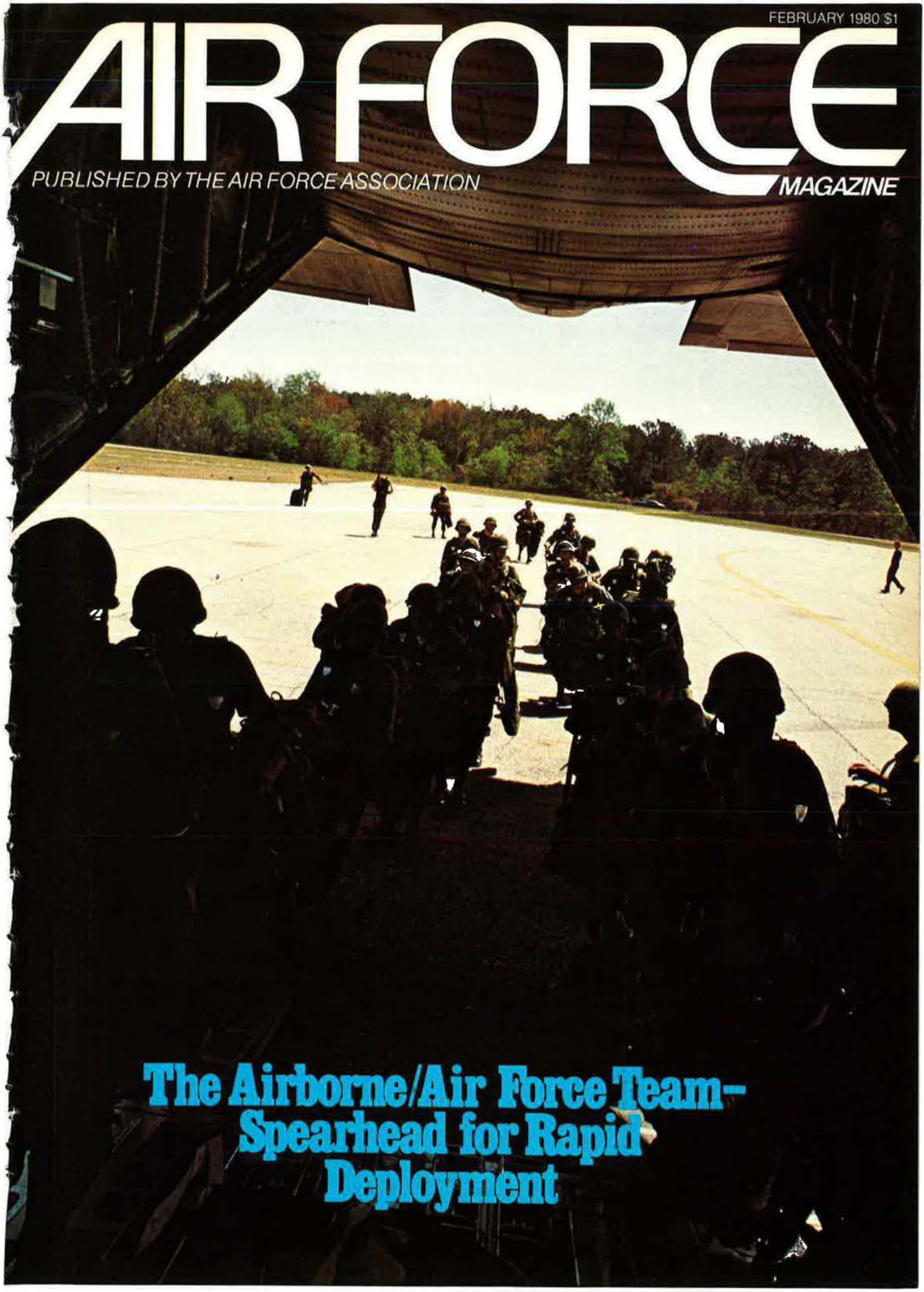
FEBRUARY 1980 $1

AIR FORCE MAGAZINE

PUBLISHED BY THE AIR FORCE ASSOCIATION



The Airborne/Air Force Team—Spearhead for Rapid Deployment

Air Force Power

TF34-POWERED A-10 CLOSE AIR SUPPORT AIRCRAFT

CF6-50-POWERED KC-10A ADVANCED TANKER/CARGO AIRCRAFT

CF6-50-POWERED E-4A ADVANCED AIRBORNE COMMAND POST

GE engines: The superior performance and reliability needed, whatever the mission

General Electric high bypass turbofans are continuing to prove their performance capabilities in key USAF missions.

Twin TF34 engines help provide Fairchild's A-10 with the short-field performance, maneuverability and extended loiter time needed for its close air support mission.

Two other advanced aircraft are powered by thoroughly proven CF6-50 engines. For the McDonnell Douglas KC-10A Advanced Tanker/Cargo Aircraft, they help provide excellent mission range and payload capabilities. And for Boeing's E-4 Advanced Airborne Command Post, CF6-50 engines offer the reliability and low fuel consumption necessary to meet varied and complex mission objectives.

GENERAL ELECTRIC

READY RADIOS

carry on emergency communications

A single portable emergency transceiver now combines broad frequency selection with modulation methods so you can tie together communications networks including air, mobile, and ground units. Use Motorola's PT-25 as a rugged portable radio or mount it in surface and airborne vehicles. Or air traffic control towers. For primary or emergency communications. Lightweight. AM/FM and VHF/UHF multimode operation. Scanning included. The PT-25 puts 8360 frequency synthesized channels to work for you over government and commercial aviation bands. Battery or AC/DC operation. From 116-150 MHz. And 225-400 MHz. Removable control unit makes for easy remote installation anywhere.

Vehicle Mount. Makes short-range, on-the-go communications easy for emergency or airport vehicles. Ideal for remote field air controller operations.

Fixed Base. Use as primary or backup in emergencies. Mount permanently or keep portable in control towers. Switched to beacon mode, aircraft can "home-in" for guidance. And back-to-back they make excellent repeaters or translators for the long haul.

Search and Rescue. Carry the PT-25 almost anywhere. Even in a helicopter to remote areas. Lets SAR teams coordinate communications with air, mobile, and ground units.

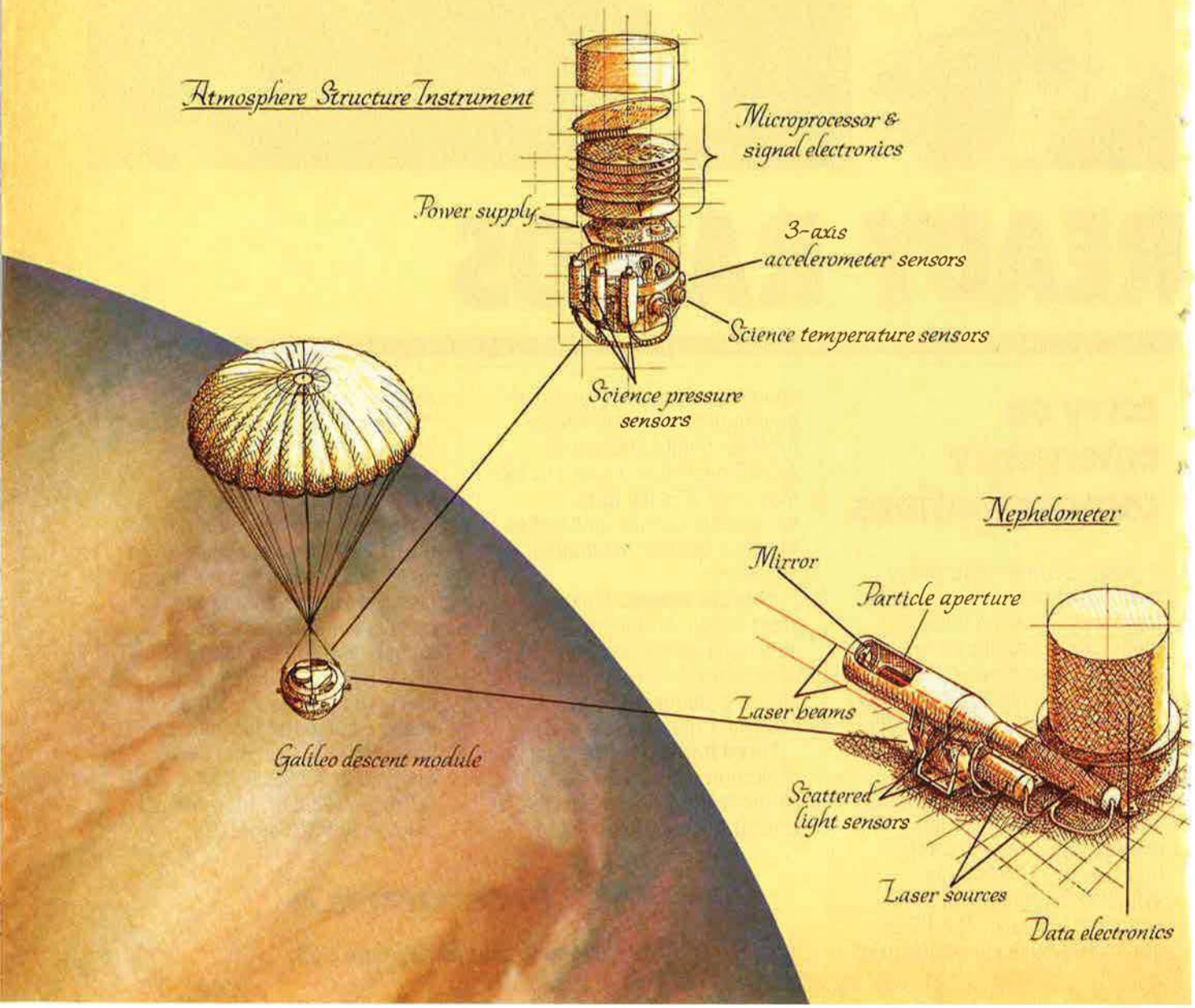
So if you would like to carry your communications center...come to Motorola. Write to us at P.O. Box 2606, Scottsdale, AZ 85252 USA. Or call 602/949-2798. For international sales, call 602/949-4176.

MOTOROLA

Making electronics history since 1928.

What does it take to advance sensor technology?

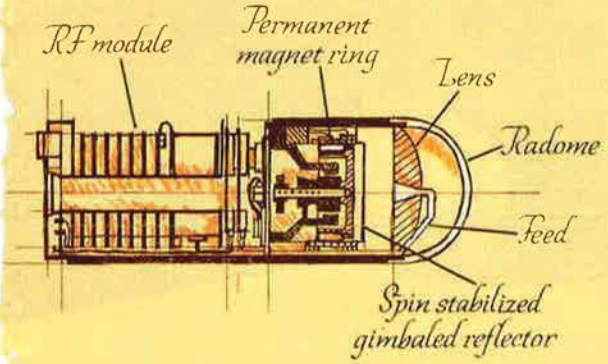
Sensor ability.



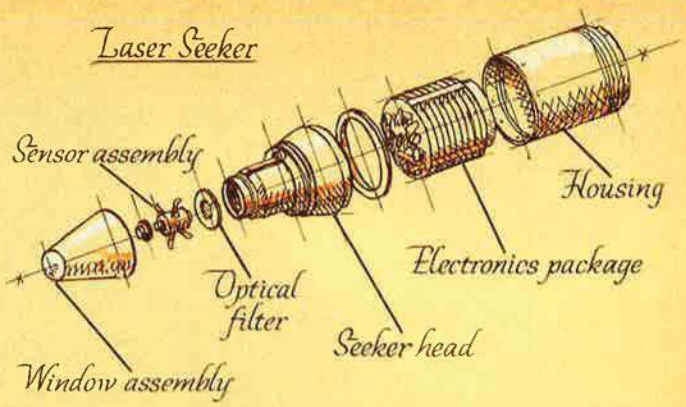
Sensors are a key to tomorrow's sophisticated space and defense systems. With more than 30 years experience in the development and integration of major systems and their sensors, we have established a solid base across this technological spectrum.

To explore the unknown worlds of space and our own planet, we have developed a wide range of sensing systems. For example, as the principal integration contractor for the highly successful Viking mission to Mars, we were responsible for the numerous sensors aboard the aeroshells and the landers. We designed and built the x-ray fluorescence spectrometer for inorganic soil analysis, and the photosensor arrays for the lander's remarkable cameras.

Our SCATHA satellite is crammed with 12 sensor instruments exploring the little understood phenomena of destructive electrical charge build up on Earth orbiting spacecraft. For the Galileo mission in 1983, we are designing instruments to take the measure of Jupiter's cloud particle density and atmospheric structure.



Millimeter-Wave Seeker



As part of the Space Telescope, we are producing the faint object spectrograph sensor that will provide unprecedented spectral data on stars, galaxies and quasars.

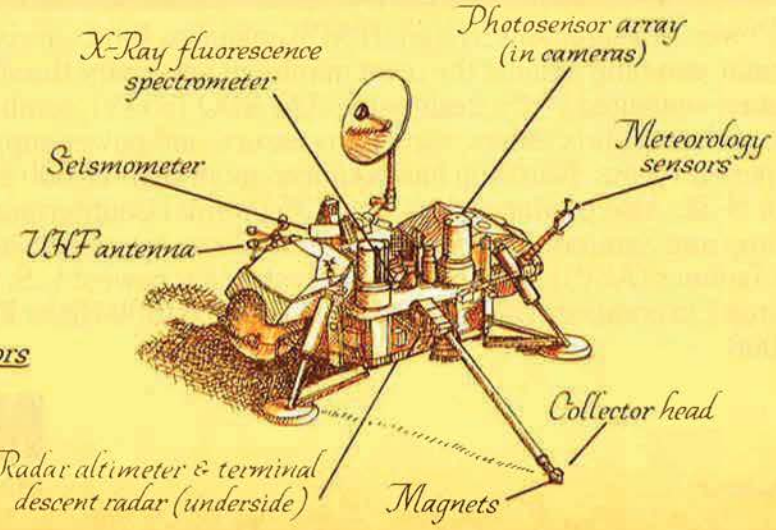
By advancing sensor technology in lasers, infrared, radar, millimeter wave radar, TV/optics, anti-radiation homing and radiometric sensing, we have developed defense systems that achieve a new measure of accuracy, that make it possible to operate effectively at night, that discern electronic countermeasures for evasion.

To give first-round accuracy to guided projectiles, we miniaturized a laser detector and control system that fits the cramped space of a projectile and still withstands the tremendous shock of firing. As a defense against armor attack we are developing missile systems with submunitions that can sense target signatures after launching and home in on them.

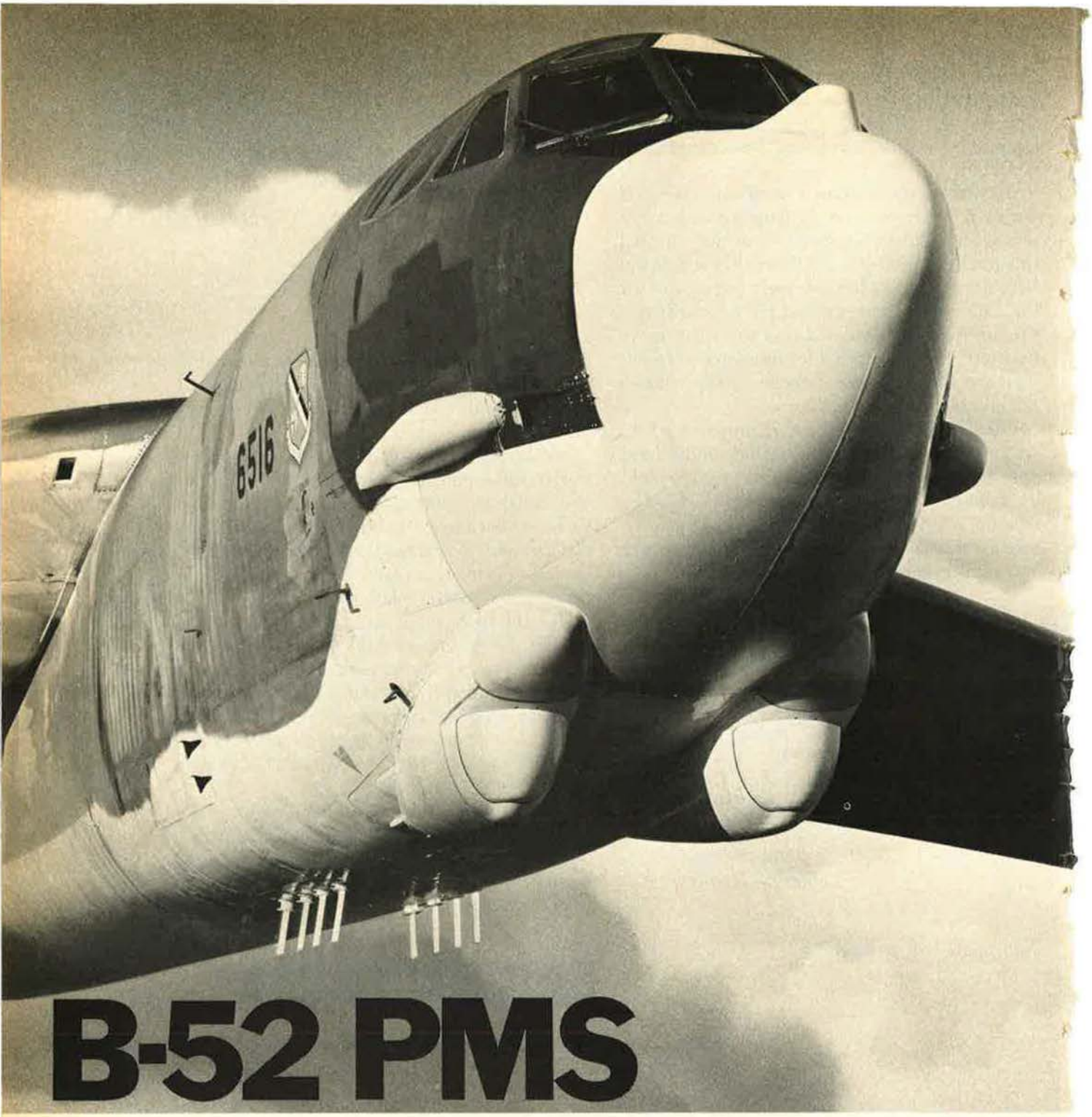
This proven ability in sensor technology, coupled with our success in integrating major systems, give us the experience and technology required to help develop advanced space and defense systems.

MARTIN MARIETTA

Martin Marietta Aerospace
6801 Rockledge Drive, Bethesda, Maryland 20034



Viking Lander Sensors



B-52 PMS

Northrop Power Management System (PMS) enhances B-52 survivability by automatically focusing radar jamming against the most imminent adversary threats.

Computer-managed PMS, designated AN/ALQ-155 (V), combines proven operational equipment with microprocessors, signal processors, and power supplies.

Over past 20 years, Northrop has produced more than 10,000 electronic countermeasures systems for B-52. Also produces AN/ALQ-135 Internal Countermeasures Set (ICS) for F-15 Eagle.

Northrop and Sanders Associates form one of two teams selected to develop Airborne Self-Protection Jammer (ASPJ), advanced ECM system for newest U.S. tactical fighters.

Northrop Corporation, Defense Systems Division, 600 Hicks Road, Rolling Meadows, Illinois 60008.

NORTHROP

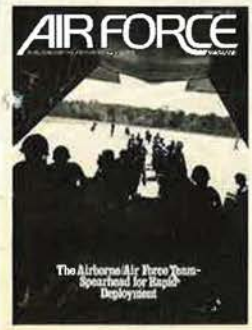
Making advanced technology work.

AIR FORCE MAGAZINE
PUBLISHED BY THE AIR FORCE ASSOCIATION

FEBRUARY 1980
VOLUME 63, NUMBER 2

This Month

ABOUT THE COVER



Paratroopers of the 82d Airborne Division board a MAC transport on Pope AFB's famous Green Ramp prior to a training jump. For a comprehensive look at the airborne's training, tactics, and weaponry—and its partnership with the Air Force as a key element of the Rapid Deployment Force—see article beginning on p. 38.

Departments

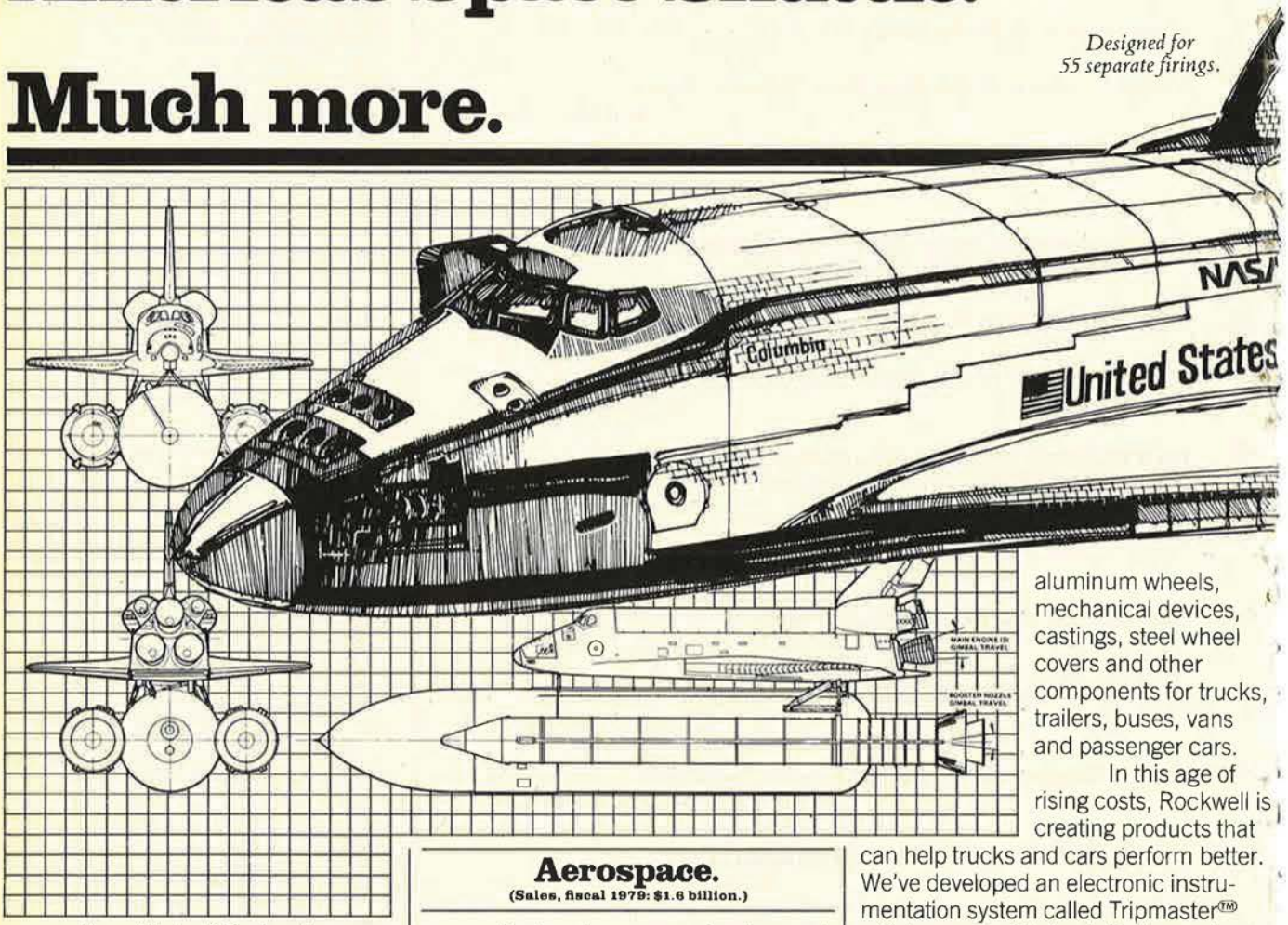
AIR FORCE Magazine (including SPACE DIGEST) is published monthly by the Air Force Association. Suite 400, 1750 Pennsylvania Ave., N.W., Washington, D.C. 20006. **Phone:** (202) 637-3300. Second-class postage paid at Washington, D.C., and additional mailing offices. **Membership rate:** $13 per year (includes $9 for one-year subscription); $30 for three-year membership (includes $21 for subscription). **Life Membership:** $200. **Subscription rate:** $13 per year; $5 additional for foreign postage. 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

Rockwell International is more than a builder of America's Space Shuttle.

Much more.



Designed for 55 separate firings.

If you think of Rockwell International as a company that makes spaceships, you have good reason. We are prime contractor to NASA for Space Shuttle orbiters and their main engines, and for integration of the entire Shuttle system and selected payloads. The Rockwell-built orbiter is the world's first reusable spaceship, capable of at least one hundred missions into space and back. It will launch like a rocket, haul like a truck, work like a space station, then return to Earth and land like a glider. But aerospace is only part of the Rockwell story.

Rockwell International is a major multi-industry company, applying advanced technology to a wide range of products — in automotive, aerospace, electronics and general industries. Following are some examples of our balanced diversification.

Aerospace.

(Sales, fiscal 1979: $1.6 billion.)

Rockwell aerospace involvement extends well beyond the Space Shuttle. Our rocket engines have been used to launch over two-thirds of all U.S.-manned space flights and satellites, and we're building the Navstar satellites that are bringing totally new standards of accuracy to world navigation.

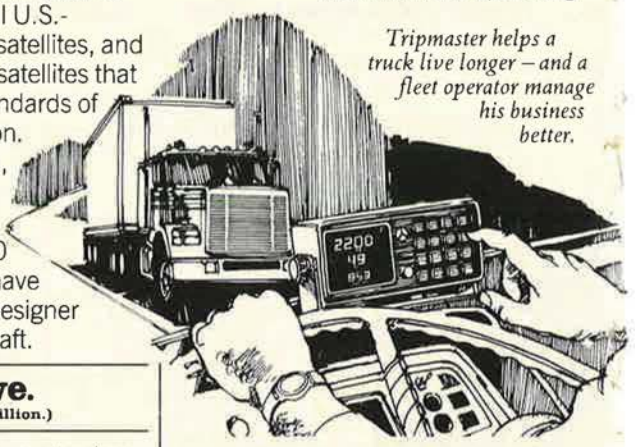
For general aviation, we build Sabreliner® business jets and Jetprop Commander® 840 and 980 business aircraft. And we have a long, proud history as a designer and builder of military aircraft.

Automotive.

(Sales, fiscal 1979: $1.8 billion.)

One-half of the highway tandem tractors in North America are equipped with Rockwell axles — and more than half of the heavy-duty trucks stop with Rockwell brakes. We're also a major supplier of drivelines, steel and styled aluminum wheels, mechanical devices, castings, steel wheel covers and other components for trucks, trailers, buses, vans and passenger cars.

In this age of rising costs, Rockwell is creating products that can help trucks and cars perform better. We've developed an electronic instrumentation system called Tripmaster™ which can provide truck fleet operators with data that can improve vehicle utilization and operating efficiency. Some of our components that can help cut a trucker's fuel consumption and increase payloads include a new aluminum front axle beam, Taper-Leaf® springs and Stopmaster® brakes.



Tripmaster helps a truck live longer – and a fleet operator manage his business better.

