's just very hard for me to overstate what it means to have the kind of people I have. . . ."
- **Productivity:** "At a time when American industry's productivity is falling, our productivity in maintenance facilities went up again last year. . . . I'm very proud of that operation."
- **Relations With Industry:** "After a period where industry was distracted by the peacetime commercial requirements, I firmly believe they are now swinging back to giving us the kind of priorities that not only I think we deserve, but that the law gives us, and I find that we are working closer with industry." AFLC last year let contracts for goods and services to industry valued at nearly $5 billion.
- **Energy:** "We've taken that very seriously. . . . When I took the job three years ago, one of the first things I did was to direct that the command be free of dependence on natural gas, purchased electricity, and fuel oil by the year 2000. . . . I knew I was pressing my engineers, and I meant to, and right now I'm very confident we're going to make it."
- **Distribution Technology:** "We have probably the most up-to-date facilities in the nation" for supplying 800,000 different items. "Hardly a day goes by that someone from industry, Sears or somebody like that, doesn't go to one of my depots and see the way we handle, say, small items. . . . We're moving, as money allows, more and more into the computer-operated and numerical machines and robots, and I see a bright future there for us."

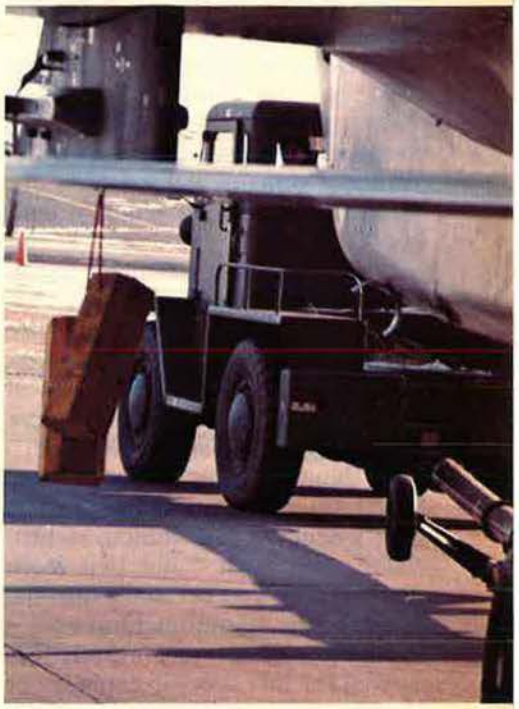
Managing Spares Shortages

But, says General Poe, "spare parts are the lifeline of what we do," and since spares funding has been "a serious problem" since about fiscal 1977, AFLC has had to redouble its efforts to perform the major overhaul tasks that are beyond the capability of operational units, and to make sure that USAF weapons can be deployed quickly anywhere in the world and fight for long periods once they get there.

The situation isn't helped by the fact that AFLC, like most other US military organizations, has a manpower problem. "In the last fifteen years," says General Poe, "this command has gone from 140,000 down to its current 89,000 people." There has been a corresponding drop in the number of USAF aircraft for which it is responsible —from 15,000 or 16,000 to the current 9,800, but the remaining aircraft are much more complex technically, and at the same time, "we've picked up almost 9,000 foreign airplanes (from more than sixty countries) that we have some measure of responsibility for."

Besides that, many of our airplanes are getting older, so repair and maintenance are generally more difficult.

Also, says General Poe, the level of training of the average maintenance person has dropped as the number of experienced maintenance hands has declined. The result, he says, is that "we'll find a



Limited spare-parts funding, lower training levels of maintenance people, complex aircraft, and the enemy threat all contribute to the difficulty of repair and maintenance of USAF weapons. (Photos by William Ford)

much more junior individual doing jobs. For example, some time ago I saw painted on a SAC B-52 that the crew chief was a senior airman. Now, that B-52 . . . is an irreplaceable piece of national treasure'' —various models over the past eighteen years have undergone close to eighty modifications at a cost of more than $3 billion—''and that young man, whom I'm certain is capable, has some very heavy responsibilities that only recently would have [been those] of a technical sergeant.''

Meanwhile, maintenance problems are made more challenging by the increasing threat to units deployed in places like South Korea and Europe. To respond to the threat, aircraft are scattered widely in shelters, and ''this makes maintenance a totally different exercise than it was when they were parked vulnerably, wingtip to wingtip,'' General Poe says. ''In those days, if a chief master sergeant on the line saw a young airman with a toolbox headed for an airplane, he might go over and ask him what he's about to do. In this case, he may never see him because he may be five miles away and entirely on his own.''

To illustrate the spare-parts problem, General Poe recounts a budget problem that arose when he was Vice Commander in Chief of the US Air Forces in Europe, the post he held before he came to Wright-Patterson. During fiscal year 1977, ''I was to be funded for War Reserve Spares at ninety-four percent. This worried me, because in the case of an F-4 squadron [of twenty-five aircraft], computer modeling will show you that the difference between ninety-four percent and 100 percent of those spares is the difference between running out of airplanes in thirteen days and having sixteen airplanes left at thirty days. So that last six percent was very important, and I rather strenuously made that point.

''As history shows, however, I didn't know how fortunate I was, because in 1978 it dropped . . . to forty-nine percent. In 1979, the decline continued to thirty-two percent funding. We hit a low in 1980 with fifteen percent funding. In fiscal 1981, it jumps back up to forty-nine percent, but you must understand that the material I [am] given money for in 1981 will not be available until 1983. And the budget program on through those next years, of course, is affected by inflation, like everything else. . . .''

Establishing Shortage Priorities

Asked what's happened to cause spares problems, General Poe says that first of all, there has been ''serious concern as to priorities within the armed forces. Where do you put the very limited funds?'' Also, ''We

were introducing new weapon systems like the F-15, the A-10, and the F-16 that had to be funded in '78 and '79 to provide for the aircraft coming in in 1980 and '81. And in some instances, we just didn't have the money [for spares]."

All this is worrisome, the General says, because "from the point of view of my responsibilities, [it] means that you better be very careful about going to war, because our sustainability is very much in danger."

And, he says, it's difficult to say when the situation will improve because "I don't know what the budgets will finally show. The first cut at the 1982–86 program showed that full funding [for War Reserve Spares] would be achieved in '85." One thing that has to be remembered, though, General Poe says, is that whenever full funding is provided, one must "add two more years before you get items into the hands of the operational forces."

And yet, things are going relatively well for this specific category of spares, with War Reserves prepositioned with operational units overseas to keep the force fighting for anywhere from seventeen to thirty days.

"The trend is worse if we look at a thing like Other War Reserve Material," required to last through the period of use of the War Reserve Spares and beyond until American industry can come up to speed (maybe as long as twenty-four months). "With the exception of about $7 million in 1977, which was one percent funding, we have had no money for Other War Reserve Material. So, as far as I'm concerned, that does not even exist. . . . The '81 budget includes [Other War Reserve Material] for the C-5 only, which amounts to about three percent of what I need for all types of aircraft. So we're beginning to get some . . . but really very little."

Still, if "the plan is to buy out that [OWRM requirement] by 1986, we're talking about an enormous amount of money. . . . We're talking about such figures as upwards of $1.8 billion in a single year during that period. We're also looking at inflation, which in my business is normally just about double what you see on your TV screen."

For spares of all kinds, "$5 billion would buy about half my requirement for '82. I need very large quantities of money."

On the other hand, "I understand that I am talking about figures that are probably not achievable."

Still, "what hurts my conscience is how long" the operational units will be able to fly and fight "without my being able to provide what I'm charged to send over and do for them." It's particularly ominous, General Poe says, that in the next two years, AFLC will be getting spares that were funded in 1979 and 1980 "at very, very low percentages."

"Common-Item" Shortages

Also a problem are the so-called "common items" that "we get from the General Services Administration and the Defense Logistics Agency—let's say such things as fasteners. For the first time, I'm beginning to find items held up because of a shortage of these common items, which may be used across several of my weapon systems or even among services, although, in fact, seventy percent of the items managed by the Defense Logistics Agency are single service items."

On a recent trip to Okinawa, General Poe found that engine turnaround time was falling off, not for the usual problems with blades, vanes, and hot section parts, but because fasteners "were in such short supply that they were being drilled out of the old engines parts in order to be reinstalled in the new."

General Poe says this concerns him for two reasons. "First, while these agencies in some ways have been better funded than [AFLC] in the past, their funding has dropped off. Second, since it is a centralized system, I don't have the visibility or the status on those items that I have for those I manage myself."

But, says General Poe, AFLC and the operational units have worked out some ways to get around the spare parts difficulty.

On engines, for instance, "we know that when we hit the overhaul [point for a specific powerplant], we're going to have trouble working the problem" because of a lack of replenishment spares. "Now, the first thing is, we do have spare engines, purchased at the time we got the airplane or thereafter, and we can, by the judicious use of those spares, extend the operation by a certain length of time and allow us to operate year to year with less money to repair the engine.

"We also—thanks to the very, very hard work of the operational units—can put off the day of reckoning under certain circumstances, and the way we do that points to some of the things we would do in wartime. Let's say we have an engine that is approaching some kind of deadline for repair. When it gets near the deadline or even reaches it, we may put that on an airplane standing alert—maybe air defense alert or strategic alert. It doesn't fly unless a serious problem comes up. Then, we have to ask the crew to take that chance, let's say in wartime, and go with that engine. . . . When that airplane goes off alert, we take that engine out and put it on the next alert airplane, and then put in the first airplane an engine that has time left on it. . . ."

The tradeoff is a lot of flight-line maintenance crew overtime and a lot of paperwork. "My organization, the engine managers, the Strategic Air Command, the Tactical Air Forces, wing commanders—everybody has to track those hours in a way that we wouldn't have to, had we been funded for the parts. . . ."

Of course, "in wartime we would probably just fly the engine to destruction. And since we do have some cushion built in, that means it might carry us quite some time. But we are to the point now where every aircraft is almost a national treasure, and we can't afford to take chances in peacetime."

Another "work-around," General Poe says, is continuing to fly aircraft with cracks or corrosion, but watching them very carefully with "rigorous inspections before each flight or after each flight." Or, "we may ask pilots to restrict to certain G forces." The ideal solution would be to repair an aircraft as soon as a defect shows up, but ". . . we may not have the part, we may not have the money to apply to either organic or contractor repair, or we may have so few airplanes of that type that we cannot ask the operational command to do without it."

Electrician SSgt. Henry Ware, 2955th Combat Logistics Support Squadron, drills holes before installing a "scab" patch on an F-105. (USAF photo by TSgt. Dave Bowers)

Again, it's "an enormous load on the operating air forces" since stepped-up inspections require "the closest management supervision, special training of inspectors and tracking—the permutations and combinations of which are very, very complicated."

People Make the Difference

But things aren't all bad. When he is asked about AFLC's people, General Poe brightens. The subject of spares "puts me as curmudgeon who's only growling about things."

The command's people, he says, "really do respond to these budgeting problems, and every day I'm just amazed at the innovative procedures they come up with." In the Acquisition Logistics Division at Wright-Patterson, for instance, "we have computerized our ability to try not to make the same mistake twice, in everything from design and repair to contracting in business practices. I'm enthusiastic about the progress made."

One ALD group has come up with a way to buy sixteen TR-1 tactical reconnaissance aircraft for the price of ten, General Poe says. "They have enabled us to go to the Department of Defense and the Congress and say, 'Look, if you will let us do this in a way we call "expenditure funding," we can [buy more TR-1s at the same price], with earlier delivery, and never once get in a situation where we would have termination liability of the sort that would require us to ask for extra funds.' "

The Combat Logistics Support Squadron (CLSS) concept, says General Poe, is another winner. "I must confess this is a horseback guess on my part, but after watching these fellows work, I think a unit in the forward area in wartime that has one of these squadrons available may have as many as ten percent more sorties available just because of the way they know how to do what I might have called as a youngster, 'blacksmith work.' They repair battle damage, they fix failed parts in ways that are not in the book."

Also, says General Poe, AFLC's civilian workers are tops. "Their talent is recognized quite clearly worldwide. . . . I don't get too hot under the collar about too many things, but one thing that really grates on me is the caricature of the overpaid, underworked, incompetent civil servant. I have, in this command, experts in what they do."

He also stresses that the ratio of high-ranking civilian workers to the rest of the work force is very low in AFLC. "If we look at the new Senior Executive Service, my ratio is one to about every 4,000. Across the Department of Defense, the ratio is one to 860. And federal-wide, the ratio is about one to 400. So we're a business organization, and we're run like one. . . ." This, General Poe says, has helped AFLC's productivity rise at a time when American business productivity has stood still or dropped.

Changing Industry Attitudes

Also helping has been industry's changing attitude toward the military, he says. Things are changing for a number of reasons. One is that "we are a little more clever about the way we do business. We made it very hard to do business with us for a while. Then we in Logistics Command invited them to come in and tell us what was wrong, and we learned some good lessons. For example, OSHA [the Occupational Safety and Health Administration] has backed away from what I would call nit-picking things, such as how high off the floor the fire extinguisher is, that kept some companies out of the federal market. . . ." Also, "Some elements of labor have come to understand" that competition with foreign countries is stiff, "and that negotiations for pay and benefits have to take that into account if we're going to stay in business in this country.

"But mostly [things are changing] because I think the management of the companies . . . have begun to understand that we in the military are insisting on more reliable equipment and in getting our money's worth. A good example is that avionics for the first time are becoming, across the board, much more reliable. That doesn't mean there aren't some avionics that give me fits. There are. But on balance, for the first time, I'm seeing in my own depots a reduced avionics load."

On energy, General Poe says the conservation goals for AFLC are "getting tougher all the time, but I think we're doing well. . . . " Energy control is important, he says, because engine test cells, facilities to test engine fuel controls and to do electroplating and painting use vast amounts. AFLC has been working with the Department of Energy "on many projects, including geothermal," and "we're using refuse-derived fuel, mixing it with coal; we're using solar energy. . . . We have central energy monitoring systems in all our stations to tell us where the bad actors are and where the efficient places are. . . . "

General Poe's thirty-five-year Air Force career—he retires in August—covers a broad spectrum, from fighters and reconnaissance aircraft (ninety combat missions in Korea, including the first USAF jet reconnaissance mission, and 213 combat missions in Southeast Asia) to strategic missiles. As a result, he speaks as an operator of equipment. He confesses a strong attraction for the operations end of things—"I left my fingernail marks all the way across the ramp on my way to the logistics shop, but I've never regretted it," he said once—and it's that perspective that he brings to his AFLC position.

"The job," he says, "is not logistics. It's putting bombs down on the target." ■

While AFLC's Air Logistics Centers have similar organizational structures, their roles vary according to assigned resources. To demonstrate, we'll focus on one ALC and its contribution in keeping a single aircraft type flying and combat-ready . . .

WARNER ROBINS AIR LOGISTICS CENTER: MANAGING THE F-15 FLEET

BY WILLIAM P. SCHLITZ, SENIOR EDITOR
USAF Photos by Mike Malone

PROMINENT among the tenants at Robins AFB in central Georgia are the headquarters of the Air Force Reserve and SAC's 19th Bomb Wing.

But in terms of base employment, these, and indeed the base itself, are largely overshadowed by the base's host—the Air Force Logistics Command's Warner Robins Air Logistics Center.

The majority of the 19,000 people working at the base, 14,000 of whom are civilians, are employed at the air logistics facility, making the ALC the largest industrial employer in the state of Georgia. The skills and expertise of the air logistics work force range from metallurgy to computer programming to aircraft-repair specialties, providing the broad base on which the Center relies in its task of systems/subsystems management, maintaining, upgrading, repairing, testing, acquiring, supplying, and keeping track of things that allow the Air Force to function. In short, logistics.

There is no argument that logistics is prevalent in almost every aspect of Air Force operations. The Air Force-wide logistics pie is huge, and Warner Robins has a big slice of it. The air logistics facility provides worldwide support for an array of weapon systems, including the C-141, C-140, C-130, C-119, and C-123 transports; the F-15 fighter; the reconnaissance-configured B-57 bomber; U-10 and U-16 utility aircraft; HH-3 and HH-53 helicopters; and AIM-7, AGM-45, and AQM/BQM-34 missiles.

Further, Warner Robins also manages for the Air Force such equipment as weapons fire control, bomb navigation, airborne communication, airborne radar, electronic warfare, propellers, airborne guns, general-purpose automatic data processing systems, and even handguns, among other things.

Ninety percent of the Center's annual budget of $1.9 billion is spent to fulfill the needs of its "customers"—the systems it manages, support for systems managed by other ALCs, the ANG, AFRES, the separate operating agencies, and the other commands. For example, when TAC plans a deployment it will submit a list of Warner Robins-managed equipment it will need and the Center complies.

In the area of programmed depot-level maintenance, the Warner Robins facility is responsible for repair of F-15, C-141, and C-130 aircraft. The ALC also is AFLC's Technology Repair Center for airborne electronics, gyros, propellers, and life-support systems. Reflecting the importance of the equipment repair function is that 3,643 persons at the Center are so employed, compared to the 1,815 engaged in aircraft maintenance and repair.

Civilian maintenance specialists on the Warner Robins ALC Speed Line perform an F-15 fuselage fuel tank modification. Three shifts operate the Speed Line around the clock.

Supporting the F-15

And while the organizational structures of all five of AFLC's Air Logistics Centers are similar, each is unique in its assigned management responsibilities for Air Force resources. As a prime example of how an Air Logistics Center contributes to keeping the Air Force flying and combat-ready, we'll focus on the relationship between Warner Robins and one aircraft type—USAF's F-15 Eagle air-superiority fighter.

Besides supporting the F-15 units in CONUS and at Kadena AB, Okinawa, in the Far East, Warner Robins in its role as "Systems Manager" is responsible for keeping at peak combat efficiency the front-line Eagles of USAFE's 36th Tactical Fighter Wing at Bitburg AB in Germany and those of the 32d TFS, Camp New Amsterdam, the Netherlands.

In terms of logistics, those aircraft are on a long tether that stretches back across the Atlantic to the US.

The "tether" joining Bitburg to the CONUS Air Logistics Centers in general and to Warner Robins in particular has several forms. Maintenance crews testing F-15 subsystems on the Bitburg flight line encounter various conditions requiring the use of a computer link by which Bitburg maintenance crews order various parts from the ALCs. These "line replaceable units" (LRUs) in logistics jargon can be found unrepairable on base or unavailable at base supply. Among them may be a number of "MICAPs." A MICAP (an acronym for mission capable) is an item considered essential for maintaining a particular aircraft at combat proficiency. Such requisitions coming in over the computer link at Warner Robins receive the highest-priority handling.

Standard parts replacement requests like those necessary to fill bench-stock requirements are processed routinely. An "Item Manager" of the Warner Robins Directorate of Materiel Management who oversees distribution of a particular part will interrogate his computer link with the Warner Robins warehouse as to whether that part is in stock. If so, the computer will kick out a shipping order.

Under normal, nonpriority procedures, parts requisitions are filled and in transit from the ALC within seventy-two hours. The parts, once the shipping order is received, are plucked from the warehouse shelves and packaged for shipment, depending on the "mode" decided upon. Standard low-priority replacement items, for example, are routinely shipped aboard ocean freighter.

Many replacement parts bound for Bitburg, however, are fed into the aerial element of the supply

The logistics "tether" stretching across the Atlantic to Bitburg AB in Germany provides the essentials that keep F-15s flying and combat-ready.

Herman Brigmond, left, and Thomas Saunders install bottom skin on an engine intake during an F-15 Speed Line procedure. Such civilian maintenance and repair specialists often accompany Combat Logistics Support Squadron members TDY to work on aircraft modifications in the field as required.

pipeline, another aspect of the logistics tether linking the air base in Germany to the ALCs in the States. Daily, commercial cargo planes operated by contractors, called LOGAIR, fly a circuit of the five ALCs scattered around the country *(see box)* to load and offload items in transit. Generally, in the case of Bitburg, the final US destination is Tinker AFB, Okla., site of the Oklahoma City ALC. At Tinker the various shipments are sorted, with parts bound for Bitburg from Warner Robins arriving at Tinker to be consolidated with items received by LOGAIR from the other ALCs to make the most efficient use of space available on regularly scheduled C-5 or C-141 MAC cargo airlift flights to Germany.

The pipeline works in reverse, with equipment requiring repair routed back to the responsible Air Logistics Center. The idea, though, is to cut the time items spend in the pipeline, so that scarce replacements are either undergoing repair or available for use.

In the replacement process, MICAPs, as noted earlier, receive special consideration. These items, essential to aircraft combat capability, are also ordered via the computer link. Bitburg takes it a step further with a follow-up telephone call direct to the Warner Robins Acquisition Division to help expedite shipment. (For urgent MICAP replacements, air base commanders have the option of dipping into the war readiness support kits that accompany aircraft, but only as a stopgap resort.)

If a MICAP item is unavailable from the Warner Robins warehouse, a check is made of the ALC's repair facility, and then other air bases—such as Luke AFB, Ariz., or Langley AFB, Va., in the case of the F-15—to locate the item. Finally, Warner Robins has the authority to request a MICAP from the backlog of items going into the production of new F-15s at the McDonnell Douglas plant in St. Louis, Mo., or from the subcontractor that produces the part for McDonnell Douglas. (To order from the plant, there is a computer link at Warner Robins manned by a McDonnell Douglas employee for just that purpose.)

If McDonnell Douglas makes the MICAP available, and it usually does, it will in all probability be trucked to nearby Scott AFB for shipment to Tinker and then on to Bitburg via regularly scheduled MAC airlift to Germany.

As last and very expensive resorts, Warner Robins can ship a MICAP by commercial airline or request a MAC specially assigned airlift mission or SAAM.

But why are such extraordinary efforts to meet replacement parts

USAF'S OTHER AIR LOGISTICS CENTERS

To help flesh out the Air Force support picture, what follows are brief logistics profiles of AFLC's four other ALCs, including their contributions to the F-15 program.

The Ogden ALC at Hill AFB, Utah, is System Manager for SAC's ICBM force as well as the new F-16 and F/RF-4s and F/RF-101s. The ALC also supports the Bomarc drone missile and Maverick air-to-ground missile and is responsible for maintaining the Emergency Rocket Communications System. Ogden's latest major support assignment is the MX missile, currently in the site-planning stage.

Ogden is manager for all Air Force air munitions, explosives except nuclear, and solid propellants, including ICBM launch motors which it tests at a nearby range. In terms of the F-15 and other aircraft, the ALC is responsible for landing-gear components. It also keeps track of all Air Force photographic and reconnaissance equipment, and oversees the maintenance and creation of training equipment for aerospace weapon systems.

The Ogden Center and Hill AFB are the state of Utah's biggest employer, with 14,000 civilians and 5,000 military on a payroll that annually exceeds $380 million.

Oklahoma City ALC at Tinker AFB, Okla., supports the A-7D, B-52, KC-135, E-3A, and E-4 aircraft. Among missiles it manages are the SRAM and Air-Launched Cruise Missile. The ALC also supports a family of aircraft engines not including the F-15's F100-PW-100 turbofans. It is from Tinker, the only inland aerial port of embarkation in the US, that MAC stages its

requirements necessary? Why doesn't Warner Robins—or whatever Air Logistics Center is managing a particular system—assure that sufficient quantities of parts, particularly MICAPs, are on hand at air bases as needed?

One major cause of spare parts shortages is the budget pinch. It is no secret that spares funding has been restricted in recent years. And no one could have anticipated the skyrocketing rate of inflation over the last decade.

Another culprit is the current lack of industrial capacity. For example, there simply is not enough extrusion/casting/forging capability in the US to keep pace with demand, a demand fattened by emerging commercial/wide-bodied aircraft as well as increasing defense needs.

Yet another drawback is competition with industry. It is ironic that the US defense community is in competition with the nation's manufacturers for the same kinds of miniature electronic components that are used to produce electronic games and pocket calculators as well as advanced weapon systems.

All this has led to lengthening —and difficult to forecast—lead times in supplying items. For example, when the first F-15s came off the production line, manufacturing lead time for its APG-63 radar was fifteen months; currently, it is from thirty-six to thirty-eight months. From order to delivery, aircraft windshields take from thirty-six to forty-eight months. Under our system, the military is merely another customer in competition with others for limited output.

And in the case of new systems equipping aircraft which incorporate state-of-the-art technology, it was impossible to forecast with any reasonable degree of accuracy the mean time between failures so that a cushion could be integrated into the contracting process. Also, in instances where manufacturers are pressing the state of the art in a particular area, say, hybrid circuits, high rejection rates of faulty parts are the result.

Traditionally, military budgets are assessed and money appropriated by Congress annually, with one-year contracts let on that basis. With procurement lead times more often stretching out over three or four years, the move now is under way toward multiyear contracts to better anticipate needs, cut production costs, and enable manufacturers to plan ahead, among other benefits.

While Air Force logistics managers are quick to assure that spares shortages have not impeded warfighting capabilities for the short haul, with war reserve spares kits to fall back on in the extreme, from the Bitburg point of view there simply are not enough spares on the supply shelves to support a sustained conflict.

Logistics managers underline a dilemma. Despite the serious spares situation, F-15 mission capability and sortie rates both rose through 1978 to 1980. Should flying proficiency training be cut back in the interests of maintenance?

Combat Logistics Support Squadrons

Assigned to each of the five Air Logistics Centers is a Combat Logistics Support Squadron manned by officer and enlisted experts in aircraft repair, maintenance, and combat packaging and supply operations. They form the core of AFLC's aircraft repair troubleshooters.

The CLSS units were established during the war in Southeast Asia for the express purpose of conducting battle- and crash-damage aircraft repair and depot-level maintenance in the field.

---

routine worldwide airlift flights. The Center supplies F-15 flight instruments.

The Center repairs all Air Force hydraulic/pneudraulics transmissions, air-driven systems, oxygen components, and engine and automatic flight control instruments. At the ALC is the Maintenance Analysis and Structural Integrity Information System, used in malfunction detection analysis aboard the C-5 and other aircraft and to develop life-cycle forecasts.

The largest single employers in the state of Oklahoma, the ALC and Tinker AFB have some 16,200 civilians and 5,500 military on an annual payroll of about $400 million.

As Systems Manager, the Sacramento ALC, McClellan AFB, Calif., is currently gearing up for the first flights of the Space Shuttle. The Center supports a dozen types of aircraft, including the F/FB-111, the A-10, F-105, F-100, and the T-39.

Besides its Space Shuttle support role, Sacramento ALC is also a key troubleshooter for several other Air Force space-related programs, including the Air Force Satellite Communications System. The Center manages ground radar units, airframe components, ground communications equipment, and all airborne and ground generators—a total of 122,000 items of which 40,000 are aircraft-related, 56,000 that are communications/electronics/meteorological, and 26,000 space/commodity-related. The Center supplies F-15 radios.

Sacramento ALC also repairs hydraulics systems, flight-control accessories, electrical components, and ground communications and electronics components. The ALC and McClellan AFB employ about 12,800 civilians and 3,500 military on an annual payroll of about $340 million.

While the F-15's Pratt & Whitney-built engines are, like all F-15 items, under the purview of Warner Robins ALC, they are actually managed by the San Antonio Air Logistics Center, Kelly AFB, Tex. Engines are the ALC's specialty. It manages 25,000 aircraft engines and 48,000 other types of engines for the Air Force. (United Airlines, the largest civil carrier in the world, by way of comparison maintains only about 1,300 aircraft engines overall for its own operations and an additional 300 for other airlines.)

San Antonio ALC supports sixteen aircraft, including the C-5, F-5, F-106, T-38, and F-5E International Fighter, the sale of which to foreign nations requires Center support in the Mideast and Europe. Among other roles, it is responsible for USAF's nuclear ordnance, USAF and NASA fuels and lubricants, the Air Force's fleet of boats and ships, and the DoD working dog program. San Antonio ALC and Kelly AFB employ some 17,500 civilians and about 4,500 military on an annual payroll of $400 million.

The Warner Robins Speed Line was set up to correct a flaw in the F-15's secondary power system and kept active thereafter in an evolving program of modifications "to enhance performance through state-of-the-art improvements." Here, civilian specialists James Thompson, left, and Wallace Johnson seal a wing fuel tank.

At Warner Robins is the 2955th CLSS, responsible for helping to maintain Air Force C-141s, C-130s, and F-15s (though the unit will take on other aircraft types on demand).

CLSS members are highly trained professionals ranging from electricians to sheet-metal craftsmen. During routine duty, they work alongside civilian technicians on the F-15 Speed Line *(see below)* and C-141 and C-130 programmed depot-level maintenance docks at Warner Robins. They perform prime depot maintenance or repair crash-damaged aircraft as required. The CLSS units do not train apprentices. CLSS members are fully qualified before assignment to the unit, with either depot or squadron experience but with the highest performance ratings.

While TDY in the field, however, CLSS people take a big step in preparing for their primary wartime mission—the rapid repair of battle- or crash-damaged aircraft. At air bases in CONUS and abroad, CLSS teams perform tasks on the ramp that are beyond the capabilities of base maintenance people, such as crash-damage repair, fixes of aircraft structural problems, and depot-level work. One of the most important and time-consuming missions is the modification of aircraft to upgrade performance as well as combat capabilities called for in Time Compliance Technical Orders (TCTOs).

For example, in 1979 the 2955th deployed a 103-man team, the largest yet from an Air Logistics Center, to perform ten depot-level TCTOs on ninety-five F-15s at Bitburg. The job required seven months and the expenditure of a total of 1,000 man-hours per aircraft. A typical example of a TCTO: the modification of the F-15's ground jet fuel starter to allow engine restarts following in-flight engine flameouts.

A more routine CLSS assignment was the deployment in August 1980 to Luke AFB, Ariz., of a fifty-five-member team that completed eight F-15 TCTOs in sixty days. Lengthy TDYs are a way of life for CLSS members. Because of their depot and other experience right from the beginning with the F-15, Warner Robins CLSS members are more knowledgeable than almost anyone in the field about the inner workings of the aircraft.

In a wartime situation, the squadron—currently numbering 158 people—would be realigned into a number of repair teams, their size dependent on the complexity of the aircraft involved and other factors. These teams would augment air base repair capabilities.

The first echelon would be the Rapid Aircraft Battle Damage Augmentation Repair Team (RAB-DART), consisting of from six to twenty people responsible for quick fixes of battle-damaged aircraft. "We won't deal with heavily damaged aircraft except to shunt them aside to be cannibalized for parts," said SMSgt. Willis Fitts. "The idea would be to patch up aircraft enough for them to perform at least one more mission."

More self-sustaining would be the Combat Aircraft Repair Team (CART), made up of from forty to sixty people. The mid-sized CART would go to greater lengths to make permanent repairs to damaged aircraft.

The third weapon in the CLSS arsenal would be the Rapid Area Maintenance (RAM) team consisting of from sixty to about 100 people, a miniature depot field team capable of major modifications and TCTOs.

The ideal CLSS member is a jack-of-all-trades such as a sheet-metal specialist capable of splicing wires or performing any number of other jobs not ordinarily in his sphere.

To supplement their on-the-job training, CLSS members are often detached for assignment to other air bases for courses on the F-15's fuel

In the Warner Robins depot maintenance program, civilian repair specialist Bobby Greene works on the engine truss mount of a C-130 transport.

system or its airframe, for example, taught by Mobile Training Teams composed of Air Training Command instructors. In July 1980 at Warner Robins was established the Aircraft Battle Damage Repair (ABDR) School, set up to teach typical combat temporary repairs and orient personnel to hostile-fire damage. Personnel from the 2955th CLSS and the 402d CLSS (Reserve) train together. Each ALC has now or is developing an ABDR school to train its active and Reserve CLSSs.

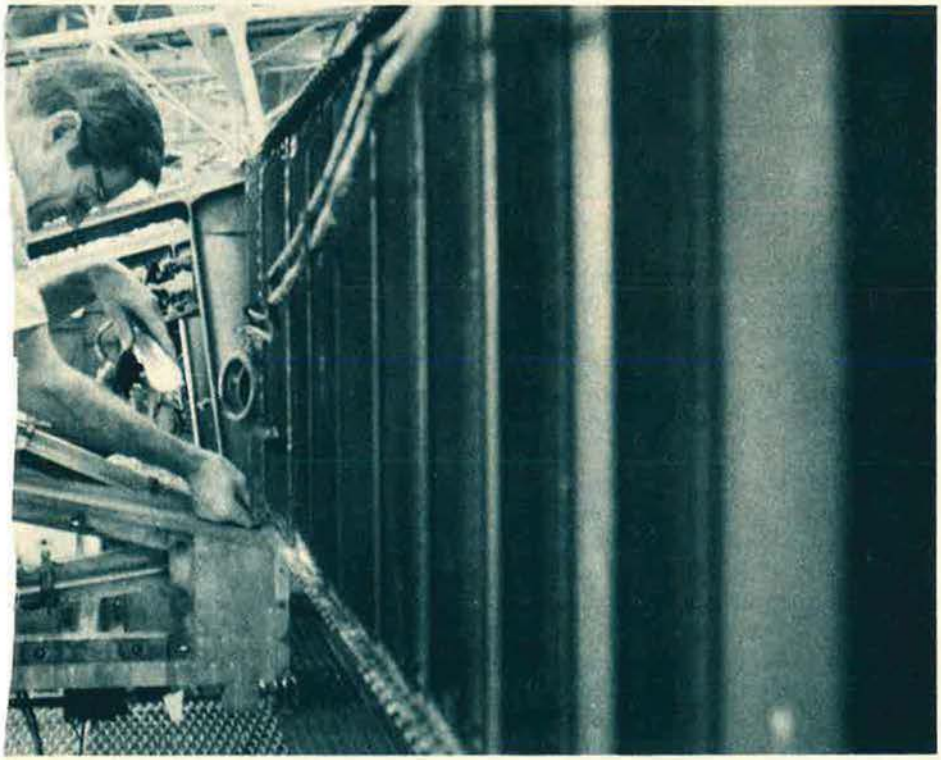
Prominent members who travel with the CLSS repair teams are supply and transportation specialists who provide liaison with air base maintenance and who in wartime would pitch in to help base repair personnel iron out snags in the replacement parts flow. Capt. Stan Justice, Commander of the 2955th CLSS, said, "The supply and transportation personnel are invaluable assets to our wartime mission as Combat Distribution Teams; and their peacetime role save millions of dollars in logistics support throughout the world."

The ALC Speed Line

Many new weapon systems develop bugs that seriously interfere with operational capabilities. One such in the early life of the F-15 was the high failure rate of the aircraft's secondary power system.

As a result, the Warner Robins ALC set up its "Speed Line," a method of fixing the F-15s in a systematic way and as rapidly as possible. As plans for other F-15 modifications came on stream, the Speed Line operation was kept open. The Speed Line has handled as many as thirty-one "mods," or modifications, on a single F-15, "not only to repair defects but to enhance performance through state-of-the-art improvements," said Col. Lee Greer of the ALC's Directorate of Maintenance. Work on the Speed Line averages about 2,500 man-hours per plane. Major mods are accomplished with manufacturer-supplied parts kits.

The Air Force now has in its inventory four types of F-15: the "A" version; "B" two-seater; "C" upgraded fighter; "D" upgraded two-seater. (The two-seaters, while used in a training role, have combat capabilities identical to single-seat F-15s.) Many of the "mods" undertaken in the field or on the Speed Line entail bringing A and B versions up to C and D standards. Other mods are to give all versions entirely new capabilities or to offset, say, newly developed Soviet threats.



Some engineering change proposals that are cut into manufacturer McDonnell Douglas F-15 production are also incorporated as Speed Line mods. When US-based F-15s, or for that matter those returned from overseas, are brought into the hangar area housing the Speed Line for modifications, their progress through the process is carefully monitored. Speed Line managers conduct daily briefings on the status of each aircraft and the owner unit is periodically advised as to the expected date of work completion.

Once the mods or repairs are completed, the aircraft are moved to the ramp area for fueling, leak testing, and the functional testing of all systems. Then they are put through their paces in checkflights by the two F-15 qualified pilots attached permanently to the ALC's Flight Test Branch.

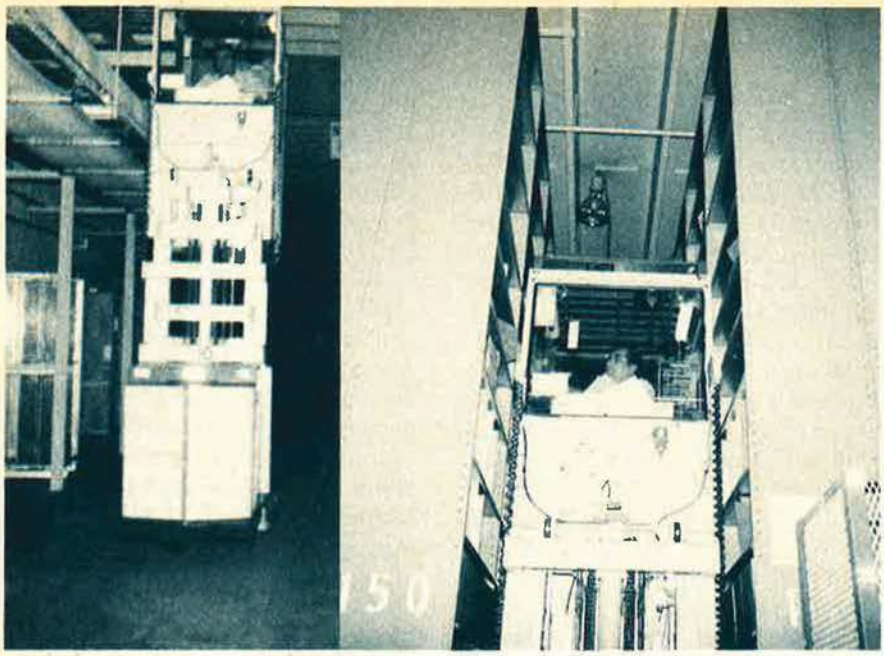
The ALC's Directorate of Maintenance (Aircraft Division) maintains the Speed Line, with civilian and Air Force maintenance specialists working around the clock in three shifts.