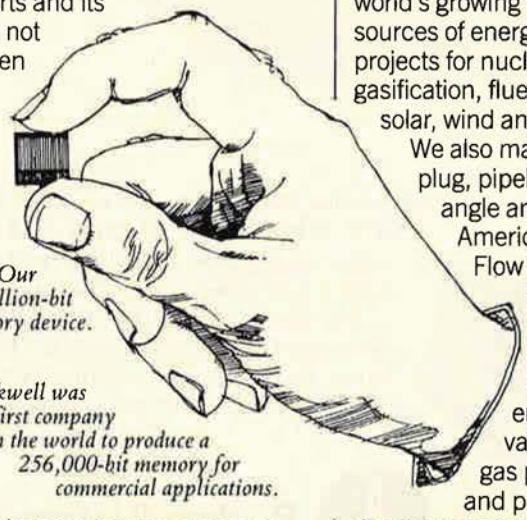
Rocket engine power equivalent to the output of 23 Hoover Dams.

Electronics.

(Sales, fiscal 1979: $1.5 billion.)

We're one of the world's leading suppliers of avionics — communications, navigation and flight control equipment — for air transport, general aviation and government aircraft. We also make microelectronic systems and devices and missile guidance and control systems. And we manufacture and install telecommunications systems for businesses and governments worldwide.

One of Rockwell's latest electronic achievements is the production of bubble domain memories. We developed and market a device measuring about two-fifths of an inch square that can store up to 256,000 bits of information. It has no moving parts and its memory is not erased when power is turned off.



Our quarter-million-bit bubble memory device.

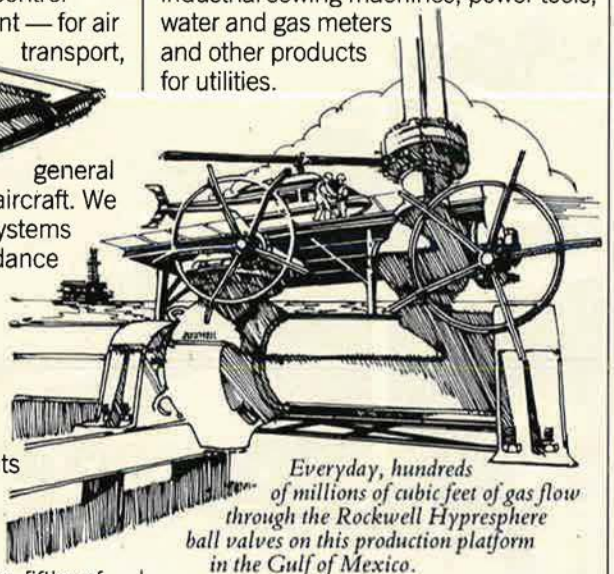
Rockwell was the first company in the world to produce a 256,000-bit memory for commercial applications.

Mechanical mass storage computer memories can now be replaced by smaller, faster, more reliable, more energy-efficient systems.

General Industries.

(Sales, fiscal 1979: $1.2 billion.)

Most of America's major daily newspapers are printed on our Goss presses. We also make textile equipment, industrial sewing machines, power tools, water and gas meters and other products for utilities.



Everyday, hundreds of millions of cubic feet of gas flow through the Rockwell Hypresphere ball valves on this production platform in the Gulf of Mexico.

In addition, our extensive technology is being applied to the world's growing need for alternate sources of energy. We're involved in projects for nuclear energy, coal gasification, flue gas desulfurization, and solar, wind and geothermal power.

We also manufacture valves — plug, pipeline ball, gate, globe, angle and check valves for America's power needs. Our Flow Control Division is one of the world's leading suppliers of high-technology valving for U.S. and international energy markets. Rockwell valves are used in oil and gas production, transmission and processing; natural gas distribution pipelines; synthetic fuel processing plants; electric power plants; shipboard power plants; and in many other energy-related markets.

Over 15,500 scientists and engineers.

Of our 114,000 employees, nearly one in eight is either a scientist or an engineer. They constitute about one percent of America's total scientific-

engineering community. This technological base positions us for leadership in each of our product areas. It also makes our corporate slogan, ". . . where science gets down to business," a fact.

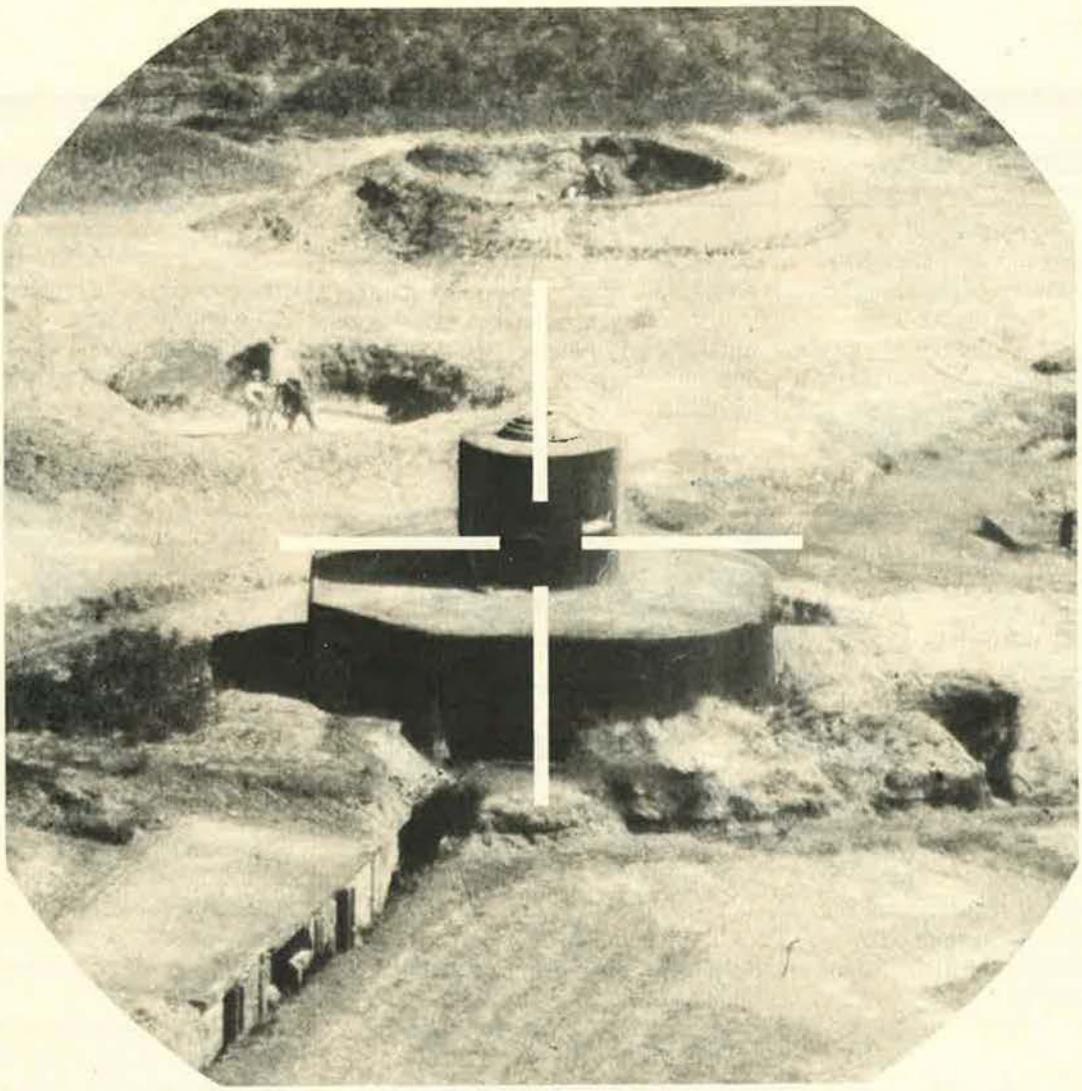
For more of the Rockwell story, please write us for a copy of our annual report. If you're an engineer interested in the kinds of challenges to be found in our company's areas of business, we would welcome the opportunity to consider your application to join us. Contact: Rockwell International, Dept. 815AF-23, 600 Grant Street, Pittsburgh, PA 15219.

Rockwell International

...where science gets down to business

Automotive/Aerospace
Electronics/General Industries

GBU-15 has an eye for heavily defended, high-value targets.



Industrial complexes, SAM sites, airfields and bridges. The nose-mounted TV camera for pinpoint accuracy and Cruciform Wing weapon design for extended range make the USAF GBU-15, developed by Rockwell International, ideal for use against such targets. GBU-15 transmits a sharp television picture of its target to the host aircraft. Using remote control, the pilot can guide GBU-15 to a direct hit — and not expose himself to radar or antiaircraft defenses in the target areas.

The unique TV guidance system, developed for the U.S. Air Force, makes the GBU-15 highly cost-effective - and essential to missions against heavily defended *high-value, time-critical* targets.

For more information, write: Missile Systems Division, Avionics & Missiles Group, Rockwell International, 4300 E. Fifth Avenue, Columbus, OH 43216.

Rockwell International

...where science gets down to business

AN EDITORIAL

Afghanistan: A Watershed

THE Soviet invasion of Afghanistan can provide a catalyst for putting US foreign and defense policy on the road to renewed credibility. The Russian seizure of Afghanistan was a tragedy for the Afghans, the vast majority of whom are staunchly anti-Soviet, and a blow to US strategic interests. Nevertheless, adversity can be turned into opportunity and opportunity into advantage. That, after all, is the job of the statesman. We hope the Carter Administration will rise to the challenge. The American people are tired of the humiliations and indignities evoked by a prolonged willingness of our policymakers to turn the other cheek.

First a few words about the invasion itself. Preparations for it could hardly have gone unnoticed in this era of electronic intelligence. It was no surprise. What apparently did surprise a frequently surprised Administration was the size and brutality of the Soviet incursion, followed by the quick liquidation of Hafizulla Amin, the Soviets' man in Kabul, and the installation of a more reliable puppet. The type of equipment moved in gives unmistakable evidence that this was not a rescue mission to bail Amin out of his difficulties with Moslem insurgents, as some Administration officials had supposed, but the start of a long-term occupation.

Afghanistan is now a full-fledged Soviet satellite, giving the USSR air bases within 400 miles of the Strait of Hormuz, through which much of the West's oil flows, and a jumping-off base for possible further advances through Pakistan or eastern Iran to the Arabian Sea.

The decision to move into Afghanistan was a display of contempt for what the Soviets have come to regard as a weak and vacillating US government, at the time preoccupied with the American hostages in Iran. It reflected disdain for world opinion, for NATO's efficacy vis-à-vis threats external to Alliance boundaries, and for China. It was a painful demonstration of the extent to which US strength and resolve have deteriorated while our government has vainly sought accommodation with the USSR.

But the Soviets may have misjudged the reaction of a seemingly somnolent West to a display of naked aggression, just as they have misjudged it before. Their seizure of the Czech government in 1948 laid the groundwork for NATO, their sponsorship of North Korea's invasion of the South in 1950 triggered US rearmament following the post-World War II dismantling of our forces, and their placement of missiles in Cuba in 1962 accelerated lagging US strategic programs to give this country overwhelming superiority in less than three years.

If there is to be a strong, concerted Western reaction, it can be brought into focus, now as in the past, only by the United States. A somewhat bizarre starting point was the President's public admission that, after three years in office, it took this Soviet act of aggression to change his assessment of Kremlin goals.

Administration actions thus far are laudable, albeit belated: lifting the arms embargo on Pakistan, resuming the transfer of military equipment to Turkey, tightening relations with China, negotiating for bases and overflight rights in the Mideast, deferring further consideration of SALT II, and minimally increasing the defense budget. These are unilateral and in most cases readily implemented moves. Another that is badly needed is to restore the intelligence community's capability to conduct clandestine operations and collect human intelligence in crisis areas.

True statesmanship will be called for in four other areas. First, we need a clear understanding of the US interests worldwide that will be defended at any cost. This demands coherent strategic thinking in contrast to the *ad hoc* decisions of recent years.

Second, our NATO partners must be persuaded that if the Alliance is to remain viable, it has to extend its responsibilities from Western Europe to any area where the interests of its members are in jeopardy.

Third, we must convince the Moslem world that its interests lie with the US—that we are its natural allies against Soviet expansion. A key here is a post-hostage policy for rebuilding cooperative relations with Iran—not more talk of punitive measures. We should forget about economic sanctions against Iran which, in any event, would be counterproductive since they would only force Iran into dependence on the USSR. The Kremlin already is representing itself as Iran's protector (a la Afghanistan?).

Finally, and perhaps most difficult of all, the effectiveness of US influence in the Mideast is heavily dependent on an equitable solution of the Palestinian situation. Israel's interests—in the long term its survival—as well as our own hinge on resolving this issue.

If American statesmanship is equal to these tasks, it can turn the adversity of Afghanistan into advantage and restore the credibility of US leadership.

The Soviets, once again, may inadvertently save us from ourselves.

—JOHN L. FRISBEE, EDITOR

Airmail

November Cover

AIR FORCE Magazine is one that people in the military have always been able to admire and enjoy. This is due mainly to the professionalism of the editors and the dedication to truth in journalism of the writers.

That is why your November 1979 issue so greatly dismayed the men and women of the 51st Composite Wing (Tactical), stationed at Osan Air Base, Korea. The picture shown on the cover most assuredly does not look like Osan and the airplanes are not the F-4E (LES) of the 36th Tac Fighter Squadron. Osan birds have OS on the tail and not the ZZ of the F/RF-4s at Kadena Air Base. While we do have the RF-4s here, on a TDY basis, it is only a small detachment and does not have the numbers shown on the cover. . . .

Lt. Col. Joseph E. Hurd, USAF
Commander, 36th TFS
and
Lt. Col. Ralph D. Barclay, USAF
Commander, 19th TAAS
Hq. 51st Composite Wing (Tac) (PACAF)
APO San Francisco

The picture on the cover of the November issue of AIR FORCE Magazine renewed my pride in the 12th Tactical Fighter Squadron. I had the privilege of serving as the Commander of the "Dirty Dozen" for over two years. I will long remember the F-4D yellow tails of the 12th TFS, the ZZ of the 18th TFW, the long sloping ramp of Kadena Air Base, the hills of Okinawa, Japan, and Capts. Dick Andregg and Russ Hanson, all of which you have "stationed at Osan AB, Korea."

The aircraft and people of the 12th TFS and the 18th TFW at Kadena represent the keystone of our Air Forces in the Pacific and demonstrated their ability to respond to a crisis during operation "Paul Bunyan" in 1976.

Col. Donald M. Majors, USAF
Armed Forces Staff College
Norfolk, Va.

I would like to compliment you on the cover photograph on the November 1979 issue and to let your readers know that the location of the photo is Kadena Air Base, Okinawa, Japan, rather than Osan Air Base, Korea. To complete the photo credit line: The photographer was TSgt. Mike Daniels, Det. 6, 1363d AAVS Squadron, Yokota Air Base, Japan. . . .

Lt. Col. William F. Frensley, USAF
Public Affairs Officer
Hq. 18th TFW (PACAF)
APO San Francisco

• *The cover photo was taken expressly for the November issue, which included an article on the US in the Pacific area. It came to us apparently incorrectly identified. Our apologies to all, particularly to the men and women of the 51st Composite Wing and the 18th TFW.*—THE EDITORS

Pilot Retention and the Airlines

As an ex-Air Force, current Air Guard and airline pilot, I wish to take issue with Ed Gates's "Speaking of People" article "The Airlines: Not All Roses" [November '79, p. 106]. He chooses to alter facts and dodge the real issue.

First, his pay figures for the airlines are low. After fourteen years with a trunk carrier, I now make more than his quoted figure for a twenty-eight-to-thirty-year senior captain on the DC-10. In fact, I have *averaged* more than his quoted thirty-year figure since I have been employed, discounting my first year.

Second, there is no such thing as being "furlough-safe." However, the chances of being furloughed today are very slim due in part to current working agreements, and what job (other than military or government) is safe from layoffs? Free enterprise offers no guarantees.

Third, there is every opportunity to get into management with the airlines. Many of today's top executives came directly from pilot ranks. Few pilots choose that route because they would rather fly and the working conditions are not favorably comparable.

My fourth and final point is that no matter how rosy or bleak the airline picture is, the reason many highly qualified personnel are leaving the Air Force today is due to dissatisfaction. The airlines are merely a means to an end; were it not for them, the people would go elsewhere. They certainly have no guarantee they will be hired by the airlines when they put in their papers.

How could the situation be changed? While I don't see it happening in the near future, I feel retainability would be substantially increased by giving the individual *some* control over his destiny, commensurate with rank/time in service. Allow Air Force men or women to choose their base, time there, and job, tempered by the needs of the service. The least that could be done now is to face facts, quit blaming others for our problems, solve the *cause* of the troubles, and quit treating the *symptoms*.

John Cross
Fort Smith, Ark.

Being an airline pilot and a former Air Force pilot and now an Air Guardsman still flying fighters, I will respond to Ed Gates's article, which stresses fuel shortages, boredom on the job, and furloughs.

Well, fuel shortages will hit both the military and the airlines. As for boredom, take someone out of the cockpit, especially a fighter, and assign him to an LSD (large steel desk) and boredom will follow. Furloughs have hit the pilot force in the Air Force also. Just look back at all of those Palace Programs the Air Force went through. In response to the statement, "If you join an airline there is no chance to do anything but fly . . . no chance to work in the management of the airlines." Well, most of us joined to fly and fight and that's what it is all about—at least that is what I have been told.

Also, you don't have to deal with OERs that don't rate you on what you do best, and that is fly. You don't compete against anyone and you move up as your seniority allows while making a good living for yourself and your family. . . .

If the Air Force would spend some of its time and money on finding out how to keep its pilots, it would not have to publish selected truths in order to keep those who are "on the fence" about leaving the Air Force. The way I see it, with the Guard getting newer equipment and the airlines hiring, one can have the best of both worlds.

(Lt.) F/O C. T. Romero, Jr.
Meridian, Miss.

• *Virtually all information was supplied by USAF and was so attributed. It should be noted, however, that the Palace Programs were dis-*

Sperry Update 9

A timely report of Sperry Flight Systems activities in the airline, defense, space and general aviation markets.

Sperry units to control space shuttle experiments.

Sperry communication and data handling systems, based on Sperry multiplexer-demultiplexer (MDM) systems for the Orbiter itself, will help integrate scientific experiments as space shuttle payloads.

The flexible MDM units with microprocessors will provide experiment control independent of the Orbiter's main on-board computers. One application of the Sperry flexible MDM will be for the NASA/TRW Materials Processing in Space (MPS) Program, a shuttle/spacelab experiment to commence in the early 1980s.

Mitsubishi, Piper select Sperry flight controls.

Mitsubishi Aircraft International has selected Sperry integrated autopilot/flight director systems for its new Diamond I business jet and the Marquise and Solitaire propjet executive transports, while Piper Aircraft Corp. will offer the Sperry SPZ-200A system in its Cheyenne II turboprop.

The SPZ-900 system will be standard in the Diamond I, and the SPZ-500 system with torque programming will be Marquise and Solitaire factory equipment. Piper plans to make the SPZ-200A a customer option beginning early in 1980.

Sperry FMCS chosen for new Airbus A310.

The digital Sperry automatic navigation and performance monitoring flight management computer system (FMCS) will be standard equipment on the new A310 wide-body airliner to be built by Airbus Industrie. The FMCS will serve as the nerve center for the aircraft's digital avionics suite. A similar system was earlier selected by Boeing Commercial Aircraft Company for its 757 and 767 airliners.

Sperry to convert F-100s to U.S. Air Force drones.

Sperry has commenced conversion of surplus F-100 fighter-bombers to QF-100 full scale afterburning targets under contract from the U.S. Air Force Armament Development and Test Center, Eglin AFB, Florida.

The QF-100 will succeed the PQM-102, of which Sperry is converting 145 from F-102 interceptors. The QF-100 will be a multiservice target for air-to-air and ground-to-air missile evaluation and combat crew training. The first of nine QF-100s will be delivered to Tyndall AFB, Fla., under an engineering development contract running through March 1982.

The QF-100 will use present PQM-102 ground control and test equipment as well as many PQM-102 airborne sub-systems. However, a digital flight control computer replaces four analog computers. The digital system will offer ease of testing and flexibility for future growth of operational modes.

Sperry expands offerings for business aviation.

New flight instruments, a cockpit voice advisory system, and a digital air data command display have been introduced by the Avionics Division of Sperry Flight Systems for business and commuter aircraft.

In addition, Sperry integrated autopilot/flight director systems are now available for retrofit into early serial number Cessna Citation I aircraft and as part of improvement packages for Model 23, 24, and 25 Learjets.

The new four-inch flight director instruments feature advanced digital electronic radio altitude displays in attitude director indicators. The new line, designated SPI-401 and 402, replaces the popular four-inch STARS line introduced in 1970.

A female voice advises pilots of vital flight conditions in the VA-100 voice advisory system. It will provide vocal callouts of altitude alert, landing gear status, track change, minimum decision height, autopilot disconnect and gyroscopic sensor anomalies.

The Sperry CD-125 air data command display offers convenient, precise control and monitoring of speed and vertical rate in high performance business jets. The 3.2 by 1.5 in. panel mounted display annunciates indicated airspeed, vertical speed, or Mach on a seven-segment incandescent numerical readout.

Talk to us.

We're Sperry Flight Systems, a division of Sperry Corporation. Talk to us. We'll listen. With us, listening is more than just a word in an advertising slogan; it's part of our philosophy of doing business.

We understand how important it is to listen.

SPERRY
FLIGHT SYSTEMS

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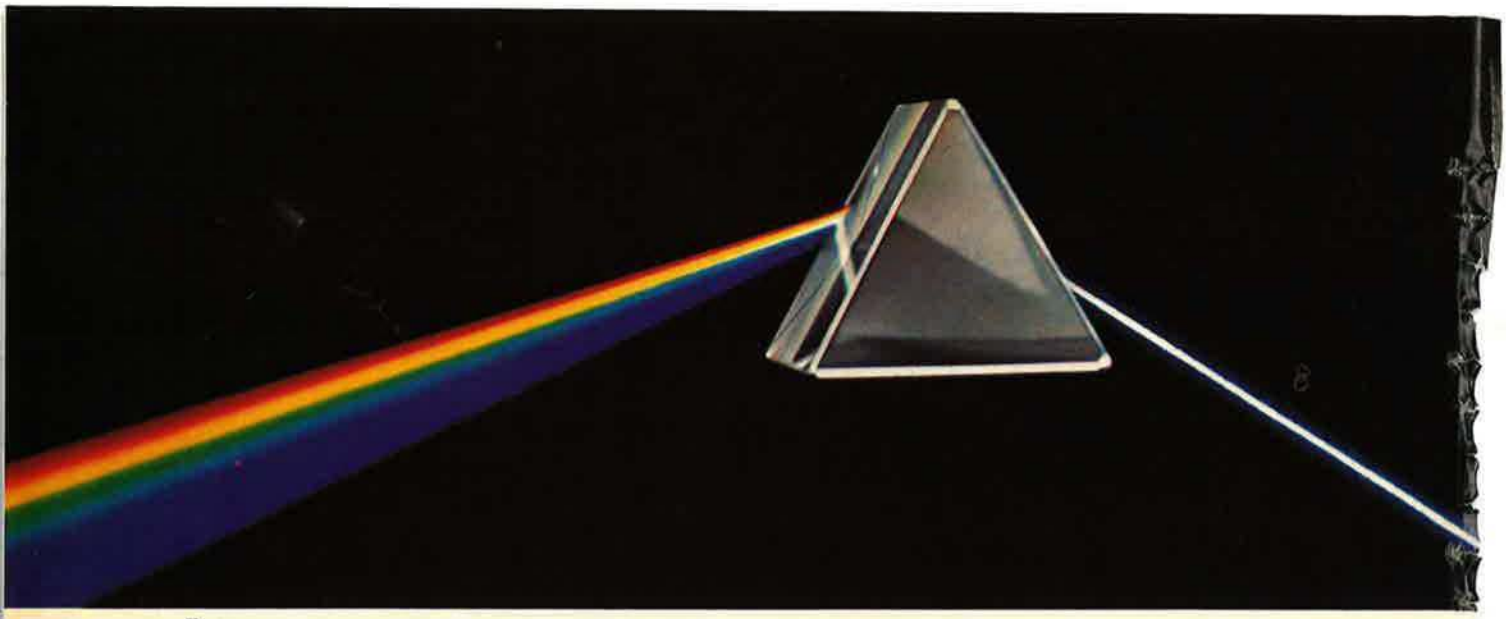

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Airmail

continued three and four years ago. Also, USAF has been trying to allow personnel to chose their base, etc., whenever possible, but it can't station everyone at the choice bases.—THE EDITORS

Tall Tale Laid to Rest

May I add a footnote to Dr. Herb Fisher's letter ("Airmail," December 1979) regarding the controversy over the "Jug's" Mach 1 capability.

Since I was the first one to be involved in that claim, I think that it is about time to set the record straight as to who did what and who talked about it.

The Jug was having radio antenna problems in the fall of 1942 (they were falling off), and Lt. Roger B. Dyer and I were assigned the mission of making high-speed runs every 5,000 feet from 25,000 up. Each run was to be at full military power for three minutes, and the aircraft were equipped with VG recorders. We became separated, and I made my last run at 49,000 (yes, it would go that high), nosed down slightly, and then rolled it over. As Dr. Fisher noted, the controls would get locked up. Mine did. I let it go through 20,000 because I had no choice. Eventually the trim tabs took effect with a large bump and recovery was commenced. I called Roger Dyer on the radio and told him of the experience and to be careful.

When I landed, I reported to Andy Kutler of Republic the above events. He in turn called Republic. In the meantime, Roger Dyer had landed and reported the same thing.

The next day we were visited by a team from Republic that was headed by Mr. Kartveli. Republic had the VG recorder, and Mr. Kartveli questioned us in great detail, as did several other people from Republic. About two or three weeks later, the newspapers had a big spread on the two Army pilots who supposedly went through the barrier. The entire idea was a product of Republic Aviation, and the only thing I noted at that time was that the aircraft had never been put into a terminal velocity dive by Republic or Wright-Pat.

Several months later in England, Roger Dyer was sent to Eighth Air Force Headquarters to confer with Lt. Col. Cass Hough about this matter, and a few weeks after that the *Stars and Stripes* announced that Hough had duplicated this supposed feat in a P-38 and then later in a P-47. From then on the story seemed to spread.

Joe Parker, the Republic test pilot, told me many months later that he would not have put a Jug into a terminal velocity dive for the first time for $50,000. Now that it had been done once, he did not mind doing it for peanuts.

This whole thing got started by Alexander Kartveli and "Braggy" Brabham at Republic, and it is time to lay it to rest. I hope that those who persist in this claim will go to their public library and look up the December 2, 1942, newspapers.

Over the years I have read various reports by engineers who have said it was impossible, and their figures have ranged from 0.79 to 0.87. It would appear that Wright-Pat should have conducted tests at the time or at least shortly thereafter in order to have some firm data on performance.

Whatever your beliefs may be, please don't lay any statements about "the pilots claimed," etc., on the pilots. We did not claim anything beyond our raw data. It was the engineers and their slipsticks who made the original wild claims, and they still appear to be wrestling with the problem.

I think the best advice at the time was contained in the TWX that we received from Gen. H. H. Arnold which, in effect, said, "Don't talk about it."

Perhaps we can leave it at that.

Col. Harold E. Comstock,
USAF (Ret.)
Fresno, Calif.

A Lot of Drag Here, Too

Regarding the letter "Mach 1 and the P-47" (December 1979), if Dr. Fisher needs any support to his argument, my memories of the F-86F should help.