In the mod docks, computer control is used to sequentially schedule the thousands of tasks involved in reworking and inspecting the aircraft. While many of these chores can be performed by one worker, others are so complex that they require a concentrated team effort.

The Speed Line handled eighty F-15s in FY '80, and other depot-level maintenance accounted for the overhaul of an additional six F-15s, 140 C-141s, and 102 C-130s, for a total of 328 aircraft. (Warner Robins is also responsible for supervising the "stretching" of the C-141 fleet in progress at the Lockheed-Georgia plant at Marietta.)

As part of the depot-level maintenance, C-130s and C-141s are overhauled at Warner Robins as a matter of course (twenty-eight percent of the entire C-141 fleet undergoes this type of maintenance each year and at any one time fifteen C-141s and six C-130s are in the docks for it). As a relatively new weapon system, the F-15 isn't expected to require a major overhaul for some years to come.

The F-15 has been designed for ease of maintenance. Its engines, for example, are equipped with coasters for adroit roll in and roll



A Remote Vehicle Processor manned by John Carranza operates in the aisles of the Warner Robins ALC warehouse, above left. Linked to the automated facility's central computer, the vehicle can be directed to the precise niche where a particular item is stored and elevate its operator, above right, to reach it. The warehouse is capable of processing some 4,000 items daily.

out. The plane's "click-click" (meaning easy removal and substitution) avionics "black boxes" number 106 compared to, say, the F-4E's 294. Again, while the F-15 has a total of 202 lubrication points, the F-4E has 510. In cockpit instruments, it is thirty vs. forty-eight in the F-4E. Hydraulic filters, seven vs. twenty-one. But despite eased maintenance, many repairs require extensive effort. When the forward bulkhead of an F-15 buckled due to overpressurization, the repair dictated the disconnect of hundreds of internal wires and an expenditure of 16,000 man-hours.

People repairing aircraft at Warner Robins use "mate-and-switch" concepts. For example, while the blown bulkhead aircraft was under repair, its wings replaced those of a plane that had been damaged by pulling excessive Gs. Under such a method, as many F-15s as possible are returned to operational status.

At Warner Robins several severely crash-damaged F-15s have been almost entirely rebuilt, that effort being more economical than replacing them from the McDonnell Douglas production line. One such aircraft, severely burned by an in-flight engine fire, required more than 20,000 man-hours on the part of maintenance planners and mechanics. After almost totally rebuilding the aircraft, it passed flight check the first time out with only two minor write-ups. After two years of work, labor costs of about $57,000, and parts costs of slightly more than $1 million, the F-15 was returned to service. This was accomplished with an estimated saving of $18 million less than the cost of replacing the aircraft from the McDonnell Douglas production line.

F-15s are brought to the ALC only for modifications and crash-damage repair that can't be performed on the flight line or at intermediate levels.

The ALC Parts Warehouse

At first inspection, the Warner Robins parts warehouse is as one might expect—a huge building containing aisle upon aisle of towering shelves reaching to the thirty-foot-high ceiling. But on those shelves you'll find no open cardboard cartons containing nuts and bolts and countless other loose thingamabobs. Nor will you find clerks wandering up and down the aisles snatching things off shelves.

No, the warehouse is almost entirely automated, and once the symbology for a particular item going into storage is punched into the facility's central computer, warehouse managers maintain complete control over that item.

And once a shipping order request for a replacement item is entered into the computer, there is usually only a twenty-minute wait before the item is delivered for shipment. This rapid response is made possible by the warehouse's inventory control system that is capable of processing some 4,000 items per day, compared to the 1,000-per-day rate of a conventional warehouse.

There are "clerks," of course, to restock and retrieve items, but they are actually computer operators who require a twelve-month training period to prepare them for the job. They ride among the aisles of the 240,000-square-foot facility on wheeled Remote Vehicle Processors that are capable of elevating their operators to upper shelves and are directed via computer link with the central computer to the precise niche where a particular item is stored. "The human tendency to forget is removed," said Col. Thomas LaPlante, the ALC Director of Distribution. "Once it's in the computer, we can find it."

With Warner Robins responsible for ninety percent of Air Force-wide avionics support, the warehouse stores 100,000 items of its

140,000-item inventory solely to cater to the needs of the ALC Avionics Center's maintenance shops.

With the precautionary shutdown of the facility's central computer because of an electrical storm or because of a power outage, business at the warehouse does not grind to a halt. There is a manual backup system to provide for the continued flow of item traffic in and out of storage, with procedures for computer update once power is restored and it comes back on line.

On a daily basis, the warehouse issues or receives for processing some 7,000 items on average. These are the products of the extensive Warner Robins repair shops or input from numerous manufacturers of Air Force items.

Once items have been selected from the warehouse in response to requisitions, they move by conveyor belt to a central shipping facility where they are appropriately packaged for shipment.

The ALC's F-15 Simulator

The F-15 simulator at Warner Robins is unique in several ways. It is the first aircraft simulator built in-house by Air Force personnel rather than purchased from a contractor. Second, and perhaps most important, is the simulator's job.

Whereas standard training cockpit simulators mate computers and aircraft electronics to give pilots the realistic but illusory feeling of flying, the ALC F-15 simulator uses a pilot and computers "to make its electronic systems think they are flying," said Maj. John Howard, F-15 Avionics Integration Support Facility Program Manager.

In other respects, the simulator is like the standard variety in duplicating the F-15's flight envelope, from takeoffs and landings to air-to-air combat. However, the simulator was not designed to teach pilots to fly and fight. "Rather," said Major Howard, "it helps 'teach' the F-15 computers, which in turn assist the pilot. The computers assist by controlling some of the avionics systems as well as by providing information to the pilot, but the programs and their interface with the pilot must be continuously updated to adapt to new conditions and new weapons."

The simulator provides a realistic flight environment to the computers so that their programs can be developed, refined, and tested, and so that the pilot/computer interface can be evaluated as if the overall system were actually in the air. The ultimate purpose is to have the F-15 computers support the pilot so that he can concentrate on his primary tasks of flying and fighting, Major Howard said.

Roland Bockhorst, left, and Kenneth Obst evaluate the effect of a computer program change on the cockpit display of the F-15 simulator.

The object of this article has been to sketch the role of an AFLC Air Logistics Center as Systems Manager of a specific type of combat aircraft—the F-15. Because of space limitations, other essential activities at Warner Robins in support of the Center's Air Force-wide responsibilities have been merely mentioned in passing, for example the ALC's extensive repair facilities. Also a story unto itself is the equipment testing effort being put forth at the Air Logistics Center.

The only Air Logistics Center on the eastern seaboard, Warner Robins recently dedicated its new $2.23 million Air Freight Terminal building, expected to handle 382 LOGAIR arrivals and departures a month.

In 60,000 square feet of cargo processing area, the terminal's new $3.2 million mechanized material handling system is capable of moving 10,000 tons of cargo per month and of sorting 3,000 packages an hour. Cargo flows to and from the terminal to fifty-five first-line defense bases and the other Air Logistics Centers via the LOGAIR system.

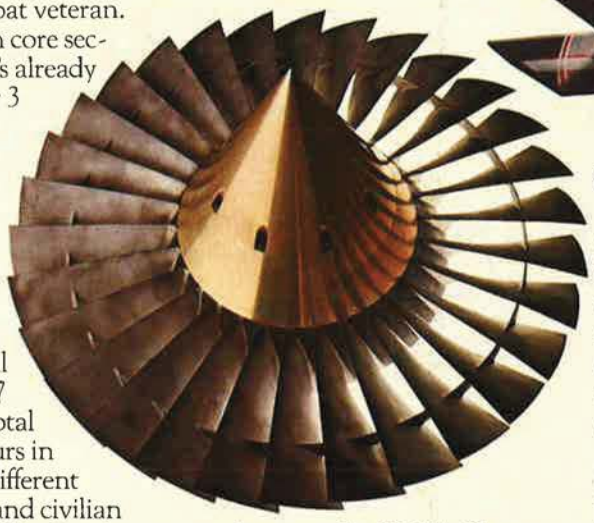
Through its continuing logistics efforts, then, the Warner Robins ALC is in full compliance with its motto: "Better, faster, cheaper." ■

The ramp area of the new Warner Robins air freight terminal is expected to handle 382 transport arrivals and departures a month in the LOGAIR resupply system.

THE AI
NEEDS THE
WE'VE A
FOUGI

Why is Garrett's TFE76 turbofan the leading candidate to power the Air Force's New Generation Trainer?

Because it's the only candidate engine with the heart of a combat veteran. A proven core section that's already seen over 3 million hours of military action in the Rockwell OV-10 Bronco.



As well as over 17 million total flight hours in over 50 different military and civilian aircraft. (That's twice as many hours as the NGT will accumulate in 20 years of operation!)

The TFE76's core section already has the design maturity and production experience of some 8,000 engines behind it. Which eliminates the high risks asso ciated with the development of an engine which has never been i production.

OV-10 Bronco

A mediur bypass, 1,200 to 1,500 lb. thrust turb fan, the core of the TFE76 is based on Garrett's extremely successful, fuel-efficient turboprops: the military T76 and th civilian TPE331. What's more, the TFE76's fan uses the advanced aerodynamics of our latest TFE731 turbofan, the engine that powers 14 of today's leading business jets. Which means you'll benefit from the latest, most cost-effective design concepts.

The adaptability of the TFE76's turboprop core to a highly efficient, rugged military turbofan has already been proven in a demonstration engine program begun back in January, 1979.

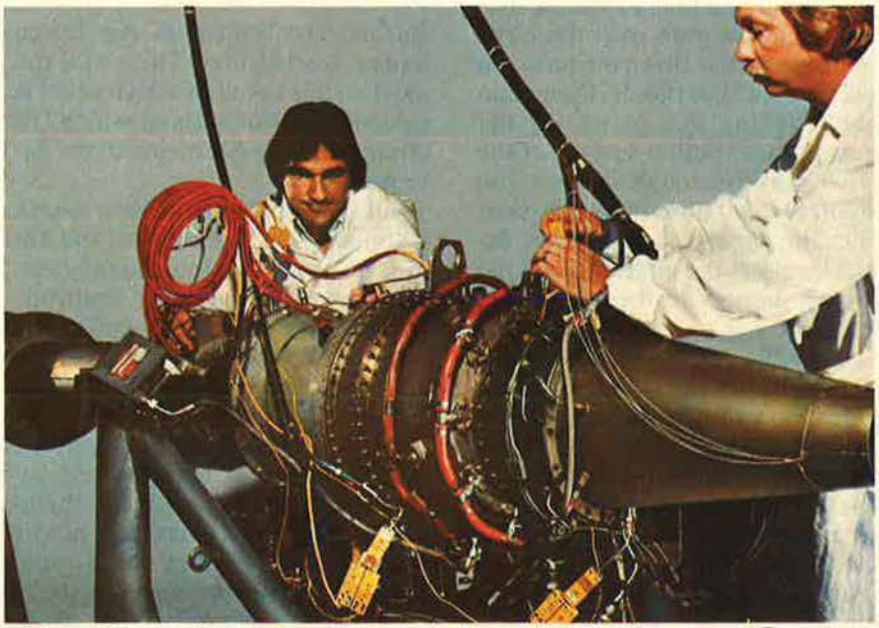
Unlike the complicated axial compressors of other candidate engines, the TFE76's rugged centrifugal compressors are

FORCE
EXPERIENCE
LREADY
T FOR.

up to 30 times more resistant to foreign object damage, and are extremely tolerant to high levels of inlet distortion.

For maximum engine protection and condition monitoring, our TFE76 is equipped with a full-authority electronic fuel control system. A feature which also helps us achieve our exceptionally low SFC. And, to reduce maintenance costs, we offer fully-modular design, backed up by our extensive experience in supporting Garrett engines worldwide.

The lesson to be learned is clear: Garrett's TFE76 is the low risk, high performance choice for the Air Force's NGT. For more information, write: Propulsion Engine Sales, AiResearch Manufacturing Company of Arizona, P.O. Box 5217, Phoenix, AZ 85010. Or call (602) 267-2319.



GARRETT The Garrett Corporation
One of The Signal Companies

Garrett's TFE76 Military Turbofan.

To do more with less, as is the case in Air Force logistics, requires initiative, innovation, and attention to detail. It also means people working extra hard. The result, stretching from depot to flight line, is . . .

GENERATING SORTIES: How to Keep Them Flying

BY F. CLIFTON BERRY, JR., EDITOR IN CHIEF / Photos by William A. Ford, ART DIRECTOR

Two F-15C Eagles of USAF's 36th Tactical Fighter Wing thread a path along the taxiways at Bitburg AB, Germany, en route from their shelters to the active runway. Pre-takeoff checks complete, they perch side by side on the threshold of runway 06. Their gray silhouettes blend into the gray sky background, but show up darker against the new snow.

At a signal from the leader, the four F100 engines on the two fighters roar louder, then both planes surge down the runway, leaping into the air together in less than one-fifth of the runway's 8,200-foot length. Their airspeed accelerates rapidly at a shallow angle of attack, and then both fighters pitch up sharply and disappear within seconds as they arrow into the gray overcast.

Ten minutes later, another pair of F-15s does the same. Still later, as the overcast has become broken cloud cover and the red winter sunset casts a pale glow over the western horizon, the first pair turns on final approach and lands, their main gear reaching like claws for the black porous friction surface of the active runway, touch it, then roll smoothly and turn onto the taxiway. The engines sigh at lower decibel levels as the aircraft begin the twisting journey to their dispersed shelters.

Darkness falls and two more F-15s take to the air, only their navigation and beacon lights marking their transition into the clouds that have once again obscured the sky. The training continues around the clock as the squadrons of the 36th TFW maintain readiness to fight and win if war comes to Europe.

Those six sorties launched into the cold winter sky over central Europe are typical of Air Force wings worldwide. They are the most visible result of activity that is seldom seen but without which US airpower could not maintain the deterrent to war.

A1C Kimberly Estrada (left) instructs A1C Patricia L. Fischer in the repair of a leading edge crack on the left vertical stabilizer of an F-15 of the 36th Tactical Fighter Wing, Bitburg AB, Germany.

That activity—rather, those activities—are the logistics and engineering functions worldwide. They are the facets of multibillion-dollar operations whose real reason for existence is to generate sorties as required by the national interest. Or, as the logisticians say, "To put bombs on the target," emphasizing that logistics and engineering are not ends in themselves, but means to an end: the Air Force's contribution to national purposes. Whether launching B-52s from Grand Forks, T-38s from Laughlin, F-111Ds from Upper Heyford, or whatever else the Air Force is doing, logistics and engineering make it possible.

The 36th TFW typifies the worldwide, ubiquitous functions of logistics and engineering, so AIR FORCE Magazine uses them in this feature to represent activities that apply to every other wing. It followed the system to and from Bitburg to gain an appreciation of the organization and the people that make it possible for USAFE and Allied Air Forces Central Europe commands to rely on mission-ready F-15 sorties from the 36th.

Keystoners Provide the Platform

For the F-15s of the 36th TFW, Bitburg Air Base is the launching platform and the base to which they return in training. The activities of the 36th Civil Engineering Squadron (the "Keystoners") establish and maintain the base and, if necessary in wartime, restore damage so it remains operational. Its 550 people, about half military and half civilian, keep the base going. Bitburg AB is an establishment of more than 1,200 acres, 450 buildings, the runways, ramps, and taxiways, and associated utilities and support systems. Acquisition cost of the base was a bit more than $100 million; its estimated replacement cost in 1980 dollars is nearly $400 million.

How does the 36th CES contribute to sortie generation? In many ways, both directly and indirectly. For example, it operates the base's own water and sewerage systems, and is responsible for buying and distributing electricity from the German government. It also is responsible for the base housing, fire protection, and crash rescue services.

For fuel, the 36th CES maintains the pipeline, tank farm, and pump-

ing systems that get the fuel into aircraft tanks either via hot point refueling (where four aircraft fuel up simultaneously) or from tank trucks that go to the aircraft for in-shelter refueling (normally eight trucks operating daily).

The aircraft shelters are maintained and modified by the wing's civil engineers, as are the ramp areas around them. When the F-15s leave the shelters for operations, the taxiways they traverse are maintained by the engineers, and so are the runways. If the runways are damaged through enemy action, the engineers undertake rapid repair, having had teams trained at Ramstein Air Base for this function.

The four F-15s on air defense alert wait in the alert barn, a shelter provided by the engineers. When snow falls, the engineers sweep it off the porous friction course on the runways. If aircraft need to use arresting gear, three sets are ready to operate, thanks to the engineers. Similarly, the navigational aids around the base and environs are supported by the engineers, who also constructed and maintain the munitions storage areas from which the weapons for the F-15s emanate. In case of fire or rescue requirements, the "Keystoners" trained for those tasks go into action.

When aircraft or components return for maintenance on the base, the shops and hangars, the engine powercheck pads, and the administrative and living facilities are all the responsibility of the engineers. Should toxic chemicals escape or be inflicted on the base, the engineers' decontamination teams are the ones who will limit the damage and clean up the mess. And when a self-help project is created to improve a building or working area, the engineers evaluate it, order the materials, assist by augmenting the skills in the using unit, then supervise the project through to completion and inspection for use.

Even the labels convey a sonse of urgency for this package of MICAP parts being transferred laterally from the 32d TFS at Camp New Amsterdam to the 36th TFW at Bitburg AB. The units dispatch trucks daily to a central meeting point.

Most of these functions are invisible when the F-15s take off and land (except the runway), but without them, the aircraft would be nothing more than static displays. With them, as even this cursory listing shows, the wing has a functioning platform for its aircraft.

Airlift the Key

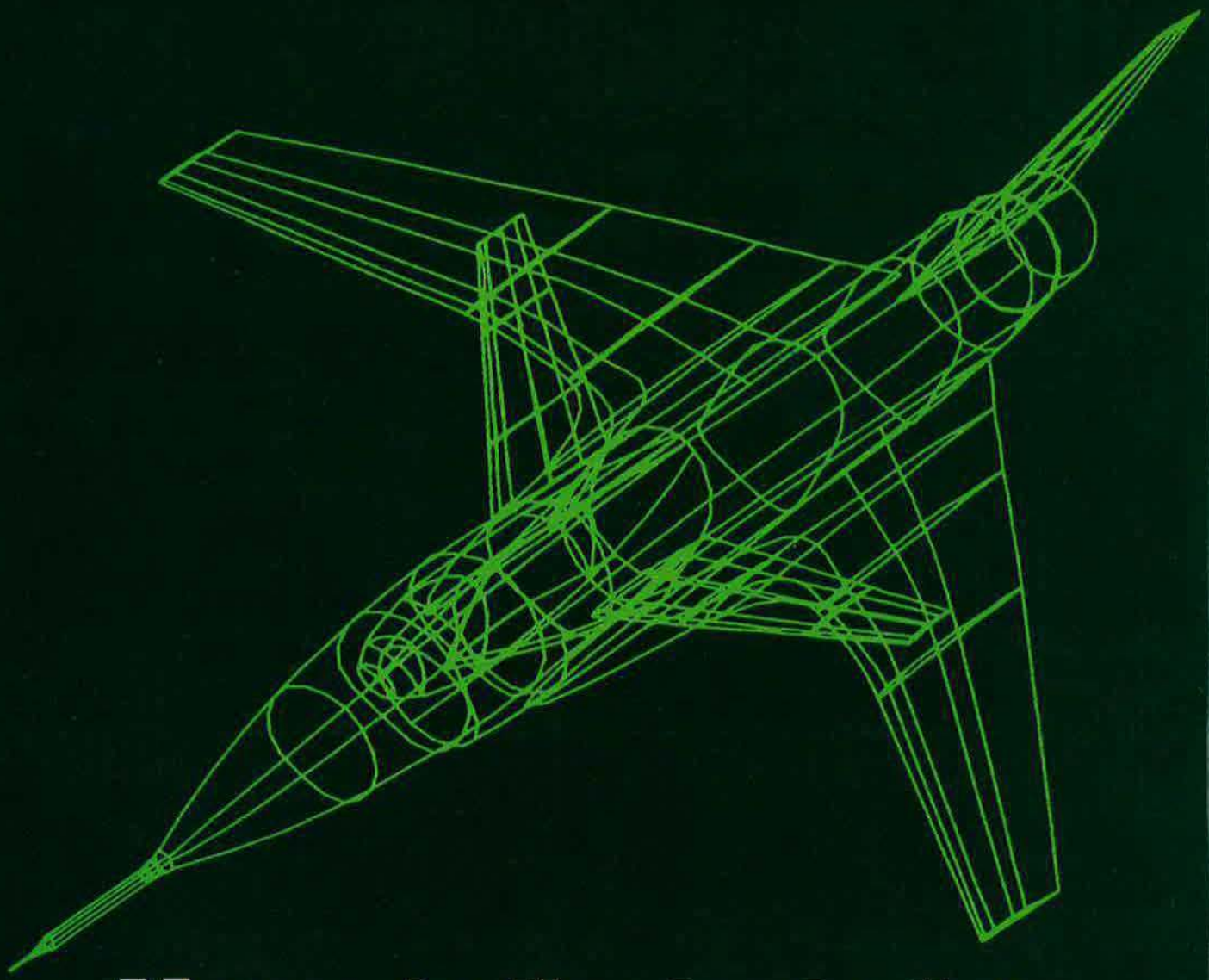
Airlift is the key to keeping the 36th TFW's F-15s mission-capable and flying sorties wherever needed. As so many people explained to AIR FORCE Magazine, the current airlift system managed by Military Airlift Command (MAC) for its worldwide customers has cut the so-called "pipeline time" dramatically. That was the time that parts took to move through the pipeline from vendor to depot to port to theater to using unit, and it could take months.

Now, the "order and ship time" for F-15 parts designated as MICAP (required for mission-capability), is less than thirteen days. For highest-priority parts, that time can be slashed to 2.5 days. That means time elapsed from the 36th's placing the order until it is received for installation on the aircraft. Within all of USAFE, about 30,000 requirements per month are ordered for its tactical aircraft, and about ten percent of that number are MICAP items. If the items are not held in unit stocks within USAFE, they must come from the US, and that's where Military Airlift Command makes the difference.

The aerial port at Dover AFB, Del., handles much of the cargo for units in Europe, including the 36th TFW. The 436th Military Airlift Wing at Dover operates the USAF C-5 Galaxy transports through the port, but also handles large numbers of additional transient aircraft such as USAF C-141s and contract-carrier 747s, and other transports. Almost every day, for example, Dover handles anywhere from half again to twice as many C-141 StarLifter departures as any of the bases where they are primary aircraft.

Given that volume of air cargo traffic, then, one would expect to see the aerial port chock-full of cargo awaiting movement. It is not full. 1st Lt. Tim Turner, OIC Air Freight, explained why—the port's purpose is not to store cargo or become a warehousing activity, but rather to fill up and empty itself as quickly as possible every day. Cargo is not allowed to age. On a recent weekend night, for instance, the oldest westbound pallet at the Dover aerial port had been ready for movement four days, including a long holiday weekend with light traffic. The oldest eastbound pallet was only two days old, and it was being readied for movement that night. Thus, although thousands of tons of cargo are handled by the Dover aerial port each month, none of it stays very long at the base.

Fastest handling is given to MICAP shipments with the "999" red label on them, as for example a critical part for one of Bitburg's F-15s. They are processed within thirty minutes of arrival at Dover, and leave for Frankfurt or Ramstein in less than twenty-four hours,



Memo to the test pilot: It's made with the right stuff.

When you test this one you'll be flying an aircraft evolution. An aerodynamic phenomenon. With forward-swept wings to give it a big boost in performance and maneuvering abilities. Quite possibly, the fighter plane of the future.

Rockwell International's North American Aircraft Division—military aircraft manufacturer for over a half century—has proposed to design and build the X-FSW SABREBAT manned demonstrator. Among other things, they will use advanced composite materials to make the forward-swept wings strong enough to take the kind of punishment you dish out.

Participating with Rockwell in this aircraft's development are six divisions of Bendix, a high technology friend of aviation for more than 50 years. Bendix will supply the aircraft with a new type motion sensor system. The unique on-board oxygen generation system will come from Bendix. So will the flexible power takeoff shafts. Bendix will also provide the entire aircraft with new Tri-start electrical connectors. And the new kind of hydraulic actuators needed to fit inside those knife-thin, forward-swept wings are also a Bendix design.

In short, this advanced prototype will be made with the right stuff. By people with the right credentials.

Think about that before you hunker down inside that advanced, integrated cockpit, (also developed by Bendix).

It might give your spirits a lift.

Bendix

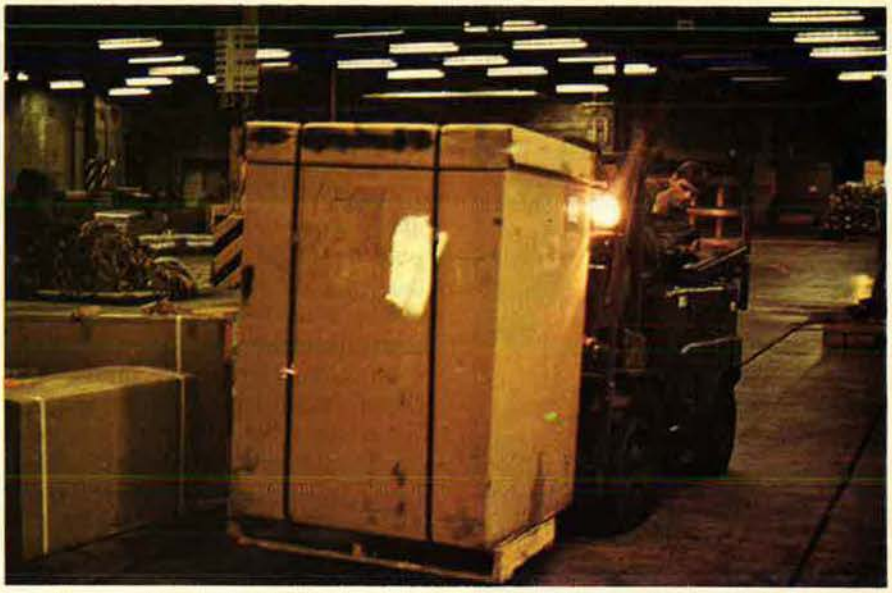
We speak tomorrow.

usually in less than twelve, either on a MAC C-141, contract 747, or MAC C-5 from the 436th.

AIR FORCE Magazine staffers accompanied a load from Dover to Ramstein aboard C-5 90005, flown by a crew from the 9th Military Airlift Squadron, based at Dover. Aircraft commander Capt. Alan C. King and his crew personified the worldwide airlift operations occurring around the clock every day: maximum training accomplished while executing real-life airlift missions.

While the flight crew was still resting and doing its preflight activities, loading of the aircraft began eight hours before takeoff time of thirty minutes after midnight. The unit's duty loadmaster and loading crew took aboard the pallets of cargo and positioned them on the main deck. They also took aboard the blankets, pillows, and food trays for the seventy-three passengers who would ride on the C-5's upper deck that night. (Only days before, the loading crews of the 436th had processed 400,000 pounds of emergency relief supplies for the Italian earthquake victims in a few hours.)

Meanwhile, in the aerial port the duty crew in the pallet pit area were building up pallets for European destinations. They assembled groups of packages, boxes, and kits on modular pallets weighing about 3,000 pounds each. Every package is identified as to its pallet, and every pallet spotted at an identifiable location within the port for quick retrieval and onward movement to an aircraft.



Building up pallets at the 436th Military Airlift Wing's aerial port at Dover AFB, Del. The activity goes on around the clock, building up multiple items into modular-weight (about 3,000 pounds) pallets for onward airlift.

Forklifts and "automated cherry-pickers" have taken most of the muscle work out of moving cargo within the port, but aboard the aircraft, human muscle power is used to position the pallets precisely over the right point for weight and balance requirements.

Promptly at 12:30 a.m. on a clear, starry winter night, Captain King began the takeoff roll from Dover, and then the training began. Examples of the training night, during the eight flying hours to Ramstein: The navigator was being checked by an examiner for his full qualification; an instructor flight engineer was upgrading a flight engineer transitioning into the C-5; a flight engineer flight examiner from the 436th Wing was performing an unannounced check; and, among the loadmasters, an instructor was assisting a new man to qualify while another was responsible for the load. So the taxpayers got eight hours of airlift from this crew and eight hours of flying training simultaneously—a bargain both ways.

Meanwhile, the parts for the 36th TFW and other USAFE units were riding along at .77 Mach, where they reached Ramstein on time and were unloaded into K-loaders for a short stay overnight at the aerial port.

Ramstein and Rhein-Main Air Bases are the main aerial ports in

How the System Copes With Parts Shortages

Examples of how the logistics system copes with critical parts shortages are provided by the cases of F-15 central gear boxes and jet fuel starters. Both are MICAP (mission-capable) components on the F-15. For a time in mid-1980, both were important elements in whether aircraft were NMCS (Not Mission Capable—Supply). That is, if they failed on an aircraft and were in stock at the unit, the maintenance people could remove and replace rapidly, returning the aircraft to mission-capable status promptly.

Two factors made the central gear box a short item: a shortage of parts for repair at San Antonio Air Logistics Center, and a temporary breakdown of the test stand there which compounded the shortage briefly. The solution: Repair the test stand and increase production by the manufacturer (AiResearch Mfg. Co.). The immediate actions filled outstanding MICAP requirements by November 30, and by April 1981 the requirements for meeting the needs of stock level and war reserve spare kits would be achieved. Meanwhile, analysis of central gear box failures is determining the cause(s), and, concurrently, stockage level revisions are planned.

Jet fuel starters were being removed prematurely (as compared with planned removal), creating abnormal demands that resulted in parts shortages for repair at the San Antonio Air Logistics Center. Analysis showed that the premature removals were caused by turbine wheel failures in the jet fuel starter. The failures resulted from attempting jet fuel starts with less than a full accumulator charge in the system.

Immediate action was taken to revise technical orders to prevent incorrect procedures causing more failures. But repair production of the jet fuel starter at the ALC was limited by availability of the turbine wheels, and they were paced by the production rate established with the manufacturer, AiResearch. San Antonio ALC increased its own repair capability, and contracted with AiResearch for additional repairs and temporarily increased production of the turbine wheels.

These cases illustrate the results achievable with command attention, quick analysis, and prompt remedies. The latter are not always possible, particularly in the cases of electronic components and rare metals. Contractors may not want to bid for the work, or they may be limited by availability of elements supplied by subcontractors. The result is AFLC's knowing what has to be done, but unable to do it because of limiting factors outside its ability to correct. When that happens, the system must "do more with less."

Airman Roger Kidd checks contents of bin at Bitburg's Materiel Storage and Distribution facility.

Germany, together handling almost 10,000 tons of cargo monthly. The action described at Dover is replicated in them: cargo in, cargo out, as fast as possible. They operate under control of MAC's 322d Airlift Division, commanded by Brig. Gen. Robert L. Springer. He points out that routine cargo arrives at using units from the aerial ports within 2.5 to three days, on the average, after offloading from the aircraft arriving from CONUS. (That average includes weekends and holidays, when the large US Army cargo trucks can't operate.)

General Springer says, "We do in peacetime the same things we'd do in wartime; that's why these airlift missions are a bargain, because for the same price we get both training and the airlift." He notes that Air Guard and Air Force Reserve specialists are an integral part of the airlift bargain. More than forty percent of the flight crews contain Reservists, and the aerial ports always have a portion of the complement from the Reserves performing active duty on actual mission-related tasks. Their participation throughout MAC, according to General Springer, "continuously builds a go-to-war capability" required of Air Force airlift resources.

"Push-Pull" Logistics

Shift mental gears now, leaving the inbound F-15 parts under the snow-covered roof of Ramstein's aerial port. They will move out over land tomorrow in US Army cargo trucks or vehicles from the 36th TFW itself. Leap mentally about 100 kilometers northwest to Bitburg AB to find out how the 36th operates what its people call "push-pull" logistics. But first, details on the wing and its systems.

The 36th TFW has three flying squadrons: the 22d, 53d, and 525th, each authorized thirty pilots. Another twenty-one pilots are assigned to wing activities and perform other command and staff functions in addition to their flying duties. Primary mission of the 36th is air superiority in central Europe, and it maintains four F-15s on air defense alert at all times. They are ready to go, capable of scrambling in less than five minutes.

The pilot experience mix in the 36th breaks into three major categories, each supplying one-third of the pilots: those with immediate previous fighter experience; those coming into fighters from staff jobs, Air Training Command, or elsewhere; and those just completing Undergraduate Pilot Training and F-15 transition qualification.

The wing flies about 18,000 hours annually, with each sortie taking about an hour. Eighty percent of the flying includes air combat training. In it, the pilots fly against each other or engage in dissimilar air combat training against USAF "Aggressor" F-5E, US Navy F-14, several nations' F-4 and F-104s, the Mirage, Draken, and others. Eight aircraft are kept on the NATO range in Sardinia, with crews rotated there for training. In 1981, after frustration because of Operations & Maintenance (O&M) fund shortages, the 36th will send aircrews to participate in Exercise Red Flag at Nellis AFB, Nev.

Experience levels on the flight line and in the maintenance squadron reflect the Air Force overall: heavily weighted with younger airmen just graduated from technical schools, and shortages in the middle and top NCO grades. The gaps, because of experience shortages, create enormous demands on the NCOs and the very junior and very senior airmen. The remarkable outcome—and a source of pride all around—is that the wing's maintenance effectiveness rate stays at or near 100 percent all the time. That is, the sorties delivered meet or exceed the number requested.

But keeping that record up, and also coping with all the stresses of contemporary life of an American airman in Germany, demands sometimes superhuman dedication and effort by all. (It is that dedication and 110-percent effort all the time that few people outside the Air Force ever see or hear about. But those qualities make the difference in compensating for years of cavalier treatment by the media and the government, and shortages of funds, parts, and skilled personnel.)

But what is "push-pull"? As the 36th TFW practices it, the phrase means making the logistics system work for the wing, not lying back

The Case of the Binding Throttle Quadrant

"The Case of the Binding Throttle Quadrant" is an example of how field reporting of materiel deficiencies can make changes and prevent future problems. In this case, several pilots of the 36th TFW reported that the aircraft throttle quadrants were binding at about one inch aft of the military stop position. This binding caused a false indication of the MilStop location, and also a safety of flight hazard because excessive force was required to move the lever past the binding, which could cause inadvertent afterburner engagement.

The wing presented the case to Oklahoma City ALC at the end of September, including in its report the indications found when throttle quadrants were torn down and inspected: throttle lever cams worn, nicked, ground, and flat-spotted. The tracks on which the cams rode were nicked and bumpy.

Oklahoma City engineering experts investigated the case. Their findings upheld the report from the 36th TFW. They also found the cause. Essential adjusting screws on the quadrants were tightened all the way down and then safety-wired. When the screws were adjusted to a reasonable pressure, the throttle levers worked fine. A further finding: Field and depot technical data did not provide any procedure for proper adjustment of the screws, and thus there could be a wide range of tension in the springs they retained. Immediate action has been taken to revise the relevant orders to include a procedure to prevent the overtightening.

Eagle Readiness Center of the 36th TFW, Bitburg AB. SrA. Daniel Hooker tracks supply items on the NMCS board.

and waiting for it. Col. Bart Crews, Deputy Commander for Resource Management, says, "For example, Warner Robins sees that a part is *pushed* into the system toward us; then we *pull* through the system to expedite its arrival here." Let's see how that works in practice for the 36th.

The F-15 maintenance concept is remove, replace, and repair. When an item malfunctions, it is removed and replaced with a spare and the defective part moves up the maintenance ladder. Much of the minor F-15 maintenance is performed on the aircraft right in the shelters, either by flying squadron personnel or technicians from a group called the Aircraft Maintenance Branch. They are a part of the 36th Aircraft Generation Squadron, but are associated and linked with a flying squadron.

The wing has supply points in the shelter areas, with bench stock and fast-moving spare items for replacement on the line. If a needed item is not there, those points have direct links to the supply computers in the wing's Demand Processing section by which the local system can be searched and the part located and designated for pickup. Once found, a part in base stocks is picked up and delivered to the flight line within thirty minutes. If not on base, the action goes into the hands of the Eagle Readiness Center, about which more will be told below.

Next level of maintenance is by the 36th Equipment Maintenance Squadron, whose members operate the shops, industrial complex, munitions storage, and the like. The highest level of local maintenance is performed by the 36th Component Repair Squadron. They identify and repair malfunctions in avionics, engines, and accessories.

If an item is beyond the wing's capabilities to repair, it is returned to the depot and a replacement starts through the system to the wing.

This is a practical and functioning system. It would provide parts for installation in aircraft at all times if spares demands had been estimated precisely before the F-15 went into service, and if spares stockage accounts had been allocated enough funds to meet the expected demands. But neither condition has been fully met, so F-15 units learn to manage shortages to keep providing sorties. As the F-15 experience Air Force-wide increases, the demand levels approach nearer reality. But the funding shortfalls of the past several years will still affect the system for two or three more years to come. That's why the "pull" of "push-pull" logistics is so important at wing level.

Eagle Readiness Center

Managing shortages to produce sorties sounds somewhat like doing tricks with mirrors. But as the 36th TFW does the job, it consists of cross-talk between and among operations, maintenance, supply, and transportation people of the wing; liaison with other F-15 units, air logistics centers, and suppliers; command support from USAFE and Air Force Logistics Command; and initiative and imagination.

Consider liaison. Residing with the 36th TFW are Weapons System Liaison Officers from AFLC; one from Warner Robins ALC for the F-15 system less engine; and one from San Antonio ALC for the F100 engine. Also on the scene are five representatives from McDonnell Aircraft, the prime contractor. All these liaison representatives are able to communicate by phone or message within their organizations at all times.

At the same time, the wing has two NCOs stationed at the two main Air Logistics Centers (Warner Robins and San Antonio) to perform legwork and liaison on-scene. They are contacted daily to stay abreast of actions requiring priority attention on their part.

Let's enter the Eagle Readiness Center now, picking up the case of the needed part that is not in base stocks. Recall that the Demand Processing section searches local resources for parts and, when located, takes action to propel them out to the flight line or shop. In ninety percent of the cases, the parts are probably in stock. It is the missing ten percent that engage the attention and initiative of the Eagle Readiness Center, or ERC.

The ERC is a group of expediters or gadflies, who pull MICAP items through the system so that aircraft "Not Mission Capable—Supply" or "Not Mission Capable—Both" (that is, for both supply and maintenance reasons) can return to fully mission capable status in the fastest time. It is established and operated by the 36th Supply Squadron. It looks like an operations center or command post, because it is a bit of both. Its existence and its people enable the wing to take effective action on the MICAP items, the ten percent of demand that create ninety percent of the problems.

Every afternoon at about 4:00 p.m. local time, the ERC staff calls the designated point of contact at Warner Robins ALC, a lady who is conversant with F-15 parts and knowledgeable in making the ALC system operate. They advise her of the priority items, and she in turn contacts the appropriate Item Managers, who initiate the action to push the parts into the system. Given the six-hour time difference between Bitburg and Warner Robins, the Item Managers have most of the workday remaining to start the expediting.

The parts requested in the 4:00 p.m. call have been determined to be out of stock at Bitburg first, and also out of stock at the 32d Tactical Fighter Squadron at Camp New Amsterdam, the other F-15 unit in Europe. There is constant cross-talk between Camp New Amsterdam and Bitburg so that lateral transfer of needed parts can be

done. The method of transfer is simplicity itself. Three times weekly, the two F-15 units each dispatch a truck to Noervenich, a base about equidistant from both, with the parts to be transferred. The transfer is done and the truck returns to home base the same day. If a part is too large or too heavy for the drivers to handle, they swap trucks and return them on the next shuttle run.

For expediting MICAP parts from the aerial ports at Ramstein and Rhein-Main, the wing dispatches a truck to each one every weekday. The normal, routine flow moves overland via US Army cargo trucks.

Much of the work of the ERC is tracking MICAP parts through the system and expediting their transit from origin to installation on the aircraft. It means following up with the Item Managers at Warner Robins or elsewhere to learn the estimated date the part will be shipped. If that date is too far away, the ERC people take initiative to urge an earlier shipping date out of the system. If they meet resistance, then USAFE headquarters is asked to give command assistance to lend more weight to the action.

The interesting aspect of the command assist is this: It usually is not required because the air logistics center won't respond to an airman in the 36th's Eagle Readiness Center, but rather because the ALC has tried to respond and met resistance it can't dislodge without the assist from USAFE. An example might be to request AFLC or the Air Staff to adjust intercommand priorities momentarily so that a vendor is told to supply direct to the 36th TFW a part originally ordered for another F-15 unit. Or the command assist could help convince AFLC to take a part from production stocks at McDonnell Aircraft to meet this immediate need.

However the initiative is practiced by the Eagle Readiness Center, its members identify and can follow every high-priority item through the logistics system. If a part slows down or stops someplace en route, they know about it and take steps to get it moving again, fast. They take the actions to meet these two major challenges on MICAP items: Find the item and get it to the 36th as fast as possible. The third challenge is getting the repairable components into the system, back to the depot for repair and reissue.

Keep Repairables Flowing

Once again, Military Airlift Command makes it possible to manage in the face of shortages. Because O&M funding was at less than requested levels for so many years, there are not enough repairable (or exchangeable) components in worldwide USAF stocks to keep the system fully flowing. If there were, a constant stream of repaired components flowing from the depots would balance the flow back from units, so that the units would always have operable components to install in aircraft. But there are not enough, so the fewer must travel faster through the system. Military Airlift Command cuts the transit times both ways, from unit back to depot for repair and from depot to unit for installation.

Vivid impressions are created by flowing through the logistics system to and from an operational wing such as the 36th. The most memorable are these:

- The age, rank, and experience level of the uniformed men and women who make the system work are very junior. On aircraft after aircraft, one sees Senior Airman for the crew chief's rank, where a few years ago it would have been Staff Sergeant or Technical Sergeant.
- These junior men and women are dedicated to overcoming shortages, and are fearless in pulling at the system to deliver. They are not deterred by rank or distance in making known their units' needs.
- The constant training—in flight and in shops—is building the foundation for a valid war-fighting capability while at the same time keeping peacetime readiness higher than it should be in light of the fund shortages of recent years.
- Significant command attention is focused on managing the toughest problems, keeping them from getting out of hand.
- The logistics "system" is no longer anonymous and amorphous. The persons responsible for items are identified by name and telephone number to the field units. Consequently, responsiveness is built in, because no one can hide.

If the new Administration and the Congress decide to respond to the Air Force's needs for spares and other essentials that have been given short shrift in the past several years, the increased parts stockages won't reach the units for another two or three years. But when they do, aircraft readiness rates will zoom upward to previously undreamed-of levels. The reason: For so many years the people of the Air Force have done wonders in the face of shortages; given adequate parts stocks, they will perform miracles. ■

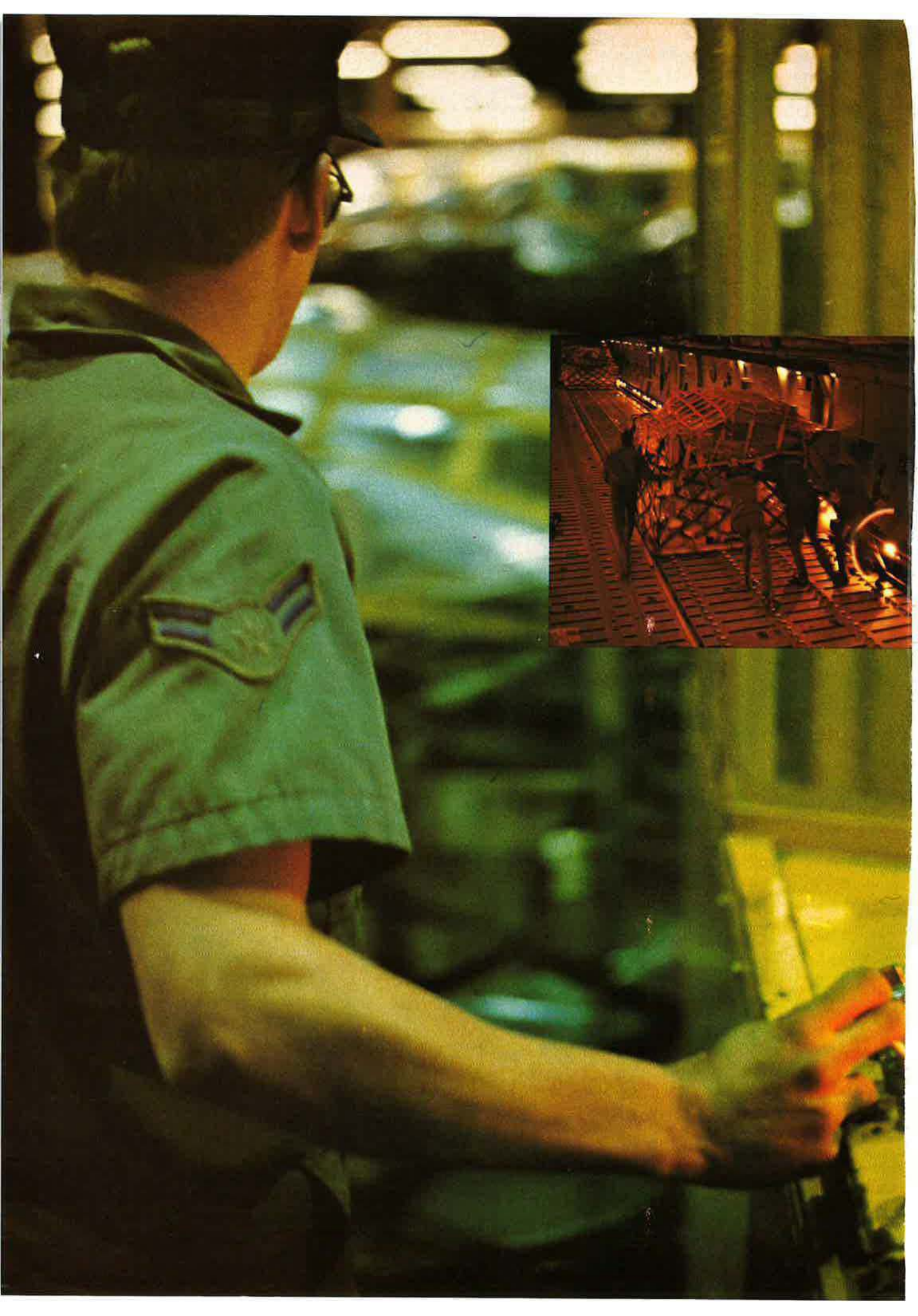
"Neither snow nor rain . . ." a MAC C-141 being loaded at Rhein-Main AB, Germany, for the flight to the CONUS. A crew from 438th Military Airlift Wing at McGuire AFB, N. J., flew this mission, under command of Maj. Lansing Price. Loadmaster was MSgt. D. L. Barnett.

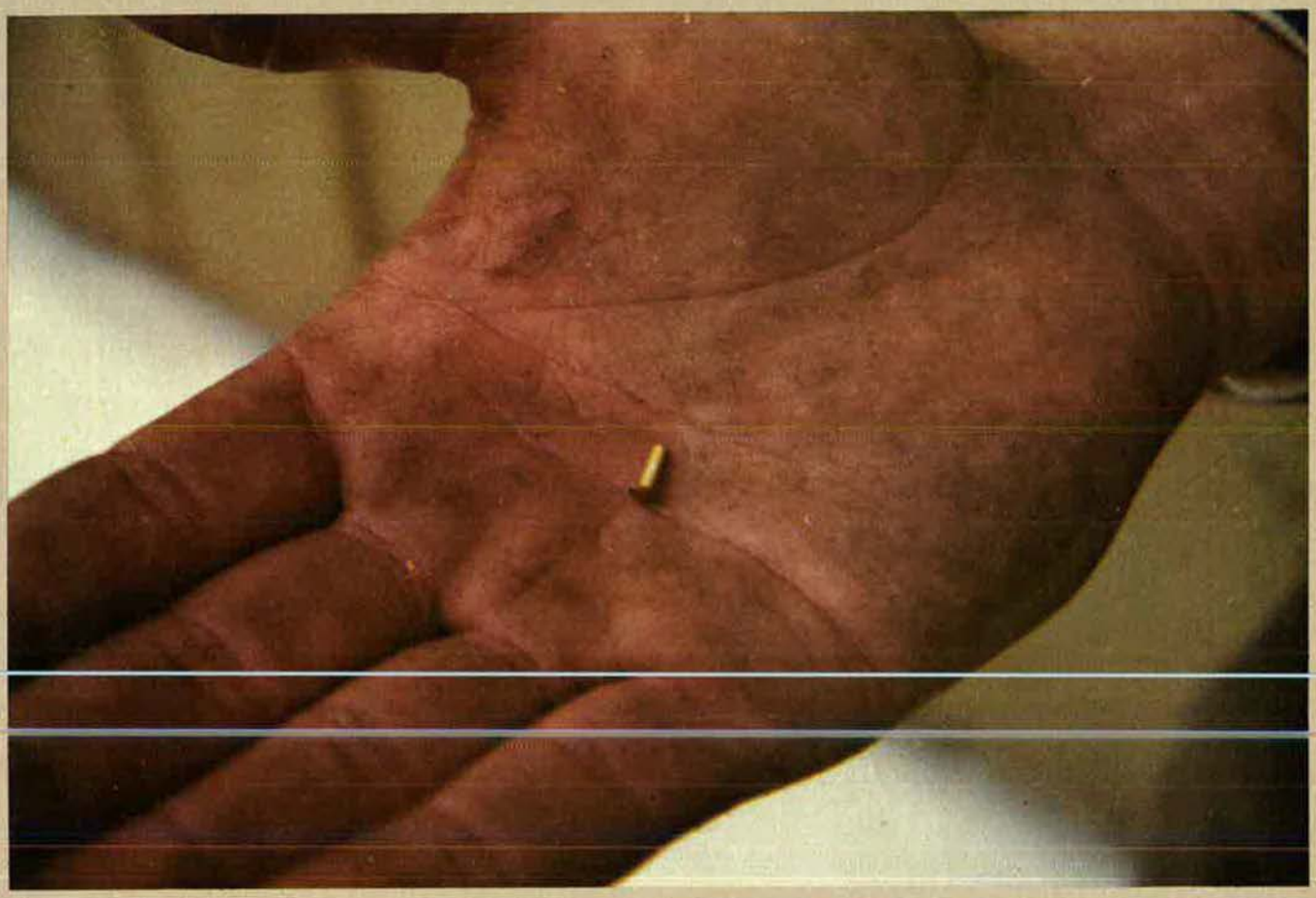
IRON ON THE TARGET

A PHOTO ESSAY BY WILLIAM A. FORD, ART DIRECTOR

NOWHERE in the writings on logistics is found the real reason why the US Air Force is able to "keep 'em flying" — the combination of hands, brains, and initiative of the Air Force people who make the logistics and engineering systems work, the work that puts "Iron on the Target." Two top USAF logisticians — Gen. Bryce Poe II and Lt. Gen. Billy Minter — testify to the importance of people in separate interviews in this issue. Also, the AIR FORCE Magazine staff found, in preparing this issue, that everywhere in the chain from depot to flight line, the system would be moribund or nonresponsive but for the dedication of the people making it function. Their skills and teamwork make up for the deficiencies of funds and spare parts that have plagued the Air Force for the past decade and that promise to vex air commanders for the years ahead.

Thus, this brief photo essay created by Art Director William A. Ford to illustrate and pay tribute to the many unsung men and women whose actions are so critical. Their teamwork is nicely illustrated by the three munitions specialists on this page lifting a Sidewinder missile onto its rack on an F-15 at Bitburg.

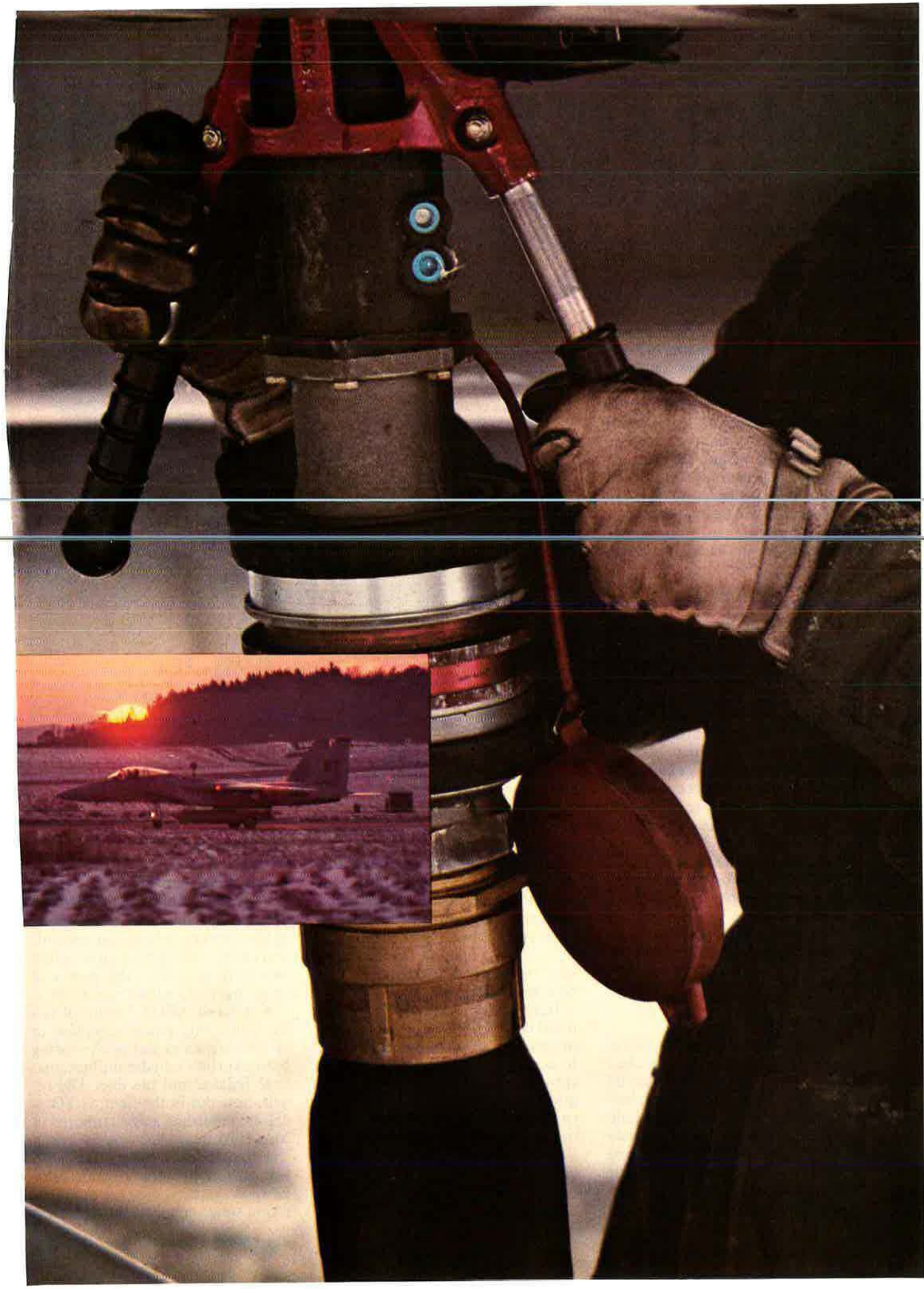




THE PHOTOS on these two pages show the movement of spares from CONUS to the 36th TFW at Bitburg. On the facing page, Amn. James Prouty operates an automated pallet finder at the Dover AFB, Del., aerial port. The inset on that page shows the muscle of Sgt. Dennis Suter's loading crew positioning a pallet on the deck of C-5 90005 at Dover for the flight to Ramstein.

This page, top, the hand of A1C Dan Titus holds a 3/32" flush aluminum solid rivet; even the smallest parts are essential in the logistics pipeline. Right, Capt. Alan C. King, aircraft commander, looks to his copilot, Capt. Paul H. Ramsay, of the 9th Military Airlift Squadron, on the flight deck of their C-5 over the Atlantic. Right, below, after the C-5 lands at Ramstein, its No. 2 engine drinks up. Right center, SSgt. Pat Duyanen, at Pickup and Delivery point of the 36th Tactical Fighter Wing, assembles MICAP priority parts for the aircraft shops and readies them for delivery. The next step is shown below, right, with Sgt. Ray Barnett loading a truck with parts ready to be delivered to the shops or directly to the aircraft.

MAINTENANCE Job Control of the 36th TFW is the nerve center for programming work on the aircraft; SSgt. Phillip W. Jones updates a status board, above. Far left, SrA. Richard Markley loads a program into an automated test stand to test radar data processing. Left, SSgt. Robert Bramer machines a steel nut for an F-15 egress seat stand; local fabrication is sometimes necessary when parts are not available. Below left, an F-15 crew chief guides his aircraft into its shelter at Bitburg; it is being pulled by a winch in the shelter. His precise guidance slips it into the tight-fitting shelter built originally for F-4s. Facing page, SSgt. William Richards's gloved hand refuels an F-15 in the blowing snow and bitter cold of a Bitburg winter afternoon, readying it for a sunset sortie. Inset, right, the refueled F-15 rolls out to the Bitburg runway from the engine runup area, preparing for launch with a sister aircraft into the darkening sky.



A true sortie-generator is created when damaged aircraft can be returned to service immediately, instead of being evacuated for repair. USAF is seizing the inherent opportunities via . . .

AIRCRAFT BATTLE DAMAGE REPAIR INITIATIVES

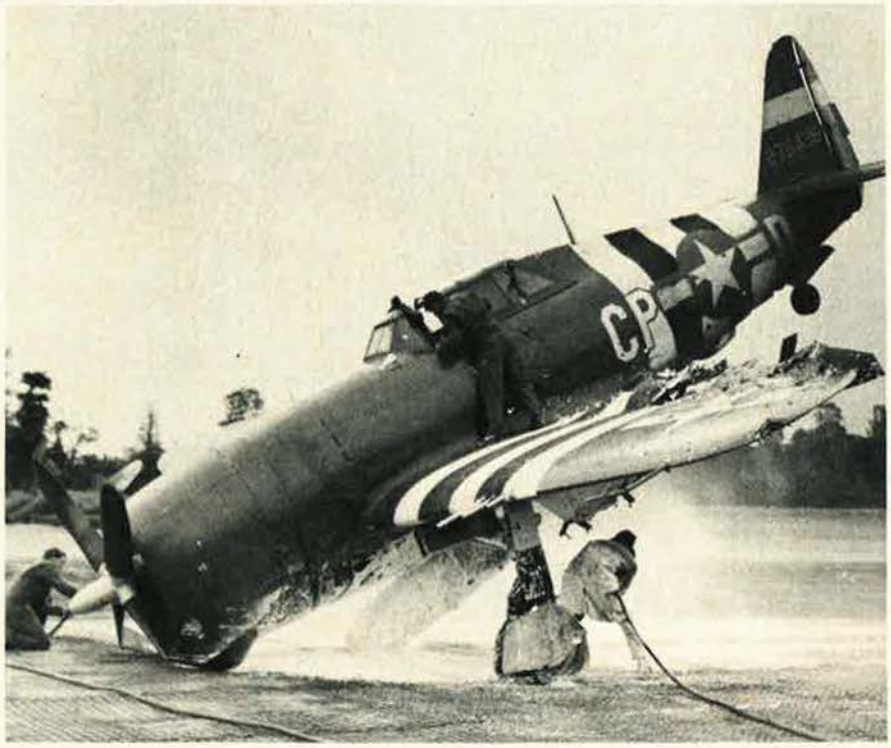
A STAFF REPORT

THE annals of airpower are peppered with examples of aircraft returning from missions with extensive damage, yet still flyable and repairable. This has been true in every conflict US airpower has fought in, and can be expected the next time as well. Far more aircraft return with damage than are lost entirely over the target or in aerial combat, and these are planes that can fly additional sorties if repaired.

Also, in a future conflict, additional aircraft can be expected to be damaged on the ground due to enemy attacks and accidents. At the same time, other aircraft will be damaged in training in the theater of operations.

Therein, in all those factors, lies the problem and at the same time the opportunity. If the damaged aircraft can be repaired quickly in the field, they can be used to generate the combat-essential high sortie rates that can literally make the difference. Peacetime repair of damage normally takes weeks rather than hours, the Air Force acknowledges; thus, those practices and procedures cannot be expected to meet wartime needs.

But if rapid battle damage repair can be performed on aircraft in the field, the practice can be a true force multiplier. That is the goal of USAF's program on Aircraft Battle Damage Repair (ABDR), now receiving top-level emphasis and attention.



This P-47 Thunderbolt in D-Day markings made it back to a forward base in France after suffering a riddled left wing. The pilot was also hit (see holes in canopy), but brought his plane back. The photo epitomizes the two force-multiplying programs of Aircraft Battle Damage Repair and Rapid Runway Repair, now in progress.

ABDR Expectations

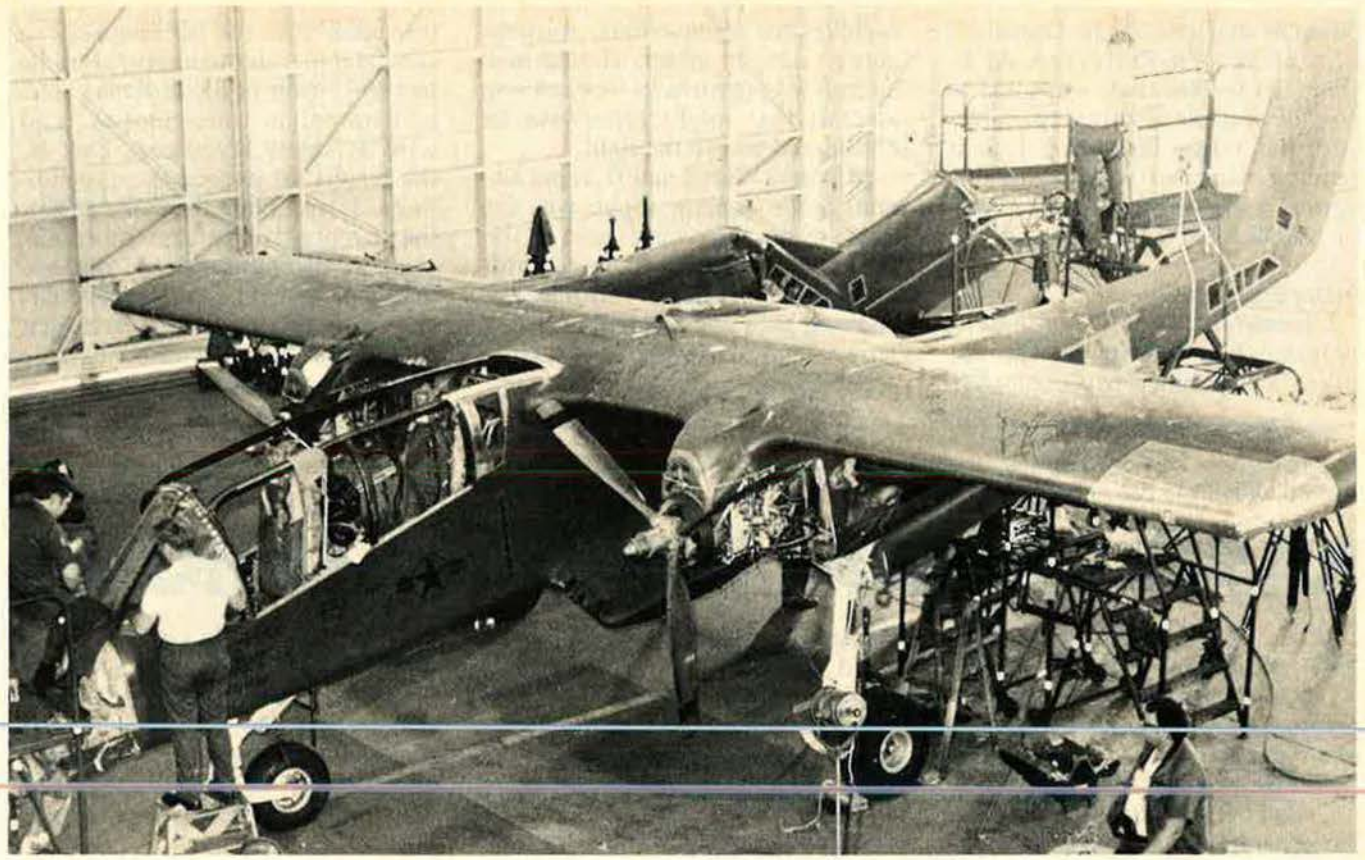
Several USAF and field studies in the past several years have reached similar conclusions that can be summarized thus: rapid aircraft battle damage repair, of all possible factors, has the greatest influence on sortie surge capabilities during the first several days of a conflict. If rather modest damage rates are assumed, up to twenty-five to thirty percent of a unit's aircraft can be damaged in the first several days of conflict and, unless repaired, are lost for future sorties. But if rapid repairs can be performed, allowing even one or two more sorties per plane, then a fighting squadron can keep up the effort needed to prevail over the battlefield.

In response to the clearly recognized need, USAF has established a program to enhance its capabilities to accomplish rapid repair of battle-damaged aircraft. The program's objective is to provide a rapid ABDR capability in each operational unit and in the Air Force Logistics Command's Combat Logistics Support Squadron (CLSS) teams that will augment the operational units.

First Things First

The first objective of the ABDR program is to achieve some level of an initial capability as widely as possible. That means using available resources in tools, equipment, and people, and getting there within two to three years. The means of achieving that goal are these:

- A basic ABDR Technical Order containing repairs common to all aircraft; examples are repairing basic skin holes, hydraulic line cuts, wire breaks, and the like. The result, now out in the field, is TO 1-1H-39, published and distributed in May 1980;
- Specific tech orders (Dash-39) for repairs peculiar to particular weapon systems; they are in preparation now, and contain minimum



B-17 crew chief, at left, prepares to install a new engine in his aircraft in Italy, 1944. Above, a team of specialists from Kelly AFB, Tex., use Aircraft Battle Damage Repair techniques to restore a damaged OV-10 to use at Patrick AFB, Fla.

essential systems/flight limitations and repairs that will return that airplane for one or more additional sorties;

- Training and orientation programs;
- ABDR tool and material kits;
- Training assessors—expert Air Force people to do triage on aircraft, as the physicians must do with mass casualties. That is, designating those that can be repaired immediately at that field and fight again, those that are unrepairable, and those that will have to be evacuated for repair.

Milestones to Date

The basic USAF concept for aircraft battle damage repair was published in April 1980; meanwhile, the Air Force sent two technicians from each base in US Air Forces in Europe and four persons from each Air Logistics Center through the Royal Air Force's ABDR course at RAF Abingdon. That two-week stint prepared the graduates to return to home station and teach others, as well as laying the groundwork for more extensive ABDR development USAF-wide.

For instance, technician courses of two weeks' duration are now in progress at the Air Logistics Centers at Hill, McClellan, Robins, Kelly, and Tinker Air Force Bases. At the same time, a USAFE one-week course is operating at Ramstein Air Base, Germany.

Development of advanced ABDR techniques, tools, and procedures proceeds under the aegis of both

AFALD and the Flight Dynamics Lab at Wright-Patterson AFB, Ohio. To further their work and to provide realistic airframes for practice, the Flight Dynamics Lab is sending damaged panels from its normal testing program for repair by ABDR teams at other bases.

In the End. . .

Ultimately, when the ABDR program hits full stride, the Air Force's capability to accomplish rapid repairs will maximize wartime sortie rates. In effect, getting new aircraft at bargain rates—or reflying aircraft that might otherwise be considered lost to the fight.

In World Wars I and II, rapid aircraft battle damage repair was the order of the day, since most of the young men dealing with the aircraft knew how to fix things with a wad of chewing gum and a length of baling wire. That widespread "fix-it" capability no longer exists in American society, so the Air Force has to rebuild it in order to apply the skills to rapid repair of its airplanes. The investment in time, money, and tools is highly leveraged. That is, the results far exceed the expenditures. It isn't quite the same as getting twenty-five percent more aircraft at discount prices, but approaches that. The reason: The aircraft are repaired quickly and fight again from a forward base, not from a depot in the States. ■

An aircraft can't take off or land in bomb craters. Returning damaged forward airfields to use is the goal of . . .

RAPID RUNWAY REPAIR FILLS HOLES

While USAF developers at Eglin AFB, Fla., are working on new ways to destroy enemy runways, others are developing rapid runway repair methods for USAF and allied use in the event of conflict.

Called "Rapid Runway Repair," the program aims to achieve expedient repair of bomb-damaged runways. That is needed in order to deny an enemy his goal of keeping USAF aircraft on the ground in a combat environment. The prime enemy targets are the aircraft, of course. Against that threat, dispersed and hardened shelters help to prevent or minimize damage. But, runways and taxiways are the next targets on the list, since cratered surfaces prevent friendly takeoffs and landings.

What Is Being Done?

The actions now under way are focused by USAF's Engineering and Services Center at Tyndall AFB, Fla. They have developed the equipment and manpower needs for rapid runway repair, along with the training needed to make it work in the field. The primary element is a ninety-one person civil engineering Prime BEEF or RED HORSE team with heavy equipment. They clear blast debris, remove upheaved concrete, backfill the bomb crater, and cover the runway or taxiway surface with aluminum matting. The object: fastest possible reuse of the surface to keep the sorties flying.

The Air Force has prepositioned heavy equipment and the aluminum matting in Europe and the Pacific. Using the equipment and training in rapid runway repair, teams have demonstrated in practice that three 750-pound bomb craters can be repaired in four hours.

Training has been steadily increasing over the past few years. It includes in-theater training of civil engineers by USAFE and PACAF, and also training in the US of active and reserve Prime BEEF forces. The prime training activity is a five-day course conducted at an operating location at Eglin AFB (taking advantage of the runway-destruction activities there). By the end of FY '81, about 12,300 civil engineering members will have received the training.

What Is Ahead?

Clearly, prepositioning more basic rapid runway repair sets will enhance the Air Force's ability to keep flying against the growing enemy capability to damage airfield pavements. The sets can be improved by augmenting with additional heavy equipment, either prepositioned or on hand for other purposes.

For the near term, USAF research and development in this field is concentrating on refining the current repair techniques, to include actual aircraft operating over repaired craters. That was tested successfully recently at North Field, S. C. Over the long term, the R&D effort (an estimated $60 million through FY '86) has two goals: developing faster and stronger repair techniques and materials, and developing possible alternative launch and recovery surfaces for aircraft operations. ■

What a pothole! Crater in test taxiway at Eglin AFB, Fla., shows the dimensions of the rapid runway repair challenge being met by USAF's Civil Engineering Center. The object is fast repairs to restore forward bases to sortie-launching service.

Supporting military readiness obviously sets the Air Force apart in purpose from civilian airlines. A half-dozen USAF officers, who are honing their aircraft maintenance and supply management skills by working with the airlines, are finding out there's still a lot to learn about both management and leadership, in a USAF program known as . . .

EDUCATION WITH INDUSTRY

BY MAJ. THOMAS L. SACK, USAF, CONTRIBUTING EDITOR

EACH year 125 active-duty Air Force officers, from lieutenant to lieutenant colonel, temporarily become a part of civilian industry. No, they're not part of the retention problem. Quite the contrary. When they return to their regular blue-suit jobs ten months later, they're better qualified to meet the challenges of their Air Force duties as graduates of a program known as Education With Industry, a cooperative effort of the Air Force and industry.

Through EWI, managed by the Air Force Institute of Technology at Wright-Patterson AFB, Ohio, qualified officers learn, first-hand, aspects of civilian industry related to their own Air Force specialties. Representing more than thirty program options, they fan out to more than seventy corporate locations around the country to increase their management skills and leadership abilities through exposure to corporate life.

EWI started as Training With Industry in 1947 and focused on officers entering the Air Force acquisition business. The Air Force wanted its officers who were involved in weapons development to understand how industry worked and how to pose Air Force needs in industry terms. The first students were lieutenant colonels and colonels, although it didn't take long for the Air Force to begin selecting younger, mid-career officers with more retainability. The program was renamed Education With Industry in the 1960s—Air Force recognition that it was educating the officers, and not just training people for their next assignments.

Maintenance and Supply Options

Six officers this year are in assignments related to the Aircraft Maintenance Management and Supply Management options. The programs of Majs. Bob Lightsey and Larry Brickman, both in Supply Management, are similar but by no means identical. Capt. Dick Stocchetti typifies the officer working in the Aircraft Maintenance Management option.

Maj. Bob Lightsey, an EWI student in Supply Management, checks on equipment being returned for repair to Eastern's facility in Miami from the company's line station in Atlanta.

American Airlines Maintenance Supervisor Ray Wiesner, right, explains to Maj. Larry Brickman, an EWI student in the Supply Management option, how parts are obtained through the company's supply system.

Major Lightsey is working with Eastern Air Lines Materiel Distribution, Technical and Logistics Support Division in Miami, Fla. Major Brickman works with the American Airlines Maintenance and Engineering Center in Tulsa, Okla., the company's central maintenance and supply facility. Both officers started their educations in the inventory control programs.