Although sleek-looking for its time, the F-86F did not enjoy the benefits of area-rule design and also suffered from Dr. Fisher's "astronomical drag rise" at high subsonic Mach. At high altitude, a clean F would do above 0.9 in level flight and reach 0.96 in a shallow dive. However, to "break the Mach" you had to go above 40,000 and make a vertical dive. How much higher never seemed to make a difference. Even in one dive from 54,000 feet I couldn't get a speed greater than 1.03 Mach.

My calculations told me that adding the weight of the airplane (approximately 14,000 pounds) to the thrust gave me an airspeed increase of approximately only fifty KTAS above that attainable in level flight.

Since the engine thrust was only 5,600 pounds, (I think) at sea level, and considerably less at high altitude, my curiosity was aroused as to how much the engine really contributed to the speed in a dive. The obvious solution was to try a no-thrust dive. In a vertical dive from 44,000 feet, with the engine stopcocked as the dive started, I achieved a Mach indication of 1.00. Obviously, the thrust of the engine was a small factor in a vertical dive. The big factor was aerodynamic drag due to Mach effects.

Dr. Fisher, I'm with you.

Lt. Col. R. J. Vanden-Heuvel,
USAF (Ret.)
Shalimar, Fla.

Beats Us

During World War II, keeping one's uniform neat and clean was a problem, especially if you were overseas. But Yankee ingenuity and a visit to the fuel truck often solved the problem, and here is the formula:

Just duck the pinks and greens into a five-gallon can of eighty octane, and quicker than you could holler flak, the job was done. Of course, there were certain risks, such as once they dried you smelled like the inside of a jerry can and wouldn't dare light up the old Zippo for fear of a flash fire.

These were acceptable penalties, but it was difficult not to become distraught when your beautiful gabardines from Lauterstein's would no longer reach the tops of the low quarter shoes; in fact, the ankle and GI socks were often immodestly exposed. Which brings me to the question: With one-day-in-and-out cleaning technology and nonshrinkable fabrics, why do so many military personnel wear trousers that in most cases are too short?

James L. Brooks
Los Angeles, Calif.

Another Visit for Rescued Airmen

As noted in your article "Reunion in China" (October 1979), it was my letter to your "Airmail" column that organized a return trip to China of B-29 aircrew veterans, two of whom (Col. William F. Savoie and Sgt. Ernie Brundage) were met by seven veterans of the 4th Route Army operating behind the Japanese lines in 1944

We suggest that readers keep their letters to a maximum of 500 words. The Editors reserve the right to excerpt or condense as required in the interest of space or good taste. Names will be withheld on request, but unsigned letters are not acceptable.

Airmail

who had participated in various capacities in the logistics of their rescue after they were forced to bail out of their burning plane north of Shanghai. Dave Anderton's account did justice to the great emotion of the reunion of men who had experienced an incredible adventure in a small corner of the war.

It was Colonel Savoie's account of the adventure at an "Escape and Evasion" briefing before one of my missions, after he had been rescued, that remained vivid in my memories of my tour of duty. When I spoke about it to Mr. Yueh Tai-heng, head of China International Travel Service, during an earlier 1976 tour of China (also with American China Veterans), he invited me to organize a return visit around some of these rescued aviators. The April 1979 tour as recounted in your article by Dave Anderton, in which I was the tour leader, was the result.

Now Mr. Yueh has invited me to return with other rescued airmen for additional tours. In addition to the crew of the B-29 *O'Reilly's Daughter*, there were other crews that went through similar experiences, some of them with bailouts in the 8th Route Army area. These rescues are said to have been entirely in Communist territory and were terminated in Yenan with meetings with Mao and others of his staff, as well as Americans in the Dixie Mission, based there on orders of Gen. Curtis LeMay for the purpose of effecting these rescues.

Once again I would like to call for rescued airmen of this period of China-based Superforts, who are interested in making a return visit to China, to get in touch with me. In addition to the probability of meeting some of the Chinese veterans who effected your rescue, the opening up of new areas to touring such as the new Chin Mausoleum and the boat ride (two days) down the Yangtze Gorges—Chungking to Wuhan—will be available to us as promised by Mr. Yueh.

Gilbert Wasserman
183 Jules Drive
Staten Island, N. Y.

416th's Memorabilia

The 416th Tactical Fighter Squadron has been redesignated the 416th Tactical Fighter Training Squadron and reactivated at Holloman Air Force Base, N. M., as a part of the 479th Tactical Training Wing. The squadron will be training US and allied aircrews as part of the Tactical Air Command (TAC) Lead-In Fighter Training program.

As the "Gateway to TAC," the 479th has a unique opportunity not only to teach basic fighter skills, but also to instill fighter attitudes in every new aircrew member entering TAC. Squadron history and tradition play a vital role in instilling this attitude as well as a sense of unit pride and esprit.

Unfortunately, virtually all squadron memorabilia were misplaced when the 416th was deactivated at England Air Force Base, La., in 1972. Anyone possessing or knowing the whereabouts of the 416th organizational flag and history is requested to contact me or the 416th Operations Officer, Lt. Col. Ray Fuller, AUTOVON 867-7243.

Col. Russell L. Violett, USAF
Commander
479th Tac Training Wing (TAC)
Holloman AFB, N. M. 88330

500th Bomb Squadron

Attempting to contact all former members of the 500th Bomb Squadron, 345th Bomb Group (M), WW II. If you are not already on our association's mailing list, write to me for important information.

Col. William J. Cavoli,
USAF (Ret.)
4314 Planters Court
Annandale, Va. 22003
Phone: (703) 827-9100 (off.)
(703) 978-3830 (home)

When V-1s and -2s Fell on London

Currently, I am under contract with William Kimber & Co., a London publisher, to write a nonfiction account on the effects of the V-1 flying bomb and V-2 rocket on London during the final phase of World War II, from June 1944 until March 1945. I am looking into not only the physical damage these secret weapons caused, but also the psychological impact they made.

I would appreciate hearing from any readers who were in London or southeast England during the time of the "doodlebugs" who can recall any specific incidents involving either the V-1 or V-2 weapons. Any personal details, such as unit, duty station, and rank held at that time, would also be a great help.

My first book about the London blitz, entitled *The City Ablaze*, will be published by Kimber in May, and should appear in the US sometime during mid-1980. I based this account of the great London fire blitz of December 29, 1940, upon personal letters from eyewitnesses, and plan on doing the same with my book on the V-1s and V-2s.

Many thanks for any assistance readers might be kind enough to offer.

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

NVNAF History

For the past several years I have been researching the history of the North Vietnamese Air Force. I would appreciate hearing from anyone having information on this subject.

Michael O'Connor
406 7th St.
Mosinee, Wis. 54455

North Texas U. AAS

I would like to hear from Arnold Air Society members who graduated from North Texas State University. We are conducting an area project and updating our files.

Cadet 1st Lt. William E. Roberts
Det. 835, AFROTC
Arnold Air, Royal N. Baker Sqdn.
North Texas State Univ.
Denton, Tex. 76203

Flight Uniform

Thank you very much for including my request for full dress uniforms, past and present, and other memorabilia in your November 1979 issue.

I am especially in search of a fighter pilot helmet and full flight uniform to be added to our exhibit. We have the male mannequins so that the items will be properly displayed and the helmet and flight uniform will be protected behind glass.

I would also appreciate Air Force squadron patches, which will be included in the Air Force display. The International Costume Exhibition welcomes any visitors from the Air Force or other military personnel presently in service or those who have retired.

Dr. Ray L. Ferguson
Project Director
International Costume Exhibition
P. O. Box 86
Burlingame, Calif. 94010

Attn: 960th AEW&C Sqdn. Alumni

On September 1, 1979, Detachment 2, 552d AWAC Wing was deactivated and redesignated the 960th Airborne Warning and Control Support Squad-

ron (AWACSS), Keflavik NI, Iceland. We fly the E-3A Sentry.

We received our new designation from the 960th Airborne Early Warning and Control (AEW&C) Squadron, 551st AEW&C Wing, Otis AFB, Mass., which was deactivated on July 31, 1969. This organization flew the EC-121 Connie.

Research with the Air Force Museum, Wright-Patterson AFB, indicates the museum did not receive any memorabilia (awards, etc.) from either the 960th AEW&C Squadron or the 551st AEW&C Wing upon deactivation at Otis AFB. We are particularly interested in finding the Air Force Outstanding Unit Award (AFOUA) Certificate and streamer from the 960th AEW&C Squadron for the period July 1, 1957, to October 30, 1958. Also, any other memorabilia such as plaques, awards, etc.

We would also like to have photos of the EC-121 operations at Keflavik, Iceland. All photos will be safeguarded, copied, and then returned to the sender.

Should anyone know the location of the above listed items, please contact:

2d Lt. Kenneth H. Woodall, USAF
Public Affairs Officer
960th AWACSS/DOM
APO New York 09571
AUTOVON: 231-1290/1/2, Ext. 4315/7922

Sabrejets in Spain

As a member of one of the few Spanish aviation research groups, I have been looking for information on the F-86Fs delivered by the USAF to the Spanish Air Force from 1955 onwards. We know many interesting facts about the Sabre's Spanish life, but we still miss information such as:

The way and dates the aircraft were delivered;

Fighter and fighter-bomber units in which the Sabres served before being delivered to the Ejército del Aire;

Relationship between USAF and Ejército del Aire codes;

The aircrafts' fate after being phased out of the Spanish units.

I would appreciate hearing from any USAF pilot who can provide some information on the above.

Gonzalo Avila Cruz
Av. Dr. F. Rubio y Galí 177 5°B
Madrid-20, Spain

UC/AFROTC Grads

University of Cincinnati AFROTC Det. 665 would like to get in touch with all UC/AFROTC Graduates and former staff. If this includes you, please send your name and address to:

AFROTC Det. 665
c/o James E. Botkin
University of Cincinnati
Cincinnati, Ohio 45221

66th Bomb Squadron

I would greatly appreciate expanding our history of this World War II flying unit. Anyone having photos, artifacts, historical data, or even addresses of places where such might be available please contact:

Lt. Col. William E. Bristol
Commander
66th Strategic Missile Squadron
Ellsworth AFB, S. D. 57706
Phone: (605) 399-2556

Fighter Unit Patches

I am a collector of USAF fighter unit patches, and I would like to hear from anyone who might be willing to sell, trade, or give any of this type of patches. Every addition to my collection will be greatly appreciated.

Rick Versteeg
Fahrenheitstraat 1
3817 WB Amersfoort
The Netherlands

446th's *Worry Bird*

I am tracing the life of *Worry Bird*, a B-24 of the 446th Bomb Group, based at Bungay, England, during WW II. Would like to correspond with anyone who has information on the plane, particularly its tail number.

Carver Rudolph
3503 Taylors Dr.
Austin, Tex. 78703

UFO Witnesses

I'm seeking additional witnesses to a UFO encounter described by ex-Astronaut L. Gordon Cooper. For two days in 1951, hundreds of disk-shaped objects flew over Neubiberg AB, near Munich. They were reportedly traveling east to west at altitudes above the ceiling of the jet interceptors sent after them.

Does *anyone* recall *anything* about this? Respondents will receive a free copy of my prize-winning essay, "The Failure of the 'Science' of Ufology."

James Oberg
Rt. 2, Box 1813
Dickinson, Tex. 77539

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35th annual convention, May 7–11, 1980, William Penn Hotel, Mellon Square, Pittsburgh, Pa. 15230. Phone: (412) 281-7100. Reservations may be made direct with hotel. For convention information **Contact:** Harry Menozzi, Box 311, West Newton, Pa. 15089. Phone: (412) 872-7126.

Santa Ana AAB

WW II military and civilian personnel stationed at Santa Ana AAB, Calif., March 1, 1980, in Costa Mesa, Calif. Searching for names, addresses, and phone numbers of persons stationed at SAAAB; also pictures and memorabilia. **Contact:** Costa Mesa Historical Society, P. O. Box 1764, Costa Mesa, Calif. 92626.

8th AF Historical Society Tour

September 3–23, 1980. First stop England, with visit to Duxford, Cambridge, Wales, London, and International Air Show at Farnborough. Cross English Channel by steamer to tour Paris, Brussels, and Amsterdam. Hosts will be former members of French, Belgian, and Dutch underground. Those interested in receiving more information are asked to write (please identify your WW II unit and England location) to: 8th AF Friendship Holiday, Box 1304, Hallandale, Fla. 33009.

11th Army Air Force

2d reunion, August 9–12, 1980, Anchorage, Alaska. Commemorating 40th anniversary of arrival of first 11th AAF cadre at Elmendorf. Want old photos (donated or loaned) to assist Alaskan historians. **Contact:** Lt. Col. Charles A. Pinney, USAF (Ret.), Chamber of Commerce, P. O. Box 404, Hermosa Beach, Calif. 90254.

32d Bomb Squadron

7th biennial reunion, July 31–August 3, 1980, San Diego, Calif. **Contact:** Q. H. (Skip) Cunningham, 16635 Yukon Ave., #12, Torrance, Calif. 90504.

Class 40-H

40th reunion, May 15–18, 1980, Sheraton Motor Inn, San Antonio, Tex., in conjunction with Randolph AFB's 50th anniversary. **Contact:** Lt. Col. Ed Gravenhorst, USAF (Ret.), 24632 Olive Tree Lane, Los Altos Hills, Calif. 94022.

58th Bomb Wing Association

Includes 40th, 444th, 462d, 468th Bomb Groups and 25th, 28th, 86th, 87th Air Service Groups. July 23–27, 1980, Nashville, Tenn. **Contact:** John A. Kavulich, 145 N. 5th St., Indiana, Pa. 15701.

401st Bomb Group (H)

4th biennial reunion, August 3–5, 1980, Hilton Airport Inn, San Francisco, Calif. **Contact:** Ralph Trout, P. O. Box 22044, Tampa, Fla. 33622.

414th Bomb Sqdn., 97th Bomb Gp. (H)

August 6–8, 1980, St. Louis, Mo. **Contact:** Charles A. Merlo, 7335 Neckel, Dearborn, Mich. 48126.

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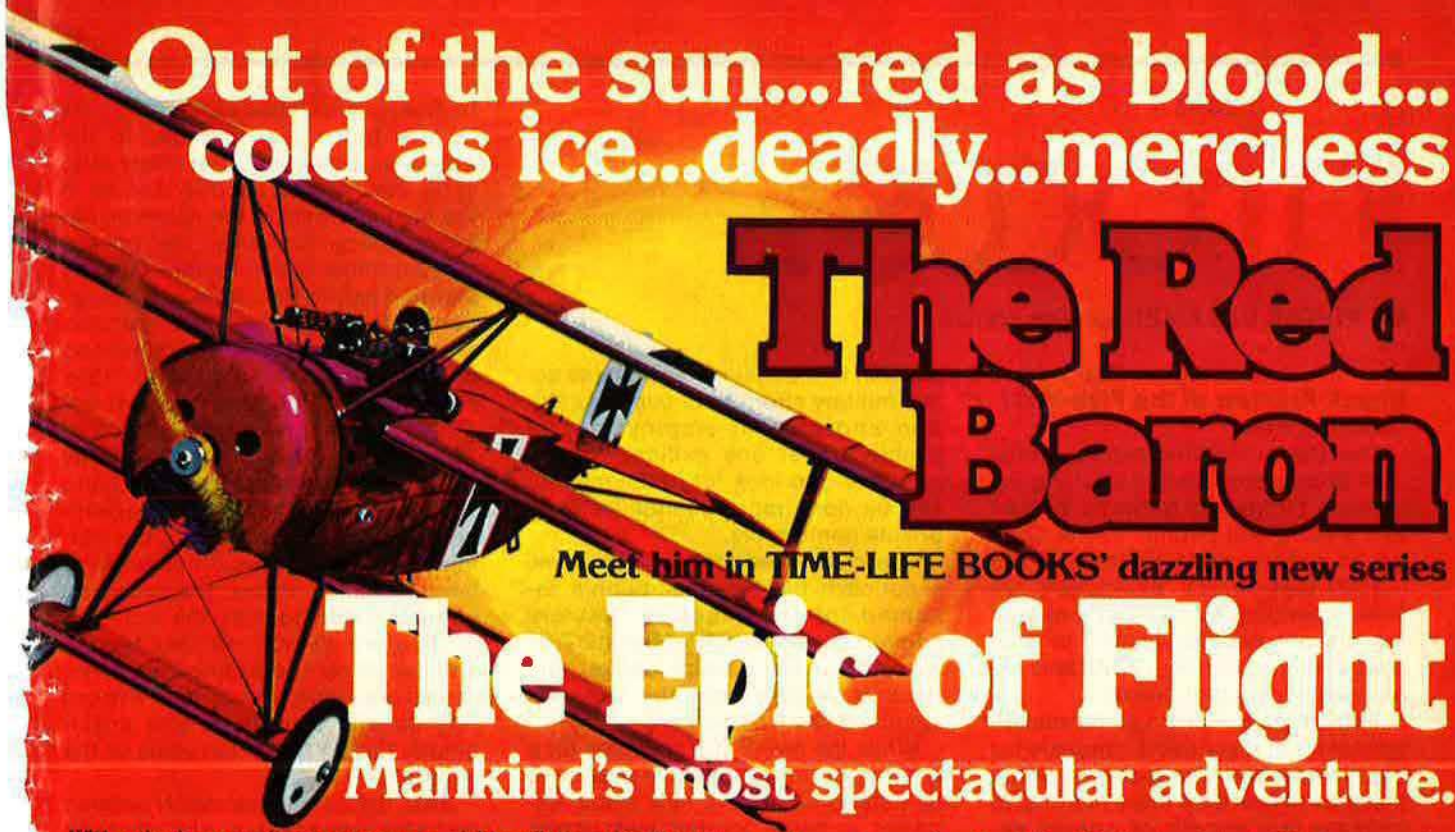

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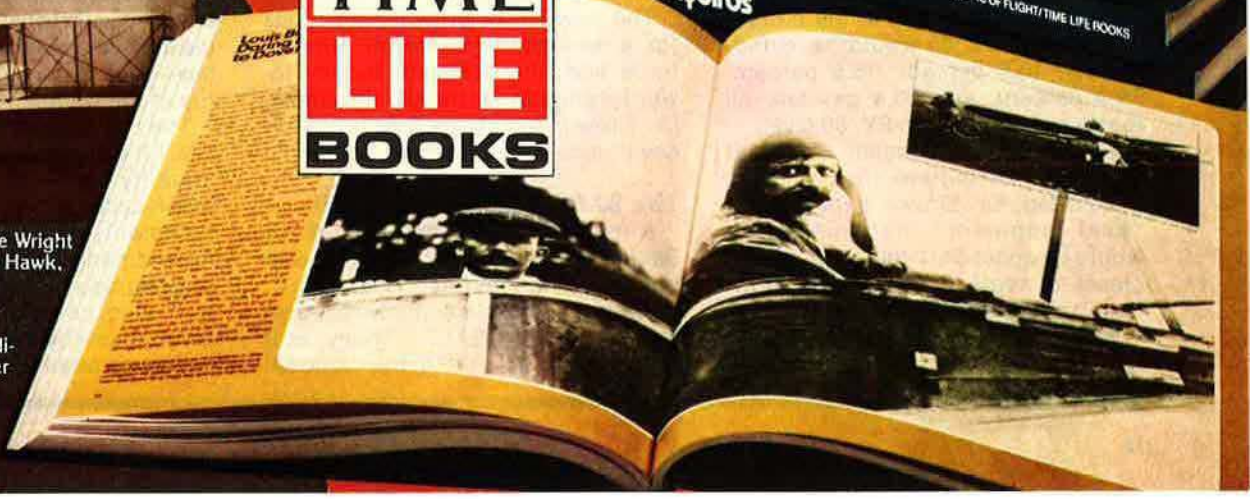

In Focus...

BY EDGAR ULSAMER, SENIOR EDITOR

Washington, D. C., Jan. 2

Sneak Preview of the Five-Year Defense Plan

The Carter Administration, which took office committed to slashing the defense budget by between $7 and $10 billion, will submit to the Congress a Five-Year Defense Plan (FYDP) that—by FY '85—boosts defense spending by 25.4 percent over the current level, measured in total obligational authority (TOA) and expressed in constant dollars.

These figures—and a somewhat elliptical if not inscrutable rationale for the Administration's decision, within the span of less than three months, to increase the growth of annual defense spending from three to about five percent—were presented by Defense Secretary Harold Brown to a mildly nonplussed Senate Armed Services Committee in mid-December. Several senior members of the committee hinted broadly that the surprising boost in proposed defense spending was motivated by the Administration's selling of the SALT II accord—now deferred because of Afghanistan—and might evaporate once the accord was voted on by the Senate. This contention drew vociferous denials from Dr. Brown, who proclaimed that, absent a SALT II agreement, "the defense budget would not be lower; it would be higher."

While the Administration's "sneak preview" of the defense budget was confined to an overview—with some details as yet not fully resolved—Dr. Brown disclosed that the FY '81 request (TOA) would shoot up by a real 5.6 percent to $157.5 billion. Annual corresponding growth in the budget years out to FY '85 would be, cumulatively, 10.6 percent, 15.5 percent, 20.3 percent, and 25.4 percent, all measured against the FY '80 level.

So far as the forecast of actual spending—or outlays—in FY '81 is concerned, Dr. Brown expressed a "best judgment" that this figure would be about $142 billion or "an increase of nearly 3.4 percent after inflation above our estimate for FY '80."

In the personnel sector, Dr. Brown reported that "over the next five years we plan to maintain a fairly stable active military strength of over two million and civilian employment of slightly under one million. We are continuing to look for functions that can be done more economically by private contractors."

The committee greeted with some skepticism the Administration's assumed inflation factors that are pegged at a seemingly optimistic 7.67 percent for the current budget and decline steadily over the five-year span to a low 6.05 percent.

While the new FYDP provides for a shoring up of the nation's seapower by adding ninety-five new ships, airpower is being treated less generously. Although claiming—with seemingly unintended irony—that the issue is still "up in the air," Secretary Brown seemed to acknowledge a committee member's contention that under the new FYDP the Air Force would be buying 240 fewer F-16s than originally planned. Sen. Howard Cannon, chairman of the tactical airpower subcommittee, specifically charged also—and seemingly drew an oblique confirmation from Secretary Brown—that reducing the buy of F-15s and stretching out their procurement will result in higher unit cost, and that the plan calls for buying fewer A-10s than had a previous five-year program.

Dr. Brown, without citing specifics, countered, however, that "we are buying about 1,700 new fighters and attack aircraft over the next five years. . . . Between 1979 and 1985, we plan to increase by roughly forty percent the number of aircraft that we can move to Europe in two days."

The new FYDP provides no funds for a dedicated interceptor aircraft force and only research money toward reengining of the KC-135 tanker, Dr. Brown said. There are funds for development of a manned bomber.

The SASC Report on SALT II

A majority of ten members of the Senate Armed Services Committee, in defiance of its chairman, Sen. John C. Stennis, approved a committee report that asserts "the SALT II Treaty, as it now stands, is not in the national interest of the United States. . . . We believe that major changes to the treaty are essential if the treaty is to serve our national security and be in the best interests of the common defense policy. Moreover, we believe that a number of ambiguities must be clarified before the rights and obligations of the parties can be fully understood and agreed." (The remaining seven members voted "present," thus avoiding an expression of either approval or disapproval of the report.)

Among the changes requested by the committee were: "Remedying such inequalities as the Soviet advantage in ICBM throw-weight, the permitted Soviet possession of modern, large ballistic missiles, the exclusion of the Backfire bomber, the inclusion of Western theater nuclear forces, and decisively addressing the unwarranted precedents set by the Protocol [the special provisions and prohibitions for the first three years of the accord]."

Also, the committee report pointed out the imperative of "closing loopholes in connection with the limitations on the testing and deployment of new types of ICBMs [and] obtaining agreement to such measures as may be necessary to assure our ability to monitor Soviet compliance."

The committee warned—as has this column—that "some treaty provisions could inhibit the deployment of various survivable and cost-effective basing modes for the MX missile, forcing the US to squander scarce resources in a technically complex effort to make MX deployment compatible with certain interpretations of the treaty. Already, the Soviet Union has invoked provisions now in the SALT II Treaty to challenge the legitimacy of MX basing options. If the SALT process, which has failed to bring about agreement under which the existing US ICBM force remains survivable, should also result in the failure to deploy a cost-effective survivable land-based missile force, then the committee believes that irreparable harm will have been done to the national security of the United States."

The report asserts that the pending SALT II accord fails to provide for the equality between the US and the USSR called for by Public Law 92-448, commonly known as the Jackson Amendment, passed by both houses of Congress following SALT I. The report also complains that the "frequent resort by the US negotiators to unilateral assertions as to the mean-

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ing of ill-defined terms and the refusal of the Administration to accept clarifying amendments has left the committee unable to conclude precisely what the treaty means on a number of important points."

The report further warns that "it is beyond the capacity of our national technical means of verification to establish sufficiently the facts about Soviet compliance with a number of important terms of the SALT II Treaty. The treaty, therefore, cannot be said to be 'verifiable,' or even 'adequately verifiable.' "

Other points raised by the committee's report allege that SALT II in no way impedes the Soviets from deploying their so-called fifth generation of ICBMs, now in early test; that limits on the number of warheads the Soviets can emplace on their heavy modern SS-18 ICBM have no practical meaning; and that the verification provisions of the accord won't curb Soviet concealment. On the latter point, the report brings out with caustic insight that before SALT there were few Soviet efforts to conceal evidence of strategic weapon development from the US. But, "the evidence strongly suggests that Soviet concealment efforts since 1972 [when SALT I was signed] have been aimed, not simply at denying us military secrets per se, but at obscuring activities that raise the issue of compliance" with arms control.

Test Ban Treaty Marks Time

The "lonely intransigence" of the British government, for the time being, has put on ice the proposed trilateral—US, USSR, and UK—Comprehensive Test Ban Treaty (CTBT). The Soviet request for ten National Seismic Stations (NSS), manned by Soviet personnel, including one in Hong Kong, reportedly outraged Prime Minister Margaret Thatcher sufficiently to call off further negotiations in spite of intense pressure by the US.

The US government and the Soviet Union were subsequently deadlocked when Moscow demanded that this nation turn over to the USSR two complete NSSs, plus assorted spare parts except for the satellite link that interrogates these devices. The US, on the other hand, was willing to make available only one complete NSS facility and insisted that it be assembled and manned by US personnel. To date the Soviets have not agreed to this US proposal, but indicated that the notion of operating some US equipment in the territory of the Soviet Union and attended by US personnel might be permissible.

Concern is mounting among US nuclear physicists and others familiar with the importance and intricacies of nuclear weapons testing that conclusion of a CTBT—even when theoretically limited to a three-year period—would be inimical to this nation's defense interests. Not only is a CTBT not verifiable, but cessation of testing would impede in a major way further development of such "safety devices" as insensitive high-energy explosives that initiate the nuclear process, "command-disable" features that would permit rendering the weapon unusable by terrorists and others, and of new "permissive-action links" designed to let only authorized users explode US nuclear weapons.

Foreign policy experts in Congress look upon the Administration's proposal for cessation of all nuclear weapons testing for a three-year period with jaundiced eyes. Because of this country's proven inability to detect—certainly in a legally enforceable way—Soviet underground tests involving yields below ten or even twenty kilotons, the Russians probably would carry out such shots and thus be able to keep intact the integrity of their stockpile by some proof-testing of new weapons. Were the US to decide after the three-year moratorium to resume testing, the full onus for doing so would fall on this country. The Soviets, these analysts fear, would exploit to the hilt the propaganda advantage that would accrue to them from such a US action.