Major Lightsey has worked through all of Eastern's repairable parts programs as well as its Logistics and Aircraft Routing Departments. Eastern is taking advantage of the major's Air Force experience also. His principal project is studying the company's repair cycle system with an eye to reducing delays and man-hour backlogs in the flow of repairable parts. Eastern has already accepted recommendations he has made to improve parts-receiving techniques, warehousing practices, and computer program changes. Still, the strength of the EWI program rests in what the individual officer can bring to future Air Force assignments.

Major Lightsey sees himself approaching future military jobs with a wealth of new experiences, including a better understanding of corporate programs and philosophies obtained from daily meetings with senior industry management. He will have helped develop a computer program providing a new formula for buying and allocating parts and another to control and assign parts, aircraft, and workloads at overnight maintenance stations. Major Lightsey is also learning about Eastern's spare parts logistics concepts, planning for new aircraft purchases, logistics budgeting, even a management program that helps identify an employee's potential for career advancement.

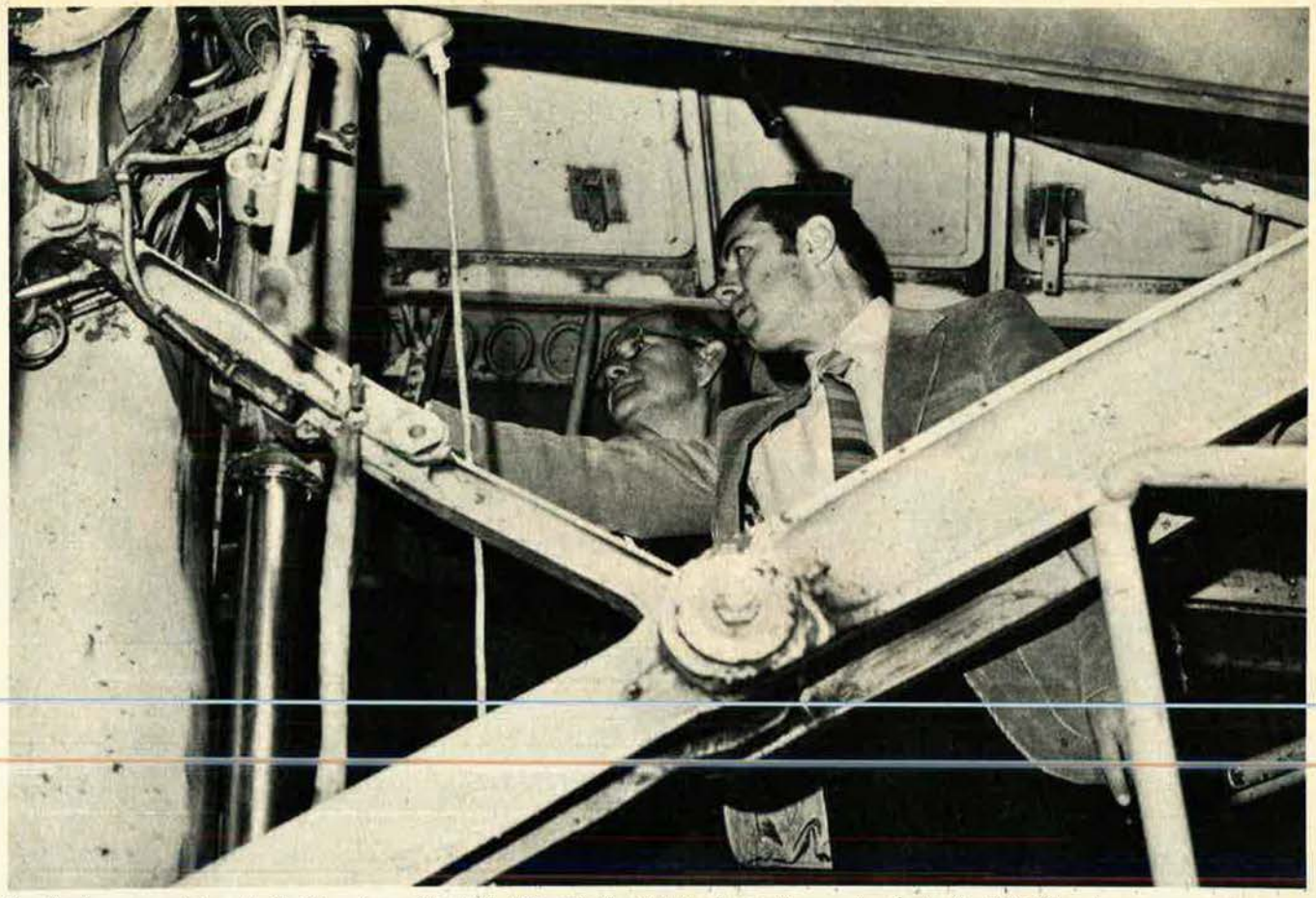
At American Airlines, Major Brickman has learned how the company controls the inventories of more than 100,000 parts used to keep its fleet flying. He is also learning how American is establishing requirements for thirty new Boeing 767s scheduled to be operational in 1983. American, he explained, is developing for the first time a fully automated initial provisioning system to support the airplane. Major Brickman is working with the task group of supply and computer specialists who are establishing the program that will tell what items need to be purchased, in what quantities, the locations for stocking them, and the budgeting requirements.

Like other EWI students, Major Brickman is also working on special projects. Describing Tulsa as the "hub of the wheel" controlling all materiel support operations for the company, he has developed a program which is helping to reduce the number of open recalls of aircraft

EWI Options by Career Field

En-route Air Traffic Control
Audiovisual Management*
Systems Acquisition Management*
Computer Resources*
Communications Management
Missile Maintenance Management
Aircraft Maintenance Management
Munitions Maintenance Management
Computer Performance Management
Civil Engineering*
Transportation Management
Billeting Management*
Fuels Management
Supply Management
Contracting & Manufacturing Management*
Logistics Management
Financial Management*
Administrative Systems Management
Management Engineering
Public Affairs

*Multiple Program Options



Quality Assurance Inspector T. Allen shows Capt. Dick Stocchetti, right, the inspection requirements on a DC-10 landing gear.

parts being returned from field maintenance stations back into the Tulsa supply account. It's the kind of work that involves him in the inner workings of the supply operations at American and the programs used to manage their inventories.

Programs Are Flexible

Also at American is Captain Stocchetti's EWI program in Aircraft Maintenance Management. He finds the Tulsa operations analogous to the maintenance capabilities of an Air Logistics Center, with the management responsibilities of a major command headquarters, and fulfilling the workaday functions of a wing-level maintenance operation. American scheduled Captain Stocchetti to work for specified periods of time within various divisions of the Maintenance and Engineering complex. Yet, his program typifies the flexibility of an EWI assignment.

For five weeks, in the structures engineering area, he participated with company engineers in developing aircraft modification programs and maintenance instructions (job cards) used by American mechanics in the performance of their tasks. Later, at his request, the captain worked with quality assurance inspectors who were auditing the structural modification programs he helped write, even though this wasn't part of his original schedule.

The requirement to support military readiness obviously sets the Air Force apart in purpose from civilian airlines, a difference that extends to Air Force maintenance and supply operations. But the value of the EWI program to an officer like Captain Stocchetti is not so much about a specific aircraft or logistic procedure. The potential, Captain Stocchetti feels, is in the exposure to another type of aircraft maintenance organization and its management programs and techniques that can be applied to Air Force aircraft maintenance programs.

Both officers at American Airlines are particularly pleased to be part of the company's management program known as Participative Action Circles, in which small groups of company employees meet regularly to study product problems and recommend solutions for them.

It's American's application of a program known more widely as Quality Control Circles and started by Japanese industries after World War II to improve the quality control of their products. Major Brickman and Captain Stocchetti attended a two-day conference in September to learn how these programs are working in corporations around the United States, and both men received additional training during January.

The other officers participating in the EWI Aircraft Maintenance Management and Supply Management options are Capt. James K. McDonald, Jr., with General Dynamics in Fort Worth, Tex., and two with Trans World Airlines in Kansas City, Mo., Capt. Dana W. Evans and Maj. Robert W. Jensen. Information about EWI and application procedures can be found in the USAF Formal Schools Catalog, AFM 50-5, or through the EWI Program Manager, Maj. Roger Alexander. His toll-free telephone number is 800-543-3577. ■

Electronic warfare systems are now more tactical and practical...

because someone asked Sperry.

Sperry is increasing the capabilities and availabilities of electronic warfare systems.

Light tactical aircraft and helicopters now can be protected by Jam Pac (V), our variable configuration jamming module. It has two transmitting systems which can be fuselage or wing mounted. Multiple modules provide complete coverage for surveillance, acquisition and fire control radars.

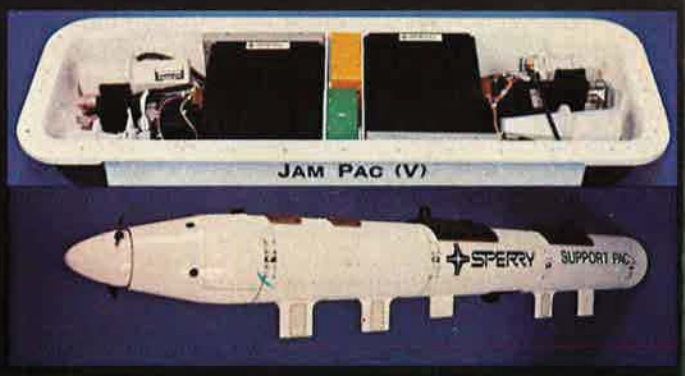
Sperry's Support Pac (V) is designed for support aircraft. It enables tactical ECM support, standoff jamming and ECCM training. The multiple frequency systems are mounted in a slim pod which can be carried on a standard munitions station.

We're currently developing a surveillance radar jamming module for the U.S. Air Force's AN/ALQ-131 ECM pod. And we're applying our advanced synthesizer technology to future EW systems and simulators.

From signal analysis simulators which prepare shipboard EW crews, to training simulators for airborne countermeasures teams, Sperry is keeping a technological step ahead.

For more information on what we're up to in electronic warfare, just ask us...we understand how important it is to listen.

Write to: Sperry Division, EW Marketing, P.O. Box 4648, Clearwater, FL 33518. Or call (813) 577-1900.



SPERRY

SPERRY IS A DIVISION OF SPERRY CORPORATION

The needs of military morale and readiness are severe, and as hazardous as at any time in the past. The temptation is to fling money at them or to promise "miracle weapons" sometime, but that won't do. Now is the time to recognize . . .

The Need for Prudent Rebuilding

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

THE emerging battle over the MX is going to be a fierce one, judging from the sounds coming out of Utah and Nevada, the chosen lands for the 200 missiles and their 4,600 silos. Neighboring states have also begun to worry aloud about the effect MX deployment will have on water, ecology, and lifestyle of the Rocky Mountain region in general. However the battle comes out, it seems certain to occupy a considerable amount of the Reagan Administration's attention in the next several months.

There is, for instance, the multivolume, $16 million environmental impact statement that must presumably be addressed. Then there will be the advocates for various alternatives to a land-based MX. They have been heard from before, but not by the folk now occupying the Pentagon's E Ring. Then again, with SALT II no longer a determining factor, maybe the new Administration will finesse the whole argument by adopting a shell-game approach around existing Minuteman sites. Whatever the final decision, we can look forward to a spirited debate, one that will tend to overshadow other important, if comparatively mundane, matters.

Not to play a broken record interminably, but the general state of readiness, esprit, and well-being of our volunteer regular forces is one of the matters that may be put in the shadows. It would be nothing new. For a good many years now, these problems of readiness and morale have been treated as abstract ones, not to be approached either too closely or in too much detail.

Instead, we have been comforted with platitudes, attributed to one senior official or other, about the high quality of our volunteer force, despite disquieting reports from senior noncoms and officers not governed by the party line. The reassuring claims of readiness and competence are also at odds with the occasional items—failed operational readiness inspections, ships unable to sail, tank gunners who cannot shoot straight—that come into public view.

Part of the solution to this readiness problem—an essential part—lies in the time-honored American custom of throwing money at it. If the new budget shows a substantial increase in operating and maintenance funds along with a generous new pay package, then we will have made a start back up the hill. There is, however, more to the solution than that.

In looking back over the years since the United States ventured into the world at large as a great power, which is to say since 1941, it is clear we have had our military ups and downs. The time just before Pearl Harbor was one of the downs as soldiers maneuvered with wooden guns, pilots took turns flying the squadron's two or three airplanes, and the graffiti slogan OHIO—"over the hill in October"—was a familiar ornament on military walls.

The demoralizing tragedy of Bataan and Corregidor was followed in a remarkably short time by some upbeat years, years in which the American fighting man was a pretty glamorous figure. V-J Day saw us forget everything we had learned in 1941 about the dangers of unpreparedness. The demobilization was both disorderly and complete. Besides, we had the atomic bomb, so what need was there for the dreary business of military preparedness in the traditional sense?

Korea caught us flat-footed, our occupation troops almost driven into the sea before they rallied, as the years of false peace along with Secretary of Defense Louis Johnson's budget meat ax had done their work. The early fighting in Korea, like Wellington's description of Waterloo, was a near run thing. We were strategically powerful but militarily weak. There are disturbing similarities to the present.

The solution to military strength is a complex one, and it involves far more than money. Some units fight well in combat and some do not, even though they all get the same pay. The difference invariably lies with intangibles like leadership and esprit.

This past decade has seen the military as a laboratory for sociological experiments and managerial innovations. Some have been successful, some have been disasters, but that is not the point. The trend has been steadily away from the age-old verities that contributed to morale, verities like unit pride and tough discipline, and toward a faceless corporate image of efficiency.

Our new President is right to worry about the strategic balance. We can all hope the MX fight is not a prolonged one. Ecological arguments notwithstanding, there are far bigger matters at stake on that one. But President Reagan will also be on the right track if he tells his military chiefs he is worried about the state of readiness and morale in the volunteer force and, what is more, he wants to know what is needed to improve matters. Whatever it is, the answer will not be found in a computer. ■

Aircraft Restoration Preserves

Preserved in a glacial river for almost four decades, a classic aircraft has been restored and is ready for exhibition.

SOMETIME in 1982 a Northrop N-3PB will be delivered to Norway. That's forty-two years after the first N-3PB was scheduled to reach Norwegian soil. An invasion, a world war, and a glacial river combined to delay that delivery more than four decades.

Originally ordered by the Norwegian government in March 1940, the N-3PB (Northrop third design—Patrol Bomber) was intended to patrol the vast shore line and fjords of Norway. The N-3PB was the first production aircraft of the newly formed Northrop Aircraft, Inc., founded in 1939 by aviation pioneer John K. Northrop.

The airplane to be delivered to Norway in 1982 is believed to be the last remaining one of twenty-four N-3PBs produced. For thirty-six of the forty years since its original construction, this particular N-3PB rested on the bottom of a glacial river in Iceland—the result of a forced landing in April 1943.

Shortly after the Norwegian Buying Commission, encouraged by famed Arctic explorer Bernt Balchen, who had piloted Northrop-designed aircraft on many exploratory flights, placed an order in 1940 with the new company for the patrol bomber, Norway was invaded and occupied by Nazi Germany. Thus, in late 1940 and early 1941, production N-3PBs were delivered to Norwegian air units operating in Canada and Iceland under the control of the British Royal Air Force.

As a result of wartime pressure

Heritage

BY WILLIAM A. SCHONEBERGER

Restored N-3PB aircraft, Northrop Corporation's first production airplane, ready for display.

Wreckage of N-3PB after it was lifted from the bottom of the River Thjorsa in Iceland, a ten-day recovery effort.

Nine of the fourteen men who worked on the original aircraft forty years ago and on the 1980 restoration inspect the work.

and the comparative ease of contractual paperwork, design, and production in the late 1930s and early 1940s, the first N-3PB rolled off the Northrop production line only eight months after the initial order was placed. First flight of the new aircraft was November 1, 1940. The N-3PB soon established itself as the world's fastest military seaplane with a max speed at military rating of 257 mph.

This particular airplane—serial number 320—arrived in Iceland in May 1941 where the famed Royal Norwegian 330th Squadron had been established in April 1941. The 330th Squadron—the entire operational strength of the Norwegian Air Force—was operating at three separate locations in Iceland during the battle for the North Atlantic. Called the "Northrops" by the Norwegians, N-3PBs performed submarine patrol, convoy escort, and photoreconnaissance missions in the North Atlantic, flying the first mission for Squadron 330 in June 1941.

The aircraft that was salvaged in 1979 from the River Thjorsa in Iceland had been on a flight in April 1943 from Budareyri to Fossvogur with Lt. W. W. Bulukin and radioman-observer Quartermaster L. Rustad. At takeoff, weather was clear. But beyond one of Iceland's many mountain ranges, the crew encountered a blizzard and were forced to land on the glacial river about eighty miles east of Reykjavik. Lieutenant Bulukin and his radioman climbed out of the aircraft, managing to swim with the aid of a one-man liferaft about 100 meters to shore.

The aircraft settled in the silt at the bottom of the glacial river. The crew managed to walk from the river bank to a nearby farmhouse to report the crash.

Ragnar Ragnarsson, vice president of the Icelandic Aviation Historical Society, discovered the aircraft while he was tracing the history of the "Northrops." As a result of his discovery, volunteer workers from the US, Iceland, Norway, and Great Britain—the same team involved with the N-3PB operation during the days of World War II—combined to salvage those remains of this historic Norwegian aircraft. There were US Navy, English, and Norwegian divers, and four original members of the 330 Squadron, including Lieutenant Bulukin. And there were countless Icelanders—whose language doesn't seem to include the word "can't"—during the ten-day recovery project in the summer of 1979. During the 1979 salvage efforts, Lieutenant Bulukin went back to the farmhouse and talked again with the man who had helped him thirty-six years earlier.

In the fall of 1979, the Royal Norwegian Air Force flew the wreckage in a C-130 to the Hawthorne, Calif., Municipal Airport, adjacent to Northrop's Aircraft Division facility. The task of restoration was eventually accomplished

---

William A. Schoneberger is a longtime aerospace communications professional, now operating his own company (William A. Schoneberger Communications) in Malibu, Calif.

through the efforts of more than 340 volunteers with a cumulative 6,100 years of experience on aircraft design, production, testing, maintenance, and support.

Fourteen of the project volunteers had actually worked on the aircraft forty years before. One volunteer, still a Northrop employee and currently working on the US Navy's F/A-18 aircraft program, called the effort "... a dedication to Jack Northrop and also the fellows I worked with all these years."

The restored N-3PB was rolled out November 10, 1980, to help celebrate the eighty-fifth birthday of its designer and the firm's founder, Jack Northrop. More than thirty special guests—most from Norway and Iceland, including a number of original members of the 330 Squadron—visited Jack Northrop following the ceremony to bring him not only their personal greetings but those of King Olav of Norway as well. Mr. Northrop was unable to attend the ceremony.

At the rollout, Lieutenant Bulukin called the N-3PB "the most lovely aircraft of the world."

Approximately twenty-five to thirty percent of the restored aircraft is made from original parts salvaged from the ruins in the glacial river. The airplane's battery was pulled out and recharged and was usable after thirty-six years under water.

Of particular interest was the contrast between 1940 and 1980 design and production methods. Although a significant number of original drawings were unearthed in storage at the Northrop facility, many parts had to be redrawn. Restorers used the modern technique of CADM—Computer-Aided Design and Manufacturing—to duplicate original components accurately.

This N-3PB, officially the property of the San Diego Air and Space Museum, will be on display at various US locations for several months. Following its US tour, it will be displayed for one year in Iceland. Then, in 1982, the N-3PB will be delivered to Norway for permanent retention and display—at the Norwegian Air Force Museum—more than forty years after it was supposed to arrive. ■

Another restoration, this one more damage repair than starting from scratch, enables a . . .

Corsair's Return to the Air

Another instance of aircraft damage repair is the former Navy F4U-1D Corsair restored to flying condition by volunteer workers at the Vought Corp. in Dallas. The plane, a part of the Confederate Air Force, had bellied in at Naval Air Station, Olathe, Kan., in 1975. It was trucked to Meacham Field near Fort Worth, Tex., and a bit of restoration work had been completed before it was moved to the Vought facility in February 1980.

Many of the volunteers who restored the aircraft were retirees who had worked on the original F4U Corsair production line through 1954.

First flight of the restored airplane was on December 16, 1980, with Paul Thayer, now chairman of the board and chief executive officer of LTV Corp., at the controls. Thayer is a former Navy and Vought test pilot.

— F. C. B., Jr.

Clockwise from left: overhauled engine in Vought shops, with aircraft in background, wings folded. The moment of rotation from runway at Naval Air Station Dallas, with LTV Chairman Paul Thayer at the controls for the first flight, which lasted about an hour and was completely successful. Two former Vought test pilots talk over the flight: on left, John Konrad (current director of flight test) and Paul Thayer.

Now there's an entirely new class of bomb, missile and pod Ejector Release Units (ERUs). EDO Government Products Division is building them.

The Federal Republic of Germany is the first government in the Free World to put the new ERU's extraordinary capabilities to work. Soon, every Tornado in German Luftwaffe and Marine squadrons will be at a significantly higher state of tactical and combat readiness; each will be equipped with as many as 21 of these new ERUs. They're Tornado's Claws.

Yes, Tornado—an extraordinary, multi-role combat aircraft built by Panavia Aircraft GmbH.

Tornado's Claws were developed by EDO through extensive internal R & D programs. Their patented features increase the reliability, accuracy and safety of weapons delivery systems to levels higher than ever before achievable.

They improve tactical readiness—by reducing turnaround time; by completely eliminating laborious, often inaccurate manual loading operations; and by dramatically reducing maintenance and downtime requirements.

Right now, EDO stands ready to demonstrate how every high-performance aircraft in the Free World today, operational or planned, can be similarly clawed.

Tornado's Claws by EDO

For more information, contact:
Director of Marketing
EDO Corporation, Government Products Division
College Point, New York 11356
Telephone (212) 445-6000. Telex: 127431.

EDO CORPORATION | GOVERNMENT PRODUCTS DIVISION

Where Technological Innovation Becomes Reality.

AIRMAN'S BOOKSHELF

First Operational Jet

Messerschmitt Me 262: Arrow to the Future, by Walter J. Boyne. Smithsonian Institution Press, Washington, D. C., 1980. 188 pages with appendices and many photographs. $19.95 clothbound; $9.95 paperback.

The Me 262 is an aircraft designer's paradox: its lines are at once sleek and stubby. To some, especially bomber crews confronting it for the first time in the skies over Europe during World War II, it had a sort of ominous beauty.

Its shark-shaped fuselage certainly contributed to this, as did its swept-back, twin-engine-mounted wings.

While there are a scattering of restored Me 262s in historic aircraft collections around the world (the Air Force Museum, Wright-Patterson AFB, Ohio, exhibits one), the National Air and Space Museum in Washington, D. C., is putting on permanent display its own Me 262, much to the delight of area aviation buffs.

Walter J. Boyne, Assistant Director of Resource Management and Operations at NASM, is a retired Air Force colonel and command pilot with twenty-three years of service. He has followed the acquisition of the Museum's Me 262 through the restoration process to its present mint-condition status.

In his book, Boyne traces the development of the Me 262 to the operational role it played in the final months of World War II. Along the way, he explodes several myths, among them the threat to Allied air superiority. By the time Me 262s got into combat, Allied control of the air was so pervasive that—despite the first jet fighter's advanced performance—the small force was simply overwhelmed. In the period from August 1944 to May 1945, for example, Me 262 units suffered more losses than they inflicted. Although service with Me 262 units drew the cream of the remaining Luftwaffe fighter pilots, lack of doctrine hampered operations. As his primary sources, Boyne corresponded with the men who actually flew the Me 262 and others involved in developing the aircraft and its all-important Junkers Jumo 004 jet engine.

The author contends that Hitler was not unaware of the Me 262's potential as a fighter, but was so desperate to stem the Allied invasion and later to stop Allied ground advances he "blundered" in dictating the plane's role as a fighter-bomber.

Boyne describes an operation in the closing days of the war performed by "Watson's Whizzers"—an elite group of USAAF pilots—who spirited from captured German airfields a fleet of flyable Me 262s to form "USAAF's first jet squadron."

The planes were later transported to the US aboard a British aircraft carrier and underwent extensive flight and ground tests at Freeman Field, Ind., the records of which have been lost.

The author explores in detail the exhaustive effort that went into the NASM's Me 262 restoration.

Despite its negligible impact on the war, the author contends, the Me 262 is a classic aircraft whose development stands as a milestone in the history of aviation.

—Reviewed by William P. Schlitz, Senior Editor.

The French Who Resisted

Soldiers of the Night, by David Schoenbrun. E. P. Dutton, New York, N. Y., 1980. 512 pages. $15.95.

Their government capitulated after only a brief struggle, and their constitution was dissolved by the occupation forces of a treacherous enemy and collaborationist regime. This dilemma, faced in 1940 by the French people, begins David Schoenbrun's account of *Soldiers of the Night.* He relies on his own experiences as a combat journalist, documentary sources, and interviews with former members of the French Resistance. The result is an informative, although opinionated, introduction to the heroic life of the French Resistance in World War II. Readers may want a scorecard to keep track of the divergent organizations and many people who disrupted Germany's occupation forces and the puppet Vichy government.

Schoenbrun describes the backstabbing intrigue that led to installation of Marshal Pétain and the almost spontaneous birth of underground activities around the country. He details the heroic but futile efforts of French intellectuals to form their own resistance movement that ended in execution or imprisonment of the top leaders in February 1942.

The eventual force of the Resistance is foreshadowed early in the book, however. Schoenbrun documents reactions to Pétain's capitulation message to Germany by those destined to become leaders of the major movements. As 1940 draws to a close, Henri Frenay, a French Army captain who fought at the Maginot Line, is seen forming the "cellular structure" of his movement called "Combat." Georges Loustanau-Lacau and Marie-Madeleine Fourcade set up the British-supported organization known ultimately by the Gestapo as "Noah's Ark," since most of the agents assumed animal code names. The activities of "Liberation," supported by trade unions and socialists, and Jean-Pierre Lévy's independent "Franc-Tireur" also receive detailed attention.

The author tends to minute detail occasionally but captures with the suspense of a spy thriller the conflicts and intrigues, the victories and defeats of those fighting for the Resistance. He includes the activities of the key collaborationist figures and blends in the perilous activities of the US's Office of Strategic Services and the futile efforts of the US and Britain to unseat de Gaulle as the future leader of liberated France. Readers may not agree with Schoenbrun's point of view here but he does force one to wonder how much more effectively the war in North Africa and Europe could have been waged had people—at all levels of the conflict—co-

operated instead of conspired. Schoenbrun, though sympathetic to his subject, remains objective enough for readers to draw their own conclusions about the impact of the Resistance on the Allied victory. The author states clearly that the liberation of France, and Paris in particular, came with the advance of the Allied forces and no sooner.

The importance of the Resistance may derive as much from the way it preserved the spirit and beliefs of the French Republic as from its actual wartime accomplishments. As Schoenbrun points out, "These men and women of the French Resistance were quite ordinary people. They never planned to be heroes, did not yearn for greatness as did a man like Charles de Gaulle. . . . They were not consciously trying to save the honor of France, although that is what they did. The simply refused at risk of their lives to accept dishonor and degradation of human values."

Schoenbrun bogs down briefly as he describes his own participation as a correspondent in France, and he presents a summary of post-World War II France that goes far beyond his principal account. He invites additional reading about the Resistance in his bibliographical notes.

—Reviewed by Maj. Thomas L. Sack, USAF, Contributing Editor.

New Books in Brief

Aviation/Space Dictionary, edited by Ernest J. Gentle and Lawrence W. Reithmaier. Aerospace technology, like all technologies, has evolved a category of jargon and various technical terms that are unique to the field. The *Aviation/Space Dictionary* is a compilation of more than 6,000 terms and phrases, complete with detailed but easy-to-understand definitions. The definitions are cross-referenced to facilitate comprehension. This updated, sixth edition of the dictionary should prove a valuable desktop reference for anyone connected with the aerospace field. Illustrated. Aero Publishers, Inc., 329 W. Aviation Rd., Fallbrook, Calif. 92028, 1980. 272 pages. $18.95 clothbound.

Bombers of World War II, by Bill Gunston. This well-illustrated guide to the bombers of the major Allied and Axis powers in World War II is a concise, fact-packed directory containing the technical specifications of the various types of aircraft, and a synopsis of their development. The many photos, color drawings, and three-view line drawings complement the text. This small but authoritative guide should jog a few memories (and perhaps settle any "gentlemen's disagreements"). Arco Publishing, Inc., 219 Park Ave. S., New York, N. Y. 10003, 1980. 160 pages. $7.95.

Diamond in the Sky, by C. A. Knotts and Pete Moore. This book is a fascinating pictorial history of USAF's flight demonstration team, perhaps better known as the Thunderbirds. Issued on the twenty-fifth anniversary of the establishment of the Thunderbirds, this book traces in text and photographs the history and traditions of these dedicated professionals and the aircraft they flew (and fly) so well. Of special delight to those who have seen the Thunderbirds perform will be the many "bird's-eye" view photographs of the team in action. Specialty Press, Box 426, 729 Prospect Ave., Osceola, Wis. 54020, 1980. 160 pages. $12.95.

Escort to Berlin, by Garry L. Fry and Jeffrey L. Ethell. This book is the complete history of the 4th Fighter Group, which sprang from the cadre of American pilots flying in the RAF's Eagle Squadrons. The leading fighter unit of World War II with more than 1,000 victories, the 4th was considered the elite fighter group of the American forces. Authors Fry and Ethell have compiled four years of operational diaries, along with eleven appendices listing such things as aces, victories, and personnel losses, resulting in a definitive work. This book is highly recommended, especially for those who served with the 4th. With photos and a foreword by Lt. Gen. Ira Eaker, USAF (Ret.). Arco Publishing, Inc., 219 Park Ave. S., New York, N. Y. 10003, 1980. 226 pages. $16.95.

The Origins of the Turbojet Revolution, by Edward W. Constant II. This sophisticated work by technology historian Constant traces the development of the turbojet, which revolutionized the field of aviation in a span of a few years. Constant proposes a model of technological change, and then traces the two centuries of evolutionary developments that led to the patenting of the first turbojet by Frank Whittle in 1930. Constant also examines the work of German inventors Hans von Ohain, Herbert Wagner, and Helmut Schelp on the turbojet. With illustrations, notes, and index. The Johns Hopkins University Press, Baltimore, Md. 21218, 1981. 311 pages. $22.50.

The Sharp End: The Fighting Man in World War II, by John Ellis. *The Sharp End* is a gripping account not of history or strategy, but of the human experience of the front-line soldier facing the grim realities of combat. Ellis has recreated the omnipresent fear and suffering endured by the common soldier, drawing extensively on original letters and memoirs of the survivors of the war. Throughout the book one finds evidence of the importance of comradeship and mutual support for the ordinary fighting man under often impossible conditions. With photos, notes, appendix, bibliography, and index. Charles Scribner's Sons, New York, N. Y., 1980. 396 pages. $17.95.

Terror in the Starboard Seat, by Dave McIntosh. A Canadian, McIntosh has written a sometimes comical, sometimes terrifying account of his experiences as a navigator in a Mosquito fighter during World War II. On the right hand of pilot Sid Seid—who seemed imbued with the idea of taking on all of the Third Reich alone—McIntosh tells of their escapades in the air, the near misses, and the wild times spent carousing in the pubs of London. The "odd couple" of Seid and McIntosh finished out forty-one missions and received the Distinguished Flying Cross. Photos. Beaufort Books, Inc., New York, N. Y. (distributed by the Scribner Book Companies), 1980. 184 pages. $10.95.

U.S. Civil Aircraft, Vol. 8, by Joseph Juptner. This latest in a series of books is part of an attempt to create a comprehensive catalog of certificated civil aircraft in the US. Volume 8 covers aircraft given ATC (Approved Type Certificate) numbers 701 to 800, covering roughly the WW II years (1939–48). More than 300 photos. Aero Publishers, Inc., 329 W. Aviation Rd., Fallbrook, Calif. 92028, 1980. 352 pages. $13.95.

World War I: An Illustrated History, by Susanne Everett. The advances of technology provided the means for mass destruction during World War I, but did not provide for the quick resolution of the conflict. In this large-scale book, author Everett outlines the history of this bloody four-year stalemate, and evokes the horrors of attrition warfare with liberal use of many period illustrations, photos, and paintings. With an introduction by Sandhurst military historian John Keegan. Appendix, index. Rand McNally & Co., New York, N. Y., 1980. (First published in the UK by Bison Books Limited.) 256 pages. $19.95.

—Reviewed by Hugh Winkler, Associate Editor.

LUCAS.

The largest range of aircraft systems and equipment from any single source - world-wide.

Lucas Aerospace systems are in use on over 100 different aircraft types.

Major airlines, air forces and operators around the globe, flying thousands of individual aircraft and millions of flying hours each year, depend on Lucas expertise, experience and the world-wide product support they provide.

Rolls Royce, Boeing, Lockheed, McDonnell Douglas, Sikorsky, British Aerospace, Airbus Industrie, Aerospatiale, Panavia, de Havilland Aircraft of Canada, Westland, Fokker and many others gain the benefit of design innovation and engineering skills through close partnership with Lucas Aerospace.

The Lucas Aerospace product range includes: engine management systems; electric, pneumatic and gas-turbine starting systems; ignition and combustion systems; hot and cold thrust reversers; hydraulic, pneumatic, electrical and mechanical actuation systems; ballscrews; small gas turbines; air control valves; electrical power generation and distribution systems; auxiliary power systems; de-icing systems; and transparencies.

Lucas serves the international aerospace industry and combines advanced technology with high reliability. Lucas also supplies the largest range of aircraft systems and equipment from any single source, world-wide.

Lucas Aerospace

Lucas Aerospace Limited, Shirley, Solihull, West Midlands, B90 2JJ, UK. Tel: 021-744 8522. Telex: 336749.
Lucas Industries Inc., Aerospace Division, 30 Van Nostrand Avenue, Englewood, NJ 07631. USA. Tel: (201) 567 6400. Telex: 135374.
and 1320 West Walnut Street, Compton, CA 90224. USA. Tel: (213) 635 3128.
Lucas Industries Canada Limited, Aerospace Division, 5595 Royalmount Avenue, Montreal, Quebec, H4P 1J9.
Tel: 514-735-1536. Telex: 055-61115.
Also at Sydney, Australia: Paris, France: Neuss, W Germany.

JANE'S

ALL THE WORLD'S AIRCRAFT SUPPLEMENT

FEBRUARY 1981

Bell claims that the new TexasRanger offers a combination of more seating/cargo space and armed mission flexibility than any other light helicopter

BELL

BELL HELICOPTER TEXTRON (Division of Textron Inc); Head Office: PO Box 482, Fort Worth, Texas 76101, USA

BELL MODEL 206L TEXASRANGER

Bell announced in October 1980 development for the export market of a multi-mission military version of the seven-seat Model 206L-1 LongRanger general-purpose light helicopter. Identified as the Model 206L TexasRanger, a demonstration prototype has been built and has already completed a successful TOW missile firing programme in the Mojave Desert. It was planned to begin at an early date a series of demonstration tours throughout Europe, the Middle and Far East.

With more than 6,000 Model 206s, including 600 LongRangers, in service, the reliability of this helicopter has been well-proven in a variety of roles. The TexasRanger has been designed to offer a number of alternative quick-change military capabilities, and can carry four TOW missiles in two launchers; fourteen 2.75 in rockets in dual pods; four 7.62 mm machine-guns, two each in dual pods with a total of 2,000 rounds of ammunition; or alternative air-to-air missile systems. All weapon pods are attached by three-point standard NATO shackles, and installations have been so designed that all of the weapon systems are jettisonable in flight. Other mission roles include troop transport, armed reconnaissance and surveillance, search and rescue, medical evacuation, command control, and battlefield resupply.

For operation in armed roles the TexasRanger carries a pilot and weapons operator, accommodated on side by side armoured seats, with the pilot on the starboard side. He is provided with a steering indicator; the weapons operator has a TOW missile sight with low and high power optics, a missile firing and control system, and is provided with dual controls. The external portion of the TOW sight is roof-mounted so that target sighting can be

carried out with most of the helicopter screened by terrain or trees. The TOW sight has provisions for future installation of a FLIR receiver and a laser rangefinder/designator.

The TOW missile avionics have a special rear-seat pallet mounting, and this enables conversion for utility missions to be carried out within 15 minutes. Four additional TOW missiles can be stowed on racks internally, and are available for reloading the launchers during a brief landing. Bell claims that its TOW system for this helicopter is the only one yet designed which does not need reboresighting in the field after removal and reinstallation.

Until such time that sales contracts are negotiated, the company has made no specific announcement of production delivery dates. However, it is suggested that TexasRangers with folding-fin rocket/gun installations could be made available by late 1981, and complete TOW-equipped versions a year later.

TYPE: Light multi-mission military helicopter.

ROTOR SYSTEM: Two-blade semi-rigid see-saw type high-inertia rotor with glassfibre safety straps, employing pre-coning and underslinging to ensure smooth operation. Two-blade tail rotor mounted at port side of tail unit.

ROTOR DRIVE: Rotors driven through tubular steel alloy shafts with spliced couplings. Initial drive from engine through 90° spiral bevel gear to single-stage planetary main gearbox. Shaft to tail rotor single-stage bevel gearbox. Freewheeling unit ensures that main rotor continues to drive tail rotor when engine is disengaged.