Nuclear Detection Limitations

The mysterious detonation of a nuclear device late last fall in an ocean area of the Southern Hemisphere detected by a US Vela satellite and subsequent erroneous radiation readings reported by a nuclear detection facility in New Zealand point up the practical impossibility of policing or enforcing nuclear-weapons test agreements and nonproliferation. While USAF's Vela satellites orbiting at extremely high altitude have a flawless record—detecting instantly and reliably forty-one out of forty-one atmospheric tests since 1973—they can't provide the evidence to pinpoint the exact nature or "nationality" of the shot. This is especially true in cases of deliberate concealment and surprise, as was the case in the last detonation, which probably involved a device carried by a tethered balloon operating over a deep ocean area. Once the explosion—in this case a low-yield device—destroys the balloon, a counterweight mechanism drags what evidence of the test remains to the bottom of the ocean.

As scientists of the Los Alamos Scientific Laboratory, one of the nation's two principal nuclear science facilities, point out, such optical sensors as the so-called "bhangmeter" can detect nuclear explosions in the atmosphere accurately and reliably. The high intensity of the light flashes from a nuclear explosion combined with the unique signature of these flashes not only rules out errors—at least in a practical sense—but also permits reasonably precise calculations of the energy, or yield, of the event.

The reason why nuclear physicists can be relatively certain that sensors monitoring nuclear explosions won't be misled by unusual natural phenomena, such as abnormal sequences of intense lightning or "superbolts," is convincing: To achieve the pulse shape and peak-radiated power of even a very low-yield nuclear explosion—in the one kiloton range—lightning would have to be both 400 times more energetic and 100 times longer in duration than ever observed, according to Los Alamos scientists.

Thus, it is possible to posit that since the nuclear signature is orders of magnitude more energetic than any other terrestrial phenomena that might resemble it, the light signature of an atmospheric nuclear event is generically unique and hence clearly detectable by sophisticated sensor systems. Further, the yield of a nuclear event can be inferred with reasonable precision by measuring the time intervals between the peaks and valleys in the light emissions triggered by nuclear explosions in the atmosphere.

But while Vela—or follow-on systems such as NUDETS (for nuclear detection system) carried by host satellites—works with extreme reliability, other radiation detection systems that could ferret out additional information and might provide clues about the originator of a nuclear shot are often chancy. When US experts, for instance, rechecked the radiation readings recorded by the New Zealand detection facility—thought by the local scientists to indicate evi-

dence of a nuclear explosion—they were compelled to categorize them as a false alarm.

The US intelligence community, thus, is in a quandary over the identity of the latest nuclear explosion: While vague and uncorroborated evidence suggests that South Africa set off the test shot, there is other circumstantial evidence to justify the notion that Japan, Taiwan, Israel, Pakistan, or India could have been the originator. Even the admittedly farfetched hypothesis that the test may have involved a Soviet "neutron" bomb cannot be disproved.

Washington Observations

★ A senior defense official told this column that the Soviet Union is taking advantage, in an "all-out sense," of the anti-Americanism fostered in the Islamic world by the Iranian militants. US intelligence, he said, finds increasing evidence that the character of the so-called student organization ostensibly in charge of occupying the US embassy in Tehran is taking on a more pronounced Marxist flavor.

★ Several influential members of Congress have expressed consternation over the Administration's decision to hold up—and possibly cancel—the final and crucial underground test of a modified nuclear warhead for the Poseidon SLBM. An underground detonation was scheduled at a test site in Nevada early in November. The White House and the US Arms Control and Disarmament Agency intervened on grounds that the yield of the device—pegged at a low forty kilotons—might exceed inadvertently the 150-kiloton ceiling of the as yet-not-ratified Threshold Treaty on nuclear weapons tests between the US and the Soviet Union. Congressional critics of the Administration equate its supercautious attitude concerning nuclear weapons tests with "pusillanimity," especially in light of the fact that last year the Soviets conducted several tests that probably exceeded the limits of the Threshold Treaty by a factor of two, according to US calculations. A senior defense official told this column that the US has under development ten nuclear weapons that require testing before they can be certified for production and transferred to the nuclear stockpile. The United States, the official contends, has curbed weapons tests also through a policy of constrained funding to the point where the nation practices a "budgetary test ban."

Two related developments contribute to the frustration of knowledgeable congressional experts over the Administration's weapons testing policy: The fact that, according to heretofore classified information revealed by Defense Secretary Harold Brown, the US ability to gauge Soviet nuclear weapons tests is held to a span ranging from half to twice the actual yield of the detonation; also, the White House has instructed the Pentagon and the Air Force to calculate the magnitude of Soviet test shots with a far more generous margin of error than had been the case in the past. Reason for the latter probably is the wide gap between what the US knows about Soviet treaty violations and how little can be legally documented.

★ Evidence of continued management problems and, concomitantly, the possibility of further slips in the scheduled availability of the Space Shuttle until the end of this year or beyond are intensifying the belief among senior defense officials that an experienced Air Force program manager should be placed in charge of developing this vital national resource. Advocates of this approach point to the singular turnaround of the Apollo program once USAF's Maj. Gen. (eventually General and Commander of the Air Force Systems Command) Samuel Phillips took over management of the program that culminated in landing American astronauts on the moon.

★ Latest DoD studies indicate that even with a generous investment of time and money, a new strategic penetrating bomber is not likely to achieve performance and survivability improvements more than ten to twenty percent above the defunct B-1. Hence, recognition that canceling the B-1 program was one of the most egregious errors of the past decade is increasing among defense analysts, in the Administration and out.

★ The Joint Chiefs of Staff, on their own initiative but encouraged by some elements of the Administration, have conducted a comprehensive review of all arms-control accords and negotiations involving the US and found that the US defense posture and world stability have gained little from them. The fact that the JCS carried out a review of these arms-accord areas rather than relying on PDM 50, a Presidential Decision Memorandum meant to preview the outlook for future arms-control accords and their potential impact on this nation's defense capabilities, has caused raised eyebrows among some White House officials.

★ Although the Air Force's drive to modernize tactical airpower in Europe as well as elsewhere is making headway, Gen. John W. Pauly, CINC USAFE, told a subcommittee of the House Committee on Armed Services, "a shadow is cast across that expanding capability. We find ourselves in the paradoxical position of having made large investments in equipment and facilities and now not being able to capitalize on those investments due to the lack of adequate O&M [operations and maintenance] funds. Consequently, the overall momentum of our readiness program is threatened."

Because of this serious deficit in O&M funds, he told the subcommittee, "we had to cancel our participation in all NATO exercises other than those financed by the Joint Chiefs of Staff. We canceled activities like our squadron exchange program whereby a USAFE squadron would visit a host nation unit and operate with [it] and practice [its] procedures. These are extremely valuable exercises and impact directly on our interoperability with our NATO allies. . . . Many of our allies question why we are not supporting these exercises and programs, when very often we took the lead in initiating the program."

Also, General Pauly pointed out, curtailed funding for the movement of munitions has caused a situation "where two-thirds of on-hand munitions are maldeployed due to changes in munitions, in weapon systems, in unit locations, or [because of] inadequate storage. While the munitions may be in the theater, they are not located close to the aircraft on which they will be loaded in wartime." In a similar fashion, inadequate O&M funding also slowed down USAF's all-important chemical warfare protection program to the point where "we were forced to reduce the buy of critical chemical warfare protection suits in FY '79 by one-third."

In summary, he said, "If USAFE is required to operate in FY '80 at the approximate level of FY '79, mission elements or bases will have to be cut, aircrew proficiency will drop, munitions will remain maldeployed, morale will be adversely impacted, and other capability indicators will decline." ■

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Aerospace World News, Views & Comments

By William P. Schlitz, ASSISTANT MANAGING EDITOR

Washington, D. C., Jan. 9

★ NASA picked two companies to undertake design definition studies of a new Solar Electric Propulsion System that could become an integral element of the US's Space Transportation System.

Boeing Aerospace Co., Seattle, Wash., and Lockheed Missiles & Space Co., Sunnyvale, Calif., each will receive $1.15 million to perform the twelve-month studies.

Such solar-energy technology, under development by government and industry since the early '60s, shows promise of being especially efficient, with long continuous operating lifetimes, for work in space.

A Solar Electric Propulsion System would be suitable for delivering probes to planets in the outer solar system, close observation of the sun, and extended operations in earth orbit, among other things.

The system is currently a candidate for NASA's proposed international mission to two comets—Halley's and Tempel-2—a journey that would span four years and cover more than 2.5 billion km (1.6 billion miles).

Using solar electric propulsion engines for the first time in deep space, an unmanned spacecraft would encounter Halley's comet in 1985, release an instrumented probe toward it, and then go on to rendezvous with Tempel-2 in 1988. The craft would accompany the comet for a year or more as Tempel-2 circles the sun. Closeup photos and scientific data about the comets' chemical and physical nature may shed more light on the origin and evolution of the solar system, NASA officials believe.

While the mission to the comets is still in the formulation stage, the early selection of participants, including members of the eleven-nation European Space Agency, is required pending approval.

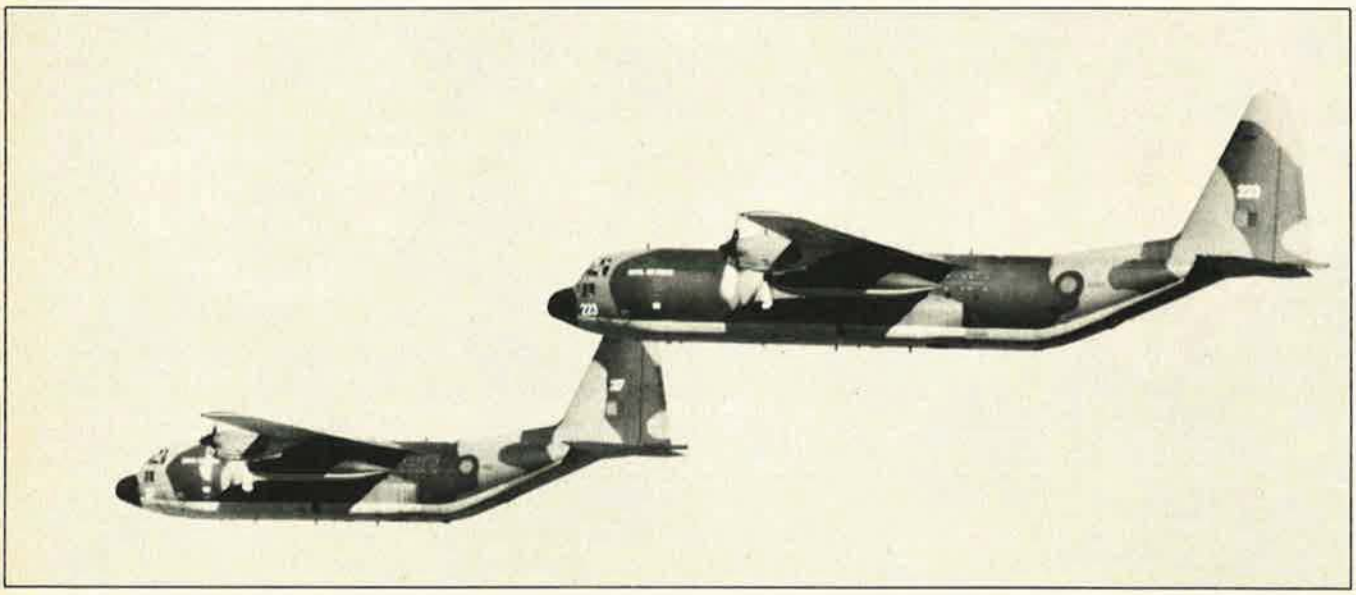
Comets, relatively small bodies circling the sun in orbits of widely varying periods and distances, are composed of loose mixtures of water, ice, frozen methane, ammonia, carbon dioxide, and other gases, and bits of cosmic dust, rock, and sand. When heated close to the sun, their tails of dust and gases can stretch hundreds of millions of miles in length.

★ USAF has awarded contracts totaling more than $88 million for the competitive validation of system concepts for the Wasp Minimissile system. The weapon is the third of three competitive concepts of the Air Force's Wide Area Antiarmor Munitions (WAAM) program to enter the validation phase.

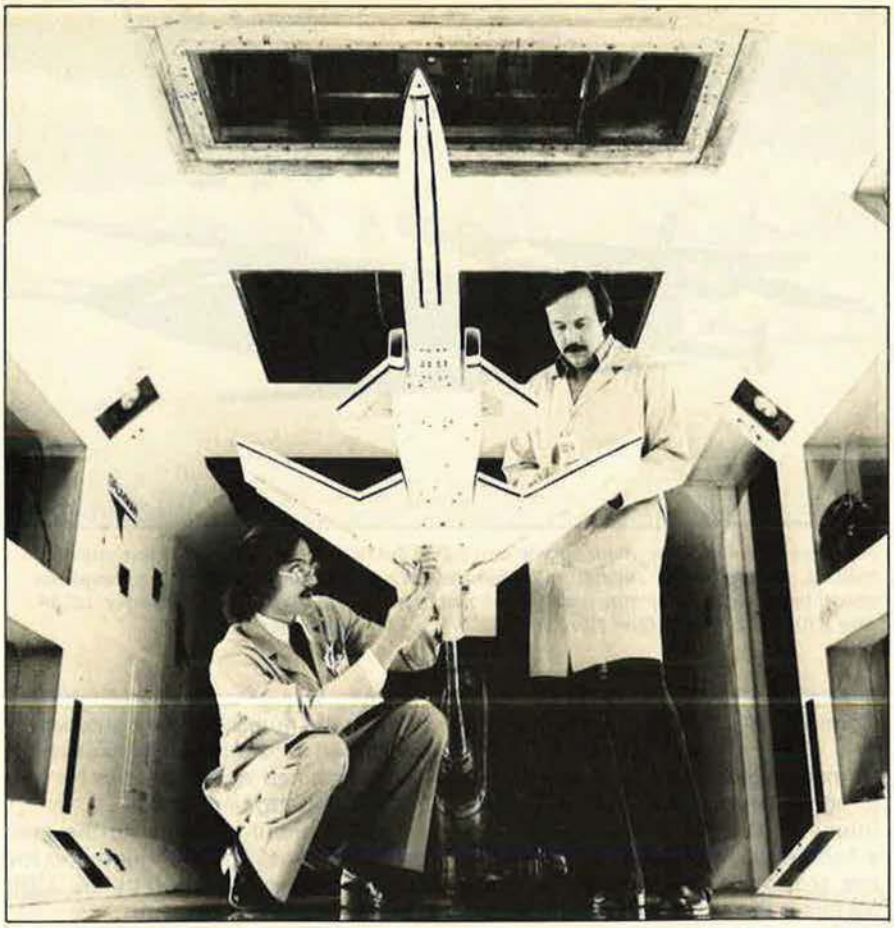
The contracts were let to Boeing Aerospace Co., Seattle, Wash. ($45.1 million), and Hughes Aircraft Co., Canoga Park, Calif. ($42.9 million).

Wasp is visualized as an air-delivered, antiarmor weapon system capable of multiple armor kills per aircraft pass or sortie. The missiles are to be launched individually or salvoed from pod launchers. Each missile will have a lock-on-after-launch seeker with adverse weather capability and hit-to-kill guidance. Wasp validation is expected to be completed in FY '82, at which time USAF will select one of the two contractors to continue full-scale engineering development.

Besides Wasp, the WAAM program includes the Antiarmor Cluster Munition (ACM) and the Extended Range Antiarmor Munition (ERAM). *(For a*



The first RAF C-130 stretched to a "Super Hercules" configuration with a standard C-130K in a fly-by at the Lockheed Marietta, Ga., facility. *See item, p. 25.*



While the forward-sweptwing is not a new concept, design engineers say the time is right for such technology because of advances in materials fabrication. Here, preparations for wind-tunnel tests at Grumman Aerospace Corp.'s Bethpage, N. Y., facility.

rundown on armaments currently being developed for USAF, see December 1979 issue, p. 40.)

★ In mid-December, Lockheed-Georgia Co. turned over to the UK the first "stretched" RAF C-130 transport. (Earlier in the month, the first stretched C-141 was delivered to USAF.)

Lengthening the plane added almost forty percent in cargo space. The planned stretch of thirty RAF C-130s—known as the C-Mk3—will net a gain equivalent to ten additional C-130s without the requirement for added maintenance personnel, aircrew, and base capacity—the same arguments that led USAF to stretch the C-141 fleet.

The remaining C-Mk3s will be stretched in the UK, with Lockheed-Georgia providing the fuselage sections. The stretched C-Mk3s will be powered by the 4,508-hp Allison propjet engine standard on the C-130.

The C-Mk3 will be able to haul ninety-two paratroopers and their equipment, compared to sixty-four in the previous configuration. Or 128 infantry and their equipment, compared to ninety-two. The longer aircraft will accommodate ninety-three litter patients, twenty-three more than the unstretched C-130, and six attendants.

No plan has been announced to stretch any of USAF's fleet of C-130s.

★ The Air Force Space Division, Los Angeles AFS, Calif., has under preliminary test a laser communications system that may find application aboard satellites for the high-speed and secure transmission of data.

According to Space Division engineers, if LASERCOM meets its potential it will be capable of transmitting one gigabit (one billion bits) of information per second. The system's narrow five microradian beamwidth would allow data to be received only by the intended user, thus providing tight security. (From its geosynchronous operating altitude of 22,250 miles in space, the LASERCOM communications "footprint" on earth would be 0.1 mile in diameter compared to a 200-mile diameter of an advanced radio frequency system.)

Additionally, the system would also offer flexibility to allow many simultaneous lower-data-rate users to communicate by utilizing a wider beamwidth. This would permit a great number of spacecraft, airplanes, surface vessels, and ground users to relay information to a LASERCOM satellite for subsequent real-time or delayed transmission to other users.

Final tests in mid-1980 using a modified KC-135 are to demonstrate the ability of sending data from the aircraft via laser link to a ground station. If proved feasible, on-orbit operation of a LASERCOM system could begin in the mid-1980s, officials said.

★ The 509th Bombardment Wing, Pease AFB, N. H., won SAC's 1979

First flight in December of Netherlands-built F-16 destined for the Norwegian Air Force. In an hour-and-a-half flight, the aircraft hit Mach 1.6. Netherlands's Fokker is to assemble seventy-two F-16 air combat fighters for Norway and 102 for the Dutch Air Force.

Aerospace World

Powered by a 48,000-hp main engine and 6,000 pounds of thrust from a Sidewinder missile, the "Budweiser Rocket" in December became the first land vehicle to break the sound barrier, driven by movie stunt man Stan Barrett. Maj. Gen. Charles Yeager, USAF (Ret.), first to achieve Mach 1 in the Bell XS-1 in 1947, witnessed the event.

Bombing and Navigation Competition with an overall 91.8 percent in possible points and was awarded the event's highest honor, the Fairchild Trophy.

The trophy is presented to the wing with the best combined bombing, short-range attack missile, and navigation team scores. It was named for Gen. Muir S. Fairchild, USAF Vice Chief of Staff in 1950.

Dubbed Giant Voice '79, the weapons meet ended with a symposium of finalist crews at Barksdale AFB, La., in late November. It began last August. Competing were SAC, TAC, NORAD, AFRES, ANG, and RAF Strike Command crews.

Runner-up in the meet was the 380th BW, Plattsburgh AFB, N. Y., which was awarded the Saunders Trophy for the tanker unit compiling the most points in all phases of the competition excluding fuel transfer. The trophy is named for Brig. Gen. Don W. Saunders, former Commander of SAC's 57th AD, killed in June 1958 while attempting to set a world cruise record aboard a KC-135.

The Mathis Trophy, presented for the most points in high- and low-altitude bombing, was taken by TAC's 27th TFW, Cannon AFB, N. M., an F-111D unit. (In his congratulatory message to the 27th, Eighth Air Force Commander Lt. Gen. Edgar S. Harris, Jr., said, "Your bombing performance gives all our crews something to shoot for in future competitions. I do trust you will not make this a habit though.") Sponsored by AFA, the trophy is named for Lt. Jack Mathis, a B-17 Medal of Honor winner killed over Vegesack, Germany, during World War II. The 27th also took home the John C. Meyer Memorial Trophy, awarded to the F/FB-111 unit best in low-level bombing and electronic countermeasures. It is named for the former CINC SAC.

The Lt. Gen. James H. Doolittle Trophy was presented to Eighth Air Force, the numbered Air Force whose assigned B-52 units achieve the highest combined average score for low-level bombing and SRAM.

The Bombing Trophy, to the crew with the most points in high and low bombing, was captured by the 380th BW.

The William J. Crumm Linebacker Memorial Trophy went to the 28th BW, Ellsworth AFB, S. D., for the B-52 or RAF Vulcan unit tops in high-altitude bombing. The trophy honors a former Commander of SAC's 3d AD.

The Navigation Trophy, for which only tankers compete, went to the

Air Force Pilot Overcomes Injuries, Logs 1,000 Hours in F-15

An Air Force pilot whose ability to walk again was questionable following an aircraft accident was first to log 1,000 hours in the new F-15 Eagle air-superiority jet fighter.

In July 1968, Lt. Col. Thomas C. Skanchy punched out of a malfunctioning F-4 Phantom on takeoff from Seymour Johnson AFB, N. C. His chute didn't open and he barely survived, suffering two broken legs, a broken ankle, pelvis, and back, plus internal and head injuries. His backseater was killed.

Though doctors were concerned that he might not walk again, the injured man fought not only to regain the use of his legs but to return to the cockpit. After four months in traction, Colonel Skanchy was discharged from the hospital wearing a special cast that covered his body from the chest down.

At home, he had the full support of his family in his herculean effort to become fully rehabilitated.

"By the spring, they had reduced my cast to where I had one leg partially free. That gave me a chance to get out and exercise," said Colonel Skanchy, who began jogging on crutches. Eleven months after the accident, he was free of the cast but not of his compulsion to return to flying status.

After proving that he could hack it physically, one test remained: "I went to Womack Hospital at Fort Bragg for tests by neurosurgeons to show there was no brain injury."

Today, Colonel Skanchy, forty, commands the 433d Fighter Weapons Squadron at Nellis AFB, Nev., where he heads an elite cadre of instructor pilots who demonstrate to other F-15 pilots how to teach the latest in aerial combat and ground-delivery tactics. On December 14, he logged his 1,000th hour in the F-15.

157th Air Refueling Group, New Hampshire ANG, Pease AFB, N. H.

The Gen. Russell E. Dougherty SRAM Trophy, named for the former CINC SAC, was presented to the 379th BW, Wurtsmith AFB, Mich., for the best B-52G/H or FB-111 unit in simulated SRAM launches.

The Maj. James F. Bartsch Electronic Warfare Trophy, named for one of USAF's most decorated EW officers, went to the 92d BW, Fairchild AFB, Wash., for tops overall in EW.

In addition to unit awards, outstanding crew honors also went to: B-52 crew S-01, 92d BW; F-111 crew R-260, 27th TFW; FB-111 crew S-01, 509th BW; KC-135 crew S-152, 380th BW; Vulcan RAF-1, RAF Waddington, UK; and best interceptor crew, 318th FIS, McChord AFB, Wash.

★ Solar flares are among sun-related phenomena responsible for causing disruptions in electronic communications here on earth and accused in our folklore of bringing about crop failures and economic calamities.

The flares are violent eruptions on the sun's surface that most frequently occur in an eleven-year cycle, a period next due in 1980–81. No one can explain the cycle.

NASA's Solar Maximum Mission will actually be a long-term program to study the phenomena using satellites, sounding rockets, and ground-based instruments. Through coordinated observations over a wide band of wavelengths in the ultraviolet, X-ray, and gamma-ray regions of the electromagnetic spectrum, scientists expect to obtain many clues about the causes of solar flares and how they might be predicted.

Although the various spacecraft will concentrate on solar-flare activity, measurements also will be taken of the sun's radiation to within one-tenth of one percent of the total output over a period of a year.

According to computer model predictions of the response of earth's atmosphere to solar radiation, such a precise measurement should be sufficient to definitely establish whether changes in total solar heat output are enough to affect earth's climate and weather.

A Sikorsky HH-53 air-recovers a Boeing AGM-86B air-launched cruise missile following a recent flight over USAF's Utah Test and Training Range. The missile simulated a strategic mission. The competition between the Boeing missile and that built by General Dynamics Corp. is expected to be decided next month, with the winner awarded the major share of ALCM production.

★ A modern transportable aircraft landing control system, procured through AFSC's Electronic Systems Division, Hanscom AFB, Mass., has been delivered to Australia.

The system will be located at Richmond AB in New South Wales on Australia's eastern coast. During defense exercises, it can be moved to normally nonactive air bases to aid in aircraft landings.

The system consists of an airport surveillance radar used to control aircraft within a sixty nm (110 km) range, a precision approach radar, and an operations center to house radar displays and air traffic controllers. The system and its operators can be transported by truck, rail, ship, helicopter, and transport aircraft. The equipment, stored in six components weighing about 6,000 pounds (2,722 kg) each, can be set up ready for operational checkout on the flight line in fourteen hours.

Besides the transportable system, radar upgrades featuring US-built equipment are to take place at the Naval Air Station at Nowra, New South Wales, and six other air bases in Australia, replacing outmoded equipment currently in use. Aussie personnel are in training by TAC to operate and maintain the systems. Raytheon Equipment Div., Wayland, Mass., built the radar systems under a $23 million Foreign Military Sales contract.

★ Since Western Europe is surrounded by thousands of miles of seaway, NATO's plans to purchase eighteen E-3A Sentry airborne warning and control system aircraft specified that the system have maritime as well as aircraft-tracking capability.

In a series of flights as much as 300 miles off the US West Coast, a test E-3A equipped with a modified radar has determined that not only can the aircraft spot ships and small patrol vessels from its operating altitude of 30,000 feet but also in very rough ocean conditions. It can locate craft

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As its name *Tracking and Data Relay Satellite implies, TDRSS can keep track of many other satellites (as many as 100 in fact); it can transmit data for as many as 27 at a time at extremely high bit-rates. It will also relay commercial TV, voice and data at lower cost than ever.

The single TDRSS ground station at White Sands, New Mexico, is now in the early testing phase and the system as a whole is planned for operational use during the 1980s. TRW is building the satellites and part of the ground equipment as well as doing the end-to-end system engineering and integration for this most advanced and most automated of all telecommunications networks. We're also developing the extremely complex control software.

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moving slowly or dead in the water and operating close to coastlines. This capability has not detracted from its function of detecting aircraft within a range of 250 miles, officials declare.

The program is being jointly directed by AFSC's Electronic Systems Division and E-3A contractor, Boeing Aerospace Co., Seattle, Wash. TAC and Westinghouse, the radar contractor, also are participating. The test flights are to continue into the early months of 1981.

The maritime surveillance feature will be added to all Air Force E-3As beginning with the twenty-fifth aircraft scheduled for delivery in late 1981. The Air Force plans a total buy of thirty-four operational E-3As. All NATO E-3As will be maritime-capable beginning with the first to be delivered early in 1982.

★ USAF has received the first production units of a new, lightweight, air-droppable navigation aid that from a ground site assists pilots in locating drop zones and landing areas.

The battery-operated tactical navigation (TACAN) system can transmit aircraft bearing and distance information up to a range of seventy-five nautical miles (139 km).

The TACAN, in three components, can be rigged on a pallet and dropped by a single cargo chute for use by an Air Force Combat Control Team jumping on an objective. On the ground, the components can be backpacked to where needed and set up in fifteen minutes. In combat conditions, members of the CCT can monitor the system via a radio link from the distance of a mile.

The TACAN can also serve in disaster relief to pinpoint sites where medical and other supplies need to be dropped.

Earlier Air Force TACANs weighed between 500 and 1,000 pounds and had limited flexibility and performance, officials said. The new system, of which seventy sets have been ordered, with the option for an additional seventy, has been extensively tested under operational conditions, including air drops and in Arctic and tropic environments. Contractor for the TACAN is E-Systems, Inc.'s Montek Division, Salt Lake City, Utah.

★ Light weight and dependability are but two attributes of a new radio developed to ease the job of TAC's ground-based forward air controllers.

The radio, the AN/PCR-104, is about the size of a cereal box and weighs fifteen pounds (6.9 kg)—a third of the weight of radios now in use.

The PCR-104's miniaturized and all-solid-state electronics provide all-weather capability and a stronger, clearer signal with considerably less background noise than radios now used.

Powered with a rechargeable battery for up to twelve hours of continuous operation, the radio is also equipped with a ten-foot (3.04 m) whip-type antenna that gives it a communication range of thirty miles (48 km). A longer, pole antenna supported by guy wires can extend the radio's range to 100 miles (161 km). Tests indicate the radio can operate some 2,500 hours before failure.

Hughes Aircraft Co.'s Ground Systems Group, Fullerton, Calif., is producing a total of 625 PCR-104s for forward air control, to include coordination of close air support for ground troops and parachute drops of personnel and equipment.

★ **NEWS NOTES—Raytheon Co.**, Lexington, Mass., a diversified electronics firm and major DoD contractor, and **Beech Aircraft Corp.**, Wichita, Kan., a leading manufacturer of general-aviation aircraft and target drones, have agreed to merge, the two companies announced. Raytheon had about $3.6 billion in sales in 1979 and employs 65,000; Beech, $607 million and more than 10,000 employees.

Long-time AFA member **Joseph A. Reich, Sr.**, was recently presented a **Special Achievement Award** by the Colorado Aviation Hall of Fame. The Colorado Springs resident, known as "Mr. Air Force Academy," was cited for **his years of service** in the location and growth of the Air Force Academy in Colorado.

The first prototype of the advanced technology SH-60B Seahawk helicopter Sikorsky Aircraft is developing for the US Navy made its maiden flight in mid-December at the company's flight center in West Palm Beach, Fla. Seahawk is to serve as air vehicle in the Light Airborne Multi-Purpose System (LAMPS), designed to seek and destroy enemy subs and ships.

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Aerospace World

Capt. Henry B. Garrett, a planetary space physicist, and **Capt. Robert M. O'Connell**, an electronics engineer, were presented the **Air Force Research and Development Award for 1978**. Captain Garrett for "developing to the point of useful application, a specification of the space environment at geosynchronous orbit altitudes," an engineering standard for the design and development of Air Force satellites. The work is considered a major breakthrough in space science. Captain O'Connell, for his work in acoustic wave research that has led to increases in antijam capabilities of radar and communications networks.

Some **2,937 hopefuls applied** for the **ten to twenty open astronaut slots** during the recruiting drive that ended December 1. More than 300 of the applicants signed up for both mission specialist and pilot astronaut. Of the total, 390 were women. NASA will narrow the field down to about 100 for screening and physicals next spring.

In mid-December, the Soviets achieved the **successful linkup of a Soyuz-T (for transport) with the orbiting Salyut-7 space station**. The unmanned Soyuz-T is believed to have been redesigned internally to carry a three-person crew instead of two. The docking test was accomplished by radio commands from earth.

"Shorty" Powers, the "eighth astronaut," died in January. See note.

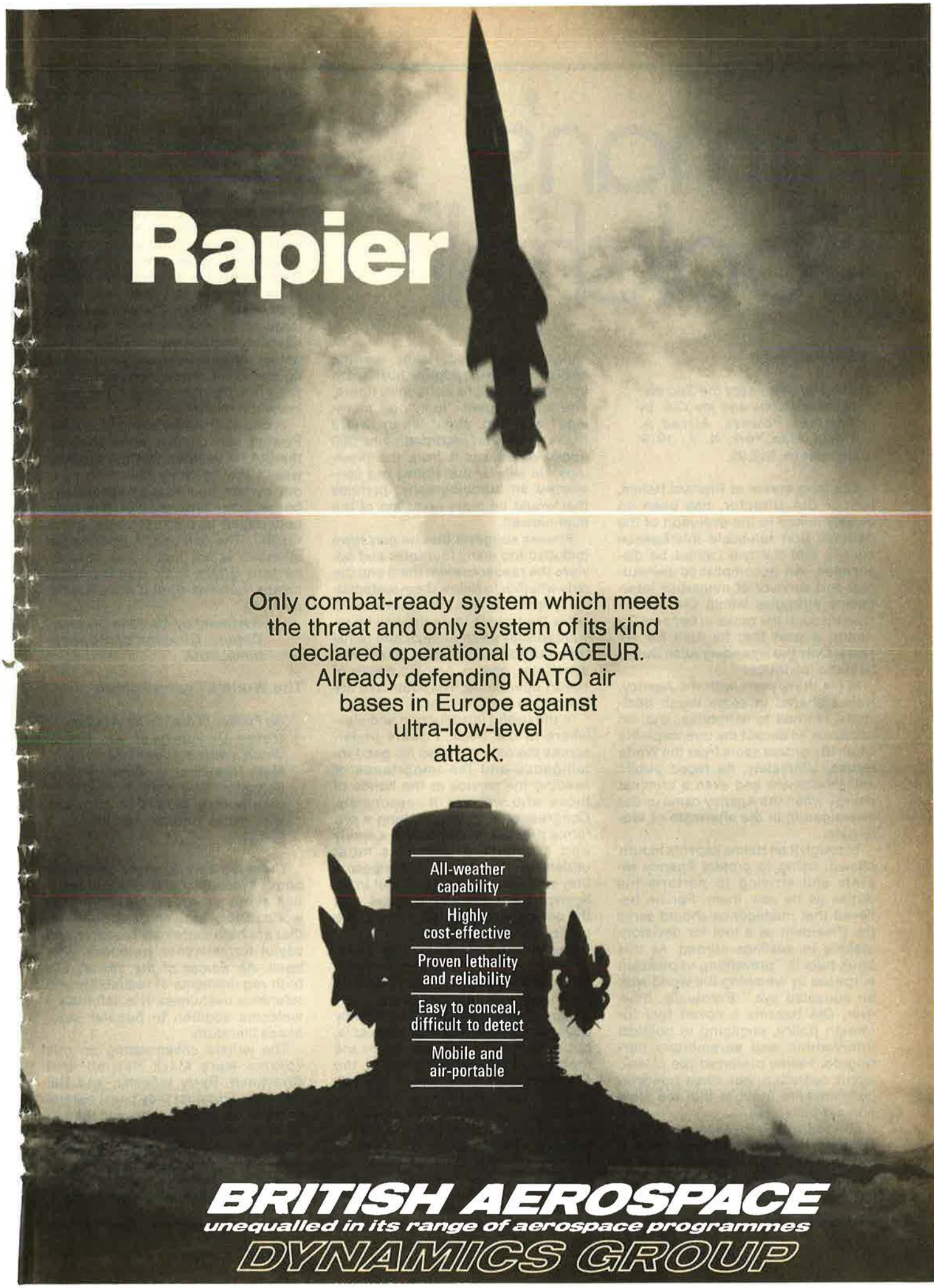
It's likely that a score of nations will be represented at the **tenth World Aerobatic Championships** to be conducted in Oshkosh, Wis., **in August 1980**. The US will host for the first time.

The 89th Military Airlift Group, Andrews AFB, Md., which provides airlift for the President and other VIPs, has put out a call **to fill several pilot slots**. Experience is a must. Deputy Commander for Ops Col. E. L. Mueller has details: AUTOVON 858-5714 or (301) 981-5714.

Lt. Gen. Ira C. Eaker, USAF (Ret.), **aviation pioneer and long-time AFA member**, was presented a Special Congressional Gold Medal in Pentagon ceremonies in mid-December. (*Also see p. 103.*) Among his contributions to aviation and national security, General Eaker's early work in instrument flying and air refueling was especially noted. During World War II, General Eaker commanded the Eighth Air Force and later Allied Air Forces in the Mediterranean. At the time of his retirement in April 1945, he was Deputy Commander of Army Air Forces.

Died: Lt. Col. John A. "Shorty" Powers, USAF (Ret.), NASA's "voice of the astronauts" during the manned space program in the 1960s, whose phrase, "A-OK," entered the lexicon, of natural causes in Phoenix, Ariz., on January 1. The long-time AFA member was fifty-seven. ■

Index to Advertisers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Airman's Bookshelf

CIA Helms-man

The Man Who Kept the Secrets: Richard Helms and the CIA, by Thomas Powers. Alfred A. Knopf, New York, N. Y., 1979. 393 pages. $12.95.

The long career of Richard Helms, former CIA Director, has been so closely linked to the evolution of the nation's first full-scale intelligence agency that the two cannot be dissociated. An accomplished bureaucrat and survivor of numerous internecine struggles within CIA, Helms rose through the ranks to become Director, a post that he held for six years. Only the legendary Allen Dulles held the job longer.

In his thirty years with the Agency, Helms shared in some tough decisions, learned to temporize, and, on occasion, to accept the unacceptable when the orders came from the White House. Ultimately, he faced public embarrassment and even a criminal charge when the Agency came under investigation in the aftermath of Watergate.

Through it all Helms kept his mouth closed, trying to protect Agency secrets and striving to perform his duties as he saw them. For he believed that intelligence should serve the President as a tool for decision-making in dealings abroad. As this book puts it, "preventing unpleasant surprises by watching the world with an educated eye." Eventually, however, CIA became a covert tool for foreign policy, engaging in political intervention and paramilitary derring-do. Helms preferred the classic agent operation, but some powerful policymakers thought this too slow and old-fashioned.

The Pulitzer Prize-winning author, Thomas Powers, has produced a well-written, well-researched, nonjudgmental book. If it deals more with the Agency than with the man, one cannot be surprised. Helms, ever the cool professional, popular but hard to know well, remains a shadowy figure. The author spent "four long mornings" with him, about ten or twelve hours in all, and recorded some 300 pages of transcript from the meetings. He tells us that Helms has considered an autobiography; perhaps that would be more revealing of the man himself.

Powers suggests that he may have included too many footnotes and advises the reader to skim them and decide whether to follow them systematically with the text. The reader who takes the trouble to do this will be rewarded with a rich mine of additional information—character sketches, anecdotes, gossip, graphic details of covert operations. The footnotes are simply too good to miss.

In the useful introduction and elsewhere in the book, Powers underscores the nation's need for good intelligence and the importance of keeping the service in the hands of those who will use it responsibly. Congressional oversight, long a *pro forma* process, must become a reality and committee members must understand the nature of the people they oversee. The professional intelligence officer usually answers only the questions asked; it is a part of the job to volunteer nothing.

The purpose of intelligence is that of "mapping the thread of American interest through the confusion of local reality" while gathering information. Powers states, "The Agency does not decide what that interest is, but once it has been defined by the mood and preconceptions of the President and his advisers, the CIA ensures that it is at the heart of every briefing. . . . The fear and resentment of the CIA around the world are justified, not because it is always on the wrong side—it is not—but because it represents an inevitable primacy of American interests which may be shallowly conceived and callously pursued."

The emphasis on secrecy goes with the territory in day-to-day dealings among agents. In Chapter Six there is a good description of the ideal working relationship that should exist between an agent and case officer to prevent compromise. As on a well-built ship, watertight compartmentalization is a paramount concern. Each element in an operation should know only that part with which it directly deals. When CIA was assigned large-scale operations, it achieved notoriety and lost much of its ability to gather information and "conduct the quieter forms of coercion appropriate to an intelligence service." Too many knew too much.

In one of those excellent footnotes, Powers tells us that while studying the CIA he decided that the problem wasn't the Agency's failure to carry out certain operations successfully, but whether they should have been undertaken in the first place. In his words, "The reason CIA justifies our attention is not that it has pursued certain goals with questionable means, but that what it does is what policy is."

—Reviewed by Marjorie Ulsamer, Deputy Director of Publications, HUD.

The World's Flying Forces

Air Forces of the World: An Illustrated Directory of All The World's Military Air Powers, by Mark Hewish *et al*. Simon and Schuster, New York, N. Y. (US distributor), 1979. 264 pages with maps, photos, and index. $24.95.

There are several useful reference books available that contain information about air forces throughout the world. There are very few, however, that are both extremely readable and useful for reference purposes. This book, *Air Forces of the World*, fills both requirements of readability and reference usefulness. It is definitely a welcome addition to popular aerospace literature.

The writers collaborating on this volume were Mark Hewish, Bill Sweetman, Barry Wheeler, and Bill Gunston. Together they boast several years of writing experience in the aviation field with such periodicals as *Flight International* and such well-respected books as *Soviet Air Power*, *Soviet War Machine*, and *U.S. War Machine*. The consultant for the book

was John W. R. Taylor, editor of *Jane's All the World's Aircraft*.

Designed to both fully describe the air arms of 125 countries and enable comparison between them, the volume divides the world's nations into thirteen major regions. Within a region, each country's air force, as well as the air arms of the army, navy, coast guard, and any military-related organization, are fully discussed. The narrative covers the organization and structure of the air force as well as the present aircraft inventory, past combat experience and future plans for force expansion, and new aircraft procurement. The section on the Soviet Union also contains a comparison between Warsaw Pact and NATO air forces in the areas of strike, close air support, and air superiority.

Nearly all of the air force descriptions for non-Communist countries contain a chart that further describes the country's current aircraft inventory in greater detail. The charts include unit designations, type of aircraft, role or mission use, home base, and number of aircraft possessed. One or more color photographs of each country's distinctively marked aircraft are also included.

A pictorial guide to 189 basic aircraft types used throughout the world includes line drawings of the aircraft as well as airframe dimensions, speed, range, and present user nations.

The book is also supplemented by an eleven-page map section depicting the world's air force bases as well as a complete index for the entire volume.

The only major fault in this book are several ambiguities in aircraft type and mission listed in the air force inventory charts. Knowledgeable readers will rightly take issue with the USAF F-15s at Bitburg, Germany, being designated as fighter/ground attack (FGA). The A-10As at Myrtle Beach are listed as fighter/ground attack while those at RAF Bentwaters are only credited in the attack role. A brief discussion of aircraft missions might have better equipped the general reader to grasp the nuances between fighter and interceptor roles or attack and fighter/ground attack.

This book holds with the tradition of excellence expected from past performance by its authors. It will be an invaluable addition to the bookshelves of both military professionals and airpower enthusiasts.

—Reviewed by Capt. Don Rightmyer, USAF, Office of Air Force History.

New Books in Brief

Corsair, by Barrett Tillman. The Corsair era—from test flights in 1940 through its use thirty-eight years later by the Honduras Air Force—is recreated in fascinating detail by the author. A sleek-looking aircraft with an inverted gull wing, the Corsair proved to be an able day and night fighter, dive bomber, and reconnaissance plane, flying both land- and carrier-based missions. The author goes behind the scenes, revealing little-known facts including the delay and near-cancellation of the Corsair's role aboard US aircraft carriers. Photos, specifications, line drawings, appendices, index. US Naval Institute, Annapolis, Md., 1979. 219 pages. $15.95.

Enemy in the Sky, by Air Vice Marshal Sandy Johnstone. The author was assigned to the 602 (City of Glasgow) Squadron at the outset of WW II, becoming commander in 1940. He kept detailed notes that chronicled the Squadron's pivotal role in the Battle of Britain. His account also offers a glimpse of civilian life at the time—air raids, blackouts, fuel shortages, and the British wit that prevailed despite deprivation and danger. Presidio Press, San Rafael, Calif., 1979. 191 pages. $12.95.

Far China Station: The US Navy in Asian Waters, 1800–1898, by Robert Erwin Johnson. While some US naval activities in Asia during the nineteenth century are known, the author believes the East India Squadron, which fought and cruised in Asian waters, has not been adequately researched. He examines the origins of the Squadron, defines its importance in implementing US policy, and describes the hazards that were routinely faced by the Squadron's ships and men. Bibliography, index, notes. US Naval Institute, Annapolis, Md., 1979. 307 pages. $18.50.

Intelligence Requirements for the 1980's: Elements of Intelligence, edited by Roy Godson. Under the auspices of the National Strategy Information Center, scholars in national security policy, law, and societal values met to study intelligence and determine steps to improve US performance in the future. This book reprints papers presented at the group's first meeting last April, which focused on US needs in four areas: analysis and estimates; clandestine collection; counterintelligence; and covert action. Participants found room for improvement in the first two areas and, in the case of the third, noted that lead times in developing intelligence capabilities can sometimes equal or exceed those required for developing strategic weapons. They agreed the US has not developed assets it will need, and, through neglect, is closing out options that may be required in the 1980s. Scholars concurred that some of the Administration's foreign intelligence guidelines are counterproductive. National Strategy Information Center, Inc., Washington, D. C., 1979. 31 pages. $4.95.

Kill Devil Hill, by Harry Combs. A veteran airman details what the Wright brothers did to conquer the unknown and invisible in their quest to build a flying machine. When most aerial experimenters had given up, the Wrights, through sheer genius, began to discard what was known at the time and develop their own theories that ultimately proved to be right. This fast-paced book is based on the Wright papers, diaries, and interviews with acquaintances. Appendices, bibliography, index. Houghton Mifflin Co., Boston, Mass., 1979. 389 pages. $16.95.

Out of the Sky: A History of Airborne Warfare, by Michael Hickey. The author examines theories of the nineteenth century and probes German, British, American, Japanese, and Russian airborne actions in WW II. He details air mobility in post-WW II conflicts, from helicopters and light aircraft in Korea, Malaya, and Indochina and amphibious airborne strikes at Suez, to the French in Algeria and Israel's battles. Photos, maps, index, sources. Charles Scribner's Sons, New York, N. Y., 1979. 288 pages. $14.95.

Strategic Air Command: People, Aircraft and Missiles, edited by Norman Polmar. Here is the history of the US Air Force's nuclear deterrent force since 1946, based on the official reports of each year's key events, organizational changes, equipment, and deployments. It is a story of a rapidly evolving, highly adaptive force that successfully adjusted to the day-by-day changes in technology, policy, tactics, resources, and weapons as it fought two conventional wars and prepared for nuclear war. The Nautical and Aviation Publishing Co. of America, Inc., Annapolis, Md., 1979. 266 pages. $17.95.

—Reviewed by Robin Whittle

Perspective
Comment & Opinion

By Dr. David S. Yost, MONTEREY, CALIF.

NATO Europe and Senate Rejection of SALT II

President Carter has claimed that European "leaders and their countries would be confused and deeply alarmed" by Senate refusal to ratify SALT II. However, the Administration and fellow SALT-sellers have misrepresented European views. They ignore European misgivings, they do not analyze critically the declaratory support offered by European governments, and they exaggerate possible consequences of Senate rejection of SALT II.

NATO European governments and their supporters have endorsed SALT II with four major arguments: (1) SALT II is strategically adequate, since no rational Soviet leadership would accept even a slight risk of nuclear war; (2) SALT is the "barometer of détente," without which we might see a return to the cold war; (3) Senate rejection of SALT II could further undermine the credibility of US leadership of NATO; and (4) sensitive West European publics can only accept NATO decisions to deploy new medium-range missiles if SALT III limitations on both Soviet and NATO theater systems seem likely.

SALT-sellers have not acknowledged the four major misgivings stressed in Europe:

1. Further impairment of the credibility of the US guarantee. Shifts in the strategic balance reflected in SALT, together with Soviet active and passive defenses, have produced a realization that the US might not find it prudent to honor its guarantee in a crisis. French scholar Pierre Lellouche calls this SALT-encouraged situation "pre-decoupling," if not true decoupling.

2. Aggravation of the medium-range theater nuclear imbalance. Soviet superiority over NATO, by definition hard to quantify precisely for "gray-area" systems, has been aggravated by deployment of SS-20 missiles and Backfire bombers. SS-20s are not limited in SALT II, even though capable of ICBM range with reduced payload and easily convertible into SS-16 mobile ICBMs. Nor are Backfire bombers included in SALT II. The Backfire's unrefueled radius with a five-ton bomb load is greater than that of SALT-counted US B-52Ds, but Backfires are not counted because the Soviets have promised to use them only in theater missions. British scholar Laurence Martin describes this US SALT concession as "only the most explicit instance of going beyond merely neglecting threats to allies to actually diverting them in that direction."

3. SALT II hindrances to theater nuclear modernization. SS-20s, above all, have made it necessary for NATO to deploy nuclear delivery systems of comparable range, accuracy, and survivability such as Pershing II and ground-launched cruise missiles. The SALT II Protocol, however, prohibits deployment of sea- and ground-launched cruise missiles capable of exceeding a range of 600 kilometers until after December 31, 1981. Many Europeans are disturbed by the risk of Protocol extension beyond this date by executive agreement. They would welcome an amendment requiring a two-thirds Senate majority vote to extend it—if SALT II is ratified.

The Treaty's noncircumvention clause could also prevent transfer of US technology to allies. The Soviets have refused to endorse US reassurances to NATO Europe on noncircumvention. Manfred Wörner, defense spokesman of West Germany's Christian Democrats, has warned that if US views were challenged in a specific case, "a loudly declaimed interpretation by the Soviet Union would be enough to convince a good part of the government in Bonn of the need to accept this interpretation."

4. American unreliability in SALT negotiations. While the Administration has declared that Senate rejection would demonstrate US incapacity to lead the alliance, some Europeans argue that Administration behavior during SALT II has already tended to demonstrate such incapacity. They cite the collapse of US SALT II objectives in comparison to the original Carter proposals of March 1977, the B-1 cancellation blunder, and the mishandling of the enhanced radiation warhead issue.

In view of these misgivings, Administration forecasts of the consequences of Senate rejection—the weakening or destruction of NATO and/or general Finlandization—appear alarmist, and based on misunderstanding of European motivations. First, if SALT II is defeated, it is plausible to expect that after an initial period of post-SALT caution and confusion, renewed awareness of the magnitude of the Soviet threat would prompt a rallying to NATO. The US would then have a propitious opportunity to restore credibility of the American guarantee and to rectify the theater nuclear imbalance.

Second, Senate rejection would be secretly welcomed by European governments if accompanied by vigorous American programs in the strategic and theater nuclear areas. Such Europeans as Uwe Nerlich and Leopold Labedz argue that their governments' public support of SALT II is partly explained by their vulnerability to Soviet political pressure. The growth of Soviet military power and the increasingly doubtful nature of the American guarantee have made it imperative for European governments that Senate rejection or amendment of SALT II not be attributable to official West European intervention in the ratification process.

West Germany is particularly exposed, not only because of West Ber-

HOW TO SHARE YOUR PERSPECTIVE

The purpose of this department is to encourage the presentation of novel ideas and constructive criticism pertinent to any phase of Air Force activity or to national security in general. Submissions should not exceed 1,000 words. AIR FORCE Magazine reserves the right to do minor editing for clarity, and will pay an honorarium to the author of each contribution accepted for publication.

lin and common borders with Warsaw Pact countries, but also because millions of human contacts between East and West Germans (which have greatly increased with détente) could be curtailed at any time by Soviet orders. In fact, West Germany's official support of SALT II can be largely explained by political factors irrelevant to the strategic interests of the US and NATO. In the words of West German strategist Uwe Nerlich, ". . . Western Europe would be harder hit politically by a failure of SALT than the USA, but . . . at the same time, it would be endangered more strongly militarily by the implications of a continued SALT process than the USA."

Third, SALT III is dreaded by many Europeans as a situation in which NATO will be simultaneously (a) trying to improve its medium-range theater nuclear systems under SALT II constraints and (b) seeking to negotiate limits on distinctly superior Soviet theater nuclear capabilities, which are not constrained by SALT II.

It is highly improbable that the Soviets will agree in SALT III to degrade the SS-20's main purpose—that is, suppression of NATO's theater nuclear capabilities—through significant limitations. It is much more probable that the Soviets will use the lure of such limitations to restrict and delay NATO's own theater nuclear modernization.

Thus, it may be more helpful to NATO's theater nuclear modernization for SALT II to be rejected than for the SALT process to continue. What truly matters is not ratification of SALT II but restoration of the credibility of the American guarantee at the intercontinental and theater levels.

Sen. Frank Church of Idaho, an ardent SALT-seller, has indulged in irrelevant theatrics by comparing SALT II to the Treaty of Versailles. Senate rejection of that treaty meant US refusal to participate in the League of Nations and to guarantee the security of Western Europe. Senate rejection of SALT II could mean precisely the opposite. Ratification of SALT II could hinder US efforts to provide a credible deterrent guarantee to Western Europe; rejection could provide an opportunity to bolster that guarantee.

Dr. Yost is an assistant professor at the Naval Postgraduate School, Monterey, Calif. These are his own views, and do not necessarily represent US government policy. [Since this was written, further action on SALT II has been deferred because of the situation in Afghanistan.]

In a global atmosphere growing increasingly tense, military forces in the US must be ready to deploy overseas on short notice to protect vital national interests. A key element in planning for such contingencies is . . .

The Airborne/Air Force Team—Spearhead for Rapid Deployment

BY WILLIAM P. SCHLITZ, ASSISTANT MANAGING EDITOR

A CHILL wind sweeps the sandy surface of Normandy Drop Zone at Fort Bragg, N. C. Heavy equipment, palletized and rigged as if it had been air-dropped, has been prepositioned around the landscape: jeeps, field pieces, armored reconnaissance vehicles. It's an eerie scene. A battlefield without soldiers.

Soon, Air Force C-130 transports appear in the cloudless sky, approaching in a long staggered column. Over the drop zone the planes disgorge their cargo: paratroopers of the 82d Airborne Division. The troopers swing in their harnesses under inflated canopies as they quickly descend to earth. Once out of their chutes, the troopers—in camouflage combat fatigues and shouldering field packs—trot toward their designated areas, M-16 automatic rifles at port arms. The exercise is to time how quickly the heavy equipment can be de-rigged and moved into simulated combat and to give newcomers in the ranks experience in handling it under field conditions.

Within minutes, engines cough to life, howitzers are in position, and jeeps—bristling with radio antennas—are on the move toward the tree line.

Recently, there has been a flurry of media interest in such training jumps at Fort Bragg and the deployment of paratroopers on exercises elsewhere. The focus on the 82d is understandable, in a world atmosphere that is growing ever more ominous. Media attention underscores that the US's only airborne division has been designated a key element of a Rapid Deployment Force of some 110,000 troops in CONUS who are not NATO-specified and could be called upon to safeguard the US's vital interests abroad. (*For a look at the makeup of the Joint Deployment Agency, recently organized to work in tandem with US Readiness Command on improving procedures for rapid reinforcement overseas, see the January issue, p. 50.*)

The US Army's airborne elements have long been the subject of controversy. They came to center stage in World War II by employing a unique form of mobility: vertical envelopment. But with the advent of the helicopter as an organic tactical mobility tool of the ground forces in the 1960s, the future looked uncertain for parachute troops.

Now, in a worldwide strategic

Exiting the aircraft, above, and on the ground, right: the 82d Airborne Division's unique ability to seize and hold terrain.

climate growing increasingly threatening, parachute forces are once again in the limelight. As yet, no one has been able to invent a substitute for the airborne's capability of projecting a large military force by aircraft over extended distances to seize and hold terrain.

The 82d is composed of three infantry brigades and support elements: about 16,000 troops. In a contingency situation, the 82d's basic force would be the Division Ready Brigade (DRB), consisting of a combined-arms force of nearly 4,000 troops with the brigade as its core. Within the DRB, one of its three battalions is on standby alert, with the lead element's equipment rigged for airborne assault. Within it, one company is on two-hour alert, ready to move out immediately. It would act as the lead element in a deployment, followed by the rest of the battalion in eighteen hours, and the entire brigade within twenty-four hours.