FUSELAGE: Forward cabin section of light alloy and aluminium honeycomb sandwich; intermediate section of light alloy semi-monocoque construction. Bell Nodamatic suspension provides vibration-reducing interface between fuselage and rotor system. Light alloy monocoque tailboom is strengthened by comparison with that of civil LongRanger by use of thicker skins and heavier longerons. Glassfibre blanket mounted externally on each side of aft fuselage to offset blast pressures of missile launch.

TAIL UNIT: Fixed stabiliser with endplate fins, at mid portion of tailboom. Fixed vertical tail fin in sweptback upper and ventral sections.

LANDING GEAR: Light alloy tubular skids, bolted to extruded cross-tubes. Tubular steel skid on ventral fin to protect tail rotor in tail-down landing.

POWER PLANT: Demonstration aircraft has one 373 kW (500 shp) Allison 250-C28B turboshaft engine, but production versions will have one 485 kW (650 shp) Allison 250-C30P turboshaft. Fuel carried by the demonstrator comprises the standard 371 litre (98 US gallon) system of the LongRanger II, but production aircraft are to have a 416 litre (110 US gallon) crash resistant system.

ACCOMMODATION: Pilot and weapons operator on side by side armoured seats for armed missions. Pilot and up to six passengers for personnel transport duties. Dual controls standard. Forward-hinged doors on each side are jettisonable.

SYSTEMS: Hydraulic system for cyclic and collective controls. Electrical supply from starter/generator. Three-axis stability augmentation and control system to enhance capability as a weapons platform.

AVIONICS AND EQUIPMENT: Includes standard military nav/com, plus TOW missile control avionics, missile firing and control system, roof-mounted sight for TOW missiles, and pilot's steering indicator.

ARMAMENT: Can include four TOW missiles in two launchers, plus four TOW missiles carried internally for reloading; or two pods each containing seven 2.75 in folding-fin rockets; or two pods each containing two Fabrique Nationale 7.62 mm machine-guns with 500 rounds of ammunition per gun; or a total of four air-to-air missiles on external launchers.

DIMENSIONS, EXTERNAL:

Diameter of main rotor	11.28 m (37 ft 0 in)
Diameter of tail rotor	1.65 m (5 ft 5 in)
Length overall	12.92 m (42 ft 4¾ in)
Height overall	3.15 m (10 ft 4 in)
Width over armament	3.05 m (10 ft 0 in)

WEIGHTS:

Weight empty, standard configuration	1,003 kg (2,211 lb)
Max T-O weight, internal load	1,882 kg (4,150 lb)
Max T-O weight, external jettisonable load	1,928 kg (4,250 lb)

PERFORMANCE (Max T-O weight at 1,220 m : 4,000 ft ISA; A: armed; B: utility):

Max cruising speed:	
A	105 knots (195 km/h; 121 mph)
B	114 knots (211 km/h; 131 mph)
Econ cruising speed:	
B	112 knots (208 km/h; 129 mph)
Rate of climb:	
A	390 m (1,280 ft)/min
B	415 m (1,360 ft)/min
Hovering ceiling IGE:	
A, B	above 3,660 m (12,000 ft)
Maximum range:	
A	275 nm (510 km; 317 miles)
B	309 nm (573 km; 356 miles)

IAI

ISRAEL AIRCRAFT INDUSTRIES LTD; Head Office and Works: Ben-Gurion International Airport, Lydda (Lod), Israel

IAI WESTWIND
Israeli Navy designation: 1124N Sea Scan

The Westwind has its origins in the Jet Commander designed in the USA by Mr Ted Smith of Aero Commander Inc and flown for the first time on 27 January 1963. Production was transferred in 1968 to Israel Aircraft Industries, which has continued to develop and market successively improved versions.

A total of 186 early-model Jet Commander/Commodore Jet/1123 Westwind executive aircraft, with General Electric CJ610 turbojet engines, was built by Aero Commander in the USA (150) and IAI (36). Details of these have appeared in previous editions of *Jane's*. Aircraft from c/n 187 onwards have Garrett-AiResearch TFE731 turbofan engines, and are designated as follows:

1124 Westwind. Initial turbofan-powered production version, announced in September 1974 and introduced in the following year. Prototypes were two converted 1123 Westwinds, the first of which made its first flight on 21 July 1975. FAA certification received in Spring 1976, with deliveries beginning shortly afterwards. Described in detail in 1978–79 *Jane's*. Total of 53 built (c/n 187-239), of which c/n 239 later became prototype for 1124A Westwind 2.

1124 Westwind 1. Current basic turbofan-powered production version, announced in September 1978 and introduced from c/n 240 onwards. Improved version of 1124 Westwind, differing chiefly in having a 317 kg (700 lb) increase in fuel load, installed in a removable tank in one of the baggage compartments; an increase of approx 5 per cent in cabin useful volume, achieved by relocation of some avionics and by lowering the floor in the toilet compartment; RCA Primus 400 colour weather radar as standard; and improved fuel and environmental control systems. In production. Described in detail in 1980–81 *Jane's*. Recent orders include one from Rhein-Flugzeugbau for four aircraft, for use as simulated high-speed targets on behalf of the West German armed forces; these are due for delivery in 1981.

1124N Sea Scan. Maritime version, announced in 1976. Prototype was converted from an 1123 Westwind (4X-CJA, c/n 154) which later served also as prototype for 1124 Westwind 1. Three specially-equipped 1123N Sea Scans, delivered to the Israeli Navy for coastal patrol and tactical support duties, have since been brought up to 1124N standard and are equipped with thrust reversers, single-point pressure refuelling, anti-corrosion protection, fuselage-side stores pylons, bubble windows, Litton APS-504(V)2 360° search radar, Global GNS-500A VLF/Omega navigation system, operators' consoles, galley, and toilet. A low-altitude search range of 1,379 nm (2,555 km; 1,588 miles), and search endurance of more than 6 h 30 min, enables the Sea Scan to cover a search area of 82,740 nm² (268,056 km²; 103,496 sq miles) along a 60 nm (111 km; 69 mile) search band at a height of 915 m (3,000 ft). Increased search range and endurance to 2,500 nm (4,633 km; 2,878 miles) and over 8 h can be attained at altitudes up to 13,720 m (45,000 ft). Available for specific operational requirements, with equipment to customer's specification. Additional sensors for multi-mission capability can be accommodated, including IFF, MAD, and low light level TV.

1124A Westwind 2. Developed version of Westwind 1 for improved range and economy of operation, announced in September 1979. Prototype (4X-CMK, c/n 239) flown for first time on 24 April 1979. Certificated by Israeli CAA on 11 December 1979 and by FAA on 17 April 1980. New 'Sigma' wing of modified NASA supercritical section, NASA-type winglets above tip-tanks, flat (instead of 'trenched') cabin floor, increased seated headroom, airline-type flushing toilet, relocated overhead passenger service units, and other improvements. First delivery (of the prototype, to Helicol of Colombia) made on 16 May 1980, at which time 18 of this version had been ordered. In production.

Astra. Proposed version, under development for deliveries beginning in 1984, combining new 'Sigma 2' wing (mounted beneath cabin floor) with 10-passenger fuselage of Westwind 2 and TFE731 engines. Expected to have max range of 3,000 nm (5,560 km; 3,455 miles).

Deliveries of turbofan-powered Westwinds (all versions) totalled approx 130 by early 1981. The fol-

TOW anti-tank missile leaving a TexasRanger during firing trials in the Mojave Desert

New 'Sigma' wings and winglets identify IAI's Westwind 2, which is produced in parallel with the Westwind 1

lowing description applies to the 1124A Westwind 2:

TYPE: Twin-turbofan business transport.

WINGS: Cantilever mid-wing monoplane. NASA 64A212 modified supercritical wing section. Dihedral 2° at 50% chord. Sweepback 4° 37′ at quarter-chord. Aluminium alloy flush-riveted two-spar fail-safe structure, with auxiliary rear spar. Manually-operated all-metal ailerons. Electrically-operated all-metal double-slotted Fowler-type trailing-edge flaps. Electrically-operated trim tab in port aileron. Hydraulically-actuated speed brake and two lift dumpers above each wing, forward of flap. All skins chemically milled and fully sealed. All primary control surfaces, including aileron tab, are fully mass-balanced. Goodyear pneumatic de-icing boots standard. Permanently-attached wingtip fuel tanks, each with a sweptback outward-canted NASA-type winglet on its upper surface.

FUSELAGE: All-metal semi-monocoque flush-riveted structure of aluminium alloy and steel sheet, with chemically milled skins. Pressurised fail-safe cabin and main baggage compartment. Forward and rear main sections joined at aft pressure bulkhead.

TAIL UNIT: Cantilever all-metal structure, with 28° sweepback at quarter-chord. Variable-incidence tailplane, actuated electrically. Manually-operated statically-balanced elevators and rudder. Electrically-operated trim tab in rudder. Goodyear pneumatic de-icing boots on fin and tailplane leading-edges.

LANDING GEAR: Hydraulically-retractable tricycle type, main wheels retracting outward into wings, twin nosewheels rearward. No doors over main wheels when retracted. Oleo-pneumatic shock-absorbers. Single Goodyear wheel on each main unit, tyre size 16 × 4.4, pressure 9.86 bars (143 lb/sq in). Twin Goodyear wheels on nose unit, tyre size 24 × 9.50-10.5, pressure 3.79 bars (55 lb/sq in). Nose unit steerable and self-centering. Goodyear multiple-disc brakes, with Hydro-Aire fully-modulated anti-skid system having automatic computer/sensor to prevent wheel lock and maintain brake effectiveness. No brake cooling. Parking brake.

POWER PLANT: Two 16.46 kN (3,700 lb st) Garrett-AiResearch TFE731-3-1G turbofan engines, with Grumman thrust reversers, mounted in pods one each side of rear fuselage. Integral fuel tank, capacity 2,070.5 litres (455.5 Imp gallons; 547 US gallons), in each wing; permanent wingtip tanks, each of 435.5 litres (96 Imp gallons; 115 US gallons) capacity; and single 378.5 litre (83 Imp gallon; 100 US gallon) auxiliary tank in fuselage, immediately aft of cabin. Total fuel capacity 5,390.5 litres (1,186 Imp gallons; 1,424 US gallons). Single-point pressure refuelling on starboard side of fuselage; gravity points in each wing upper surface, each tip-tank, and for fuselage auxiliary tank. Oil capacity 5.7 litres (1.25 Imp gallons; 1.5 US gallons) per engine.

ACCOMMODATION: Standard seating for pilot, co-pilot, and seven passengers, or up to a maximum of 10 passengers, in pressurised and air-conditioned cabin. Electrically-heated windscreen, pitot system, and angle of attack sensor. Standard passenger layout comprises six individual tracked and swivelling seats, with tables between, plus a one-person divan. Fully-enclosed toilet compartment at rear of cabin on starboard side. Plug-type door, at front on port side, provides access to both cabin and flight deck. Emergency exit on each side, forward of wing. Baggage compartments at rear of cabin (pressurised) and in rear fuselage (unpressurised), both with external access on port side.

SYSTEMS: Garrett-AiResearch three-spool free-wheeling turbine air-conditioning system; pressurisation differential 0.61 bars (8.8 lb/sq in) normal, 0.62 bars (9.0 lb/sq in) maximum. Primary hydraulic system, pressure 138 bars (2,000 lb/sq in), operates through two engine-driven pumps to actuate landing gear extension/retraction, wheel brakes, nosewheel steering, speed brakes, lift dumpers, and thrust reversers. Electrically-operated emergency system, pressure 69 bars (1,000 lb/sq in), for brakes only. Pneumatic system, using engine bleed air, for wing and tail unit de-icing boots only. DC electrical system, with two 350A 28V engine-driven starter/generators and two 37Ah 28V long-life nickel-cadmium batteries. One main bus for each generator, connected to central battery bus. Two 1,000VA solid-state static inverters provide 115V AC power at 400Hz, each inverter being independently capable of supplying the entire AC load if required. Engine air intakes anti-iced by engine bleed air. Oxygen system supplied by cylinder of 1.36 m³ (48 cu ft) capacity. Cabin fire extinguishing system. No APU.

AVIONICS AND EQUIPMENT: Standard avionics and equipment (all Collins except where indicated) include dual VHF-20A VHF com, dual VIR-30A VHF nav, IAI nav switching system, FCS-80 flight control system, FDS-85 flight director, APS-80 autopilot, ADS-80 air data system, LRN-90 Loran, DME-40 DME, ADF-60A ADF, dual RMI-36 RMIs, dual TDR-90 transponders, ALT-50A radio altimeter, ALI-80A encoding altimeter (pilot), Kollsman B4420 digital altimeter (co-pilot), MSI-80C Mach/airspeed indicator (pilot), IDC Mach/airspeed indicator (co-pilot), VNI-80A vertical nav indicator (pilot), Teledyne SLZ-9706-DGLE vertical nav indicator (co-pilot), PRE-80A preselector/alerter, dual 346B-3 audio systems, RNS-300 R/Nav, WXR-300 weather radar, Teledyne SLZ-9618-5 angle of attack system, dual Sperry C-14 compasses, HSI-84 co-pilot's HSI, Sperry GH-14B co-pilot's attitude gyro, J.E.T. A1-804 standby attitude gyro, and Davco 811-B digital clock. Landing light in nose of each wingtip tank. Optional avionics include dual VHF-20B (instead of VHF-20A) and single VHF-251 VHF com; HF-718U-5 and HF-220 HF com; Litton LTN-211, Collins LRN-85 or Global GNS-500A-2 VLF/Omega nav; second FDS-85, second ADC-80J for co-pilot's FDS-85, and comparator warning annunciator system; second ADF-60A and controller, second DME-40, FPA-80 Flight Profile ADV, Collins TAI-80A SAT/TAS indicator, DRI-55 digital radio altimeter, ALT-55B (instead of ALT-50A) radio altimeter; Fairchild 5424-501 flight data recorder; Fairchild A-100 cockpit voice recorder; Kollsman ALT B4515 co-pilot's encoding altimeter (instead of B4420); Davco 811-B co-pilot's digital clock, Hobbs hour meter, Dorne and Margolin ELT-6 emergency locator transmitter, Devore Tel-Tail lights, Wulfsberg Flitefone III PA system, and ICD cabin display.

DIMENSIONS, EXTERNAL:

Wing span: incl tip-tanks	13.65 m (44 ft 9½ in)
excl tip-tanks	13.16 m (43 ft 2 in)
Wing chord: at root	3.20 m (10 ft 6 in)
at tip	1.15 m (3 ft 9.232 in)
Wing aspect ratio	6.51
Length overall	15.93 m (52 ft 3.09 in)
Fuselage: Max width	1.57 m (5 ft 2 in)
Max depth	1.83 m (6 ft 0 in)
Height overall	4.81 m (15 ft 9½ in)
Tailplane span	6.40 m (21 ft 0 in)
Wheel track	3.35 m (11 ft 0 in)
Wheelbase	7.79 m (25 ft 6¾ in)
Passenger door: Height	1.37 m (4 ft 6 in)
Width	0.61 m (2 ft 0 in)
Height to sill	0.51 m (1 ft 8 in)
Baggage compartment door (main):	
Height	0.61 m (2 ft 0 in)
Width	0.56 m (1 ft 10 in)
Height to sill	0.91 m (3 ft 0 in)
Baggage compartment door (rear):	
Height	0.38 m (1 ft 3 in)
Width	0.51 m (1 ft 8 in)
Height to sill	1.27 m (4 ft 2 in)
Emergency exits (each):	
Height	0.66 m (2 ft 2 in)
Width	0.51 m (1 ft 8 in)

DIMENSIONS, INTERNAL:

Cabin:	
Length (incl flight deck and toilet)	6.08 m (19 ft 11.2 in)
Length (excl flight deck, incl toilet)	4.74 m (15 ft 6½ in)
Max width	1.37 m (4 ft 6 in)
Max height	1.50 m (4 ft 11 in)
Floor area (excl flight deck)	6.52 m² (70.2 sq ft)
Volume (excl flight deck)	9.83 m³ (347 cu ft)
Baggage compartment volume:	
main	1.13 m³ (40 cu ft)
rear	0.40 m³ (14 cu ft)
cabin	0.25 m³ (9 cu ft)

AREAS:

Wings, gross	28.64 m² (308.26 sq ft)
Ailerons (total)	1.43 m² (15.40 sq ft)
Trailing-edge flaps (total)	3.85 m² (41.40 sq ft)
Speed brakes/lift dumpers (total)	1.37 m² (14.80 sq ft)
Fin	3.02 m² (32.52 sq ft)
Rudder, incl tab	1.02 m² (11.00 sq ft)
Tailplane	4.86 m² (52.28 sq ft)
Elevators (total)	1.64 m² (17.66 sq ft)

WEIGHTS AND LOADINGS:

Weight empty, equipped	6,010 kg (13,250 lb)
Max payload	1,474 kg (3,250 lb)
Max fuel load	4,286 kg (9,450 lb)
Max T-O weight	10,660 kg (23,500 lb)
Max ramp weight	10,725 kg (23,650 lb)
Max zero-fuel weight	7,485 kg (16,500 lb)
Max landing weight	8,620 kg (19,000 lb)
Max wing loading	372.00 kg/m² (76.23 lb/sq ft)
Max power loading	332.65 kg/kN (3.26 lb/lb st)

PERFORMANCE (at max T-O weight except where indicated):

Never-exceed, max level and max cruising speed at 8,840 m (29,000 ft)
463 knots (858 km/h; 533 mph)

Econ cruising speed between 11,890 and 12,500 m (39,000–41,000 ft)
390 knots (723 km/h; 449 mph)
Stalling speed at max landing weight, flaps down, engines idling
99 knots (184 km/h; 114 mph) CAS
Max rate of climb at S/L 1,524 m (5,000 ft)/min
Rate of climb at S/L, one engine out
250 m (820 ft)/min
Service ceiling 11,280 m (37,000 ft)
Service ceiling, one engine out:
at 9,072 kg (20,000 lb) gross weight
6,400 m (21,000 ft)
at 7,030 kg (15,500 lb) gross weight
9,450 m (31,000 ft)
Min ground turning radius 14.50 m (47 ft 7 in)
T-O run 1,218 m (3,995 ft)
T-O balanced field length 1,600 m (5,250 ft)
Landing from 15 m (50 ft) at max landing weight 747 m (2,450 ft)
Landing run at max landing weight
534 m (1,750 ft)
Range, NBAA VFR reserves:
with max payload (10 passengers)
2,390 nm (4,430 km; 2,750 miles)
with max fuel and 4 passengers
2,905 nm (5,385 km; 3,345 miles)
OPERATIONAL NOISE LEVELS (FAR Pt 36 at max T-O weight):
T-O 85.1 EPNdB
Approach 92.8 EPNdB
Sideline 88.5 EPNdB

AÉROSPATIALE/SOCATA

SOCIÉTÉ DE CONSTRUCTION D'AVIONS DE TOURISME ET D'AFFAIRES (Subsidiary of Aérospatiale); Head Office: Aérodrome de Tarbes-Ossun-Lourdes, BP 38, 65001 Tarbes Cédex, France

AÉROSPATIALE EPSILON

Two prototypes of this two-seat military primary trainer were built, under a French Air Force programme aimed at reducing future training costs by reintroducing a piston-engined type for the initial stages of flying prior to basic instruction on the jet Magister. These aircraft flew for the first time on 22 December 1979 and 12 July 1980 respectively, each powered by a 224 kW (300 hp) Avco Lycoming AEIO-540-L1B5D flat-six engine. A full description of the first Epsilon prototype (F-WZVO), in its original form, can be found in the 1980–81 *Jane's*.

Flight testing is reported to have revealed a pitch-yaw coupling problem. To overcome this, VO was sent back to the Socata works at Tarbes to have a completely redesigned rear fuselage and tail unit fitted, together with revised wingtips. The current fin and rudder are taller, with increased sweepback. The horizontal tail surfaces are repositioned further aft, on the extended tailcone, instead of being mid-mounted on the fin. The original small dorsal fin has been removed, but a long ventral fin has been added. Modified dimensions include an increased wing span of 7.92 m (25 ft 11¾ in) and overall length of 7.59 m (24 ft 10¾ in).

At the same time, Socata installed an Hurel-Dubois 'Away' pilot ejection system in the front cockpit, in preparation for the start of high-speed flutter testing. This involved replacement of the original four-section canopy with the new three-section canopy shown in an accompanying illustration.

Flight testing of the Epsilon in its new form began on 31 October 1980. Negotiations are under way with the Service Technique des Programmes Aéronautiques to initiate production of the trainer for the French Air Force.

First prototype of Aérospatiale's Epsilon military primary trainer in much-modified current form


Westland Lynx AH. Mk 1 in service with the British Army

WESTLAND

WESTLAND HELICOPTERS LTD; Head Office, Works, and Airfield: Yeovil, Somerset BA20 2YB, UK

WESTLAND LYNX

Versions of the Lynx currently in production and service are identified by Mark numbers as follows:

Lynx AH. Mk 1. General-purpose version for British Army Aviation. Capable of operation on tactical troop transport, logistic support, armed escort of troop-carrying helicopters, anti-tank strike, search and rescue, casualty evacuation, reconnaissance, command post, and utility duties. First production example (XZ170) flown on 11 February 1977. Entered service with No. 654 Squadron; now in service with several squadrons in UK and West Germany. Total of 114 ordered, of which approx half have been delivered.

Lynx HAS. Mk 2. Version for Royal Navy (Fleet Air Arm), for advanced shipborne anti-submarine and other duties. Ferranti Sea Spray search and tracking radar in modified nose; primary armament of four BAe Dynamics Sea Skua air-to-surface missiles. Capable of operation on anti-submarine classification and strike, air to surface vessel search and strike, search and rescue, reconnaissance, personnel transport, fire support, communications and fleet liaison, and vertical replenishment duties. May be fitted with additional submarine detection gear, including dipping sonar. First production example (XZ229) flown on 10 February 1976. First operational FAA unit, No. 702 Squadron, formed at RNAS Yeovilton on completion of Navy intensive flight trials in December 1977. Total of 80 ordered, of which more than half have been delivered. Most examples are delivered initially to No. 702 Squadron, and are then assigned to detachments on board RN ships. Serving in 1980 with nine Ships' Flights (five in Type 21 frigates, two in 'Leander' class frigates, and two in Type 42 destroyers).

Lynx Mk 2. Version for French Naval Aviation (Aéronautique Navale). Generally similar to HAS. Mk 2, but with CIT-Alcatel HS-71 dipping sonar, Omera ORB-31Wa search radar, EMD RDN-72B Doppler navigation radar, Crouzet EP-140 computer, and Aérospatiale AS.12 wire-guided air-to-surface missiles. Crew of two for anti-shipping role, three for ASW missions. Total of 26 ordered initially, all of which had been delivered by the end of 1980. Further 14 ordered in May 1980, with uprated Gem 41-1 engines and increased max T-O weight of 4,763 kg (10,500 lb). In service with Flottilles 31F, 34F, and 35F on board French Navy aircraft and helicopter carriers and frigates, and from land bases at Lanvéoc-Poulmic and St-Mandrier.

Lynx Mk 21. Version for Brazilian Naval Air Force (Fôrça Aéronaval de Marinha do Brasil), for anti-submarine strike, air/sea rescue, and other duties. Nine delivered: in service on board 'Niteroi' class frigates and from naval air base at São Pedro de Aldeia.

Lynx Mk 23. Version for Argentinian Naval Aviation (Comando de Aviación Naval Argentina), for ASW duties. Two delivered initially: in service with 4a Escuadrilla in two Type 42 destroyers. Further eight ordered in 1980.

Lynx Mk 25. ASW version, with Alcatel dipping sonar, for Royal Netherlands Naval Air Service (Marine Luchtvaartdienst), by which it is designated **SH-14B.** Ten delivered from 3 September 1979; in service, together with Mk 81/SH-14C, with

Lynx Mk 2 of the French Navy's Flottille 31F on the carrier *Foch*
(Brian M. Service)

Lynx Mk 21 of the Brazilian Naval Air Force

detachments of No. 860 Squadron on board 'Van Speijk' and 'Kortenaer' class frigates.

Lynx Mk 27. SAR, communications, and training version for Royal Netherlands Naval Air Service, by which it is designated **UH-14A.** Six delivered: in service with No. 7 Squadron at de Kooij.

Lynx Mk 28. Military general-purpose version for Qatar Emiri Air Force, for patrol and other duties. Three delivered.

Lynx Mk 80. Uprated and higher AUW version for Royal Danish Naval Air Service (Søvaernets Flyvetjaeneste), for coastal surveillance and fishery protection duties in Greenland, the Faröes, and the North Sea. Eight ordered, of which deliveries began on 15 May 1980: for service on board fishery protection vessels and from Vaerløse and other land bases.

Lynx Mk 81. Uprated and higher AUW ASW version for Royal Netherlands Naval Air Service, by which it is designated **SH-14C.** Otherwise similar to Mk 25/SH-14B except for revised ASW equipment, including MAD. Six delivered.

Lynx Mk 86. Uprated and higher AUW version for Royal Norwegian Air Force (Kongelige Norske Luftforsvaret), for coastguard, fishery, and oil rig protection duties with No. 337 Squadron. Six ordered: deliveries to begin in 1981.

Lynx Mk 88. Uprated and higher AUW version for Federal German Naval Aviation (Marineflieger), for ASW and anti-shipping duties on board 'Bremen' class frigates. Bendix AN/AQS-18 dipping sonar. Twelve ordered: deliveries to begin in mid-1981.

One of the initial batch of six Lynx Mk 27s delivered to the Royal Netherlands Naval Air Service

Westland Sea King HAS. Mk 5 helicopter, a new version first delivered to the Royal Navy on 2 October 1980

PARTENAVIA

PARTENAVIA COSTRUZIONI AERONAUTICHE SpA; Head Office and Works: Via Cava, CP 2179, 80026 Casoria (Naples), Italy

PARTENAVIA P.78

The P.78 is an enlarged development of the P.68 Victor, intended primarily for the third-level commuter airline market. Certification will be to FAR/SFAR Pt 23 (Normal category) and Appendix A to Pt 135.

TYPE: Twin-turboprop commuter transport.

WINGS: Cantilever high-wing monoplane. Constant-chord non-swept wings, of NACA 63 series section. No dihedral or anhedral. All-metal two-spar box structure, of 2024 light alloy, with four-point attachment to fuselage. Ailerons and wide-span flaps on trailing-edge. No tabs. Downward-curving wingtips, to minimise induced drag.

FUSELAGE: Conventional semi-monocoque structure of 2024 aluminium alloy, built in three main sections.

TAIL UNIT: Cantilever sweptback fin and rudder, with dorsal fin; non-swept all-moving tailplane, inner leading-edges of which are swept forward. Trim tab in rudder; wide-span anti-tab in tailplane. Construction of 2024 light alloy.

LANDING GEAR: Non-retractable tricycle type, with single steerable nosewheel and twin-wheel main units. Oleo-pneumatic shock-absorber on each unit. Low-pressure tyres (Type III on main units) for rough-field operation. Streamlined wheel fairing on each unit.

POWER PLANT: Two Rolls-Royce/Alfa Romeo RB.318 turboprop engines, each flat rated to 335.5 kW (450 shp) and driving a Dowty Rotol R-291 three-blade constant-speed fully-feathering propeller. Fuel in two integral tanks in wings outboard of engine nacelles, total capacity 1,140 litres (251 Imp gallons).

ACCOMMODATION: Crew of two, or pilot and one passenger, on flight deck. Standard passenger version accommodates 12 persons in main cabin, on three pairs of seats (with aisle on port side), plus a forward-facing bench seat for three at rear and a similar rearward-facing bench seat at front. Alternative layouts available for all-cargo, executive, maritime reconnaissance, parachutist (14 in addition to pilot), and ambulance operation (six stretchers plus medical attendant). Crew

The six/seven-seat piston-engined Partenavia P.68C Victor, from which the larger P.78 is being developed

door on each side of flight deck. Access to main cabin via the larger (forward) one of two port-side doors at rear (passenger version), or with both doors open for the loading of bulky items of freight. Baggage compartment aft of main cabin, with access door on starboard side. Space in nose for avionics and equipment. Accommodation heated and ventilated by mixture of engine bleed air and ambient cold air. Ventilation outlet and individual reading light for each seat.

SYSTEMS: Pneumatic system for anti-icing of wing and tail leading-edges, and for gyroscopic instruments. Electrical system provides both DC and AC power. Fire extinguishing system for engines.

AVIONICS AND EQUIPMENT: Integrated automatic flight control system, incorporating autopilot, flight director indicator, and mode annunciator. Provision for such avionics as weather radar, pictorial navigation indicator, integrated navigation system, and RMI, at customer's option.

DIMENSIONS, EXTERNAL:

Wing span	14.00 m (45 ft 11¼ in)
Wing aspect ratio	8.24
Length overall	11.05 m (36 ft 3 in)
Height overall	3.60 m (11 ft 9¾ in)

DIMENSIONS, INTERNAL:

Fuselage: Max width	1.40 m (4 ft 7 in)
Max height	1.25 m (4 ft 1¼ in)

AREA:

Wings, gross	23.8 m² (256.2 sq ft)

WEIGHTS:

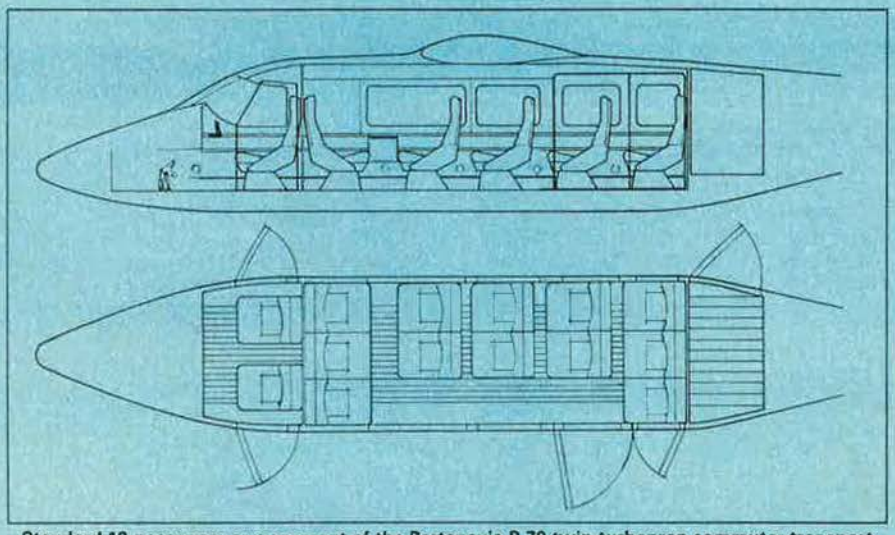
Basic weight empty	2,430 kg (5,357 lb)
Max T-O weight	4,000 kg (8,818 lb)
Max landing weight	3,800 kg (8,377 lb)

PERFORMANCE (estimated, at max T-O weight, ISA):

Max level speed at 3,050 m (10,000 ft)
223 knots (413 km/h; 257 mph)
Max cruising speed at 3,050 m (10,000 ft)
207 knots (384 km/h; 238 mph)
Econ cruising speed at 3,050 m (10,000 ft)
189 knots (350 km/h; 217 mph)
Max climbing speed
120 knots (222 km/h; 138 mph)
Stalling speed, flaps down
68 knots (126 km/h; 78.5 mph)

Max rate of climb at S/L	536 m (1,760 ft)/min
Rate of climb at S/L, one engine out	122 m (400 ft)/min
Service ceiling	9,150 m (30,000 ft)
Service ceiling, one engine out	4,875 m (16,000 ft)
T-O run	448 m (1,470 ft)
T-O to 15 m (50 ft)	747 m (2,450 ft)
Landing from 15 m (50 ft)	640 m (2,100 ft)
Landing run	381 m (1,250 ft)
Accelerate/stop distance	701 m (2,300 ft)

Range with max fuel, 9 passengers plus 88.5 kg (195 lb) baggage, at 3,050 m (10,000 ft), 45 min reserves at 45% power:
at 213 knots (395 km/h; 245 mph)
720 nm (1,334 km; 829 miles)
at 189 knots (350 km/h; 217 mph)
830 nm (1,538 km; 955 miles)



Standard 12-passenger arrangement of the Partenavia P.78 twin-turboprop commuter transport

BAe

BRITISH AEROSPACE AIRCRAFT GROUP, WEYBRIDGE/BRISTOL DIVISION: Head Office: Brooklands Road, Weybridge, Surrey KT13 OSF, UK

BAe (BAC/VICKERS) VC10 K.Mk 2/Mk 3 TANKERS

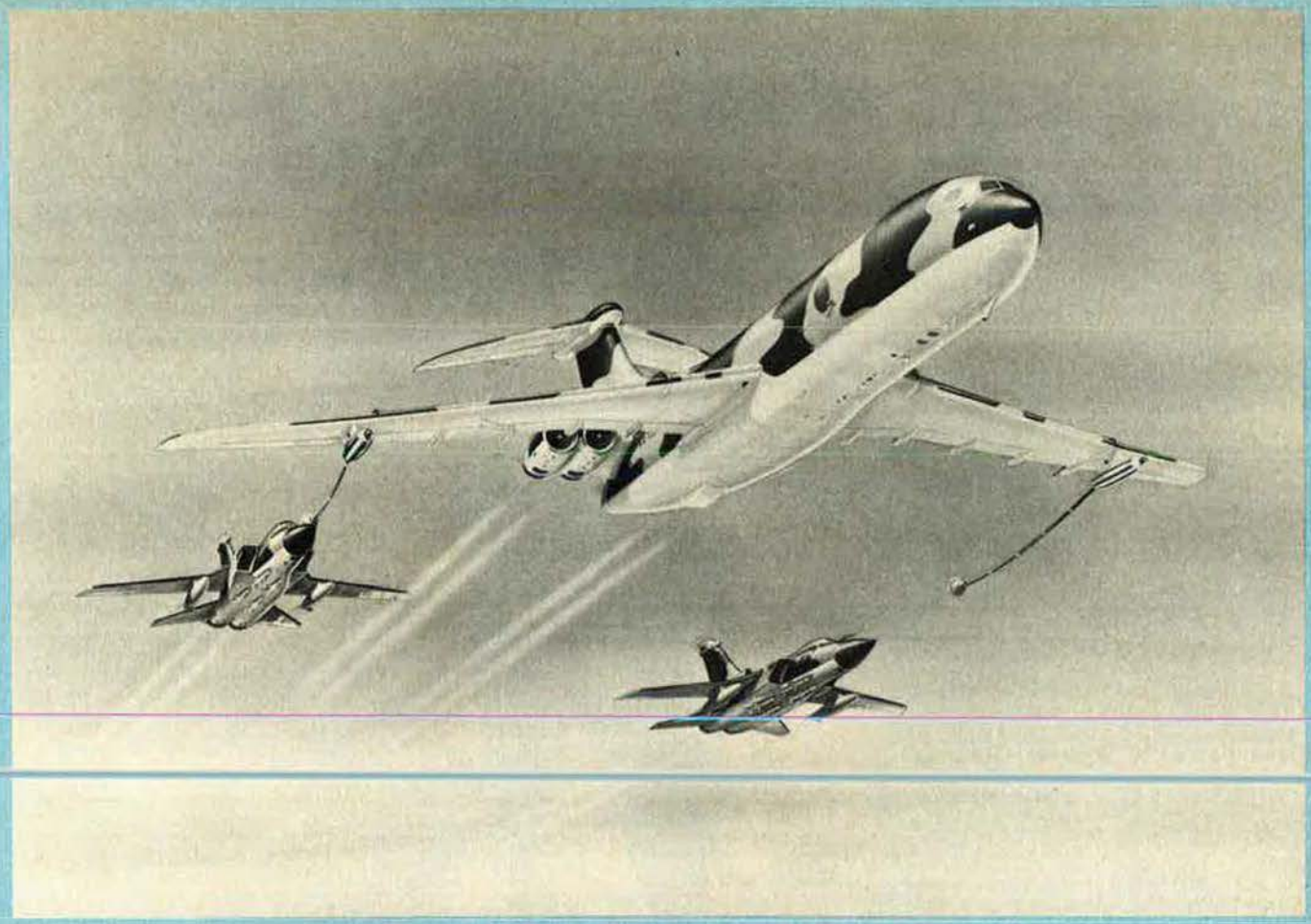
In early 1978 it was announced in Parliament by the Under-Secretary of State for Defence that the Royal Air Force had a requirement for additional flight refuelling tankers, and that it was intended to investigate the feasibility of converting a number of civil VC10s for this role. By April 1978 Air Staff Requirement 406 had been formulated, and a contract for the design study awarded to British Aerospace. This work was carried out before the end of the year, proving that the aircraft could be converted effectively for such operations, and leading to the award to British Aerospace of a contract for this work in May 1979. Valued at that time at some £40 million, it covers the conversion of nine aircraft to tanker configuration, with delivery planned during 1982–83.