The mission of the 82d is to be ready to fight anywhere in the world. This is reflected in the period of intense training through which the three infantry brigades are rotated, generally on a monthly basis in three cycles each quarter. (Summer months are reserved for ROTC and Reserve unit training and major component joint exercises under such authorities as US Readiness Command.)

During the intense training phase, the brigade and support units engaged in it are relieved of all such nontraining distractions as post guard duties, and spend weeks in the field. Honed to a fine edge and at the height of its combat-readiness at the conclusion of this training, the brigade then takes its place as the DRB.

Thus, with one brigade in intensive training and one designated as DRB, the third is free to attend to such routine matters as housekeeping chores in garrison, dispatching individuals to leadership and specialized schools, and leave.

But the rotational training cycle is simply the basic building block of divisional training. There are the annual exercises like Bold Eagle, to which a reinforced brigade is committed, and others up to division level that provide four major exercises a year. In scores of other exercises, elements of the division are likely to find themselves waist-deep in snow in Alaska, eating sand in the California desert, or slogging through the jungle in Panama. Furthermore, each of the division's nine infantry battalions undergoes a yearly training evaluation under the Army Training Diagnostic Program (ATDP), that includes a parachute assault followed by ground and airmobile (helicopter) operations with live-fire phases. Battalion, brigade, and division staffs participate in ad-

Pope AFB: The Airborne's Partner in Airlift

Pope AFB, N. C., more or less in the midst of the Army's Fort Bragg reservation, can best be described as an island of blue-suiters in a sea of Army green.

But the unity of the two installations goes beyond mere geography. Commonality of purpose in performing the airlift/airborne mission has created an atmosphere of mutual regard, and relations between personnel of the two services are cordial and cooperative.

At Pope is the famous Green Ramp, a staging area where, literally, everything comes together. It is on the Green Ramp that the paratroopers and their equipment are loaded aboard MAC's transports and become the responsibility of the Air Force.

The 317th Tactical Airlift Wing of Military Airlift Command's Twenty-first Air Force is headquartered at Pope. Also at Pope is USAF's Airlift Center, which reports directly to Hq. MAC, and is involved in developing and testing airlift capabilities and techniques. Currently the Center has seventy-one projects under way, including test-dropping new and modified Army equipment, high- and low-altitude test drops, and all-weather drops.

The 317th has three tactical airlift squadrons assigned to it at Pope, but can and often does draw on additional airlift resources throughout MAC.

Since the 317th is responsible not only for exercise and deployment airlift, but also for training drops of from 130,000 to 140,000 troops a year, Pope is the busiest air base in MAC (its operations center handles the mission assignments of fifty to sixty planes a day on average), and the seventh busiest in the Air Force. In its planning function, the 317th works closely with its Army counterparts to ensure that aircraft availability dovetails as closely as possible with airborne needs.

Methods of resupplying airborne troops include low-level parachute extractions, above, and heavy-cargo drops using multiple chutes, right.

On the ground and out of their chutes, paratroopers head for designated assembly points.

ditional annual training in the form of command post exercises (CPXs).

Logistics and Support

Overseeing the 82d's extensive training program is its parent organization at Fort Bragg, the XVIII Airborne Corps. At corps level, too, is finalized much of the contingency planning for the division's rapid deployment in a crisis situation. And that's a tall order for a division that is expected to fight anywhere in the world.

Corps planners constantly face an enormous logistics challenge, not only to supply the considerable ongoing needs of the division but to assure that materiel is stocked to meet possible contingencies (at corps, the "What if . . .?" questions are asked). This means not only basics like food and ammunition, but thousands of other items from snowshoes to insect repellent.

Magnifying corps planning and logistics problems further is that corps is also the parent organization of the 101st Airborne Division (Air Assault) stationed at Fort Campbell, Ky. (The big 101st—17,900 strong—is currently transitioning to the new UH-60 Sikorsky Black Hawk troop-carrier helicopter. The 101st's mass helicopter assault capability makes it unique among US infantry divisions.)

Supplying the two divisions with "assets" not inherent at the divisional level or within the two divisions' Support Commands is the job of XVIII Corps's 1st Corps Support Command. That command's assets and capabilities are formidable. A partial list: medical and dental treatment, field hospitals, water purification, parachute riggers, graves registration, truck transport, vehicle and weapons repair, decontamination capabilities, sanitation facilities, computer support (housed in air-transportable, camouflaged vans), plus thousands and thousands of spare parts for all division combat and other equipment. Further, 1st Corps Support Command deals in every item required to keep a small city going, and, in fact, acts as wholesaler for the "small city" of Fort Bragg.

"Slices" of 1st Corps Support Command equipment and personnel support combat elements of the two divisions on training exercises, just as they would in combat. To this end, some of its personnel are on jump status.

But 1st Corps Support Command's role goes far beyond that of mere supplier—as important as that function may be. It has a direct interface with the Air Force, and is involved heavily in the planning that ensures the flow of troops and equipment meshes with that of Air Force transports when an airlift deployment, in training or in the event of war, takes place.

Staging for an Assault

Many scenarios can be written with the 82d in mind as a major element of a contingency force based in the US. But no one is suggesting that the division be airlifted halfway around the world to, say, the Middle East, jump in, and go immediately into action. (That would be an impossibility, given the shortage of transport aircraft. It would take, for example, 823 C-141s to airlift the entire division, and that's not counting support elements such as Air Force maintenance personnel and others that would have to accompany tac air assigned to the mission. MAC's total force of C-141s numbers 271.)

However, the 82d's ace in the hole, and the factor that distinguishes it from other infantry divisions, is its jump capability. In terms of US Army doctrine, then, the jump capability delineates the types of missions appropriate to the airborne forces. These include the ability to:

- Seize and hold important objectives until ground linkup or withdrawal.
- Exploit the effects of nuclear weapons.
- Occupy areas or reinforce units beyond the immediate reach of land forces.
- Seize an advanced base for further deployment of forces, or to deny its use to the enemy.
- Conduct a quick-reaction movement to an oversea land area as a deterrent combat force.
- Constitute a strategic reserve.
- Conduct stability operations.
- Conduct airmobile operations.
- Conduct raids.

Joint plans call for using the airborne division in various con-

Helicopters provide battlefield firepower and mobility: a TOW-launching AH-1S Cobra, left, and UH-1H Huey transports, above, which can double as medevac aircraft.

tingencies. The missions could include small "show-the-flag" operations, operations similar to those of the Dominican Republic 1965 crisis, and employment on the sophisticated armor-heavy battlefields of the Mideast and Central Europe.

Enemy forces against which the division may be expected to be employed range in size from a small insurgent force (company) to a sophisticated, mobile, and mechanized force capable of conducting warfare at any level of intensity. The size of the division "slice" employed to accomplish a given mission may vary from a reinforced company to the entire division (reinforced).

If a mass parachute assault is called for somewhere in the world, the ideal situation, according to planners, would be for the parachute force to stage in a noncontested area several hundred or so miles from the objective. In the staging area the troops could rest, acclimatize, and receive final briefings based on the latest intelligence.

Among the first to jump on an objective could be an Air Force Combat Control Team, jump-qualified specialists with navigation aids to guide incoming aircraft to the drop zone. Jumping with them would be paratroopers to form a security screen, equipped perhaps with man-portable antitank weapons and scout jeeps.

Jump-qualified Air Force forward air controllers could be with the advance party, responsible for directing tactical air in a close-support role.

Then the main body of paratroopers would jump, to secure the airhead so that heavy equipment and conventional-force troop reinforcements could be airlanded.

Antiarmor Defense

Warsaw Pact ground forces are armed with numerous and very accurate individual- and crew-operated antiaircraft weapons. It is almost inconceivable that mass parachute assaults a la World War II could be mounted against them, certainly not in any FEBA (forward edge of the battle area) visualized in a possible war in Europe. Perhaps small unit landings behind Pact forward areas are still feasible to disrupt communications and the like.

Two essentials have traditionally loomed large in airborne thinking: perimeter defense of the drop zone or airhead and the threat of enemy armor. A sound perimeter defense is vital until linkup is made with powerful main battle forces or until enough conventional muscle is airlifted in to back up the relatively lightly armed airborne force.

Enemy armor penetrating the defensive perimeter is seen as the greatest threat to airborne operations. The traditional wisdom has been that the best defense against a tank is another tank—but airborne forces are not equipped with tanks. The advent of new weapons and the way they were used in the Egyptian-Israeli War of 1973 brought about a revision in these concepts.

Many lessons were learned from the fighting in the Sinai in 1973, when infantry-operated antitank weapons echeloned in depth took a horrendous toll of armor. Under some conditions, it is possible for infantry—without benefit of armor and heavy artillery—to take on enemy armor—and win. Staff officers of the 82d think so. Using the weapons in their inventory and applying the lessons learned in the Sinai, airborne planners have devised antiarmor tactics that are at once dynamic and controversial. (While these tactics are not currently incorporated into official Army doctrine, they are internal standard operating procedures for, and unique to, the 82d.)

"We have the right mix of weapons and have developed the tactics to destroy enemy armor coming against us," maintains Maj. Gen. G. S. Meloy, Commander of the 82d.

Essentially, the tactics devised by the 82d, called the Airborne Antiarmor Defense (AAAD), do away with defending a perimeter altogether, but maintain the 360-degree "all-around" defense in the airborne area of operation (AAO) vital to safeguarding the airhead. This, say 82d staffers, is accomplished by using terrain and other natural and man-made obstacles to create "islands" of resistance made up of antiarmor weapon teams that are mutually supporting. These positions would be backed up by division artillery, close air support

Airborne antiarmor weaponry includes the jeep-mounted TOW missile system, above, and shoulder-fired Dragon, right. Left, a paratrooper emerges from smoke concealment.

(perhaps Army attack helicopters working in partnership with Air Force A-10s), mining, and engineer-created tank obstacles.

The defensive islands would avoid decisive engagement, shifting to alternate positions when coming under fire, and would form cul-de-sacs (armor kill zones) into which enemy armor could be "canalized" to be destroyed piecemeal from flanks and rear. A mobile armor/mechanized force could be kept in reserve for emergencies.

With antiarmor weapons in the division capable of ranging out to 3,000 meters (about 3,280 yards), the islands could spread out in maximum depth in the AAO and leave no linear defense to penetrate and no force to envelop. What's more, with the kind of dispersal foreseen, no lucrative targets for nuclear weapons would be presented.

Absolutely essential in such a defense, 82d staffers say, would be the command and control provided by the division's organic communications. To this end, the 82d, as is the case with other Army divisions, is currently equipped with 3,500 man-packed and vehicle-mounted radios.

Airborne division and other theorists say the island-defense concept has already been proven in combat. To quote from "The Airborne Antiarmor Defense," an article by Army Maj. Theodore T. Sendak, which appeared in the September 1979 issue of *Military Review*:

> To defeat Israeli armored counterattacks in 1973, the Egyptians employed an average of fifty-five infantry antitank weapons every 1,000 meters. Their antitank positions were mutually supporting and in depth, using Russian-made RPG7 armor-defeating rockets, backed up by *Sagger*, antitank guided missiles (ATGMs), and Soviet tanks and *Saggers* in a third echelon. By using the maximum standoff ranges of all antitank weapons and neutralizing the Israeli air force with an effective air defense umbrella over the main battle area (MBA), the Egyptians repulsed attack after attack of Israeli armor.

Antiarmor Capability

The 82d is constituted as a "light" infantry division and as such has no heavy artillery or armor at its disposal. Yet, its inherent firepower combined with the mobility of its attack helicopters provides a fairly potent punch. Basic to the division are its three battalions of artillery, each equipped with eighteen 105-mm howitzers.

But it is the crew- and individual-operated antitank weapons that would form the backbone of the AAAD. Against armor, the airborne troops can deploy:

- The M-72A2 Light Antitank Weapon (LAW) is a self-contained weapon consisting of a 66-mm high-explosive rocket packed in a disposable fiberglass and aluminum launch tube. LAW's complete weight is 2.36 kg, or a bit over five pounds. The weapon has been designed not only to engage armor but bunkers and other hardened targets at an optimum range of 200 m (218 yards). An individual, shoulder-fired weapon, LAW's light weight means an infantryman can carry several of them. While LAW has admitted limitations against heavy enemy armor, its successor, Viper, is already in engineering development. Viper will also be shoulder-fired and its launcher will double as handling and storage container. Such individual-fired weapons give every infantryman tank-killer potential.
- The M-220 TOW (for tube-launched, optically tracked, wire-command link-guided missile system) is a crew-operated weapon that can kill any known tank; its maximum range of 3,000 m (about 3,280 yards) makes it the best infantry bet against armor. TOW can be mounted on a tripod or on an assortment of carriers, including jeeps and helicopters. The total system with missile weighs 102 kg (about 225 pounds). (Exclusive to the airborne division is a company in each brigade armed with eighteen TOW weapons. There are also twelve TOWs in each infantry battalion.)
- The XM-47 Dragon is a shoulder-fired medium antitank weapon that is wire-guided to a maximum range of 1,000 m (1,095 yards). Dragon has a total weight of twenty-nine kg (about sixty-four pounds), and its launcher acts as handling and storage container.

Above, aiming the M-190 subcaliber rocket launcher. Right, dug in with the 7.62-mm M-60 machine gun. Paratroopers are also equipped with .50-caliber machine guns.

Loading ammunition aboard the tracked and air-droppable Sheridan armored reconnaissance vehicle.

• Also in the 82d's inventory is a battalion of fifty-four M-551 tracked Sheridan armored reconnaissance vehicles. Sheridan, drop-capable, is equipped to fire the Shillelagh laser-guided antitank missile and high-explosive rounds. Sheridan can also launch smoke and other types of grenades and is armed with a .50-caliber machine gun. It was not designed as a true armored vehicle but to serve as a light armored reconnaissance vehicle and therefore cannot slug it out with enemy armor. There have been maintenance and reliability problems with Sheridan and it has been phased out of other Army units in favor of the newer M-60 tank, which is not air-droppable. As yet, no successor to Sheridan has been decided on for the airborne division.

Besides the division's engineer and signal battalions, there is a combat electronic warfare and intelligence (CEWI) unit that has only recently grown to battalion size. The unit is an outgrowth of the Department of the Army's Intelligence Organization and Stationing Study that integrated all tactical intelligence and electronic warfare units into a single unified battalion at the division level. The CEWI battalion provides fully integrated, all-source intelligence, electronic warfare, and operations security support to the division. The battalion enables the division commander to "see" the battlefield night and day, in rain and shine, and thus evaluate the enemy's intentions in order to concentrate combat firepower at the decisive place and time to defeat the enemy despite possible superior numbers.

The CEWI battalion has language capability to monitor enemy radio traffic and is also equipped with a wealth of electronic devices for jamming and such specialized tasks as monitoring enemy vehicle traffic.

Air Defense

For air defense, the 82d has forty-eight six-barrel 20-mm Vul-

Fort Benning: Site of the Jump School

The Army's Basic Airborne Course—its Jump School—at Fort Benning, Ga., admits nearly 16,000 students each year, with about a ten percent washout rate.

In the thirty-seven years since the Parachute School was organized in May 1942, it has graduated more than 500,000 parachutists. This translates into more than 2,500,000 jumps at the school. (In times past, the airborne divisions and separate regiments/brigades had authority to conduct qualification training and award the Parachutist Badge. Fort Bragg can do so now in certain circumstances.) The current jump training injury rate is less than four-tenths of one percent at the school.

Training—and most other activities at Jump School—is administered by the corps of famous "Black Hats" (for the black baseball-type caps they wear). These instructors are hand-picked super NCOs, held in absolute awe by the student parachutists, officers and enlisted alike. Because of them, Jump School has maintained a reputation as the finest training in the Army.

The student parachutists—men and women—are primarily Army, but include Air Force, Marine, Navy, and some foreign personnel as well.

Airborne classes vary in size from 200 to 500, the largest classes in the summer, when many ROTC students and Academy cadets and midshipmen elect to undergo airborne training.

The basic airborne course is divided into three phases. The first phase, known as Ground Week, is spent on physical conditioning (heavily emphasized throughout the course and a way of life in airborne units), parachute landing falls (PLFs), mock door, and mock tower training. During mock tower training, students practice aircraft exits by leaping from tower doors in parachute harness attached to descent cables. (Myth says that the height of the towers—thirty-four feet—is the psychological breakpoint for a person in the fear of height; if a student can jump from the tower, he should be able to jump from the plane. The tower is a valid screening mechanism, but its thirty-four-foot height was accidental. Power-line poles were used as tower uprights in the early wartime period. The tower floor just happened to be thirty-four feet above the ground.)

Next is Tower Week, when the students perfect and add to the first week's skills. In various pieces of equipment, students learn the feel of the parachute harness, how to control a parachute's direction, and how to land properly. They must demonstrate these techniques before progressing to the week's high point, the 250-foot towers. There they first experience the sensation of descending from the sky and hitting the ground in a parachute.

Jump Week concludes the training. Five jumps, from both C-130 and C-141 transports, are made. One is a night jump and at least one is made in full combat gear. The jumps earn the students their wings as parachutists.

Camouflaging an 81-mm mortar, left, and a heavy 4.2-inch mortar, above, awaiting firing commands (note how camouflage fatigue uniforms blend in with terrain background).

cans, Gatling-gun-type rapid-fire weapons that can be depressed in elevation to provide devastating fire as ground weapons. Vulcans can fire at the rate of 3,000 rounds a minute.

Another antiaircraft weapon, Redeye, is a man-portable, shoulder-fired missile system. It is to be replaced by Stinger, another man-portable, guided-missile weapon specifically designed to meet the air threat beyond the 1980s. Stinger, already in production, is a fire-and-forget weapon that employs a passive infrared seeker. It will provide low-altitude air defense to counter jet aircraft and helicopter gunship threats against company-size units.

As part of its aviation, the division has forty-eight AH-1S Cobra helicopters armed with TOW missiles. Other weapons can include 2.75-mm rockets, 7.62-mm miniguns, and a 40-mm grenade launcher. A 20-mm cannon is mounted on some models.

To provide tactical mobility, the 82d is equipped with ninety UH-1H Huey transport helicopters, each of which can carry an eleven-man combat squad and a crew of two. The Hueys also double as aerial ambulances for battlefield medevac. Fifty-nine OH-58 observation helicopters are available for reconnaissance and such other requirements as command and control. The division has no heavy-lift helicopter capability.

Aerial Resupply

Once committed to battle, units of the 82d carry enough materiel—ammunition, food, water—to sustain three days of combat. Aerial resupply, then, is essential. The Airlift Center at Pope *(see p. 39)* has developed both high- and low-altitude delivery systems, and a Container Delivery System devised especially for the resupply of airborne troops. The Container Delivery System provides increased flexibility because the equipment, ammunition, and supplies of a platoon, company, or battalion can be delivered accurately within a 100- to 400-meter area. For the first time, the airborne force does not have to protect fixed supply points. A C-130 can airdrop sixteen CDS containers; a C-141 can drop twenty-eight. Each container can hold 2,000 pounds of cargo.

The Center is also using the Adverse Weather Air Delivery System (AWADS) to deliver paratroopers or cargo with great accuracy onto cloud- or fog-covered drop zones or

The US's Military Parachutists

The US armed forces are authorized about 27,000 paid parachute-related slots. Remaining on jump status by making at least one jump per quarter earns officers an additional $110 per month and enlisted people $55.

The Army, of course, has the greatest number of parachutists, with some 16,000 in the airborne division at Fort Bragg, the jump-qualified personnel in XVIII Airborne Corps there, and about 300 in the Corps's 1st Corps Support Command, including the parachute rigger detachment. (As of December 1979, thirteen female officers and 188 enlisted women were on jump status at Fort Bragg.) There is also an airborne battalion combat team in Vicenza, Italy, and an airborne infantry company in each of the infantry battalions of the 172d Arctic Light Infantry Brigade at Fort Richardson, Alaska, near Anchorage, plus an airborne infantry company with the 193d Infantry Brigade in Panama.

At Fort Bragg are also located two Special Forces Groups totaling about 2,500 and the parachute-qualified staff at the John F. Kennedy Center and Institute for Military Assistance, the Special Forces training facility there. Special Forces units are also at Fort Devens, Mass., in Panama, and at Bad Tölz in Germany. There are two airborne Ranger Battalions totaling 1,300 at Fort Lewis, Wash., and Fort Stewart, Ga.

The Golden Knights, the Army's parachute demonstration and competition team, are all on jump status, of course, as are personnel at the Riggers School at Fort Lee, Va., and those in pathfinder units and a sprinkling elsewhere such as in US Readiness Command (the REDCOM CINC, who is also Director of the new Joint Deployment Agency, is Gen. Volney Warner, former Commander of XVIII Airborne Corps). Certain Reserve and Guard units are on jump status.

In the Air Force, members of combat control teams and forward air controllers are on jump status, as are Aerospace Rescue and Recovery Service team members and personnel of TAC's 1st Special Operations Wing at Hurlburt Field, Fla. In the Marine Corps, long-range reconnaissance team members wear parachute wings, and in the Navy, Seal team members are qualified parachutists.

Vulcan antiaircraft weapon, above, can be depressed to deliver a devastating 3,000 rounds a minute against a ground opponent. Right, Sheridan crews await attack orders at sunup.

under other conditions that ordinarily would make accurate drops impossible. The High Altitude Airdrop Resupply System (HAARS) will allow cargo drops of 2,000 pounds up to altitudes of 3,000 m (nearly 10,000 feet).

Airdrop platforms, suspension systems, extraction methods, and shock-absorbing materials have been developed to the extent that delivery of fragile items, such as communications equipment, is just as feasible as the delivery of heavy vehicles and weapons. Parachute delivery of 500 gallons of gasoline in a collapsible drum, the current family of radios, Sheridans, artillery pieces, nuclear rockets, and even bulldozers is standard.

The Low-Altitude Parachute Extraction System (LAPES) is another recently standardized system. LAPES uses from one to three extraction parachutes to pull the load from a C-130 aircraft flying two to ten feet above the ground. The system is routinely used for delivering bulldozers, artillery pieces with prime movers, and fuel and water bladders.

LAPES is continuing to be improved and the Center is striving for a night-delivery capability, testing various cockpit electronic displays to make such drops possible. (When the low-level night flight tests began, said a Center briefing officer with massive understatement: "The pilots were at first reluctant to fly their aircraft six to ten feet above the ground at night. . . ." The Center is also testing the effect that various ground surface conditions—ice and snow, wet grass, packed earth, and the like—have on LAPES drops.

One problem with tactical airlift reinforcement and resupply persists, however. The C-130 transport now tasked with that mission "is threatened with age," says Col. Duane H. Erickson, who wears two hats as Commander of both the 317th Tactical Airlift Wing and the USAF Airlift Center. "The aircraft has the capability of airlifting only 26,000 pounds, which restricts payload options. The C-130 is also limited because of the lack of aerial refueling capability. We're hoping for a replacement."

In this regard, the Air Force is tending toward a CX transport designed to perform both strategic and intratheater airlift. Such an aircraft would be equipped for aerial refueling and capable of accommodating such outsize cargo as tanks. Special emphasis is being placed on tactical airlift as well as long-range capabilities in the interests of the Rapid Deployment Force.

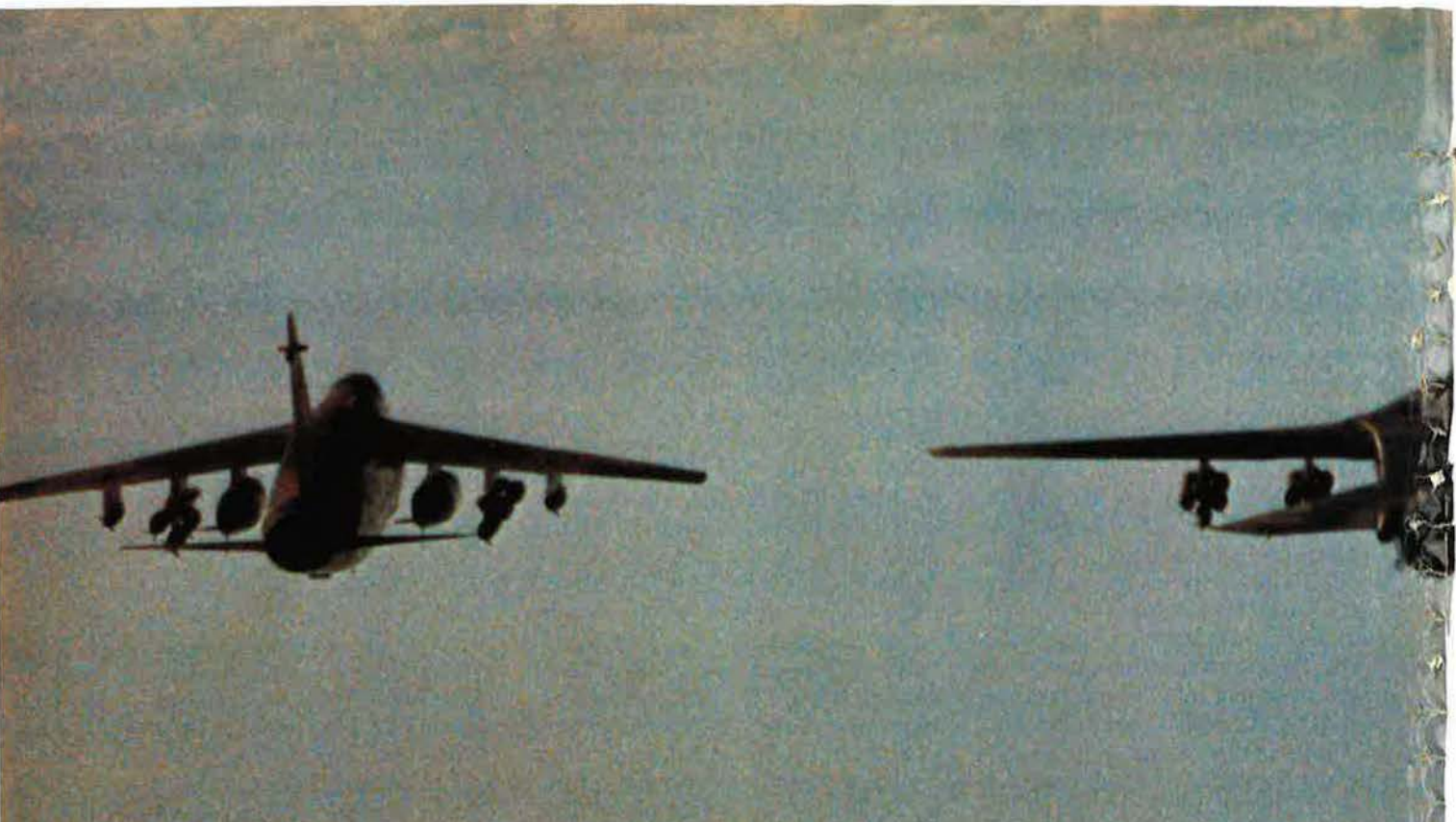
A study group made up of Air Staff, Army Staff, MAC, and AFSC personnel is working on mission and performance requirements for such an aircraft, with a report to be made to the Secretary of Defense next month. It is expected that Requests for Proposals (RFPs) will be opened to aircraft manufacturers in April to include derivatives of both the Boeing YC-14 and the McDonnell Douglas YC-15. These two aircraft, developed for the AMST (Advanced Medium STOL Transport) program, have been in limbo since Congress refused to provide funding in the FY '79 budget.

In other respects, the airlift situation is looking up. The first production stretched C-141 was delivered to the Air Force late last year. The schedule calls for Lockheed-Georgia Co. to deliver seventy-nine C-141Bs in 1980 and the rest of the fleet by mid-1982. These [illegible] with air-refueling capability, will be a major addition to airlift in the '80s. The program to reequip the C-5 fleet with modified wings and thus extend the aircraft's service life from 8,000 to 30,000 hours is well along. Prospects for strengthening Civil Reserve Air Fleet capabilities are improving. (*For a report on USAF's CRAF program, see p. 54.*)

But at the Pentagon and Fort Bragg, a chief and chronic topic of conversation is the strategic and tactical shortfall in airlift. It is pointed out that, in broad numbers, the Soviet Union's civil Aeroflot fleet of medium- and long-range aircraft available to supplement its military airlift stands at 1,300, *alone* more than USAF's combined airlift resources of about 1,200 transports *including* current CRAF aircraft.

It is also underscored that the USSR has *eight* airborne divisions, and its airlift reach and capacity are continuing to expand, as the massive troop and equipment buildup in Afghanistan bears witness. ■

Left, the 250-foot jump training towers at Fort Benning's Airborne School. Above, honoring the colors.



The F-111 was designed as a night, all-weather interdiction aircraft. Now, because of its unique capabilities, it has become a multimission bird that is filling every tacair role except that of an air-superiority fighter.

New Roles for TAC's F-111

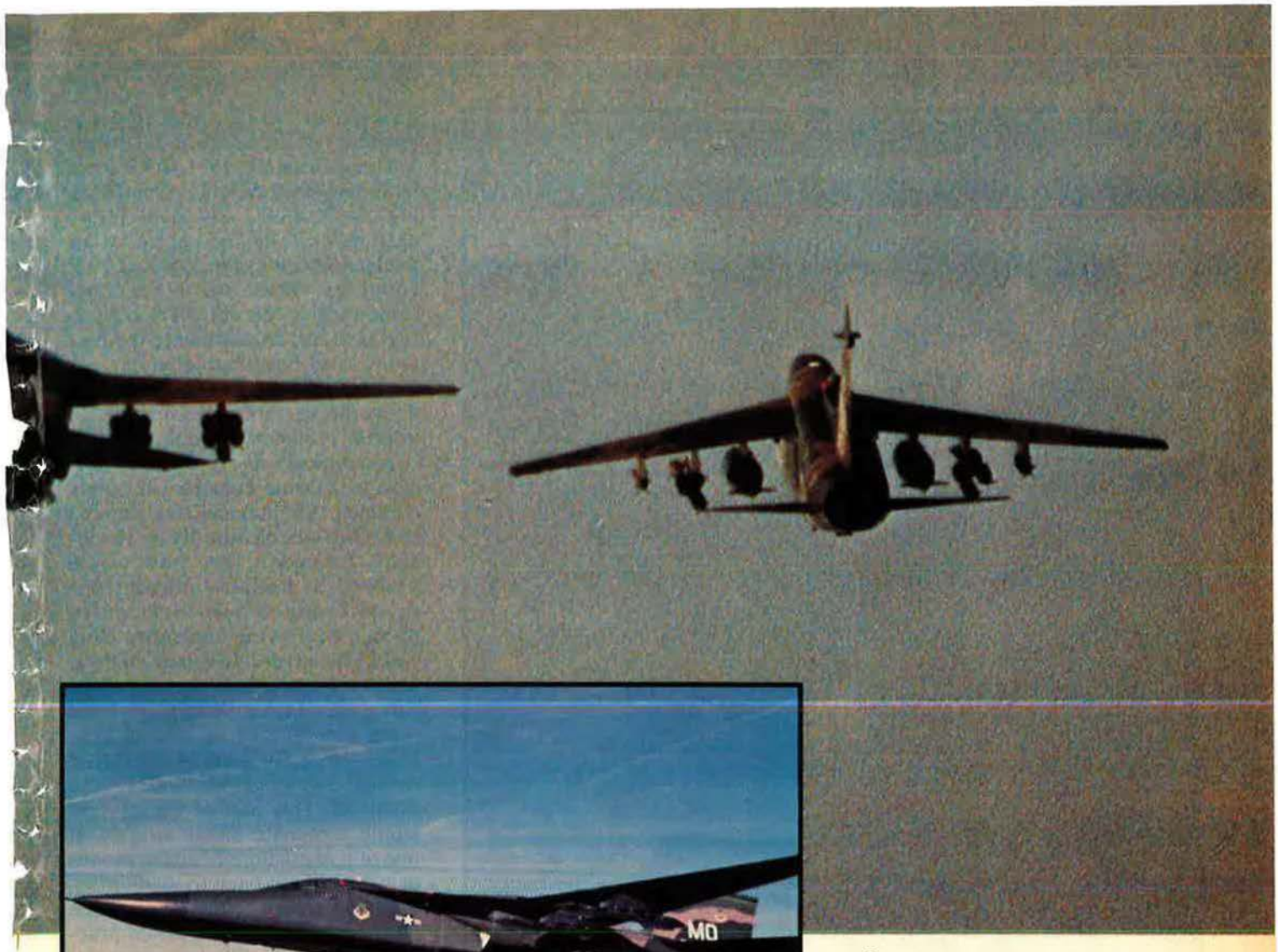
BY CAPT. KENNETH C. STOEHRMANN, USAF

More than a decade has passed since the first F-111 rolled off the General Dynamics assembly line in Fort Worth, Tex. The aircraft has had its share of ups and downs. Cost overruns. Limited combat in Southeast Asia. Engine problems. Closing the assembly line and the cancellation of orders for the last twelve F-111F aircraft. Deployment to Western Europe to bolster NATO's defense. Expansion of its night, all-weather interdiction role into areas that were not dreamed of a few years back. Yet, through it all, the "Aardvark" and her aircrews have matured, and today the two commands operating F-111s—USAFE and TAC—have an aircraft that is doing a wide range of jobs and doing them better and more reliably than ever before. The F-111 has come of age.

The F-111 was designed for tactical use as a night, all-weather interdiction aircraft. It was not a "fighter" but rather a "fighter-bomber." Four different tactical models were built by General Dynamics. (The FB-111A medium bomber flown by SAC is another story, which I leave to those better qualified to tell it.) The first, the F-111A, of which 141 were produced, was the model that saw limited combat in Southeast Asia. This first-generation F-111 has two TF30-P-3 turbofan engines and an Mk I avionics package with analog computers. It is still the workhorse of the fleet. F-111As equip the 366th Tactical Fighter Wing (TFW) at Mountain Home AFB, Idaho, where they moved in 1977, after many years with the 474th Tactical Fighter Wing at Nellis AFB, Nev. The move was part of the USAF "Ready Switch" redeployment of F-111 forces worldwide. Some forty F-111As are to be converted to EF-111A Tactical Jamming Systems (TJS) by Grumman. The rest of the F-111A fleet will remain combat-ready at Mountain Home.

The F-111A was quickly followed by the F-111E, with basically the same structure and avionics, but incorporating advanced engine inlet technology (the A's splitter plates and translating cowls were replaced by blow-in doors) and some modification of the weapons delivery panel and switches. Ninety-four were built, and after a short stay at Cannon AFB, N. M., most of them deployed to RAF Upper Heyford, UK, where they remain today, equipping the 20th Tactical Fighter Wing (TFW).

The F-111D, next off the assembly line, marked the beginning of the second generation of F-111s. Equipped with TF30-P-9 engines, the D outwardly resembled the older F-111s, but the similarity stopped there. In the cockpit, the D was a completely new aircraft. Its computer system was a high-speed digital complex with a general navigation computer and a weapons-delivery computer. An integrated display set (IDS) with dual head-up displays (HUD)—one for each crew member—was installed as well as a multisensor display (MSD) for the weapons system officer and a vertical situation display (VSD) for the



In SEA, the F-111 was used not only for low-altitude missions but also as a pathfinder (above). Left, an F-111 on a CONUS training mission.

aircraft commander. A horizontal situation display (HSD), also known as a moving map display, was another part of the avionics package.

In many ways, this 1972 equipment, designated the Mk II Avionics System, is similar to IDS technology used in the ill-fated B-1 bomber and the F-15. The fusion of digital computers and the IDS made the F-111D the most sophisticated aircraft ever built.

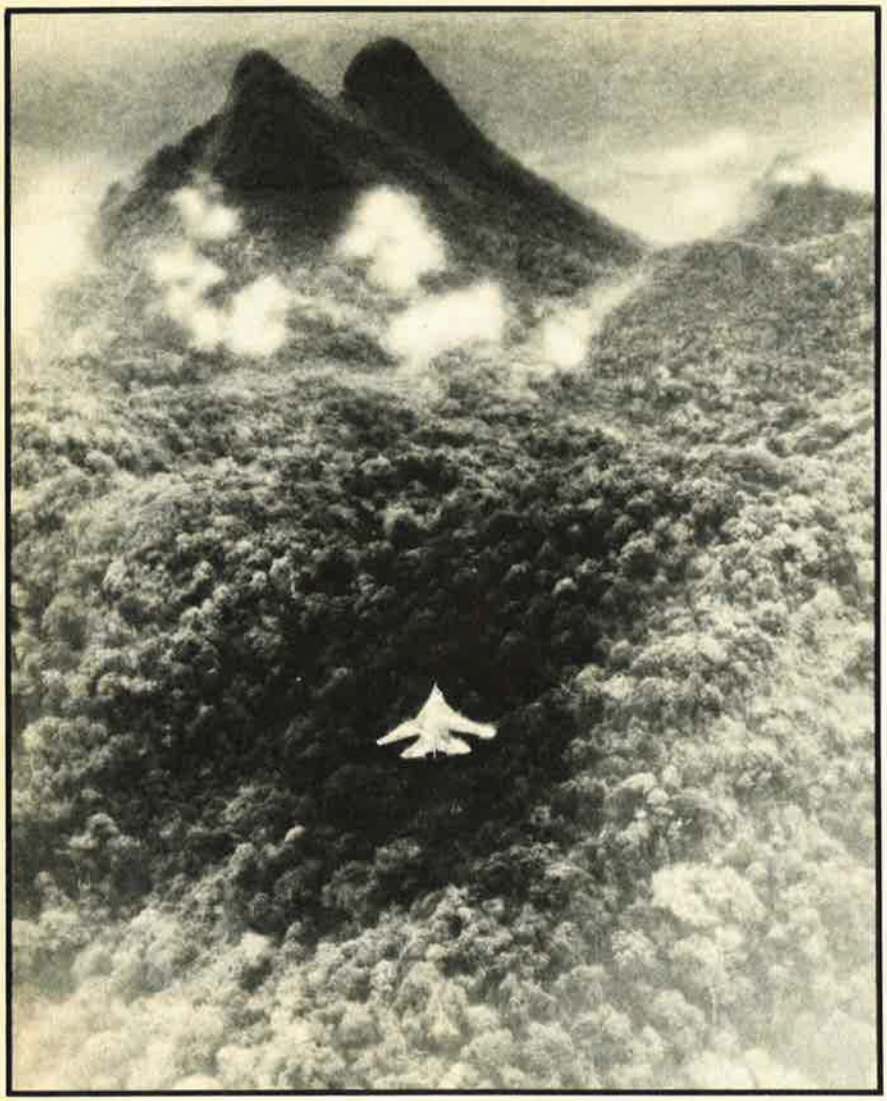
Sophistication costs money and demands highly trained operators and maintenance people. The D's avionics "bugs" were expensive and time-consuming to correct. Thus, after only ninety-six production aircraft that now equip the 27th TFW at Cannon AFB, the F-111D gave way to the F-111F, a compromise between the D's sophistication and the reliability and maintainability of the A and E models.

The F-111F, of which 106 were built, changed homes in 1977 as part of "Ready Switch," moving from the 366th TFW at Mountain Home to new quarters at RAF Lakenheath as the 48th TFW. This aircraft combines the speed and flexibility of digital computers with the more reliable attack radar and flight director systems of the A and E models. Many believe the F-111F to be the marriage of computer sophistication and airframe reliability that should have occurred much earlier in the F-111's production life. Powered by two TF30-P-100 engines, the F is the most powerful of all the F-111s and the last produced by General Dynamics before the production line was closed.

Today, the F-111 fleet is split between two major commands, USAFE and TAC. USAFE has two combat wings of F-111Es and Fs while TAC has two wings equipped with F-111As and Ds. These commands have used the F-111 in a wide variety of roles that illustrate the evolution of the aircraft over the years.

Widened Combat Horizons

Because of its unique terrain-following radar (TFR) and all-weather, automatic, low-level, terrain-following capability, the F-111 originally was used as a night, all-



The F-111 "is still the only aircraft in service anywhere . . . with a truly day/night, low-level, all-weather . . . capability." Most SEA missions were at night, through this kind of terrain at 200 feet.

weather fighter-bomber. This meant training for a single, unique mission with emphasis on day and night low-level flying and all types of visual and radar low-altitude, level bombing deliveries. That was how the aircraft was used in Southeast Asia. Armed with up to twenty-four 500-pound general-purpose bombs, the F-111As would take off singly at night, proceed on the deck to preplanned North Vietnamese targets, and return. Except for an occasional in-flight refueling, the F-111As required no air or ground assistance. *(For an excellent account of the F-111A's role in SEA, see the June 1973 issue.)*

Air Force tacticians then saw an expanded combat role for the F-111A. Because of its reliable and (for the time) accurate analog computers and inertial navigation system, the aircraft were used as "pathfinders," leading F-4s and A-7s on medium-altitude bombing missions. The F-111As also were equipped for beacon bombing, a fact that made American ground forces extremely happy. Using an electronic beacon on the ground as an offset aiming point, the F-111As could drop a large amount of ordnance on the enemy and, using the pathfinder concept, direct other aircraft to the target area. As the US involvement in Southeast Asia drew to a close, the F-111A was doing much more than originally envisioned. Low-altitude night interdiction was the primary but no longer the sole mission of the F-111.

Nevertheless, interdiction, with a new twist, was how the F-111 was to be used in NATO. With the deployment of the entire F-111E fleet to Great Britain in 1971, NATO got its first aircraft capable of performing all-weather, day/night interdiction—either conventional or nuclear—deep in the Warsaw Pact countries. Thus, the F-111E became a major part of NATO's deterrent posture. In addition to the previous level bombing deliveries, visual and radar low-altitude drogue deliveries (LADDs) were added to aircrew proficiency requirements.

A "typical" F-111 training mission in Europe became extremely complex. After takeoff singly or as a two-ship—occasionally a three-ship—formation, the crew would proceed at medium altitude to a predetermined low-level entry point. Following descent, they would fly several hundred miles at low level, either on a segment of the Royal Air Force (RAF) low-level route structure or in several low-level "free-fly" areas scattered throughout England, Wales, and Scotland. This part of the mission would terminate either directly at one of five offshore bombing ranges or with a climb back to medium altitude for transit to the range. Once on the range, the crew would practice some or all of five weapons delivery techniques.

After approximately thirty minutes of range work, the aircraft would again climb to medium altitude and proceed with other training events. If radar bomb scoring (RBS) activity were planned, it would be at medium altitude with RAF Tumby bomb plot or at low altitude with RAF Spadeadam bomb plot, the latter having an extensive electronic warfare range for simultaneous use. The crew could also elect to fly practice approaches, either singly or in two-ship formation, at several RAF and USAFE bases, and practice emergency patterns back at the home airfield. After a two-and-a-half to three-hour mission, they would return home, often with fuel to spare.

The Repertoire Expands

While the F-111Es in Europe were extending their mission, TAC began training Stateside F-111 aircrews in similar delivery techniques, since TAC F-111s would be used to augment NATO forces if

war were to break out in Western Europe. But the F-111 still was basically a level-bombing interdiction aircraft.

That was not to last for very long. Remembering the pathfinder and beacon bombing roles of the F-111As in Southeast Asia, TAC began a coordinated plan to expand F-111 operations, specifically in the area of conventional weapons deliveries—low angle and thirty-degree dive, high-altitude dive, dive toss, and low toss bombing. Within eight months, the three TAC F-111 wings at Nellis, Cannon, and Mountain Home were performing these maneuvers on normal training missions.

20th TFW F-111Es at Upper Heyford, UK, together with the 48th TFW at RAF Lakenheath, support NATO forces in a variety of old and new roles.

Now the "typical" F-111 training mission in TAC changed. Most day missions were two- and three-ship formations that would fly a preplanned low-level route, usually terminating at a bombing range. Several weapon delivery passes would be made using a mixture of new and old techniques. One scenario called for one or two level deliveries (either radar or visual), followed by three low-angle deliveries, three thirty-degree dive deliveries, a couple of low toss deliveries, and finishing up with visual and radar LADDs.

Another option was a totally conventional pattern of range work, where the deliveries would be thirty-degree dive, low angle, and low toss. A third commonly used scenario, one that maximized training in a short thirty-minute range period, was three level deliveries and three dive deliveries. Using only six practice bombs, an aircrew could perform five entirely different deliveries. These missions required a great deal of concentration, ability, and aircrew coordination. Overall, weapon deliveries were freely mixed, while staying within the bounds of flight integrity and safety.

At first conventional deliveries were difficult for both the aircrews and range personnel. Hurling a 70,000- to 75,000-pound "fighter" aircraft at the ground was somewhat staggering. But soon aircrews were required to qualify and remain current in three of the new conventional deliveries—thirty-degree dive, low angle, and low toss—in addition to the other level-flight techniques that F-111s had been using for years. Night missions were still single-ship sorties, incorporating low-level work and night range work (all level deliveries) or RBS activity. The entire scope of F-111 operations had opened up greatly, led by this expanded weapons delivery program.

Coincident with this expansion, TAC also began employing the aircraft in other than the traditional interdiction role. F-111s were used in joint Army-Air Force exercises and ORIs that stressed delivery of both conventional and nuclear munitions in a variety of scenarios. Tests also were begun using the internal 20-mm gun installed in the right weapons bay.

Tactics also changed. Two- and three-ship formations were developed for both conventional weapons deliveries and low-level

SUMMARY OF F-111 AIRCRAFT

MODEL	USER	NUMBER BUILT	ENGINES	AVIONICS	REMARKS
F-111A	TAC	159	TF30-P-3	Mk I analog	Total includes 18 preproduction developmental aircraft. Equips 366th TFW, Mountain Home AFB.
EF-111A	TAC	2*	TF30-P-3	ALQ-99A	New Tactical Jamming System (TJS). Total planned production is 42 aircraft.
RF-111A	n/a	1*	TF30-P-3	Mk I analog	Prototype #11 modified for reconnaissance role; no further development.
YF-111A (F-111K)	RAF/ USAF	2*	TF30-P-3	Mk I analog	First 2 aircraft of 50-aircraft order for Britain as strike/reconnaissance aircraft; order canceled by Britain; aircraft used for USAF RDT&E.
F-111B	USN	7	TF30-P-12	—	Navy carrier version of F-111A; contract called for 5 developmental and 24 production aircraft; contract canceled by Congress in 1968.
F-111C	RAAF	24	TF30-P-3	Mk I analog	In service with Royal Australian Air Force in strike role.
F-111D	TAC	96	TF30-P-9	Mk II digital	Equips 27th TFW, Cannon AFB.
F-111E	USAFE	94	TF30-P-3	Mk I analog	Equips 20th TFW, RAF Upper Heyford, some used for OT&E.
F-111F	USAFE	106	TF30-P-100	Mk I & Mk IIB combination	Equips 48th TFW, RAF Lakenheath, some used for OT&E.
FB-111A	SAC	76	TF30-P-7	Mk IIB digital	Medium-range SAC bomber with SRAM.

*These five aircraft included in 159 F-111A total.
Source: *Jane's All the World's Aircraft.*

flight. A new term (at least to F-111 aircrews)—mutual support—became "the word." With the advent of Red Flag in 1976, F-111s used these tactics with great success in engagements against air and ground threats. The F-111 began doing many of the weapons deliveries, flight formations, tactics, and missions previously reserved for fighters like the F-4 or A-7. Tactical planners wanted F-111 aircrews to be capable of performing an F-4 or A-7 mission while still retaining the day/night, all-weather, interdiction role.

The New F-111 Look in Europe

This change to a varied, multimission capability for the F-111 came slower to the Es in Europe, mainly because of their unique position as a NATO deep interdiction deterrent force and the development of new missions specifically for the NATO theater.

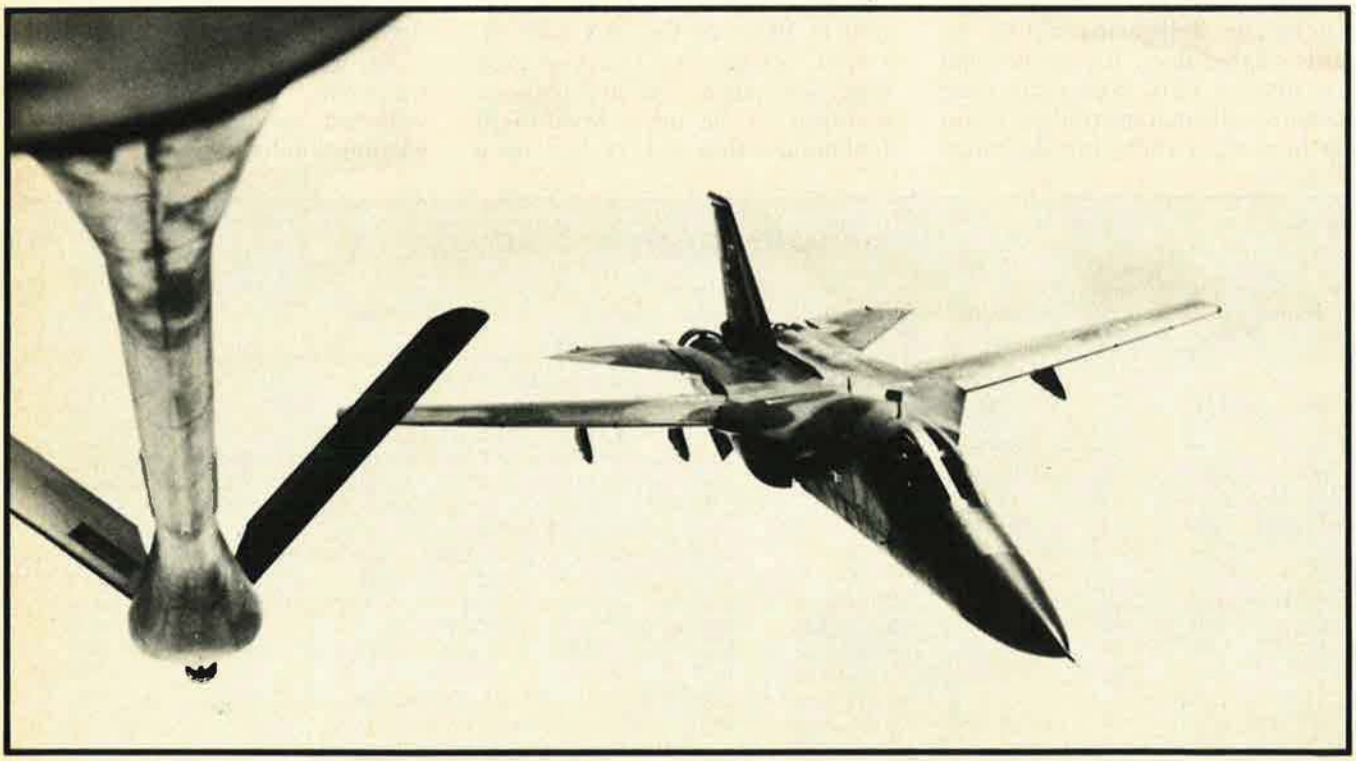
One of the first new NATO missions was sea surveillance/interdiction, also called antiship warfare (ASW). The F-111's accurate navigation equipment, superior low-level stability, and long range were well adapted to pathfinder interdiction against enemy shipping.

Capt. Kenneth C. Stoehrmann is a 1972 Distinguished Graduate of the Air Force Academy who holds a master's degree in international affairs from the Fletcher School of Law and Diplomacy, Tufts University. A navigator with extensive experience in the F-111D and -E, he recently completed a one-year Air Staff Training tour at USAF Headquarters and is now a member of the Political Science faculty at the Air Force Academy. Captain Stoehrmann is the author of several articles and a contributor to two Adelphi Papers, *published by the International Institute for Strategic Studies, London, England.*

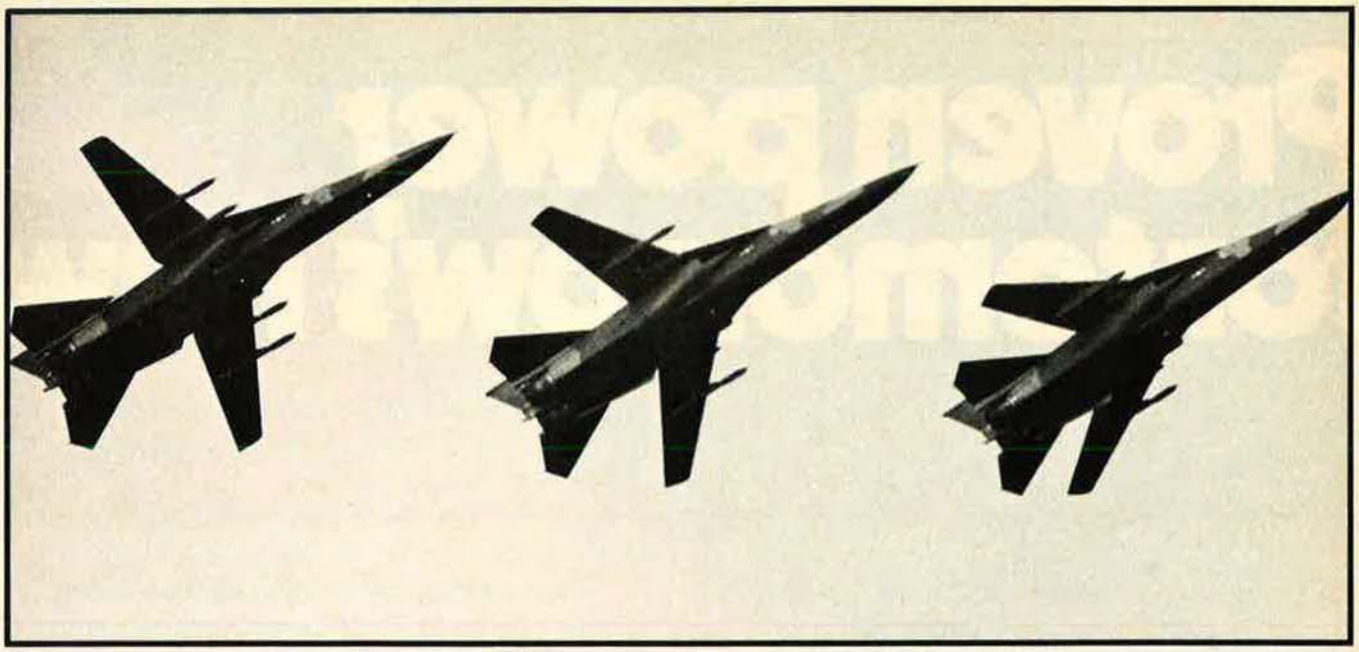
On a typical mission, two F-111s would lead a flight of other tactical aircraft, generally F-4s, against naval targets. Taking off from the same airfield, the flight would join up with the F-111s in the lead. At a predetermined point, the flight would descend to low level and proceed to the target. The attack itself is highly complex and intricately coordinated, usually carried out in an extremely hostile environment and structured to be as short as possible without sacrificing effectiveness. Because of the lack of terrain concealment and hence of total surprise, the flight's tactics, ingress, and egress must combine accurate navigation and weapons delivery with some degree of survivability. This is best achieved by each aircraft in the flight performing a specific task—bombing, Wild Weasel, etc. While it might appear that each aircraft is acting individually, the combined effect is usually lethal, especially when more than one F-111/F-4 flight is involved.