The nine VC10s which have been acquired to fulfil this programme comprise five of the 12 standard Model 1101s built during 1962–64 for service with British Overseas Airways Corporation, and four of the five Model 1154 Super VC10s that were delivered to East African Airways in the period 1966–70. RAF designations for the VC10 and Super VC10 tanker conversions will be VC10 K.Mk 2 and VC10 K.Mk 3 respectively. The modification of these commercial transports to a tanker configuration clearly presents a number of problems, but in this instance it is complicated by the fact that the RAF's No. 10 Squadron already operates a fleet of 13 of these aircraft as multi-mission transports under the designation VC10 C.Mk 1. These differ in several ways from the standard civil transports, and the need for these aircraft and the new tanker fleet to have generally similar configurations is desirable for both operating and engineering considerations.

Modification of these aircraft is being carried out by British Aerospace at Filton, with one Model 1101 and one Model 1154 being worked upon initially to serve as prototype/development aircraft, and scheduled to fly in late 1981 and early 1982 respectively. The seven aircraft awaiting conversion will be stored in the open until required for rework, protected by PVC covers which will incorporate suitable dehumidifiers.

The RAF operates currently a fleet of 23 Victor K.Mk 2 tankers, but the planned procurement of 165 examples of the Panavia Tornado ADV (air defence variant) demands that this fleet should be expanded, and hence the VC10 conversion programme. The Tornado ADV highlights the vital role of flight refuelling tankers, for when this interceptor becomes operational in 1984–85 it will be deployed over a wide UK defence region. To enable it to fulfil the task of long-range interception and destruction of enemy aircraft, in-flight refuelling will be essential to ensure not only that an adequate patrol can be maintained as and when required, but also to expand the operational envelope. For example, it is estimated that the Tornado ADV will have an unrefuelled radius of action of some 300–400 nm (555–742 km; 345–461 miles) on combat air patrol, with a capability of two hours loiter and with sufficient fuel for an interception and ten minutes combat. Any increase in this duration or range of patrol will necessitate a flight refuelling operation.

A description of both the VC10 and Super VC10 can be found under the British Aircraft Corporation entry in the 1970–71 *Jane's*. Detailed below are the modifications that will be carried out to make these commercial transports suitable for their new tanker



Artist's impression of a VC10 tanker flight refuelling two air defence Tornado fighters

role, as well as those needed to maintain an acceptable degree of commonality between these aircraft and the VC10 C.Mk 1s which are in service with the RAF's No. 10 Squadron.

TYPE: Military flight refuelling tanker aircraft.

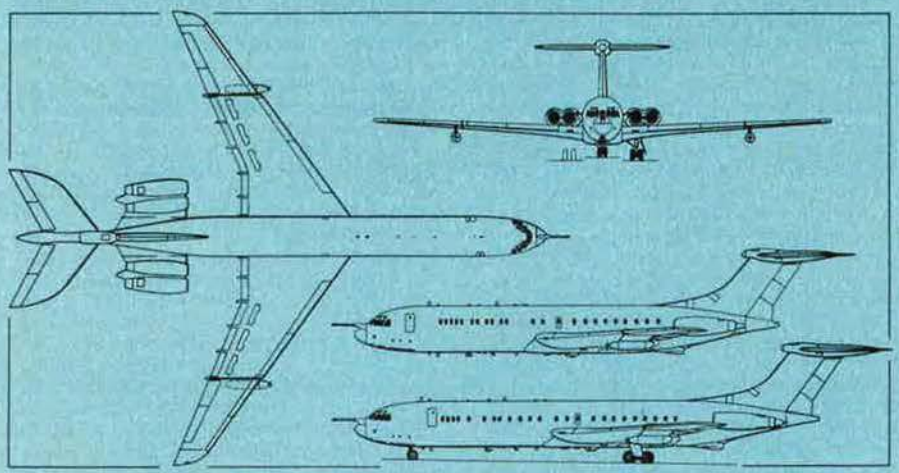
WINGS: As for VC10 and Super VC10, but pylons installed beneath the wings, immediately outboard of the trailing-edge flaps, to carry Flight Refuelling Mk 20B or Mk 32 refuelling pods. The former requires a separate hydraulic pump to drive the hose drum unit (HDU), whereas the latter incorporates a ram air turbine to drive the fuel pump, which also powers the HDU. Aircraft can be flown without these pods attached. Floodlights installed on each side of wing pylon fairings, and in the wing flap actuator fairings, to illuminate the aircraft for night operations.

FUSELAGE: As for VC10 and Super VC10, but with installation of flight refuelling probe in fuselage nose, directly above weather radar, to conform with installation in C.Mk 1s. Remotely controlled Flight Refuelling Mk 17B HDU installed in lower rear fuselage, and involving the cutting of an aperture in the pressurised structure. This requires provision of new pressure bulkheads fore and aft of the cutout, new sidewalls, and a pressure floor over the HDU. Other items being incorporated in the underfuselage structure include a ram air turbine for emergency electrical power; aft of this a remotely-operated closed-circuit TV (CCTV) for examination of HDUs; and a floodlight in the rear fuselage to illuminate the engine nacelles.

TAIL UNIT AND LANDING GEAR: As for VC10 and Super VC10.

POWER PLANT: Four 96.9 kN (21,800 lb) st Rolls-Royce Conway Mk 550B turbofan engines, interchangeable with the Conway 301 engines installed in the VC10 C.Mk 1s. Thrust-reversers installed on outboard engines only to conform with C.Mk 1s. Basic fuel capacity of the VC10 K.Mk 2 will be 81,486 litres (17,925 Imp gallons), the same as that of the standard VC10, and of the K.Mk 3 88,032 litres (19,365 Imp gallons) which is the same as the Super VC10. Additional fuel for flight refuelling operations accommodated in five cylindrical tanks installed within the fuselage. Each consists of a double-skinned metal container with an inner flexible bag tank, and each is mounted on two large beams and restrained from forward movement by a heavy A-frame in front of each tank. These supplementary tanks and the aircraft's basic fuel system are interconnected, and it is possible to transfer all but sufficient fuel for the tanker's mission requirement, or to take on board a similar volume via the nose-mounted refuelling probe. Installation of these fuselage tanks in the standard VC10s will require a section of the fuselage upper surface to be cut out and replaced. In the case of the Model 1154s which were built for East African Airways, these incorporate a large freight door forward of the wing on the port side, and this will be large enough to accept these tanks. Following installation the freight door will be sealed.

ACCOMMODATION: Primary flight crew of four, comprising pilot, co-pilot, navigator, and flight engineer. Flight engineer's station, on starboard side of flight deck, equipped also for control of the air refuelling operation, and has a cathode ray tube (CRT) display from the CCTV. At the forward end of the cabin, and separated from the tank bay by a bulkhead, limited rear-facing seats are provided for airlift of essential ground personnel when the tanker is deployed away from its home base: K.Mk 2 seats 18, K.Mk 3 has seats



BAe (BAC/Vickers) VC10 K.Mk 3 flight refuelling tanker, with additional side view of the shorter K.Mk 2 *(Pilot Press)*

for 17. Cabin windows and overhead baggage racks retained in this passenger area, but most windows will be blanked off in the tank bay and all baggage racks removed. Access for crew and passengers through forward starboard door. Forward port door is to serve only for emergency exit by parachute. Remaining cabin doors and two of the four emergency exits to be sealed. Forward underfloor freight hold unchanged, and can be used to carry spares or accommodate refuelling pods during ferry flights.

SYSTEMS: Generally similar to those of C.Mk 1. A Rolls-Royce/Turboméca Artouste Mk 520 APU is to be installed in the tailcone of both tanker versions to conform with the C.Mk 1s. This provides compressed air for engine starting, or essential electrical power when required on the ground.

AVIONICS AND EQUIPMENT: Avionics will conform with those provided in VC10 C.Mk 1s, including dual VHF/UHF com, dual HF, ADF, IFF, Omega, Tacan, and weather radar. Equipment includes Flight Refuelling Mk 20B or Mk 32, and Mk 17B HDUs, a 10-man dinghy carried on the floor of the passenger compartment, and a 26-man dinghy in the ceiling of that compartment.

DIMENSIONS, EXTERNAL:

Wing span	44.55 m (146 ft 2 in)
Length overall:	
K.Mk 2 (excl refuelling probe)	48.36 m (158 ft 8 in)
K.Mk 3 (excl refuelling probe)	52.32 m (171 ft 8 in)
Height overall	12.04 m (39 ft 6 in)
Tailplane span	13.36 m (43 ft 10 in)
Wheel track	6.53 m (21 ft 5 in)
Wheelbase:	
K.Mk 2	20.08 m (65 ft 10½ in)
K.Mk 3	21.98 m (72 ft 1½ in)

Lockheed F-104G Starfighter modified by MBB as part of its five-year CCV flight research programme

MBB

MESSERSCHMITT-BÖLKOW-BLOHM GmbH: Head Office: Ottobrunn bei München, 8000 München 80, Postfach 801109, Federal Republic of Germany.

MBB F-104 CCV

MBB's Military Aircraft Division has for several years been undertaking, under contract to the Federal German Ministry of Defence, a programme to develop and demonstrate an advanced control-configured vehicle (CCV) flight control system. A Luftwaffe F-104G Starfighter (98 + 36, formerly 23 + 91) is being used as the test aircraft in this programme, the results of which are expected to have particular relevance to the Luftwaffe's TKF 90 requirement for an advanced tactical combat aircraft for service in the 1990s. Data may also yield information of value to other modern combat types in or on the verge of service, such as the Panavia Tornado.

The CCV test aircraft is equipped with a digital fly-by-wire flight control system which incorporates modular, self-monitoring, triple-redundant series actuators for the primary control surfaces. Those for the ailerons are located in large fairings on the fuselage sides, on the upper surface of the engine air intake trunks; actuators for the rudder and all-moving tailplane are located in the fin, and all utilise the aircraft's standard power jacks. All other elements of the FBW system, including the four 16-bit 16K onboard computers, are quadruplexed to provide parallel redundancy. Aircraft control column and rudder pedals, instead of fulfilling their conventional functions, are used instead to initiate normal acceleration, rate of roll, and changes in angle of sideslip. The necessary control inputs are generated by the computers, each of which is supplied with information via a strapdown inertial platform and skewed vane-type airflow direction sensor. The computers are interconnected to provide access to each other's memory, and between them manage the aircraft's pre-flight checks, stabilisation and control, autopilot, inertial navigation, air data calculations, and systems redundancy management.

The main purpose of the CCV programme is to investigate the use of an artificial stability system in an unstable aircraft, and the performance improvements expected from this concept, although the current investigation is of aircraft behaviour rather than of specific performance gains. The system is required to be able to continue a mission after a single failure, and to permit a safe return to base after any additional failure. Safety problems are also being studied as they arise, and as a precautionary measure the test aircraft retains a conventional mechanical backup system of flight control.

Work on the F-104 CCV programme began in December 1974, and installation of the FBW flight control system was completed in May 1977. The first stage of flight testing, with the aircraft fully stable (approx 20% positive stability) and otherwise unmodified, began in December of that year and was completed in October 1979. This is being followed by four further stages (B2, E1, E2, and E3) in which the aircraft is made progressively less stable, culminating in the final stage with a shift in CG of up to 20% of the wing mean chord aft of the aerodynamic centre. In the first of these stages (B2), the test aircraft was rendered moderately stable by adding 600 kg (1,323 lb) of lead shot ballast aft of the CG, beneath the jetpipe. Conversion to B2 configuration, and flight trials which included flutter and ballast jettison tests, took place in October/November 1979. In this configuration a modified fuel transfer system was also adopted, in which the normal (tip-tanks first) sequence of fuel usage was reversed. With internal tanks depleted, the CG is displaced to the most rearward position; before landing the CG is moved forward, to 22% of the mean aerodynamic chord, by transferring fuel to the fuselage tanks from the wingtip tanks.

By December 1979 the testbed aircraft had been further modified to E1 (marginally stable) configuration. This was achieved by deleting the aft ballast, pylon-mounting a canard surface (actually the tailplane of another F-104) on top of the forward fuselage just aft of the cockpit, with a fixed angle of incidence of −4°, and adding forward ballast.

Installation of the canard has the effect of relocating the aircraft's aerodynamic centre further forward by some 35% of the wing mean aerodynamic chord. The purpose of the forward ballast is to restore it to a position just aft of the CG for the E1 phase; when aft ballast is added in the two final stages, the aerodynamic centre will revert to a position forward of the CG. The canard, which supports approx 20% of the weight of the aircraft in flight, becomes lift-free at the same angle of attack as the wings. It stalls at an angle of 11°, restoring positive stability. To prevent the onset of wing stall (which would occur at 16° wing angle of attack), artificial stall warning is given by a stick-shaker when the wing angle reaches 12°. The F-104 CCV made a successful 46 min first flight in the E1 configuration on 20 November 1980.

In the two remaining stages of the programme, the F-104 CCV will be rendered moderately unstable in stage E2, and highly unstable (20% negative stability) in stage E3, by the reintroduction of aft ballast (400 kg; 882 lb and 600 kg; 1,323 lb respectively). The reversed fuel transfer system will again be used in the E3 trials, to act as a ballast trim. All flight testing is being carried out within a flight envelope limited to speeds of Mach 1.3 and 650 knots (1,205 km/h; 748 mph) IAS. The overall flight test programme calls for a total of 120 flights, of which 76 were with the aircraft in partly de-stabilised form (B1 and B2 configurations).

MAGNIFIQUE!

Once every two years, Paris comes alive with aviation. And AFA has arranged, through Destinations Unlimited, to take you there in worry-free comfort.

The Paris Air Show is the best in exhibits and technology — worldwide. Military, air carrier, general aviation and space are fully represented — from the single engine to sophisticated military aircraft, electronics and weaponry. All the latest developments in air transportation.

Add the beauty and splendor of Paris and you have a dream come true. AFA and Destinations Unlimited will help you live that dream.

This is Destinations Unlimited's fourth Paris Air Show tour, so they have the experience and know-how to make your trip successful. They make all your travel arrangements down to the last detail. If you need to go earlier or want to stay later than our tour, just tell them what your needs are and they will take care of the rest while you sit back, relax and enjoy!

After the air show, consider staying an extra week or two abroad — river barging thru the wine country — ballooning — visiting the chateau country — the Riviera — or the ultimate, fly the Concorde to Paris and sail home on the Queen Elizabeth II!

Take advantage of our package plan, June 6-13, or we'll make special arrangements to suit your personal travel requirements.

Join us at the 1981 Paris Air Show.

Package plan includes:

• Round trip airfare from New York to Paris via Air France Concorde or wide-body jet. • Six nights at the deluxe Hotel Concorde LaFayette or the standard Hotel Saint Augustin. • Continental breakfast daily. • Transfers airport/hotel/airport. • Half-day orientation tour of Paris. • Transportation and entrance ticket to the airshow on 2 days. • Taxes and services for hotels, porterage, etc. • Professional escort.

June 6-13, 1981

$1495 per person (standard hotel/double occupancy)
$1780 per person (deluxe hotel/double occupancy)
$4399 per person (Concorde/deluxe hotel)
Single supplement $150 standard hotel
$650 deluxe hotel
Dine-Around $199 (6 dinners/variety of restaurants)

Rates quoted as of October 1,1980 and are subject to change.

FANTASTIQUE!

Enclosed is my check for $_____ ($250 per person)

as deposit to hold _____ spaces on the Paris Air Show Tour.

Name(s)_____
(please print)

_____

Address:_____

City_____ State_____ Zip_____

Telephone: Home ( )_____ Office ( )_____

☐ Please send further information

Make check payable and mail to: **Destinations Unlimited** 7315 Wisconsin Avenue, Suite 1209 Bethesda, Maryland 20014 (301) 951-3954

Cancellation Clause Your deposit, less a $25.00 per person administration fee, will be returned to you if cancellation is received in writing 60 days prior to departure. Thereafter you will be assesed a cancellation fee of $150.00 per person plus any charges made by hotels, airlines or land operators.

The 34th PARIS AIR SHOW

Le Bourget Airport

JUNE 4-14

Highlights of the 1979 Paris Air Show:

26 countries
209 aircraft
692 exhibitors
730 flight demonstrations
552,338 attendees

THE 1981 SHOW PROMISES TO BE EVEN MORE IMPRESSIVE!

THE Air Force's ability to project force anywhere on the globe, to sustain that force as long as needed, and to surge production of weapons and war materiel to meet national security needs were the broad topics at the second session of AFA's national symposium, "America's Security in the '80s," October 23–24, 1980, in Los Angeles, Calif.

Pointing out that no state or combination of states in Southwest Asia can respond effectively to the "air, land, and naval forces which the Soviets could commit to further campaigns of aggression" in the Persian Gulf region, Gen. Lew Allen, Jr., USAF Chief of Staff, said that US naval and marine forces in the area "cannot bring to bear the power required to discourage, or if necessary meet, a determined Soviet military thrust." Thus it becomes imperative to introduce substantial land-based air and ground forces, a requirement that is difficult to meet because of deployment distances in excess of 8,000 miles and inadequate access to facilities in the region. Prepositioning of heavy equipment, munitions, and spare parts is vital to offset US air and sealift limitations, yet entails "delicate negotiations with . . . nations whose complex internal and regional politics often make them hesitant to develop strong military ties with the United States."

The US, nevertheless, is "making important progress in gaining better access for both the prepositioning of stocks and the reception and staging of US land-based air and ground forces. This process has been influenced . . . by the outbreak of hostilities between Iran and Iraq, which has sparked a growing realization among the nonbelligerent nations of the region that the presence of . . . US forces, such as the AWACS aircraft currently deployed to Saudi Arabia can contribute to their defense against potential threats to their territorial integrity and natural resources. While we have maintained a neutral posture with respect to Iran and Iraq, we are prepared to come to the assistance of other nations who recognize that enhanced US capability in Southwest Asia is important to forestall wider regional conflict or possible Soviet intervention," according to General Allen.

Because the US could be drawn into a Southwest Asian conflict, the Air Force is making pertinent adjustments, according to General Allen: "With respect to training, we have placed a premium on deployments of active and Reserve units based in the US to overseas locations, with emphasis on the greater Middle East. [Recently] we deployed over 200 aircraft to overseas locations for training, with the bulk of these moving to Europe and the Middle East. While deployed, these units flew over 6,000 sorties under simulated combat conditions," the Chief of Staff reported.

In a similar manner, components of the Rapid Deployment Force (RDF) are being acclimatized to desert warfare in high-intensity Red Flag exercises at Nellis AFB, Nev., he said.

One of the tough questions associated with Middle East scenarios, General Allen said, is how to preposition material and how to protect it in forward areas from preemptive attack. A number of courses are open, each offering some relative advantages and disadvantages, he said. If prepositioned on shore, there is a need for point defense, area defense, and defense against terrorists. Additionally, it might become prudent to use hardened shelters.

On the other hand, if essential supplies are placed on ships they become vulnerable as the ships come forward—as inevitably they must—and get within reach of the enemy's aircraft, General Allen pointed out. The US, therefore, is pursuing multiple approaches in the Indian Ocean area. "We are putting heavy munitions aboard ships as well as maximizing airlift," in order to be able to respond quickly and flexibly and to assure that essential material can be delivered as close to the conflict site as possible, he said.

Tactical Airpower Challenges

Focusing on the Persian Gulf cauldron from the perspective of tactical airpower, Lt. Gen. Jerome F. O'Malley, USAF Deputy Chief of Staff for Operations, Plans and Readiness, stressed that the world situation is ripe for more Soviet interventionism patterned after the invasion of Afghanistan. "Bolstered by a nuclear deterrent equal to our own," he said, "the Soviet Union has reiterated to the world its own blueprint for the future—bold and brutal use of military power beyond its own borders." Concomitantly, "our tactical forces play a vital role between the extremes of strategic nuclear deterrence and peaceful bargaining." Because the Soviets have made great strides in improving their tactical airpower, the challenge to USAF is formidable, he said. By producing combat aircraft at twice the US rate, the Soviets could completely reequip "our active tactical force every eighteen months."

Equally alarming, as the Soviets pull abreast of the US in terms of weapon systems quality, it is generally no longer possible to offset their numerical advantage with superior technology on the part of the US. "Their current generation of fighters include models specifically designed for ground attack with advanced avionics and navigation equipment. These are complemented by advanced air-superiority fighters with radars and missiles capable of engaging our aircraft beyond visual range of the pilot. Complicating our own air-superiority mission is the large-scale introduction of advanced armed helicopters, which the Soviets have effectively demonstrated while supporting their ground forces in Afghani-

The state of US industry and the host of factors that affect productivity, the ability to rapidly increase production, and lead times were among the topics highlighted at a recent Air Force Association symposium that featured senior Air Force leaders.

CRACKS IN THE DEFENSE INDUSTRIAL BASE

BY EDGAR ULSAMER
SENIOR EDITOR (POLICY & TECHNOLOGY)

stan," General O'Malley told the AFA symposium. He added that countering the Soviet helicopter threat as manifested in Afghanistan requires massive ground-based air defenses as well as large numbers of air-superiority fighters.

As the Soviets expand their numerical lead in tactical aircraft while closing the technological and qualitative gap, finite funds and other resource limits force the Air Force into a delicate tradeoff between "modernization and readiness." As General Allen told the AFA symposium, "we have been forced to make a major shift in budget priorities from weapons acquisition to urgent measures to improve the combat capability and staying power of our current inventory.

"In pursuing this revised emphasis, we are plagued by two concerns. The first is that critical modernization programs across all mission areas are already underfunded, leading to inadequate force replacement rates and inefficient production schedules. Further cutbacks in acquisition will only aggravate these problems and put us further in the hole. Equally disturbing is the fact that despite our sense of urgency and greater funding emphasis on critical spare parts, such as engines and avionics components, both the cost and lead times of these items are increasing rapidly and at rates much worse than other areas of manufacturing."

In essence, the dilemma is induced by the fact that USAF's budget "is inadequate in regard to both system acquisition and logistics support." Affixing blame for the situation on both industry and the Air Force, he said that industry failed to provide weapon systems with essential sustainability while USAF did not "balance sustainability against modernization as well as we should have." The time has come, he warned, "to pause, shift emphasis, and straighten out. We can't have F-15s and F-16s that can't support the wartime plan. We will have to make the fighting force capable of fighting." For the moment, he stressed, "I don't have any choice—I must put priority on the sustainability of the existing force."

In the tradeoff between force modernization, on the one hand, and readiness and sustainability, on the other, the former represents the more expensive part of the equation. Yet as General O'Malley pointed out, the mounting Soviet threat dictates expansion of the "war-fighting potential of our tactical arm. We will see the tactical fleet expand to a total of forty wings—twenty-six active and fourteen reserve. As part of the total force policy, our Reserve forces will share the inventory of front-line fighters and play a primary role in operational planning."

Concurrent with this growth in force size, he said, will be substantial increases in spares, munitions, and flying hours, balanced with a continued modernization program. In the case of the latter, he said, "our program through 1985 calls for a constant five percent annual increase in flying hours to a goal of twenty hours per month for each crew. These increases will provide the training necessary to exploit the potential of our latest fighters and meet the challenges" posed by a mushrooming threat, according to General O'Malley.

In spite of the rapid strides taken by the Soviets to catch up qualitatively with USAF's combat aircraft, the F-15 remains "clearly the finest air-superiority fighter in the world, while the F-16 is proving equally superb in a multirole capacity. In addition, the firepower and survivability of the A-10 have added a new dimension to close air support of our ground forces," General O'Malley stressed.

Rising to the defense of high-performance, technologically advanced fighters of the F-14/F-15 type against what he termed "a colony of Luddites that exists in the Pentagon," General Allen excoriated facile arguments that purport to show that quantity is more important than quality so far as tactical airpower is concerned. Premise for the "myth" that low-cost, limited performance aircraft can overwhelm easily smaller numbers of sophisticated, expensive aircraft was a series of tests, known as AIMVAL and ACEVAL, General Allen explained.

Gen. Lew Allen, Jr., raised the question of the tradeoff between aircraft modernization and readiness.

Deputy Chief of Staff for Ops, Plans and Readiness Lt. Gen. Jerome F. O'Malley discussed Soviet interventionism.

These tests, he added, stacked the deck against the F-14 and F-15 since they were confined to visual contact scenarios and denied the high-performance aircraft their intrinsic advantages of greater range and radar capabilities. "Close-in, of course, numbers convey an advantage. Yet it doesn't do any good to have hordes of low-technology aircraft if they can't do the job," he said. He stressed that the Air Force continually examines various and changing tradeoffs between quality and quantity in tactical aircraft, but warned that "there is no formula that provides us with a lasting answer."

New, Stiffer Demands on Rapid Deployment Forces

Pointing out that the concept of a rapid deployment force is not new—its lineage is clearly traceable to the composite air strike force formed by the Tactical Air Command in 1956—General O'Malley explained, however, that in the past this country's overwhelming strategic capabilities made it possible to project force involving more symbolism than actual capability. Today's environment, he stressed "is much more complex. A force deployed today must expect to be confronted. More importantly, that force must have the sustained firepower to resolve conflicts at the local level—to avoid the prospect of global confrontation."

Realistic training exercises, carried out in regions likely to be involved in future conflicts, take on added

importance, therefore, General O'Malley told the symposium. He cited as an example the recent deployment of twelve F-4Es from Moody AFB, Ga., to a remote airfield in Egypt in an exercise called "Proud Phantom."

The base, he said, was Cairo West, located some twenty miles from the Egyptian capital: "It consisted of a runway, a ramp, and an inoperative water system. . . . Every element of maintenance, support, and recreation had to be deployed and accommodated in bare-base facilities. In ninety days we erected the minibase which would sustain up to 600 people for the ninety-day deployment. The F-4s deployed nonstop from Georgia. It took thirteen hours. From July to October, these twelve aircraft flew over 900 sorties at a rate almost twice that of normal peacetime training."

"We proved that an effective rapid deployment force—like any other military force—is dependent on dedicated people who, when given the equipment and mission, can go anywhere in the world and get the job done."

The most significant aspect of "Proud Phantom" and similar tough training exercises was the performance of the Air Force personnel involved, according to General O'Malley. Although operating in some of the most forbidding environments in the world "they responded with pride and determination. . . . We proved that an effective rapid deployment force—like any other military force—is dependent on dedicated people who, when given the equipment and mission, can go anywhere in the world and get the job done."

Weakening Defense Industrial Base

As the Air Force struggles with difficult budget-imposed choices between force modernization and sustainability, widening cracks in the nation's defense industrial base aggravate the problem, General Allen told the symposium. Citing "poor productivity, inadequate capacity at the subcontractor level, skyrocketing costs, and shortages of critical materials," the Chief of Staff pointed out that over the past year alone, the cost of aircraft engines shot up by an average of twenty-eight percent, the price of electrical connectors for aircraft skyrocketed by 170 percent, and the cost of nonferrous metals, induced in part by scarcity, went up ninety percent.

At the same time, General Allen reported, industrial lead times also have increased dramatically: "Procurement lead time for aluminum forgings increased from twenty weeks in 1976 to 120 weeks in 1980. Since 1977, the lead time for aircraft landing gear has gone from twelve months to nearly two and one-half years. The problem is even worse with aircraft engines, with lead times now exceeding three years."

These conditions cause not only production stretchouts but also drive up weapon systems costs at an annual rate of more than twenty percent, which he said is roughly double the inflation planning factor used by the Defense Department's budget analysts. The problem is especially severe in the case of replenishment spares "which include those spare parts . . . required to sustain the effectiveness of our aircraft in a prolonged conflict. Despite significant increases in funding in this area in the FY '81 budget, inflation, rising unit costs, and shortages of materials have already [left] us well short of desired goals," General Allen disclosed.

One of the causes for the cracks in the nation's defense industrial base, General Allen suggested, is the "growing impression in this country that we can't build things right any more, whether it's automobiles or F-15s. The media [are] filled with stories of cost overruns, schedule slippages, computers that don't work, and sophisticated weapons of questionable reliability and supportability. To the degree that we in the military and . . . industry have a hand in creating this impression of incompetence, it's up to us to change it."

The Air Force intends to do its part, he said, by ensuring that "we keep high-quality, well-trained professionals in our Air Force, and by maintaining our new emphasis on effective support for current systems until we get them to work properly and efficiently."

He exhorted the aerospace industry executives who made up the bulk of the symposium's audience to ensure that "the quality you build into our products extends to every facet affecting their performance—to include day-to-day supportability and reliability under combat conditions. In short, let's do the job right the first time, and on time. Only then can we expect the American people to make the long-term commitment to levels of defense spending that will preclude the necessity to trade off one urgent need for another, and will let us build a balanced force truly capable of executing national strategy."

People—The Top Priority Concern

"We have learned, at a terrible cost, that it does no good to fund equipment, munitions, and spares unless we devote equal attention to the compensation and quality of life of our military professionals who operate, maintain, and support our machines and far-flung basing structure," General Allen emphasized. Thus, the single most important element of Air Force capacity is "experienced, dedicated, quality people."

Yet over the past few years, he conceded, "we have lost many good and devoted people because they simply could not maintain a decent standard of living for themselves and their families. In many cases, this loss was not simply a matter of money, painful as the squeeze had become. We compounded the problem of making ends meet by forcing our people to live and work in substandard facilities, to spend long, frustrating hours maintaining equipment without adequate stocks of spares, and worst of all, to wonder if the nation really appreciated

the sacrifices they were making to keep our defenses strong."

The Chief of Staff suggested, however, that there is a cause for optimism: "After years of inadequate compensation and recognition, there are encouraging signs that the nation and its political leaders have come to understand the plight of military members and their families" and are taking corrective steps by shoring up pay and benefits.

The AFSC Perspective

The theme of the symposium presentation by Gen. Alton D. Slay, Commander of the Air Force Systems Command, was "decline" within and beyond the military meaning of that term. Probing beyond the purely military ascendancy of the Soviets and their overwhelming lead over the US in weapons production, General Slay stressed the nation's industrial and technical decline "has brought us to a position today where much of our industry is less efficient and produces lower-quality products than Japanese, German, French, or Italian industry . . . where our productivity growth rate for the total economy is the lowest of all major free world nations and continues to decline [and] to the point where we have been passed—or soon will be passed—by several western nations in important areas of technology like microcircuitry, robotics, and machine tools."

Air Force Systems Command Commander Gen. Alton D. Slay stressed the nation's industrial and technical decline. General Slay has recently retired from the Air Force.

A key factor behind declining productivity, he said, is poor quality, a "national disease" that is "a particularly worrisome disease for those of us charged with shepherding the taxpayers' weapon system acquisition dollars."

Juxtaposing Japanese and US industrial and business prowess, General Slay dramatized the results of Japan's "quality revolution" that he said is patterned after the US quality control system of twenty years ago: "Look at the many . . . cases where businesses in the United States are failing or faltering and Japanese businessmen enter with the key ingredients—leadership, capital, and attitude—and turned them around. Look at Quasar, Sanyo, Sony of America, and Amdahl, for instance. The facts are clear—remarkable yield improvements—ten to one at Amdahl, forty to one at Quasar—" and achieved with American rather than Japanese workers.

The Japanese managers achieve these spectacular results, he pointed out, because "quality is made a company-wide goal and it permeates the entire operation, from the president to the production trainee."

Slipping quality of US products—both a cause and effect of low productivity—is manifest in such statistics as an average US productivity growth rate of 1.5 percent over the past twenty years, while over the same period Japan scored annual gains of eight percent and West Germany five percent, General Slay reported.

Worse yet, "last year we had a negative growth rate of minus 0.8 percent, and this year it appears that it will be minus three percent," he added. Warning that "in my opinion, we are well on our way toward becoming a second-rate industrial power," he termed it a "gross contradiction to think that we can maintain our position as a first-rate military power with a second-rate industrial base. It's never been done in the history of the modern world."

Looking for the root causes for the US industrial plight, the AFSC Commander found the culprits in the form of "complacent, short-term planning, short-term profit-oriented industry" for one, and "too few positive and too many negative incentives for investment in modern plant and equipment" as another.

Among major "disincentives" that government is responsible for, he said, were "on-again, off-again defense budgets; government overregulation; repressive profit, depreciation, and tax policies; [and] repressive inflation and interest rates."

While many of the cures for the industrial malaise are beyond the Pentagon's ken and purview, some incisive steps are being taken by the Air Force and the other services to correct existing deficiencies. These include "an executive level course on product assurance application" for program directors and key acquisition executives of all military services as well as a "quality technology program" that parallels and complements the Air Force's Manufacturing Technology Program. Current plans call for investing one dollar in quality technology for every four dollars the Air Force invests in manufacturing technology. A primary payoff from this measure, General Slay predicted, will be "tremendous cost savings" in the labor-intensive inspection process.

The Air Force also will stress the need for improved product assurance by means of industrial contractual techniques such as award fee plans and warranty provisions. Toward this end, the Air Force is collaborating with the leaders of the aerospace and mining industries and with national labor leaders whose organizations encompass these industries, General Slay said.

Because of the gravity of the current situation, the response to Air Force recommendations and initiatives on how the problem should be tackled has been extremely positive at "all levels of both government and industry," General Slay said. As a result there appears to be a "groundswell of opinion in favor of really getting at the roots of the problem." He emphasized that because "these problems are national in scope [they] have to be attacked on a national scale. . . . And the key—the absolute key—to our success or failure . . . is leadership. Leadership at all levels . . . of government; all levels of the military; all levels of business and industry; all levels of the education system."

The Airlift Challenge

With the national emphasis on force projection, one of the key requirements is strategic airlift. It is in short supply, as Lt. Gen. Thomas M. Ryan, Jr., the Military Airlift Command's Vice CINC, pointed out. Because of budget constraints and long lead times, the only means available for easing airlift deficiencies is through "updating" current equipment and bolstering CRAF, the Civil Reserve Air Fleet, General Ryan said. After years of delays, the CRAF enhancement program has gotten under way with one United Airlines DC-10 wide-body airlifter configured for convertibility to the CRAF mission, General Ryan said. The importance of this program transcends US concerns since NATO plans to pattern its own CRAF along the lines pioneered by the US CRAF arrangement.

The European NATO member nations, he said, possess 419 commercial transport aircraft, which represent a very significant potential for increasing the alliance's airlift capacity. A European CRAF could boost current capability by about forty percent, he said, because the civilian fleet includes thirteen wide-body freighters, twenty-one 747 convertible passenger/freighter aircraft, and nine convertible DC-10s. NATO's Civil Air Augmentation program, he said, is "well along." The nations involved agreed to assign fifty-five aircraft to a NATO CRAF "that will become available for rapid reinforcement missions in times of crisis or war," General Ryan said. He added that the Joint Chiefs of Staff designated MAC as the US agent in current negotiations with the European countries over how to set up technical and operational arrangements for a NATO CRAF system.

Roughly half of MAC's own airlift capacity, he told the symposium, can be furnished by CRAF under mobilized conditions. CRAF, which was formed twenty-eight years ago, is comprised of 685 aircraft, nearly half of which are long-range passenger aircraft.

In underscoring the importance of strategic airlift, General Ryan pointed out that while under protracted conflict conditions only about twenty percent of all required cargo would be carried by airlift—compared to eighty percent by sealift—the ability to sustain the war effort exclusively by airlift during the first thirty days or so is "decisive."

Strategic Defense and C^3

Soviet bombers are being modernized and "we can't afford to give them a free ride," Lt. Gen. James V. Hartinger, Commander in Chief of the North American Air Defense Command and of the Aerospace Defense Command told the AFA symposium. The need is for an "atmospheric warning belt around North America, which will give us a balanced missile and bomber warning system," he said.

In order to cover coastal approaches, he said, "we are testing an over-the-horizon radar whose energy is bounced off the ionosphere [which provides] warning out to 2,000 miles, as compared to the 250-mile coverage we now have. If this radar test is successful, a modernized Early Warning Line across the North will be the logical last segment in this atmospheric warning belt." Eventually, he suggested, however, it might become possible to carry out the air surveillance and bomber warning mission through the use of space-based systems.

This warning belt will make it possible to put E-3A AWACS assigned to NORAD on orbit in time to provide survivable command and control capabilities in case the attacker succeeds in putting the ground-based Region Operations Control Centers (ROCCs) out of commission. Battle staffs are being trained to serve aboard the AWACS aircraft to enable NORAD's seven Region Commanders to control the air battle from these airborne platforms, General Hartinger said.

A related requirement is modernization of the aging interceptor force. "Our goal is to modernize this interceptor fleet with F-15s in the US and CF-18s in Canada. The greater range, broader radar envelope, and look-down/shoot-down capability of these aircraft would greatly improve NORAD's ability to monitor the outer fringes of the North American airspace, maintain air sovereignty, and defend against bomber attacks of limited size," General Hartinger said. The F-15, intrinsically a capable interceptor, will become even more efficient in this role when equipped with the high-performance AMRAAM (advanced medium-range air-to-air missile), according to NORAD's Commander in Chief.

Lt. Gen. Thomas M. Ryan, Jr., Vice Commander in Chief of the Military Airlift Command, urged updating equipment and bolstering CRAF.

Lt. Gen. James V. Hartinger is Commander in Chief of the North American Air Defense Command and the Aerospace Defense Command.

NORAD's ability to detect and assess hostile ballistic missile launches will improve significantly once the early warning satellites, also known as the Defense Support Satellites, are provided with simultaneous data-processing capabilities, General Hartinger said. This feature, he said, makes possible triangulation of infrared sensor information, thus overcoming what he termed "gross" inaccuracies in current satellite information. Other improvement programs involving satellite systems center on satellite protection, but are as yet in an "embryonic" state. "The only action taken to protect friendly satellites is through agreements to tell owners of a possible antisatellite or electronic warfare attack against their satellites and to help coordinate any defense actions. [Satellite survivability] will increase greatly with satellite hardening, countermeasures, and with more satellites having a maneuver capability," according to General Hartinger.

AFA's 1981 national symposium in Los Angeles is scheduled for November 12–13, 1981. ■

Industrial Associates of the Air Force Association

"Partners in Aerospace Power"

Listed below are the Industrial Associates of the Air Force Association. Through this affiliation, these companies support the objectives of AFA as they relate to the responsible use of aerospace technology for the betterment of society, and the maintenance of adequate aerospace power as a requisite of national security and international amity.

Aeritalia, S.p.A.
Aerojet ElectroSystems Co.
Aerojet-General Corp.
*Aerojet Ordnance Co.
Aerojet Services Co.
Aerojet Strategic Propulsion Co.
Aerospace Corp.
Aircraft Porous Media, Inc.
Allegheny Ludlum Industries, Inc.
American Electronic Laboratories, Inc.
American Telephone & Telegraph Co.
AT&T Long Lines Department
Analytic Services Inc. (ANSER)
Applied Technology, Div. of Itek Corp.
AVCO Corp.
Battelle Memorial Institute
BDM Corp., The
Beech Aircraft Corp.
Bell Aerospace Textron
Bell Helicopter Textron
Bell & Howell Co.
Bendix Corp.
Benham-Blair & Affiliates, Inc.
Boeing Co.
British Aerospace, Inc.
Brunswick Corp., Defense Div.
Brush Wellman, Inc.
Burroughs Corp.
CAI, A Division of Recon/Optical, Inc.
Calspan Corp., Advanced Technology Center
Canadair, Inc.
Canadian Marconi Co.
Cessna Aircraft Co.
Chamberlain Manufacturing Corp.
Cincinnati Electronics Corp.
Clearprint Paper Co., Inc.
Collins Divisions, Rockwell Int'l
Colt Industries, Inc.
Computer Sciences Corp.
Conrac Corp.
Control Data Corp.
Cubic Corp.
Decca Navigator System, Inc.
Decisions and Designs, Inc.
Dynalectron Corp.
Eastman Kodak Co.
Eaton Corp., AIL Div.
ECI Div., E-Systems, Inc.
E. I. Du Pont de Nemours & Co.
Emerson Electric Co.
E-Systems, Inc.
Ex-Cell-O Corp.—Aerospace
Fairchild Industries, Inc.
Fairchild Western Systems, Inc.
Falcon Jet Corp.
Federal Electric Corp., ITT
Ford Aerospace & Communications Corp.
Garrett Corp.
Gates Learjet Corp.
General Dynamics Corp.
General Dynamics, Electronics Div.
General Dynamics, Fort Worth Div.
General Electric Co.
GE Aircraft Engine Group
General Motors Corp.
GMC, Delco Electronics Div.
GMC, Detroit Diesel Allison Div.
GMC, Harrison Radiator Div.
Goodyear Aerospace Corp.
Gould Inc., Government Systems Group
Grumman Corp.
GTE Products Corp., Sylvania Systems Group
Gulfstream American Corp.
*Harris Corp., Government Communications Systems Div.
Harris Corp., Government Systems Group
Hayes International Corp.
Hazeltine Corp.
Hi-Shear Corp.
HITCO
Honeywell, Inc., Aerospace & Defense Group
Howell Instruments, Inc.
Hughes Aircraft Co.
Hughes Helicopters
Hydraulic Research Textron
IBM Corp.—Federal Systems Div.
IBM, Office Products Div.
International Harvester Co.
Interstate Electronics Corp.
Israel Aircraft Industries Int'l, Inc.
Itek Optical Systems, a Division of Itek Corp.
ITT Defense Communications Group
ITT Telecommunications and Electronics Group—North America
Kelsey-Hayes Co.
Kentron International, Inc.
Lear Siegler, Inc.
Leigh Instruments, Ltd.
Lewis Engineering Co., The
Litton Aero Products Div.
Litton Industries
Litton Industries Guidance & Control Systems Div.
Lockheed Corp.
Lockheed Aircraft Service Co.
Lockheed California Co.
Lockheed Electronics Co.
Lockheed Georgia Co.
Lockheed Missiles & Space Co.
Logicon, Inc.
Loral Corp.
Magnavox Government & Industrial Electronics Co.
Marconi Avionics, Inc.
Marquardt Co., The
Martin Marietta Aerospace
Martin Marietta, Denver Div.
Martin Marietta, Orlando Div.
McDonnell Douglas Corp.
MITRE Corp.
Moog, Inc.
Motorola Government Electronics Div.
Northrop Corp.
OEA, Inc.
O. Miller Associates
Pan American World Airways, Inc., Aerospace Services Div.
Perkin-Elmer Corp., Computer Systems Div.
PRC Information Sciences Co.
Products Research & Chemical Corp.
Rand Corp.
Raytheon Co.
RCA, Government Systems Div.
Rockwell International
Rockwell Int'l, Electronic Operations Group
Rockwell Int'l, North American Aerospace Operations
Rockwell Int'l, Rocketdyne Div.
Rohr Industries, Inc.
Rolls-Royce, Inc.
Rosemount Inc.
Sanders Associates, Inc.
Satellite Business Systems
Science Applications, Inc.
Sierra Research Corp.
Simmonds Precision, Instrument Systems Div.
Singer Co.
Space Applications Corp.
Sperry Corp.
SRI International
Standard Manufacturing Co., Inc.
Sundstrand Corp.
Sverdrup & Parcel & Associates, Inc.
Syscon Co.
System Development Corp.
Talley Industries, Inc.
Teledyne, Inc.
Teledyne CAE
Texas Instruments Inc.
Thiokol Corp.
Tracor, Inc.
TRW Defense & Space Systems Group
United Technologies Corp.
UTC, Chemical Systems Div.
UTC, Hamilton Standard Div.
UTC, Norden Systems, Inc.
UTC, Pratt & Whitney Aircraft Group
UTC, Research Center
UTC, Sikorsky Aircraft Div.
Vought Corp.
Wayne H. Coloney, Inc.
Western Electric Co., Inc.
Western Gear Corp.
Western Union Telegraph Co., Government Systems Div.
Westinghouse Electric Corp.
Williams Research Corp.
World Airways, Inc.
Wyman-Gordon Co.
Xerox Corp.

*New affiliation

For his name, his prestige, and his support, AFA's Aerospace Education Foundation owes a lot to the famed aviation pioneer. So on December 9, Foundation officials invited key congressional and military leaders as well as the Foundation's "Corporate Jimmy Doolittle Fellows" to enjoy . . .

An Elegant Evening With Jimmy Doolittle

BY ROBIN L. WHITTLE, AFA DIRECTOR OF COMMUNICATIONS

CORPORATE executives joined senior military and congressional leaders for a black-tie "Salute to General Jimmy Doolittle," at Washington's National Air and Space Museum the evening of December 9.

The event was sponsored by the Aerospace Education Foundation, the educational arm of the Air Force Association, which has pioneered in making military courses available to civilian schools. General Doolittle was the Association's first national president and currently serves as a permanent AFA national director and trustee of the Foundation.

Six corporations have been strong supporters of the Foundation, contributing funds to become "Corporate Jimmy Doolittle Fellows." The Fellow program is the Foundation's main funding source. All contributions are applied to adapting more Air Force courses for civilian school use.

The gala affair brought together the Foundation's Corporate Fellows and other supporters to honor the famed aviation hero "who has lent his name, his prestige, and his active support to our Fellow program, for which we can't thank him enough," said retired Air Force Gen. Russell E. Dougherty, the new Executive Director of both the Association and the Foundation, in his welcome. (General Dougherty was Commander in Chief of the Strategic Air Command prior to his retirement in 1977.)

Sen. Barry M. Goldwater (R-Ariz.), who is Chairman of the Board of Trustees of the Foundation, served as master of ceremonies and introduced several distinguished guests, including Air Force Chief of Staff Gen. Lew Allen, Jr.; Air Force Secretary Dr. Hans Mark; Chairman of the Joint Chiefs of Staff Gen. David Jones; and Chairman of the House Armed Services Committee Rep. Melvin Price (D-Ill.).

"Jimmy, on behalf of the Foundation and, frankly, on behalf of myself, I say that there is no other person that deserves this tribute more than you. Your career epitomizes all that is right with the human race," and, with that, Senator Goldwater presented Doolittle with two distinctive, gold AFA watches for himself and his wife, Jo, who was unable to attend the Salute.

Silver Anniversary Year

Noting that 1981 will be the twenty-fifth anniversary of the Foundation, Senator Goldwater paid special tribute to the corporate representatives and their companies for making the Foundation's work possible.

"We have 220 individual Fellows and seven Corporate Fellows who have contributed to the Foundation," he said (*see box*). Senator Goldwater introduced the senior representatives from these companies and then explained his role in the Foundation.

"Gentlemen, I know that you know that I don't take on additional activities for fun—I've got too much to do as it is. So, you'll appreciate that I feel the Foundation is doing a tremendous job, and I am proud to serve as its Chairman. In turn, we could not do many of the things we do without the financial assistance provided by our Fellows, especially the Corporate Fellows."

Senator Goldwater then intro-

ABOVE: Enjoying a relaxing moment during the reception are, from left, Air Force Chief of Staff Gen. Lew Allen, Jr.; Air Force Secretary Dr. Hans Mark; Chairman of the Joint Chiefs of Staff Gen. David C. Jones; Lt. Gen. Jimmy Doolittle, USAF (Ret.); Foundation Board Chairman Sen. Barry Goldwater (R-Ariz.); and Air Force Vice Chief of Staff Gen. Robert C. Mathis. LEFT: General Doolittle makes a point to his dinner partner, Gen. David C. Jones.

duced the National President of the Air Force Association, Victor R. Kregel from Dallas, Tex.; the AFA Board Chairman, retired Maj. Gen. Dan Callahan from Nashville, Tenn.; and Foundation President Dr. William L. Ramsey from Milwaukee, Wis., also President of the Milwaukee Area Technical Colleges.

The Doolittle Legend

All had come to honor the man of the hour, Lt. Gen. Jimmy Doolittle, whose life story the Senator then briefly recounted. Senator Goldwater told the audience that in the early years kids wanted to fight Doolittle because he was small, but they soon learned he was also tough. By age eleven he was a boxer, and by age fifteen, the master of the 105-pound-weight class at his school. Later he became the amateur bantamweight champion of the West Coast.

He was also the curious sort. He built a glider by reading *Popular Mechanics* Magazine and later was intrigued with building a powered airplane. Lacking $30 to buy an engine, he boxed to earn the money. Concerned for his safety, his mother gave him the money which he then used to buy a motorcycle.

Senator Goldwater noted that the General's interests soon turned to a pretty girl named Josephine Daniels, who was not all that impressed with his achievements in the boxing ring or the cockpit or on a motorcycle, but married him anyway on Christmas Eve, 1917.

The hour-long reception afforded guests the opportunity to greet General Doolittle and enjoy the stunning aerospace memorabilia of the National Air and Space Museum. Here, Gen. Alton D. Slay, Commander of Air Force Systems Command, shares a light moment with General Doolittle as Marie Kregel and AFA President Victor R. Kregel join in.

"Between the wars, Doolittle won fame as an aviator and garnered many firsts, including the first to do an outside loop; first to take off, fly a set course, and land, all in blind flight," Senator Goldwater recalled. He also won many air races and endurance contests, and set innumerable speed and distance records.

The rest of Doolittle's career is legend. During World War II he commanded the mighty Eighth Air Force.

"But, of course, we all remember him as the man who planned and executed the famous wartime bombing raid on Tokyo in 1942. This daring exploit gave hope and inspiration to a battered and despondent America. There are those who even say this raid immeasurably changed the course of the war by forcing the Japanese to give maximum attention to America and thus slight their contribution to the total Axis cause," Senator Goldwater said. For this brave effort, later to be chronicled in the book and Hollywood film, "Thirty Seconds Over Tokyo," he earned America's highest military distinction, the Medal of Honor.

With that, Senator Goldwater presented Doolittle with two AFA watches, one for himself and one for Mrs. Doolittle "in behalf of the people here and those many, many people whom we just could not fit in here tonight."

General Doolittle pointed out three old friends in the audience—retired Maj. Gen. Leigh Wade, a pilot on the first flight around the world in 1924; Brig. Gen. Ben Kelsey, who joined Doolittle on that first blind flight; and Paul Garber, Historian Emeritus of the Smithsonian Institution, who worked with Doolittle to get the R3C-2 airplane into the National Museum in 1935. Gen. Ira Eaker, well-known aviation pioneer and defense writer, was unable to attend at the last minute, but sent his best wishes.

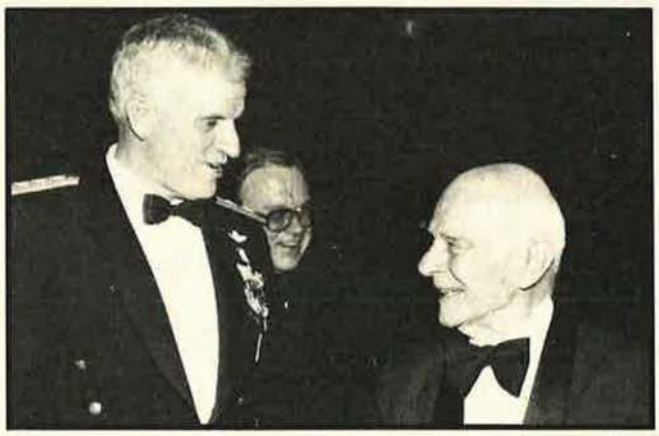
"To my mind," General Doolittle said, "the Foundation is doing a job that no other organization is doing, and I think the ones who should be saluted are the people of AFA who back it, and especially such contributors as these Corporate Fellows here tonight who provide the money to keep it going."

The General paid special tribute to "that dynamic individual whom God has blessed by making certain he was reelected to the legislative branch of our government," and led applause for Senator Goldwater.

Before General Doolittle could sit down, the Senator asked the audience to join in a toast to Doolittle on his eighty-fourth birthday on December 14.

Senator Goldwater adjourned the evening immediately following recitation by Paul Garber of John Gillespie Magee's poem "High Flight," which Goldwater said was

Retired Maj. Gen. Leigh Wade left, pilot of Boston *on the first flight around the world in 1924, recalls some of his more vivid experiences for Lt. Gen. Jerome O'Malley, Deputy Chief of Staff for Operations, Plans and Readiness.*



Catching a moment to speak with General Doolittle is Lt. Gen. Kelly H. Burke, Deputy Chief of Staff for Research, Development and Acquisition.

not written about Doolittle, but should have been.

Technical Courses for Civilian Schools

The Aerospace Education Foundation began reproducing and distributing Air Force courses eight years ago when an independent evaluation team found that both students and teachers preferred Air Force courses over similar civilian courses.

Students taking Air Force courses learned faster and retained the technical information longer than students in similar civilian courses. The highly visual course content coupled with the self-paced structure of many Air Force courses keeps interest high, even among slow learners.

Foundation officials reasoned that since taxpayers had already invested heavily in developing Air Force instruction, it was only right that civilian schools benefit from Air Force-developed teaching techniques, particularly since they proved to be more effective.

The Foundation now offers fifty-eight course packages, ranging from Electronic Principles and Automotive Mechanics to Computer Science and the Metal and Construction trades, fourteen home study courses, and seven special publications. The courses are used by more than 800 schools and training centers in the US, the District of Columbia, and thirteen foreign entities.

Many more Air Force courses could be used by public and private schools. The Foundation's goal is to make as many as possible available, thus providing the civilian educational community with low-cost, effective instruction. (For more information on the Foundation, see "The Aerospace Education Foundation's Silver Anniversary," p. 94 of the January '81 issue.)

Other guests included Gen. Robert C. Mathis, USAF Vice Chief of Staff; Gen. Alton D. Slay, Commander, Air Force Systems Command; Lt. Gen. Marion L. Boswell, USAF Assistant Vice Chief of Staff; Lt. Gen. Kelly Burke, Deputy Chief of Staff, Research, Development and Acquisition; Lt. Gen. Andrew Iosue, Deputy Chief of Staff, Manpower and Personnel; Lt. Gen. Billy Minter, Deputy Chief of Staff, Logistics and Engineering; Lt. Gen. Jerome O'Malley, Deputy Chief of Staff, Operations, Plans and Readiness; Inspector General Lt. Gen. Howard Leaf; Maj. Gen. Guy Hecker, Jr., Director, USAF Legislative Liaison; and CMSAF James McCoy. ■

Air Force Chief of Staff Gen. Lew Allen, Jr., joins in the appreciation of General Doolittle on the occasion of his eighty-fourth birthday on December 14. Guests later broke into song for the venerable aviation pioneer.

Aerospace Education Foundation
Corporate Jimmy Doolittle Fellows

Company	Representatives at the Salute
Boeing Company, The	Russell B. Light, Vice President, Washington operations Gene Bradley, Director of Congressional Affairs
General Dynamics Corporation	Edward J. LeFevre, Vice President, Government Relations William H. L. Mullins, Director Legislative Liaison
Martin Marietta Aerospace	Laurence J. Adams, President George J. Dalferes, Director, Government Affairs
Mutual of Omaha Insurance Company	James E. Barrett, Executive Vice President
Northrop Corporation*	Dr. Donald A. Hicks, Senior Vice President, Marketing and Technology Stanley Ebner, Vice President, Washington office
Vought Corporation	Robert L. Kirk, President and Chief Executive Officer Michael Collins, Vice President, Field Operations J. W. Lankford, Director, Washington office

For more information on how to become an Individual or Corporate Jimmy Doolittle Fellow, contact Foundation Headquarters at (202) 637-3373 or write in care of the AFA address.

*Twice named a Corporate Jimmy Doolittle Fellow

THE BULLETIN BOARD

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

Bachelors Gain, But Gripes Continue

Bachelor members scored gains recently in their skirmish for equality in pay, benefits, and living conditions with marrieds. Another probable winner is waiting in the wings. But will these silence the critics?

One victory for the bachelors came with Presidential approval in late December of "optional residency" for single E-7s through O-3s (O-4s and above have enjoyed the option for years). It means that these additional bachelors can at long last live off base and collect BAQ, even if base quarters are available.

Hq. USAF also said the recent approval of per diem equity legislation will help many single airmen (as well as married ones). Furthermore, singles are "the primary beneficiaries" of the recent PCS mileage allowance boost from 10¢ to 18.5¢ per mile, officials told AIR FORCE Magazine. Bachelors also shared in the basic pay and flight pay improvements.

But some bachelors insist that marrieds won out in last fall's pay improvements. They cite the variable housing allowance, family separation allowance, and two subsistence allowance raises (the straight ten percent BAS raise and the BAS portion of the 11.7 percent general pay hike), both of which favored married personnel.

The failure of the singles COLA overseas proposal was another disappointment, to Air Force leaders as well as to bachelors. Hq. USAF officials vowed to keep pressing Congress for approval of this small increase in pay. These bachelors, USAF declared, "suffer a real financial loss in comparison with their counterparts serving in the CONUS."

Probably the bachelors' most persistent complaint is that even when they are allowed to live off base and collect a BAQ, it is less than a married BAQ. Other singles' gripes center on the large outlays for family housing and dependent medical care.

What about eventually getting BAQ for all single airmen wishing to live off base? USAF is not pursuing this idea, in the hope and belief that with optional residency for single E-7s and above now approved, many will elect to move off base and this will pave the way to better on-base quarters for most airmen. "Our ultimate objective . . . is to provide each bachelor with a private room with a private or semiprivate bath. . . ." the Air Force said.

Meanwhile, the chances of paying out more subsistence allowances in the near future were called "excellent." Originally, the Air Force proposed BAS for E-5 and E-6 supervisors, but now it wants authority to pay the allowance to all E-4s and above with more than four years of service.

Paying more bachelor airmen BAS and BAQ and thus untying them from the dining hall and the base itself should silence many "bachelors-are-discriminated-against" complaints.

Pilot, Nav Retention Up

Retention of USAF pilots and navigators improved considerably last year, but officials say rated officer retention "remains one of the most important readiness issues of the '80s." They expect the actual requirements won't be met for the next five years.

Continuation rates for pilots in the six- to eleven-year group rose from twenty-six percent in FY '79 to forty-two percent in FY '80. Among navigators in the same year group, retention rose from forty-four to fifty-seven percent. Hq. USAF attributed the improvement to the gains in pay and compensation. The twenty-five percent flight pay boost and the rated continuation bonus "have sent positive signals to the force."

Continuation bonus rules, to be announced early this year, could add up to an extra four months' basic pay per year. However, flyers must have completed six years of service to be eligible and not all eligibles are slated to receive the bonus.

A related development pleasing authorities is the growing number of flyers delaying separation. These extensions "indicate that more pilots and navigators are and will continue to remain on board if pay and entitlements continue to move toward comparability with their civilian counterparts," Hq. USAF said.

Meantime, the quality of flying trainees remains high. It's tough to get into a class, as many active-duty people have discovered. The Military Manpower and Personnel Center last year considered 1,278 nonrated members and 334 navigators for undergraduate pilot training; it selected only 275 of the former and fifty-one of the navs. Another 130 nonrateds tried to get into undergraduate navigator training; thirty-four made it. Even fewer made flying training schools in 1979.

The bulk of flying trainees are procured through the recruiting service.

VA Paying Record Dividends

The nearly 4,000,000 veterans with GI insurance policies will share in a record $619.7 million dividend during 1981, $53 million above the 1980 dividend. The VA attributed the increase to higher interest rates earned by insurance funds. The dividend will be paid automatically on the anniversary date of the veterans' policies.

The dividends by policy category follow:

- **World War I.** The 85,700 veterans with current policies will receive an average of $296.
- **World War II.** The 3,231,397 policyholders—about one-third of the living vets of that war—will split $554.4 million, for an average payment of $168, up from the $148 average last year.
- **Korean War.** The 510,487 who kept their insurance in force will receive an average of $67, up from $62 last year.

The 165,549 disabled veterans holding a special type of GI insurance will average $96, compared with $94 in 1980.

Dividends are not payable to holders of SGLI or VGLI policies.

Engineer Shortage Worsens

The Air Force is losing ground in its battle to recruit and keep engineering officers. The in-service deficit, put at more than 1,300, is just part of a growing national problem that finds the US

"slipping and sliding on a course toward the status of a second-rate industrial power and . . . a second-rate military power." Meantime, the Soviet Union, which is graduating six times as many new engineers as the US, "is outproducing us in every aspect of Defense production."

This is just a sample of the grim picture painted recently by Gen. Alton D. Slay, who retires this month as Commander of the Air Force Systems Command. He spoke to the American Defense Preparedness Association, a group of top industrial, scientific, and military leaders.

General Slay said that Systems Command is only eighty-six percent manned in engineers, down from eighty-eight percent two years ago. Electrical engineer manning is down to eighty percent "with no relief in sight."

Worse still, he declared, is "my experience base, [which] has decreased by nearly twenty percent in the last two years as reflected by fifty-two percent manning in captains and 228 percent in lieutenants."

The leader of USAF's R&D effort flayed this country's educational system for the low overall production of engineers, absence of a "rigorous curriculum" needed to produce quality graduates, and "antiquated physical plants" at universities. "Our educational system has failed. . . . We're a nation of soft-core degrees," he said in lamenting the huge numbers of lawyers and social scientists US colleges are turning out.

Only by a sharp turnaround in US policy, increased public awareness of the problems, and greatly increased government funding can the dilemma be solved, the retiring AFSC Commander declared.

For the military's S&E officer problem, he urged "increased pay to approach parity with industry, accelerated promotions, more ROTC scholarships, and more education and family benefits." Graduate education quotas must be increased, he added. He made no mention of the $15,000 engineer officer bonus that appeared earlier on a Hq. USAF new pay shopping list.

Waiver Rule Tightens in DOPMA

The DOPMA measure that became law in late December, following years of Pentagon efforts, contains a controversial section requiring that officers promoted to lieutenant colonel through major general serve three years in such grade to retire in it.

Only the President can waive this rule, but Hq. USAF officials expect almost no waiver requests to reach the White House. "Probably only under the most unusual circumstances," an informed source said. Without the waiver, officers voluntarily retiring before the three years in grade will retire in the next lower grade.

The three-year rule applies only to people selected by "DOPMA" boards those that meet after September 15, 1981, the measure's effective date.

Lawmakers for years have been irked by quickie military retirements, particularly those few cases where high-ranking officers have been allowed to leave just a few months after their promotion. DoD policy calls for two years in grade in order to retire in it, but it is frequently waived within the Pentagon. Inserting the three-year rule and shifting waiver authority to the Chief Executive is the lawmakers' way of cracking down, to assure the government gets reasonable mileage from officers.

Other implementing details of DOPMA will be worked out in the months ahead. They include decisions on how far the Air Force will go toward requiring all officers to be Regulars after the eleven-year service point. An all-Regular force is not mandated by the new statute.

USAF calls the new law a "landmark in officer personnel legislation. It updates outmoded aspects of existing law and provides the basis for attractive and predictable career opportunities for present and future officers," the Air Force said. AFA has endorsed it heartily.

Civilian Work Force Stable

The civilian engineering work force in the USAF, like its officer counterpart, isn't up to full strength, but it remains at a fairly stable level. But USAF officials forecast big trouble ahead if federal pay raises fall behind those in the private sector.

At the end of FY '80, the Air Force employed 9,336 civilian engineers, representing seventeen percent of authorized strength. Systems Command has 5,177 of the total. The average age of the civilian engineers is 43.4, average years of service is 15.6, and 1,847 of the employees will be eligible to retire within the next five years. Hiring problems plague the service in that regular Civil Service salary rates fall well below what industry pays. However, special salary rates and schedules authorized last year allow engineer entry into GS grades at highest salary steps. Thus, entry salaries for GS-5 and GS-7 engineers are at step 10, the highest of the regular GS schedule. Accelerated promotions also help the Air Force attract and keep engineers. For example, a new USAF engineer entering as a GS-5 can progress to GS-12 in three and one-half years.

Retirees Win Indexing Issue

Throughout most of 1980, federal and military retirees seemed likely to lose one of their two annual cost-of-living raises. Congressional budget cutters and the Carter Administration favored "indexing" retired pay to living costs once a year instead of twice, claiming it would save the government money. The critics noted that Social Security annuitants receive only one cost-of-living hike a year.

But in the final days, the Ninety-sixth Congress rejected the cut.

Continued attacks are promised, however. Rep. Eldon Rudd (R-Ariz.), for instance, declared that in demanding twice-a-year COLAs "government employees are enjoying a special privilege denied others. Continuation of such demands may lead to elimination of all indexing of federal benefits," he said. Representative Rudd did not mention that while most federal-military pensions are fully tax-

Maj. Gen. Norman O. Thomson, right, Vice CINC of PACAF, swears in his daughter, Kathy Thomson, as PACAF recruiter MSgt. Sing M. Lee looks on. Kathy, a recent graduate of Arizona State University, wants to become an Air Force intelligence officer.

THE BULLETIN BOARD

able, Social Security and veterans' benefits are tax-free.

Military retired pay in FY '81 is estimated to hit almost $14 billion, approximately $2 billion more than in FY '80.

Suggestions Cash OK'ed for Reservists

Suggestions awards payments at long last have been approved for members of the Reserve Forces. An amendment to the FY '81 military appropriations bill lifted the prohibition on Reserves and Guardsmen from collecting cash for a suggestion, invention, or scientific achievement. This column long ago urged this move.

Village Expansion Under Way

Expansion of the Air Force Village in San Antonio, Tex., from the present 275 residents to 600 by next summer is under way. The new residents have been selected from more than 900 names of retired Air Force officers, wives, and widows on the waiting list.

The expanded Village, the keystone of which is a new $2 million nursing home, offers 252 residential units in its two high-rise buildings and 125 units in garden apartments. The new nursing facility more than doubles the Village's capacity to provide this service, from twenty-four to sixty-eight patient beds.

Village Executive Director Col. R. W. Hagauer, USAF (Ret.), says the nursing home "will rank with the finest in the Southwest" when fully completed and fully equipped by mid-1981. Hagauer and other Village officials are engaged in an extensive fund-raising program to cover the expansion costs.

Air Force base officers' wives clubs worldwide recently raised another $64,000 for the Village. The clubs for years have contributed generously to the retirement home. Two-thirds of the residents are women, including twenty-three who are lacking in financial means and are subsidized by the Village.

The Village, now a familiar landmark on the San Antonio scene near Lackland AFB, celebrated its tenth birthday this past November.

Alcohol-Drug Use Heavier in Other Services

A survey of 19,582 military personnel at eighty-one sites found considerably fewer Air Force people into drugs and heavy drinking than soldiers, sailors, and Marines. Defense-wide, said Assistant Secretary of Defense (Health Affairs) Dr. John Moxley III, service drug use has declined in recent years and now approximates that in the civilian sector.

Somewhat surprisingly, the survey revealed that heavy drinking in the services is greatest among low-ranking enlisted members. Twelve percent of the E-1s through E-5s, for instance, frequently downed oceans of beer, and eight percent of them are consistent users of the hard stuff. By contrast, only one percent of the officers go overboard regularly with beer or liquor, according to the survey respondents.

Fewer USAF members became dependent on alcohol than other service people. Similarly, fewer USAFers are late for work, guilty of lower job performance, etc.

As for nonmedical drug use, twenty-seven percent of all service members used some type of drug, primarily marijuana or hashish, during the month before the survey. By service, however, the percentages were Army twenty-nine, Navy thirty-three, Marine Corps thirty-seven, and Air Force fourteen percent. Again, usage was heaviest among the lower-ranking enlisted members.

The Pentagon's battle against drug and alcohol use continues, Dr. Moxley reporting that half a million military members have been treated during the past six years. He said 325,000 had been returned to productive duty. The USAF in Europe, meanwhile, dished out its stiffest sentence ever to a drug pusher: eighteen years of hard labor, a $10,000 fine, and a dishonorable discharge, to an airman drug pusher.

Short Bursts

That proposed increase in another education plan—**tuition aid for off-duty study**—has been approved. It boosts the government subsidy from seventy-five to ninety percent of course costs, but limits it to E-5s and above with less than fourteen years of service *(see last month's "Bulletin Board").*

Most of USAF's nearly 475,000 retirees filled out emergency data forms when they retired, but many have not updated them since. This means that if a retiree dies, the right person may not receive the back pay. The Air Force asks that **retirees who aren't sure about the data on their forms** check with the nearest base personnel office. Those not near a base should write the Air Force Accounting and Finance Center (AFAFC-RPT), Denver, Colo. 80279.

The Air Force Uniform Board has reaffirmed current policy of **barring the wear of coveralls, smocks, and "similar functional clothing"** outside the immediate work area.

The Manpower and Personnel Center has taken unidentified base newspapers to task for suggesting that **airmen meet in group study sessions** to share knowledge and thus improve their promotion test scores. "That's contrary to established Air Force policy," the Center said, because it might lead to compromise of test content.

The US military's **presence in West Germany** is so large that considerable German property is being damaged, *e.g.,* during training maneuvers. Thus, damage claims against the US are soaring. Germany pays for part of them, but DoD's portion has risen from $5.5 million in 1975 to $38 million in 1979. The US Comptroller General, Elmer B. Staats, in a report to Congress, says "it may be time to seek a new cost-sharing agreement" with the Bonn government.

Reservists with questions regarding **recent changes in the Survivor Benefits Plan** should contact the Air Reserve Personnel Center at its toll-free number 1-800-525-0102, extension 402.

The **Veterans Administration** again asks all vets who contact the agency about compensation, education funds, or other benefits to provide their military Social Security or VA claim number. How else, the VA asks, can it cope with the 305,000 Smiths, 203,000 Johnsons, 150,000 Williamses, 145,000 Joneses, and even the mere 24,000 each Schmidts, Ryans, and Wallaces in its files?

Senior Staff Changes

PROMOTIONS: To be **General:** Robert T. **Marsh.**

RETIREMENTS: M/G Len C. **Russell;** Gen. Alton D. **Slay;** M/G Robert M. **White.**

CHANGES: L/G (Gen. selectee) Robert T. Marsh, from Cmdr., ESD, AFSC, Hanscom AFB, Mass., to Cmdr., Hq. AFSC, Andrews AFB, Md., replacing retiring Gen. Alton D. Slay.

SENIOR ENLISTED ADVISOR CHANGES: CMSgt. Jeffriy D. Evans, from SEA, 21st Tactical Fighter Wing, AAC, Elmendorf AFB, Alaska, to SEA, Hq. AAC, Elmendorf AFB, Alaska, replacing CMSgt. Richard P. E. Cook.■

SPEAKING OF PEOPLE

Working Wives—Few Opportunities Overseas

By Ed Gates, CONTRIBUTING EDITOR

SERVICE wives, like most young women today, are working wives. And, according to a recent USAF-wide survey, more than three-quarters of those not now employed intend to work in the future.

All this is in step with the working wives trend outside the military. The idea of two breadwinners in the family instead of one is appealing; in most cases, the high cost of living makes it essential. That's basically why two-thirds of the Air Force wives married to airmen and forty-five percent of the officers' wives hold down jobs.

But there's a major hitch in this pattern. When the military husband is transferred abroad, his wife's job chances plunge. The US government contributes greatly to the security of other nations and by its presence in foreign countries spurs their economies, yet in agreements with other nations on who can hold jobs at US bases, dependents come out second best to local nationals.

The arithmetic is bleak. The Air Force estimates that of its roughly 130,000 dependents overseas, 65,000 are wives. Counting spouses of men in the other three services, the total US military wife force abroad is probably close to 175,000.

Yet, according to Pentagon officials, there are only about 5,000 appropriated-fund jobs abroad open to them. And of these, DoD wives actually fill only half, or 2,500. Similarly with the roughly 6,000 nonappropriated-fund jobs overseas, DoD wives occupy about 3,000 (moonlighting enlisted men hold most of the others).

In other words, only a tiny fraction of the wives overseas find jobs at US bases. And their chances of employment "on the economy" are described as equally poor, though the government's Office of Personnel Management says "a special State Department effort . . . is beginning to overcome this" through more liberal pacts with certain countries. Still, the language barrier remains a strong job deterrent.

A third possible source of jobs abroad is with branches of American companies located overseas. Little has been done so far to cultivate this idea, though some Air Force officials urge that a dialogue with such firms be initiated.

The poor overall job picture combined with the appalling inflation overseas dampens morale and explains why more and more military families try to avoid foreign service. When this can't be done, some are leaving the service. They don't want to surrender that second paycheck. Officials worry that more people will take this same route.

Meanwhile, OPM, formerly the Civil Service Commission, is studying the foreign job picture for all federal dependents overseas and hopes to improve it. Its aim is not only opening more jobs but creating higher-level ones as well. Most DoD jobs abroad are limited to GS-8 and below.

An OPM official said he thought the new Administration, as part of its "defense mindedness," will support the effort with enthusiasm. But OPM cites hurdles standing between job seekers and available positions:

- Separate agreements exist that severely limit the number of US dependents who can be employed; the pacts generally require hiring of local nationals. In a few cases, DoD has eased the situation through negotiations that, in effect, "buy back" a few of the previously barred jobs for DoD dependents. Another recent move allows DoD to "pro-rate part-time employees" against their personnel ceilings. In this way, OPM states, two twenty-hour-a-week part-timers can replace one full-timer, thereby "doubling" the job opportunities. This course contains obvious defects. What energetic boss, for example, would welcome two part-time secretaries?
- US hiring abroad is usually limited to lower grade, noncareer posts. OPM is asking federal agencies to examine various changes that would upgrade them. Establishing competitive Civil Service registers overseas has been suggested.
- Special problems await service wives who are employed overseas. Often there is no reinstatement as a career civil servant on their return Stateside; to be reemployed they must again go through the competitive employment process. Furthermore, time accrued toward career tenure may also be lost. And even if a career worker lands a DoD job overseas, it may be temporary and may not count toward the three-year service requirement needed to acquire career tenure.
- Most wives working abroad are ineligible to participate in the Civil Service retirement program. This causes all kinds of complications if they later become eligible for a pension.

OPM says it is working up a list of recommendations, hopefully to be implemented by executive order, that would ease overseas job barriers. But don't look for major relief soon. ■

THE HALF-MILLION DOLLAR YEAR

BY JAMES A. McDONNELL, JR., MILITARY RELATIONS EDITOR
USAF Photos by Mel Gibson and Mike Keefe

THE Ninth Annual Air Force Ball in Los Angeles, sponsored by the Air Force Association, in 1980 passed the half-million dollar mark in funds raised for two worthy organizations. Beneficiaries of this event—the only function of its kind sponsored by a military-oriented organization in the Los Angeles area—are Scholarships for Children of American Military Personnel (SCAMP) and the Aerospace Education Foundation.

K. Robert Hahn, Executive Vice President and Director, Lear Siegler, Inc., served as General Chairman of the 1980 fund-raiser. Retired Air Force Brig. Gen. Charles E. (Chuck) Yeager—first person in the world to fly faster than the speed of sound—was the Honorary Chairman. Music was provided by the Air Force Band of the Golden West from March AFB, Calif., and the Michael Paige Orchestra.

The theme was "The Air Force Salutes Hollywood." The decorations for the evening captured the spirit and excitement of a 1920s gala Hollywood premiere, enhanced by mannequins of famous movie personalities in strategic places around the Century Plaza Hotel ballroom. The capstone of the evening's festivities was a special film produced by the Academy of Motion Picture Arts and Sciences, narrated by Lorne Greene. It consisted of clips from several films with Army Air Corps, AAF, or USAF story backgrounds, beginning with "Wings," first released in 1927. Buddy Rogers, star of "Wings," was in the audience as were several of the other stars who appeared in the film. Executive Producer of the film was Anna Keeler, of AFA's Los Angeles office.

SCAMP has now committed more than $298,000 in four-year scholarships to children of US servicemen killed in action, missing in action, or who were prisoners of war in Southeast Asia. The Aerospace Education Foundation, a recipient of more than $220,000 from the annual balls, has pioneered in expanding and upgrading occupational education through the transfer of courses and teaching techniques from military to civilian classrooms.

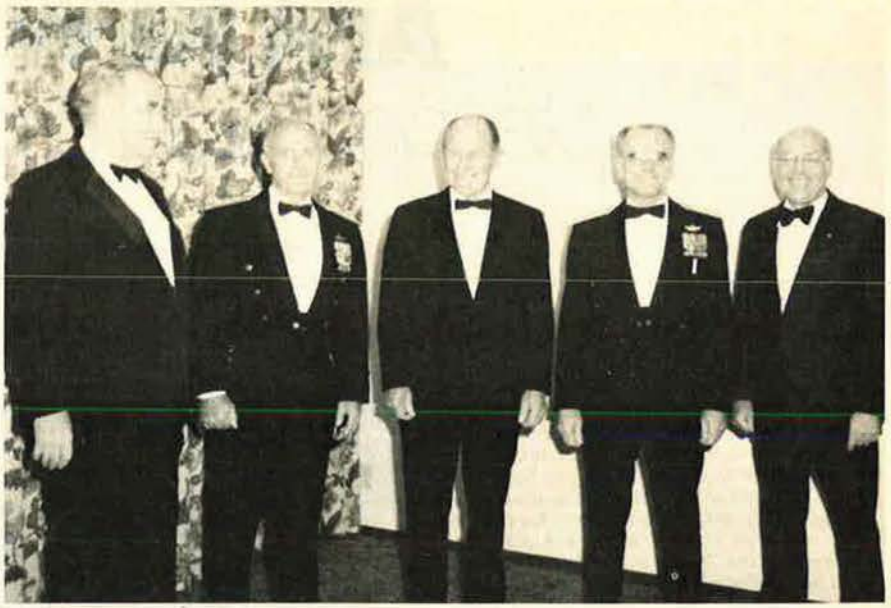
The Tenth Annual Ball will take place at the Century Plaza Hotel in Los Angeles, Friday evening, November 13. ■

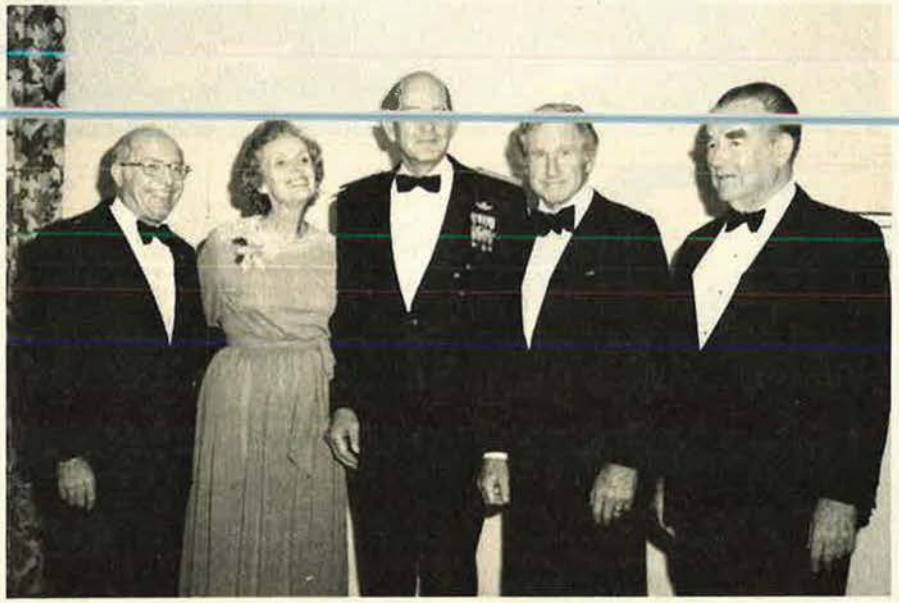
This year's SCAMP recipients, who each receive $1,500 annually for four years, were represented at the Ball by four of the selectees. Shown, left to right, are Mr. and Mrs. Robert Lawson, long-time AFA volunteer leaders, who serve as chaperones for the students in Los Angeles; SCAMP winners James E. Bonnarens and Timothy W. Duffy; Lorne Greene; Mary B. Perrine; Lloyd Bridges; Christopher R. Walsh; and Mr. and Mrs. Marty Ostrow. Mr. Ostrow, a former AFA President and Chairman of the Board, serves as President and Board Chairman of SCAMP.

Discussing the Ball with Ball Chairman K. Robert Hahn (left) is Chairman of the Joint Chiefs of Staff, Gen. David C. Jones.

Lloyd Bridges (left) and Air Force Secretary Hans Mark share a moment with Honorary Ball Chairman, Brig. Gen. Charles E. Yeager, USAF (Ret.).

Lt. Gens. Richard C. Henry, Commander, Space Division, AFSC, and James P. Mullins, Commander, Fifteenth Air Force (SAC), served as military co-hosts for the fund-raiser. Shown at the right with Honorary Ball Chairman Chuck Yeager are (left to right) AFA Board Chairman Dan Callahan; General Henry; General Mullins; and AFA President Victor R. Kregel.





Meeting with Air Force Chief of Staff Gen. and Mrs. Lew Allen, Jr., are (left to right) AFA President Vic Kregel; Lloyd Bridges; and AFA's Board Chairman, retired Air Force Maj Gen. Dan Callahan.

Adding their talents to this star-filled evening were Hollywood luminaries Lloyd Bridges (left) and Lorne Greene.

AFA NEWS
Chapter and State Photo Gallery

By Vic Powell, AFA AFFAIRS EDITOR

Iron Gate Chapter, New York City, recently presented checks totaling $26,000 to Dr. Hans Mark, Secretary of the Air Force, and to Gen. Lew Allen, Jr., Chief of Staff, for the Air Force Enlisted Men's Widows and Dependents Home, and for the Air Force Aid Society. The checks were part of $72,000 raised by the Chapter during 1980 for distribution to Air Force-oriented charities. At left is Nathaniel A. Gallagher, Chairman of the Chapter's 17th Air Force Salute. At right is Francis S. Gabreski, immediate past President of the Chapter. With 34½ aerial victories in World War II and Korea, he is the nation's top living ace.

The Hawaii Chapter recently donated a commemorative plaque to the University of Hawaii AFROTC detachment, designed to bear the name of each AFROTC cadet selected as the outstanding member of the class. The plaque was presented at a recent AFA Board of Directors luncheon at Hickam AFB, Hawaii, hosted by Lt. Gen. James D. Hughes, Commander in Chief of Pacific Air Forces, right. Chapter President Col. Bill Taylor, USAF (Ret.), left, made the presentation during the luncheon to Col. Ken Munechika, Professor of Aerospace Studies at the University. The outstanding cadets are announced each year during Governor's Day parade ceremonies. Cadet Maj. James D. Mau is the 1980 honoree, and his name will be the first inscribed on the plaque. The plaque will be hung in the cadet lounge at the University of Hawaii.

AFA Executive Director Russell E. Dougherty was the featured speaker at a recent meeting of the Andrews Area Chapter in Maryland. Left to right: Jon R. Donnelly, Central East Vice President; Brig. Gen. Archer Durham, Commander of the 76th Military Airlift Wing; Russ Dougherty; William Ryon, Chapter President; and Daniel F. Callahan, AFA Board Chairman. Twenty members of the WW II fighter group, the Tuskeegee Airmen, were honored guests.

During recent ceremonies at a Rushmore Chapter meeting, Larry Waller, center, Secretary of the Chapter, was presented the AFA Medal of Merit by Ernest Collette, Jr., Vice President of the North Central Region. Assisting in the presentation is AFA National Director Hoadley Dean, right. Air Force Chief of Staff Gen. Lew Allen, Jr., was the featured speaker at the Rapid City, S. D., meeting.

CALENDAR OF EVENTS

February 21, **AFA National Board of Directors Meeting,** Holiday Inn, Melbourne Beach, Fla. . . . March 14, **Chicagoland O'Hare Chapter Symposium,** O'Hare Ramada Inn, Des Plaines, Ill. . . . March 28, **Iron Gate Chapter 18th National Air Force Salute,** Sheraton Center, New York City . . . May 1–2, **South Carolina State AFA Convention,** Charleston . . . May 15–18, **Florida State AFA Convention,** Miami . . . May 16, **Kansas State AFA Convention,** Wichita . . . May 22–24, **Washington State AFA Convention,** Spokane . . . May 23, **Connecticut State AFA Convention,** Windsor Locks . . . June 19–21, **New York State AFA Convention,** Niagara Falls . . . June 26–28, **New Jersey State AFA Convention,** Cape May . . . June 26–28, **Texas State AFA Convention,** San Antonio . . . July 17–19, **Pennsylvania State AFA Convention,** Hershey . . . August 7–8, **Missouri State AFA Convention,** Springfield . . . August 13–15, **California State AFA Convention,** Lompoc . . . August 21–22, **Colorado State AFA Convention,** Colorado Springs . . . September 14–17, **AFA National Convention,** Washington, D. C.

Col. Pete Knight, Vice Commander, Edwards AFB, Calif., was the guest speaker at a recent meeting of the Northern Connecticut Chapter. He spoke about activities at Edwards AFB and his experiences as a test pilot flying the X-15. With Colonel Knight at the meeting were (from left): Brig. Gen. Raymond Lilly, Chief of Staff of the Connecticut Air National Guard; Colonel Knight; Raymond E. Choquette, Chapter President; and Joseph Falcone, New England Region Vice President.

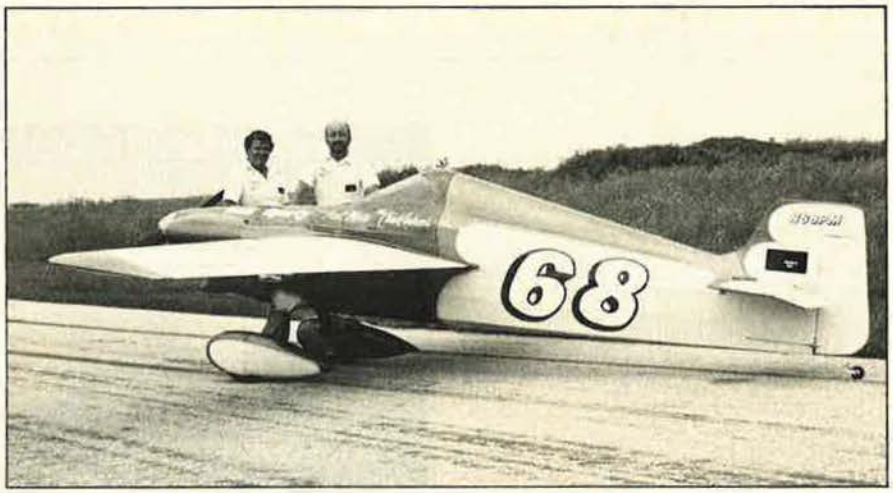
The David J. Price/Beale Chapter presented its Outstanding Unit Award to the 100th Combat Support Group Civil Engineering Squadron. Sherwood Johnson, Awards Committee Chairman, right, presented the award to Col. Curtis F. Archer, Jr., Commander of the 100th CES. At far left is squadron first sergeant SMSgt. John T. Sellers. Squadron structure superintendent CMSgt. Frederick C. Little is second from left.

Col. Alfred G. Hansen, Commander of the 314th TAW at Little Rock AFB, Ark., left, and Lt. Col. (Dr.) James J. Rocco, also stationed at Little Rock AFB, right, were inducted as Jimmy Doolittle Fellows during the Aerospace Education Foundation Silver Anniversary Awards Banquet sponsored by the David D. Terry, Jr., Chapter in Arkansas. Also present at the ceremonies were Benjamin S. Catlin, second from left, AFA Special Assistant for Defense Personnel Matters and featured speaker at the event; and Terry Chapter President Bobbie McCracken.

Texas State AFA recently held a reception in San Antonio for visiting foreign air attachés. Pictured here at the reception are (from left): George R. Weinbrenner, Texas State AFA Executive Secretary; Maj. Gen. Ramon Mota Sanchez, military and air attaché, Mexico; Maj. Gen. William B. Acker, Commander of the Air Force Military Training Center at Lackland AFB, Tex.; and Judge Carlos Cadena of the 4th Court of Civil Appeals.

AFA NEWS PHOTO GALLERY

Charles T. Andrews, left, a member of the Chuck Yeager Chapter, established a world speed record claim on a three-kilometer course at Raleigh County Airport near Beckley, W. Va. The 575-pound "Real Sporty," built and owned by Paul Musso, right, achieved a top speed of 245.21 mph and an average speed of 237.66 mph for the course. The former record, held by a Frenchman, was 208 mph. The National Aeronautic Association certified the record claim.



AIR FORCE Magazine Editor in Chief F. Clifton Berry, Jr., was one of several AFA staff leaders to address the state presidents' meeting held recently in Washington, D. C. Also attending the two-day briefing on the Association's activities were national vice presidents, newly elected members of the board of directors, and under-forty members of the board. Seated at the head table are (from left) Board Chairman Daniel F. Callahan, National President Victor R. Kregel, and Executive Director Russell E. Dougherty.

The Fort Smith Chapter recently elected new officers with something in common–they are all members of the Arkansas Air National Guard. The new officers are Buddy Acoach, seated, Vice President; Rosewitha Farris, left, Secretary; Gene McVay, center, President; and Bob Dempsey, Treasurer.

Bob Devaney, athletic director at the University of Nebraska, was a guest speaker at a recent awards banquet of the Ak-Sar-Ben Chapter. Maj. Gen. Andrew Pringle, SAC Chief of Staff, left, and Chapter President Donald D. Adams, right, joined in the presentation of Arthur C. Storz Awards to the Outstanding Civilian Employee at Offutt AFB, Neb., Susan B. Williams; Outstanding Junior Officer, Capt. Jeffrey R. Wenzel; and Outstanding Airman, SrA. Peter B. Andrews.

SrA. Barbara J. Barry, 57th Fighter Weapons Wing, Nellis AFB, Nev., was presented the Outstanding Airman of the Year Award during recent ceremonies sponsored by the Las Vegas Chapter. Brig. Gen. Charles Cunningham, left, Commander of the 57th FWW, and Chapter Vice President Juan Sotomayor made the presentation at the Awards and Installation banquet held at the Flamingo Hilton Hotel.

Maj. Gen. Sidney S. Novaresi, left, Commander of the Fourth Air Force (Reserve), was the special guest speaker at the recent Gen. Robert F. Travis Chapter awards banquet. General Novaresi received an AFA gold pen as a token of appreciation from Don W. Disbrow, President of the Fairfield, Calif., Chapter. (Photo by Connie Hermann)

The Arc Light Chapter on Guam raised $500 to assist the annual Christmas Drop project of the 54th Weather Squadron. During training missions, the squadron parachutes gifts to children on tiny, isolated Micronesian islands and atolls. Brig. Gen. Stanley Beck, Commander of the 3d Air Division on Guam, was presented the $500 check by Drew Kaye, Chapter Vice President and Chairman of the unit's Christmas Drop effort. Also attending the presentation were Chapter Secretary and chief fund raiser Lee Webber, right, and Lt. Col. Paul R. Prescott, left, Commander of the 54th Weather Squadron.

AFA STATE CONTACTS

Following each state name, in parentheses, are the names of the localities in which AFA Chapters are located. Information regarding these Chapters, or any place of AFA's activities within the state, may be obtained from the state contact.

ALABAMA (Auburn, Birmingham, Huntsville, Mobile, Montgomery, Selma): **Frank M. Lugo,** 5 S. Springbank Rd., Mobile, Ala. 36608 (phone 205-344-9234).

ALASKA (Anchorage, Fairbanks): **Frank X. Chapados,** 1426 Well St., Fairbanks, Alaska 99701 (phone 907-452-1286).

ARIZONA (Phoenix, Tucson): **John P. Byrne,** P. O. Box 1705, Sun City, Ariz. 85372 (phone 602-974-7137).

ARKANSAS (Blytheville, Fayetteville, Fort Smith, Little Rock): **Arthur R. Brannen,** 605 N. Hospital Dr., Jacksonville, Ark. 72076 (phone 501-982-2585).

CALIFORNIA (Apple Valley, Edwards, Fairfield, Fresno, Hawthorne, Hermosa Beach, Long Beach, Los Angeles, Merced, Monterey, Novato, Orange County, Palo Alto, Pasadena, Riverside, Sacramento, San Bernardino, San Diego, San Francisco, San Mateo, Santa Barbara, Santa Monica, Yuba City, Vandenberg AFB): **Richard C. Doom,** P. O. Box 2027, Canyon Country, Calif. 91351 (phone 213-887-2923).

COLORADO (Aurora, Boulder, Colorado Springs, Denver, Fort Collins, Grand Junction, Greeley, Littleton, Pueblo, Waterton): **Jack E. Ingles,** 1131 S. Nome St., Aurora, Colo. 80012 (phone 303-320-7575).

CONNECTICUT (East Hartford, North Haven, Storrs, Stratford, Westport, Windsor Locks): **Frank J. Wallace,** 935 Poquonock Ave., Windsor, Conn. 06095 (phone 203-688-3090).

DELAWARE (Dover, Wilmington): **John E. Strickland,** 8 Holly Cove Lane, Dover, Del. 19901 (phone 302-678-6070).

DISTRICT OF COLUMBIA (Washington, D. C.): **Jack Reiter,** 1800 K St., N. W., Suite 600, Washington, D. C. 20006 (phone 202-463-7970).

FLORIDA (Broward, Cape Coral, Fort Walton Beach, Jacksonville, New Port Richey, Orlando, Panama City, Patrick AFB, Redington Beach, Sarasota, Tallahassee, Tampa, West Palm Beach): **Lee R. Terrell,** 39 Hemlock Dr., Fort Walton Beach, Fla. 32548 (phone 904-882-4486).

GEORGIA (Athens, Atlanta, Columbus, Rome, Savannah, St. Simons Island, Valdosta, Warner Robins): **Lee C. Lingelbach,** 217 Ridgeland Dr., Warner Robins, Ga. 31093 (phone 912-922-7615).

GUAM (Agana): **Joe Gyulavics,** P. O. Box 21543, Guam 96921 (phone 671-734-2369).

HAWAII (Honolulu): **William B. Taylor,** 233 Keawe St., #630, Honolulu, Hawaii 96813 (phone 808-531-5035).

IDAHO (Boise, Twin Falls): **Ronald R. Galloway,** Box 45, Boise, Idaho 83707 (phone 208-385-5247).

ILLINOIS (Belleville, Champaign, Chicago, Elmhurst, Peoria): **Kurt Schmidt,** 2009 Vawter St., Urbana, Ill. 61801 (phone 217-367-6633).

INDIANA (Bloomfield, Indianapolis, Lafayette, Logansport, Marion, Mentone, South Bend): **Donald E. Bradford,** 4235 Marten Court, W., #262, Indianapolis, Ind. 46226 (phone 317-546-4321).

IOWA (Des Moines): **William D. Sampson,** 2600 48th Pl., Des Moines, Iowa 50310.

KANSAS (Topeka, Wichita): **Cletus J. Pottebaum,** 6503 E. Murdock, Wichita, Kan. 67206 (phone 316-683-3963).

KENTUCKY (Louisville): **Ray H. Sanders,** 2517 Windsor Forest Dr., Louisville, Ky. 40272 (phone 502-935-8208).

LOUISIANA (Alexandria, Baton Rouge, Bossier City, Monroe, New Orleans, Shreveport): **John H. Allen,** 10064 Heritage Dr., Shreveport, La. 71115 (phone 318-797-3306).

MAINE (Limestone, N. Berwick): **Alban E. Cyr,** P. O. Box 160, Caribou, Me. 04736 (phone 207-492-4171).

MARYLAND (Andrews AFB, Baltimore): **William L. Ryon,** 8711 Liberty Lane, Potomac, Md. 20854 (phone 301-299-8717).

MASSACHUSETTS (Boston, Falmouth, Florence, Hanscom AFB, Lexington, Taunton, Worcester): **Zaven Kaprielian,** 428 Mt. Auburn St., Watertown, Mass. 02172 (phone 617-924-5010).

MICHIGAN (Battle Creek, Detroit, Kalamazoo, Marquette, Mount Clemens, Oscoda, Petoskey, Southfield): **Howard C. Strand,** P. O. Box 668, Battle Creek, Mich. 49016 (phone 616-963-1596).

MISSISSIPPI (Biloxi, Columbus, Jackson): **Don Wylie,** P. O. Box 70, Biloxi, Miss. 39533 (phone 601-374-3611).

MISSOURI (Kansas City, Knob Noster, Springfield, St. Louis): **William A. Dietrich,** 904 Carnoustie Dr., Kansas City, Mo. 64145 (phone 816-561-2134).

MONTANA (Great Falls): **Lucien E. Bourcier,** P. O. Box 685, Great Falls, Mont. 59403 (phone 406-453-1351).

NEBRASKA (Lincoln, Omaha): **Lyle O. Remde,** 4911 S. 25th St., Omaha, Neb. 68107 (phone 402-731-4747).

NEVADA (Las Vegas, Reno): **James L. Murphy,** 2370 Skyline Blvd., Reno, Nev. 89509 (phone 702-786-1520).

NEW HAMPSHIRE (Manchester, Pease AFB): **Charles J. Sattan,** 53 Gale Ave., Laconia, N. H. 03246 (phone 603-524-5407).

NEW JERSEY (Andover, Atlantic City, Belleville, Camden, Chatham, Cherry Hill, E. Rutherford, Forked River, Fort Monmouth, Jersey City, McGuire AFB, Middlesex County, Newark, Trenton, Wallington, West Orange): **John P. Kruse,** 1022 Chelten Pkwy., Cherry Hill, N. J. 08034 (phone 609-428-3036).

NEW MEXICO (Alamogordo, Albuquerque, Clovis): **Joseph H. Turner,** P. O. Drawer 1946, Clovis, N. M. 88101 (phone 505-762-4535).

NEW YORK (Albany, Brooklyn, Buffalo, Chautauqua, Garden City, Hempstead, Hudson Valley, New York City, Niagara Falls, Plattsburgh, Queens, Rochester, Rome/Utica, Southern Tier, Staten Island, Suffolk County, Syosset, Syracuse, Westchester): **Thomas J. Hanlon,** P. O. Box 400, Buffalo, N. Y. 14225 (phone 716-632-7500).

NORTH CAROLINA (Asheville, Charlotte, Fayetteville, Goldsboro, Greensboro, Kitty Hawk, Raleigh): **William M. Bowden,** 509 Greenbriar Dr., Goldsboro, N. C. 27530 (phone 919-735-5884).

NORTH DAKOTA (Concrete, Fargo, Grand Forks, Minot): **Warren L. Sands,** 7 Spruce CC Village, Minot, N. D. 58701 (phone 701-852-1061).

OHIO (Cincinnati, Cleveland, Columbus, Dayton, Newark, Youngstown): **Francis D. Spalding,** 718 Martha Lane, Columbus, Ohio 43213 (phone 614-866-9381).

OKLAHOMA (Altus, Enid, Oklahoma City, Tulsa): **Aaron C. Burleson,** P. O. Box 757, Altus, Okla. 73521 (phone 405-482-0005).

OREGON (Eugene, Portland): **Martin T. Bergan,** 12868 SE Ridgecrest, Portland, Ore. 97236 (phone 503-288-5611, ext. 236).

PENNSYLVANIA (Allentown, Beaver Falls, Chester, Dormont, Erie, Harrisburg, Homestead, Lewistown, Philadelphia, Pittsburgh, Scranton, State College, Washington, Willow Grove, York): **John B. Flaig,** P. O. Box 375, Lemont, Pa. 16851 (phone 717-233-0357).

RHODE ISLAND (Warwick): **King Odell,** 413 Atlantic Ave., Warwick, R. I. 02888 (phone 401-941-5472).

SOUTH CAROLINA (Charleston, Columbia, Myrtle Beach, Sumter): **Worth T. Allen,** 1020 Butler St., #6, Columbia, S. C. 29205 (phone 803-776-5121, ext. 204).

SOUTH DAKOTA (Rapid City, Sioux Falls): **Charles P. Benson, Jr.,** Box 90, Rapid City, S. D. 57709 (phone 605-394-2026).

TENNESSEE (Chattanooga, Knoxville, Memphis, Nashville, Tri-Cities Area, Tullahoma): **Polly Murphy,** Twin City Real Estate, Midland Shopping Center, Alcoa, Tenn. 37701 (phone 615-983-4414).

TEXAS (Abilene, Amarillo, Austin, Big Spring, College Station, Commerce, Corpus Christi, Dallas, Del Rio, Denton, El Paso, Fort Worth, Harlingen, Houston, Kerrville, Laredo, Lubbock, San Angelo, San Antonio, Waco, Wichita Falls): **William W. Roth,** P. O. Box 360, San Antonio, Tex. 78292 (phone 512-226-8301).

UTAH (Brigham City, Clearfield, Ogden, Provo, Salt Lake City): **William J. Gibson,** 5013 South 2275 West, Roy, Utah 84067 (phone 801-773-4307).

VERMONT (Burlington): **John Navin,** 350 Spear St., Unit 64, South Burlington, Vt. 05401 (phone 802-658-0770).

VIRGINIA (Arlington, Danville, Harrisonburg, Langley AFB, Lynchburg, Norfolk, Petersburg, Richmond, Roanoke): **H. B. Henderson,** 10 Cove Dr., Seaford, Va. 23696 (phone 804-838-1300).

WASHINGTON (Seattle, Spokane, Tacoma): **Harry E. Goldsworthy,** 40 Parkwood Circle, Spokane, Wash. 99203 (phone 509-838-5079).

WEST VIRGINIA (Huntington): **James Hazelrigg,** Rt. 3, Box 32, Barboursville, W. Va. 25504 (phone 304-522-3616).

WISCONSIN (Madison, Milwaukee): **Kenneth Kuenn,** 3239 N. 81st St., Milwaukee, Wis. 53222 (phone 414-747-5300).

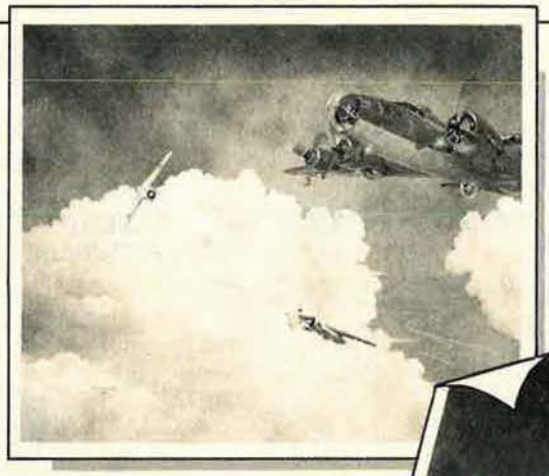
WYOMING (Cheyenne): **Lynn A. Wallace,** 409 Saddle Dr., Cheyenne, Wyo. 82001 (phone 307-771-6988).

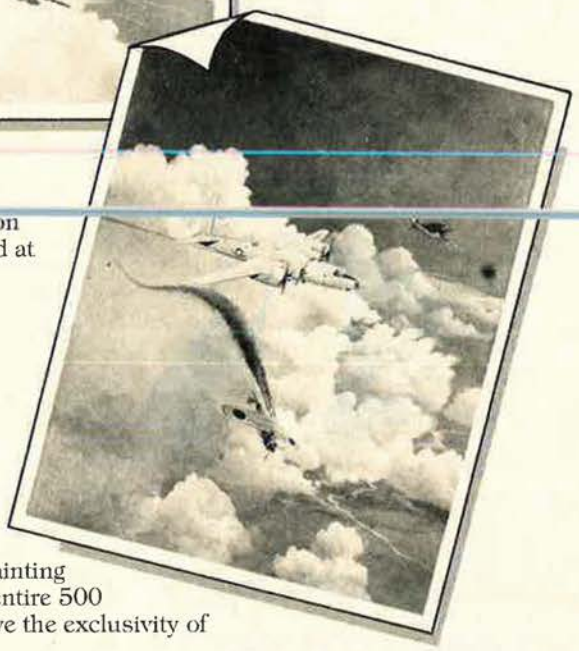
A Few of These
Limited-Edition Lithographs
Still Available

Approaching the Initial Point

The B-17 crewman with the best seat in the house during World War II was the bombardier. His station was the "greenhouse," the unprotected Plexiglas nose of the aircraft. The bombardier's station gave him an unparalleled opportunity to watch incoming enemy fighters. That's the situation shown in this fine Bill Reynolds painting "Aproaching the Initial Point." The Initial Point (IP) was the place where the bomb run to the target began. After the IP, the fighters usually left the area because of the volume of antiaircraft fire from the ground. It was the bombardier's job to keep the aircraft on a constant course and heading so he could synchronize his Norden bombsight on the target. Since the bomber's nose area was a prime target for incoming enemy fighters, bombardiers needed not only technical skills but also a special measure of courage and dedication.

The oil painting was specially commissioned for the 9th Biennial Reunion of the Bombardiers Alumni Association held in Washington, D.C., in August 1980.





As part of its continuing fund-raising effort, the Aerospace Education Foundation of the Air Force Association has arranged with artist William Reynolds to produce special-edition lithographs of his two most recent paintings (shown above and at right).

The print entitled "Last Aerial Combat of World War II" (B-32) measures 21-3/4" × 26-1/2" "Approaching the Initial Point" measures 21-3/4" × 24". Both include borders and appropriate legends and are struck on quality heavy paper.

For accuracy of detail and situation the artist drew heavily on his World War II experience as a fighter pilot and on his subsequent flying experiences.

The finished prints are offered at a price of $75 each, postpaid, to the first 500 individuals who reply. Each print is numbered and accompanied by a Certificate of Authenticity. Each will include a description of the action depicted by the painting and will carry the artist's authenticating signature. When the entire 500 lithographs are sold, no more will be struck in order to preserve the exclusivity of each print.

This is an excellent opportunity to enhance your collection or that of someone of your choice with unique works of art and support the Foundation at the same time. Remember that the value of your lithographs is assured. To order simply complete and return the coupon below. Please allow two to three weeks for delivery.

Last Aerial Combat of World War II

This is believed to be the last aerial combat of World War II, fought on August 18, 1945. A pair of B-32 Dominator aircraft were flying a photo-reconnaissance mission over Tokyo when they were attacked by an estimated fourteen Japanese fighters—Zekes and Tojos. The B-32 shown in the painting had its number three engine shot out. One of its two photographers was killed, and the other photographer and the top-turret gunner were wounded. The B-32s fought their way clear and returned to base in Okinawa. The Dominator, originally intended as a backup to the B-29 Superfortress, was one of the less well-known aircraft of the war. Of the 1,706 ordered, only 118 were built, and only 15 saw action. The flurry of combat over Japan on August 18, 1945, earned the B-32 a footnote in the history of US aerial combat.

This painting appeared on the cover of the September 1980 issue of this magazine.

Return this coupon to: **Aerospace Education Foundation, 1750 Pennsylvania Avenue, NW, Washington, DC 20006, Telephone (202) 637-3370**

Please Send:	**Number of Prints**	**Total**
"Last Aerial Combat of World War II"	_____ @ $75.00 each	$_____
"Approaching the Initial Point"	_____ @ $75.00 each	$_____
	GRAND TOTAL	$_____

☐ Enclosed is my check in the amount of $_____

☐ Please charge to my credit card: VISA #_____

Mastercard #_____ My card expires on _____

Signature _____

Name _____
(Please Print)

Street Address _____

City _____ State _____ Zip _____

Telephone _____
(Area Code)

"He that is down need fear no fall"
Bunyan

Bob Stevens'

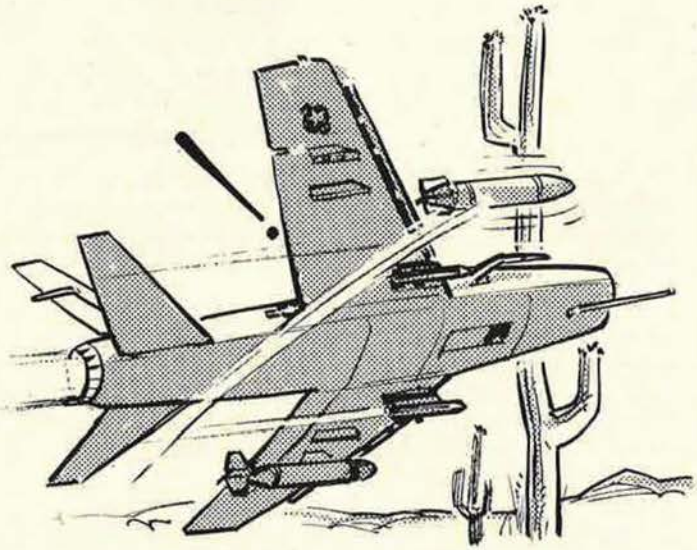
"There I was..."

THIS PAGE IS DEDICATED TO ALL OF US WHO'VE HAD THOSE DAYS WHEN WE "SHOULDA STAYED IN BED" AS MURPHY'S LAW TOOK OVER.

YOU ***KNOW*** IT'S NOT YOUR DAY WHEN...

...RETURNING FROM A MISSION YOU WALK INTO SQUADRON OPS and SEE THE EJECTION SEAT PINS- COMPLETE WITH STREAMERS-IN YOUR POCKET!

...YOU PULL UP OFF A BOMB RANGE PASS TO FIND ONE OF YOUR 500 POUNDERS FLYING CLOSE FORMATION WITH YOU!

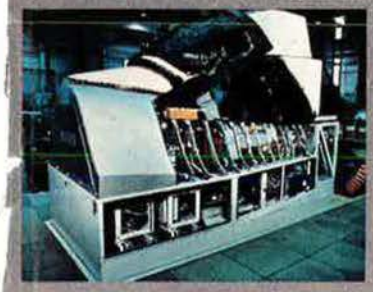


...YOU REACH FOR THE "FLAP" RETRACT LEVER ON LANDING and GET THAT SINKING FEELING, LITERALLY and FIGURATIVELY!

...TAXIING OFF THE RUNWAY AFTER LANDING YOU TAXI INTO THE GRASS WHILE FILLING OUT THE AIRCRAFT FORMS-

Who helps pilots fly F-16's and F-16's fly themselves?

The F-16 multi-national fighter doesn't go anywhere without Singer. Our Link Division helps train F-16 pilots by supplying the F-16 simulator, a trainer which duplicates in detail the aircraft's mission from take-off to landing.



It's even equipped with a G-seat that reproduces the pressure felt during acceleration.

In the air, the inertial guidance system takes over. Our Kearfott Division developed and produced it, using the most advanced inertial and electronics technology.

State of the art in the arts of simulation and navigation. That's Singer.

SINGER

SINGER
Products & Services for Government
8 Stamford Forum, Stamford CT 06904

DESIGNERS WITH A "MAKE-ROOM-FOR-INVENTION" PHILOSOPHY CREATED THE EAGLE.

While others get older,

Eagles get better.

The McDonnell Douglas engineering team that brought the world the multi-nation/multi-mission Phantom applied the same foresight in the growth-oriented design of the F-15 Eagle.

They wrapped the awesome power of two Pratt & Whitney engines into a light and nimble airframe with the internal strength of a giant. They provided extra electricity to power future systems. They left space for new systems yet to be devised. They've added more internal fuel to give greater range for new missions.

Working with the legendary genius inherent in the Hughes radar, the Eagle has been given new ability to analyze the formations it may face, new ability to find and strike ground targets at night and in all weather.

Tanks that fit the fuselage like new skin have been added to give the Eagle intercontinental range and potential for reconnaissance and counter-measures effectiveness.

McDonnell Douglas development teams continue to improve the Eagle, keeping the best of what they have, adding the best of what is new. They are demonstrating that the Eagle is not only superior in the air but, even with an acquisition cost competitive with other less capable aircraft, is superior to all others for the air defense, rapid deployment, and high-value-interdiction tactical air missions of the U.S. Air Force.

F-15 Eagle

MCDONNELL DOUGLAS