While this role was being developed, the F-111Es (and now the Fs) began using the 20-mm internal Vulcan cannon in the air-to-ground strafing role, as well as practicing conventional weapon deliveries. Because of the F-111's stability, strafing was relatively simple compared to some other tactical aircraft. This was evident at the 1977 Royal Air Force Tactical Bombing Competition (TBC), where the F-111E crews from RAF Upper Heyford, after having practiced strafing for only two months, scored higher than most other aircraft in the competition.

However, the major expansion of the F-111's role in Europe was its employment in close air support. The aircraft is ideally suited for that role. No air or ground support besides the FAC is needed. The air-



The F-111's unrefueled range of more than 2,500 miles gives it a capability for deep interdiction missions in any kind of weather. Its operational range and deployment flexibility are enhanced by air refueling.



A formation of NATO-assigned F-111s demonstrate the variable-geometry wing, which can be swept to an angle of seventy-two degrees.

craft has a relatively long loiter time, it stages out of less vulnerable British bases, carries a large load of weapons, and delivers them with great accuracy. It has an all-weather delivery capability and is equipped for beacon bombing. These last two capabilities are extremely important in the European theater where weather, terrain, and probably enemy tactics limit dependence on clear air mass, daylight, VFR close-support operations.

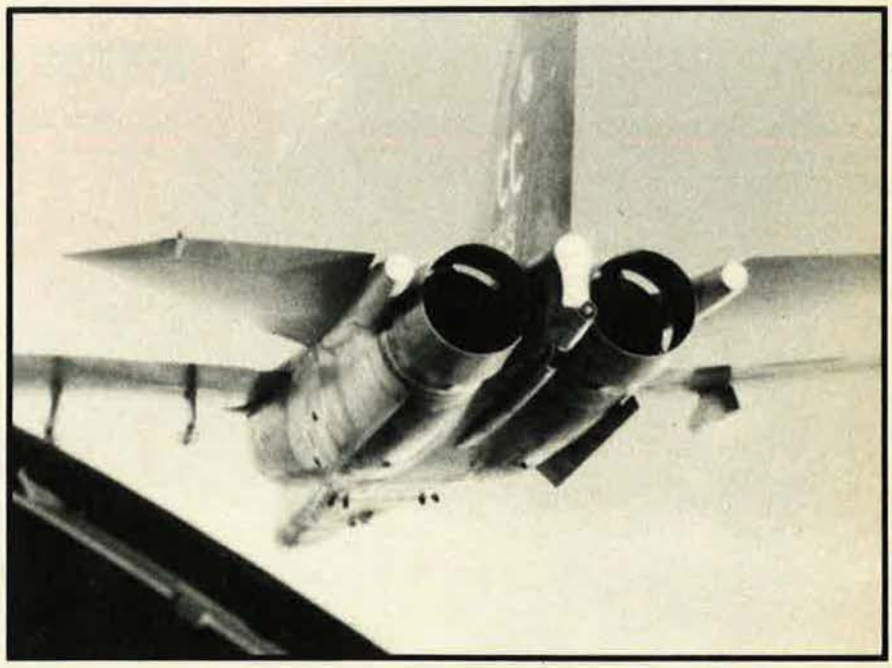
Close air support adds a completely new dimension to F-111 operations—and to the complexity of training missions, too. It gives the aircraft the ability to carry out every mission needed by NATO air commanders with the single exception of air superiority.

Where does the F-111 stand today? In Western Europe, two combat-ready wings are on alert as NATO's principal deep interdiction and deterrent force, with the additional capability of performing sea surveillance/interdiction and close air support. TAC's two CONUS-based combat wings continue their training in all types of weapon deliveries as well as training all F-111 aircrews. They stand ready to augment tactical air forces anywhere in the world, as demonstrated by the F-111F deployment to South Korea after two Army officers were killed by North Koreans in 1976, and by several deployments in support of NATO exercises.

And the aircrews? Their training has expanded from a single role of night, all-weather interdiction to a variety of missions, each different and demanding. Today the F-111 force has capabilities that a few years ago were unimaginable. The aircrews, and the aircraft, have come of age.

It has been a long and often bumpy road for the "Aardvark" since it first flew. But today, the F-111 still performs its night, all-weather interdiction role better than any aircraft in the Air Force inventory. It is still the only aircraft in service anywhere in the world with a truly day/night, low-level, all-weather, accurate weapons delivery capability. Add to that the F-111's expanded roles in sea surveillance/antiship warfare, day interdiction, close air support, and conventional weapons deliveries, and you have a tried and tested aircraft that can do its job remarkably well.

The F-111 has come a long way! ■



F-111 tactics now include not only single ship penetrations, but formation missions at both low and high altitude with conventional or nuclear weapons.

Proven power for tomorrow's new

It's not yet certain what the next generation of military trainers will look like. However, some things are certain.

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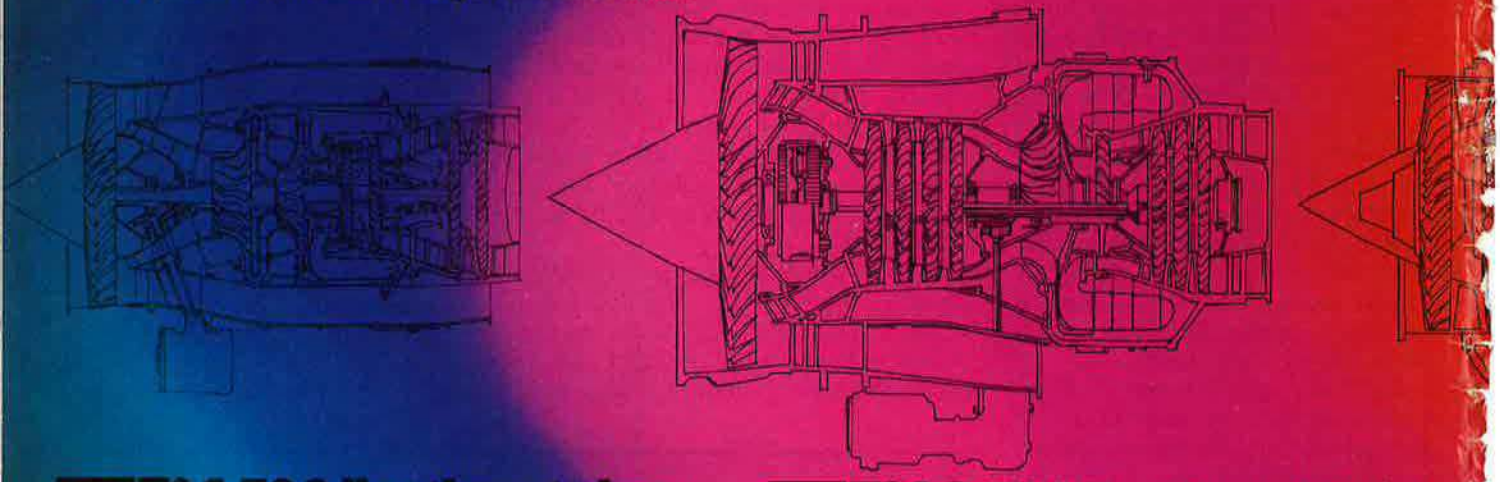

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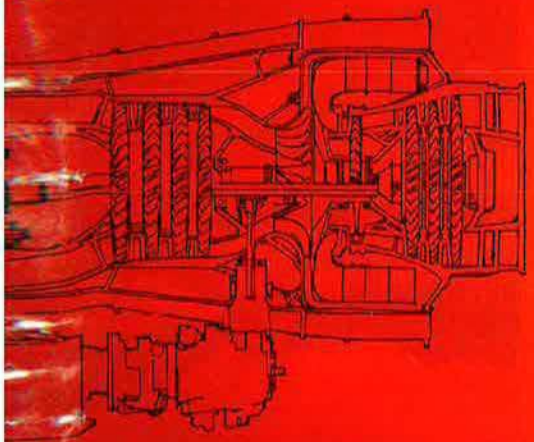

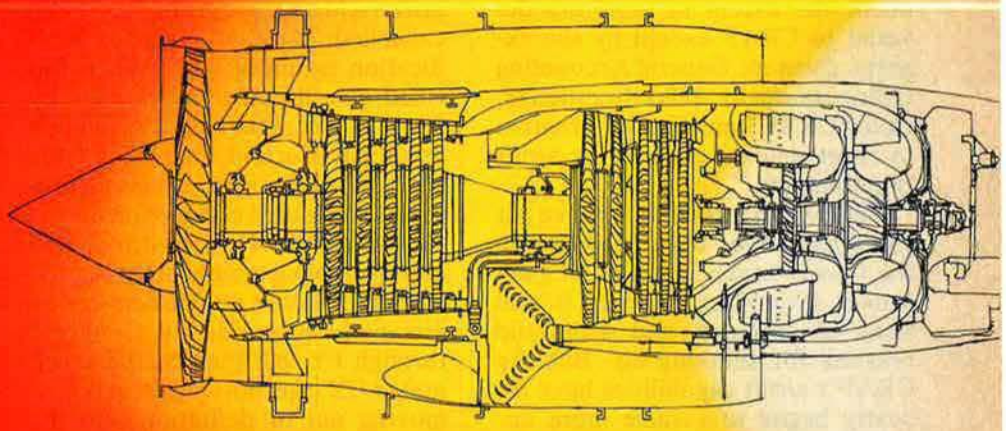

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A total of 462 passenger and cargo aircraft of twenty-two civilian airlines constitutes fifty percent of the strategic airlift available to the Department of Defense. They are . . .

The Civil Reserve Air Fleet—National Airlift Asset

BY F. CLIFTON BERRY, JR., SENIOR EDITOR

THE Civil Reserve Air Fleet (CRAF) is one of those national assets, like fresh air and forests, always taken for granted. Defense Department witnesses usually mention CRAF in testimony before Congress each year. They cite its contribution as a major element of the nation's strategic airlift, and everyone nods in agreement. That's about the extent of attention devoted to CRAF except by the experts. Even the General Accounting Office, normally quick to criticize, called CRAF "an effective program to meet defense emergency airlift requirements."

Yet in truth, the Civil Reserve Air Fleet has never been activated in the twenty-seven years of its existence. Everyone expects it will work as designed, and with valid reasons for thinking so. But the CRAF's airlift capabilities have recently begun to assume more importance than in the recent past. So it is time to examine CRAF in some detail—to see what it is, what it is capable of doing now, and the expectations for its future contributions to the national airlift capability.

Renewed interest in CRAF flows from recent shifts in two areas: philosophy and hardware. On the philosophy side, there is a waning of the "Vietnam Syndrome"—that the US will refrain forever from using its military power in remote parts of the world. Instead, officials and commentators alike acknowledge that indeed the United States may deploy forces into out-of-the-way places to protect its interests. The public seems to agree. The support for the Rapid Deployment Force (RDF) concept is a gauge of this shift. So is the ballyhoo surrounding the RDF. But the airlift and sealift resources to move the RDF force—from brigade- to corps-size units—are less than required.

Shortages exist in both modes of transportation—sealift and airlift. Significantly, Defense officials have been frank about the shortages and possible solutions; those are the hardware changes. But in airlift, the solutions will not be at hand very soon. The advanced medium transport (AMST) program has been cancelled. The C-5A wing box modification is under way. When finished, it will extend service life by 30,000 hours at the time each wing is modified. (Current wing life is 7,100 hours of representative mission profiles.) Scheduled completion date is July 1987. The C-141B stretch and aerial refueling modification is moving faster. Funds for 236 conversion kits were provided by Congress through FY '80. Finally, the accelerated CX transport program is now moving out of definition into the Request for Proposal phase, thanks to formation of a joint task force and its hard work at year-end. The CX airplane is scheduled to achieve operational status not later than 1987. It will likely exploit existing technologies. Its successor, the CXX, is still just a gleam in a planner's eye, not to reach the fleet until the late nineties.

Therefore, for the present and some time ahead, the airlift augmentation provided by the Civil Reserve Air Fleet is important to US strategic planning (and execution). Using up to 462 civilian transport aircraft—both passenger and cargo—the CRAF is the cheapest and doubtless the fastest way to double the national airlift capacity. The necessity of responsive airlift is underlined by Deputy Secretary of Defense W. Graham Claytor, Jr., who told the Senate in November: "Although we expect sealift to de-

This Seaboard World Airlines 747 "Containership" typifies the long-range international wide-body cargo aircraft in the Civil Reserve Air Fleet.

—Seaboard World Airlines photo

The CRAF Fleet

Segment	Stage I	Stage II	Stage III
Domestic		36	39
Alaskan			8
Long-range International (Passengers)	8	18	250
Long-range International (Cargo)	49	68	124
Short-range International			41
Total CRAF	57	122	462

liver the vast majority of our equipment and supplies in most contingencies, we must rely on airlift for the initial rapid response that can be crucial to deterrence or to a successful forward defense. To carry out this task, our airlift must be able to meet the demands of contingencies that range from a small show-of-force to a war between NATO and the Warsaw Pact."

Regarding the NATO requirement, Claytor referred to an examination of strategic mobility made by the Joint Chiefs of Staff. It concluded that existing airlift capability could haul only about one-third of the cargo needed in the first three weeks. He cited four programs to increase the supply of airlift: stretching the C-141, which will add about ten percent; Reserve associate aircrews and increased parts stockage for C-5s, adding another ten percent; possibly using commercial aircraft of NATO allies, ten percent; and the CRAF Enhancement Program, expected to add another fifteen percent. More on CRAF enhancement later. First, it is necessary to explain what is being enhanced.

CRAF Background

The Civil Reserve Air Fleet (CRAF) program is called a "voluntary civil-military partnership" by the Air Force. Under CRAF, the civilian air carrier industry commits selected airlift resources (airplanes and crews) to the Department of Defense in time of emergency. President Truman issued the Executive Order creating CRAF in February 1951, during the Korean War. It has been reaffirmed by succeeding Executive Orders. The mechanisms for constituting CRAF have been developed through memorandums of understanding between Defense and Transportation Departments.

As the Air Staff puts it, "this partnership has proven effective in various levels of emergencies while operating in a peacetime mode." Essentially, the Executive Orders and memos provide for allocation of civil airlift resources to the Defense Department in time of emergency. At the same time, procedures have been set up to ensure efficient DoD use of the airlift with minimum disruption to civil (commercial) service, depending on the degree of emergency.

To allocate and plan in an orderly way, each year the Military Airlift Command (MAC) defines its airlift requirements according to the missions assigned by the national command authorities. MAC enters into agreements with US commercial air carriers to provide aircraft and crews for call-up. MAC transmits the requirements through the Defense Department organization, then across to Department of Transportation. There the Office of Emergency Transportation actually allocates aircraft to the CRAF program by airline and airplane registry number, and passes the allocation to MAC, DoD, the airlines, and the Civil Aeronautics Board and Federal Aviation Administration. That done—and updated monthly—the scene is set for CRAF activation by stages, if and when needed.

Civil Airlift Augmentation

The airline industry considers the Civil Aeronautics Act of 1938 as laying the cornerstone of airlift policy. It called for the encouragement and development of an air transportation system properly adapted to the present and future needs of the foreign and domestic commerce of the United States, the postal service, and the *national defense.* (Emphasis added.) Airline industry cooperation in military airlift began in World War II. Under contract with the Air Transport Command and the Naval Air Transport Service, the commercial airlines delivered more than four billion passenger-miles and one billion cargo ton-miles while performing more than 1.4 million flying hours for the military overseas.

During the 1948–49 Berlin Airlift, US airlines flew more than 270 transatlantic support flights. During the Korean War, the airlines carried sixty-seven percent of the passengers, fifty-six percent of the freight, and seventy percent of the mail airlifted as a result of the conflict.

At the height of the Vietnam conflict, the airlines were lifting an estimated eighty-eight percent of the military passenger traffic between the US and Southeast Asia. It is estimated that commercial carriers were airlifting more than 2,500 passengers and 180 tons of cargo daily in those years.

—Photo by Bill Csmundor Air Transport Association

Palletized cargo is loaded straight into the main cargo deck of this Pan American 747 freighter. Seventy-six Pan Am planes are in CRAF.

The Three Stages of CRAF

• Stage I consists of aircraft committed by contract to a call-up by CINC, Military Airlift Command, presently Gen. Robert E. Huyser. (These aircraft are in addition to those civil aircraft performing regular MAC airlift services. The aircraft engaged in day-to-day service may be part of Stage I, II, or III.) Stage I is sized to provide maximum augmentation to meet DoD needs, while permitting the civil carriers to continue peacetime operations.

• Stage II is sized for a "minor contingency," and is designed to provide augmentation during an emergency not requiring national mobilization. This stage is activated by the Secretary of Defense after conferring with the Secretary of Transportation.

• Stage III is activated after the President or Congress has declared a national emergency. The Secretary of Defense (again after conferring with Secretary of Transportation) can issue the Stage III order under delegated authority. This stage calls up all the long-range international cargo aircraft owned by US carriers, and a significant chunk of similar passenger aircraft. That is why Department of Transportation coordination is necessary; the Secretary of Transportation is charged with allocating all modes of national transportation resources in an emergency according to national priorities.

Not all carriers participate in MAC's peacetime business; some offer aircraft and crews for wartime use, but decline to participate otherwise. They and MAC enter into "call contracts" activated in Stage III. In all cases, the contracts between the carriers and MAC provide for aircraft, materiel, and crew support sufficient to yield a utilization rate of ten hours per day per aircraft. (MAC's C-141 utilization rate in peacetime is 3.5 hours per day.) The crew resources are exclusive of those company employees with Reserve or National Guard commitments.

For January 1980, a total of 462 commercial jet aircraft were available for CRAF Stage III. For Stage I, fifty-seven were earmarked, and for Stage II a total of 122 were designated. The 462 aircraft are further subdivided by segments, according to current aircraft use and location. *(See box, opposite page.)*

Aircraft types in each segment include:

• Domestic: McDonnell Douglas DC-9, and the Lockheed Hercules and Electra.

• Alaska: Boeing 737, Curtiss C-46, and Lockheed Electra.

• Short-range International: Boeing 727.

• Long-range International (Passenger): Boeing 707 and 747, Lockheed L-1011, and McDonnell Douglas DC-8 and DC-10.

• Long-range International (Cargo): Boeing 707 and 747, and McDonnell Douglas DC-8 and DC-10.

Other CRAF Considerations

Since the CRAF has never actually been activated, will it work when called upon? The Air Force and the carriers believe it will, and say so confidently. A senior Air Staff officer told AIR FORCE that the capabilities are used daily as a by-product of the MAC contracting process. He also pointed out that MAC periodically holds command post exercises (CPXs) to simulate generation of the Stage III CRAF. Participants include representatives from the carriers and other agencies of government. He also says that MAC and the carriers are accustomed to working together on a routine basis. The carriers concur in these assessments.

Another open question is, will the aircrews fly into combat zones if necessary? Also, if an airline is on strike when called upon, will its crews fly the CRAF missions or honor the strike? According to USAF and the Department of Transportation, the combat zone problem does not exist. They point out that commercial aircrews flew regularly into Vietnam during the war there, for example, and that in World War II the commercial airlines under contract performed more than 1.4 million flying hours worldwide, including missions into combat areas.

As for work stoppages, the CRAF carriers have letters of agreement with their pilots on the topic. They provide that in the event of a strike, the union members will continue operating Department of Defense

—Photo by Bill Osmun for Air Transport Association

Long-range international wide-body passenger planes like this Northwest DC-10 typify those to participate in CRAF Enhancement Program.

(MAC) military passenger or cargo flights, as covered by the agreements with MAC.

Another question pertains to aircraft under the CRAF allocation which are overseas or in depot maintenance when CRAF is activated. Under the agreements, such aircraft must be replaced by the carriers, so that the total number and types they have obligated are available on call.

Finally, another uncertainty arises from the imminent retirement of many of the narrow-body aircraft in the CRAF fleet, the 707s and DC-8s. According to the carriers, one-fourth of the four-engine narrow-body aircraft will be retired by January 1981. An additional fifty percent will retire by January 1983, and the remaining one-quarter will go out of service of the US carriers by January 1985. A few DC-8-61 and -63 models (up to forty-five in CRAF) will be reengined with the CFM-56 engine, and remain in service for some years past the 1985 date. But discounting those forty-five aircraft, some ninety-three narrow-body planes that are now part of CRAF will be out of service. They constitute twenty percent of the 462-plane fleet.

Thus, the narrow-body retirements and increased need for airlift lend new urgency to a program just starting. It is called the CRAF Enhancement Program.

Spiraling Fuel Prices

The Air Transport Association (ATA), the airlines' organization, highlighted for the Senate the impact of skyrocketing fuel prices and the risks of predicting fuel price and availability. According to ATA, fuel is the second largest cost element for the airlines, after wages, and is the fastest-growing cost element. Before the 1973–74 embargo, fuel comprised eleven to twelve percent of total operating expenses. That jumped to more than nineteen percent in 1978, and in 1979 is estimated to eat up more than twenty-seven percent of operating expenses.

The Air Force faces a similar situation. Average fuel prices for the airlines and USAF are shown in the table below. The trends are comparable. However, one should not draw direct comparisons because the data are based on different conditions. USAF prices are FOB origin, and do not include the cost of transportation, services, and loss. The averages for airline prices are usually based on delivery at an airport. USAF prices are by fiscal year; the airlines by calendar year. Pre-1973, both groups paid about eleven cents per gallon.

Average Cost Per Gallon of Jet Fuel
(in cents)

	Airlines, System-wide	USAF, Worldwide
1974	24.2	22.4
1975	29.3	32.1
1976	31.8	31.1
1977	36.3	34.5
1978	39.4	37.5
1979	78 (est.)	47.1 (est.)

Sources: Air Transport Association and Defense Fuel Supply Center

CRAF Enhancement Program

As background to the CRAF Enhancement Program, one should acknowledge that the CRAF fleet's availability has not required any capital investment by the taxpayers. The airlines have invested in the equipment and crews, and have responded voluntarily when DoD has required additional airlift. The CRAF Enhancement Program for the first time requests appropriation of funds to pay participating carriers for air cargo features added to new passenger aircraft built by US manufacturers. The money is to reimburse the carriers for the additional cost and operating expenses they will incur in the process.

As USAF plans the program, cargo features will be added to new wide-body passenger aircraft during the initial production process. Currently, that means the Boeing 747, McDonnell Douglas DC-10, and Lockheed L-1011 wide-body passenger aircraft. A participating carrier will order a convertible instead of a pure passenger airplane.

As planned by USAF and approved by Congress, General Huyser says the US government will pay the additional costs involved in making the new aircraft convertible to a cargo-carrying role, and the additional operating costs associated with using the slightly heavier planes. USAF planners expect that added weight will be about 12,000 pounds for a passenger 747, 3,000 pounds for a DC-10, and 2,200 pounds for an L-1011. (Note: The

paint job alone on a commercial 747 weighs about 500 pounds.)

In return for the reimbursement, the air carrier would agree to keep the aircraft available for use in an emergency throughout its projected sixteen-year life. The carrier would also reimburse the government if the aircraft were sold or destroyed before the end of the sixteen-year period, or used in cargo service before the contract had run eight full years.

Modifications for the CRAF Enhancement Program include the addition of a nose visor or side-loading cargo-access door, as well as a strengthened floor. In addition, removable cargo-handling kits, rollers, and rails compatible with USAF's 463L cargo-handling system are provided.

USAF planners expect that the enhancement program can be applied to sixty-five wide-body passenger aircraft between now and 1987, if Congress approves and the carriers participate. Congress has in fact appropriated $53.6 million in FY '80 and earlier funds to start the CRAF Enhancement Program. In January 1980, Military Airlift Command dispatched requests for proposal to all carriers who might be eligible to participate. According to knowledgeable officers, four to six new wide-body aircraft will be earmarked by carriers for participation right away, and will be covered by the money available. As the program gains momentum, they expect to attain additional participation as money is appropriated. They plan to fund seven aircraft in 1983, thirteen in 1984, fifteen each in 1985 and 1986, and seven more in 1987. If that schedule is followed, the additional capacity of the new aircraft will offset the loss of capacity from narrow-body retirements affecting MAC in the mid-1980s.

The airlines were reluctant to take part in CRAF enhancement as first proposed to Congress. Under that scheme, USAF would have reimbursed a carrier with a one-time, lump-sum payment for modification and operating costs. But the carriers balked, mainly because of the uncertainty of spiraling fuel costs and availability. "The carriers want to see a plan which will adjust reimbursement for fuel to reflect the actual economic situation," General Huyser says. He and Graham Claytor asked the Congress to give them flexibility in negotiating with the carriers so that adjustments could be made, if necessary, at any point during the life of the agreement. (That includes the carriers' reimbursing the government if fuel costs turn out lower than the funds provided.) In essence, General Huyser and Secretary Claytor sought—and Congress approved—flexibility to select the alternative that would be in the best interest of the government and the taxpayer.

The situation stands like this now: Carriers wishing to participate in the CRAF Enhancement Program will respond to MAC's request for proposal. Each carrier will propose that its new aircraft contain the cargo-carrying features, and will propose a utilization rate for the aircraft during its service life. That might be, for instance, twelve hours per day, 340 days per year, for sixteen years. At that utilization rate and aircraft weight, the carrier will estimate its additional fuel consumption to be a certain amount, say 500,000 gallons per year. MAC will negotiate an agreement with those carriers which will be to the best advantage of the government. Both sides will know that MAC will have the option to make additional payments to participating carriers based on abnormal fuel price increases, and can make those payments in cash or in fuel. In that situation, the carriers' fuel risks are minimized and MAC's access to cargo capacity is assured.

General Huyser estimates that the Civil Reserve Air Fleet provides about fifty percent of the total DoD strategic airlift capability. As such, it is a vital component of national power which, although taken for granted, could make the difference between success and failure in a crisis. ■

Airline Participation in CRAF

US airlines with aircraft allocated to the Civil Reserve Air Fleet (CRAF) totaled twenty-two in December 1979. They are listed here for reference. Numbers of aircraft committed range from two (Alaska, Capitol International) to seventy-six (Pan American).

Airlift International	Flying Tiger	Trans World
Alaska	Hawaiian	United
American	National	Western
Braniff	Northwest	Wien Air Alaska
Capitol International	Pan American	World Airways
Continental	Reeve Aleutian	Zantop
Eastern	Seaboard World	
Evergreen International	Transamerica	

Solutions to problems ranging from readiness and rapid reinforcement to night/all-weather capability in the face of growing Soviet strategic and conventional strength both in Europe and the Pacific are discussed by Air Force leaders in this concluding report on AFA's recent Symposium . . .

New Defense Horizons: Changing Strategies for a Changing World

BY EDGAR ULSAMER, SENIOR EDITOR

"FOR THE first time in thirty years, the United States stands on the threshold of a new decade in a position of military parity, rather than supremacy. . . . History has taught us the danger of allowing the military balance to tilt against the forces of democracy. We cannot afford to learn that lesson again." That warning was issued by USAF's Chief of Staff, Gen. Lew Allen, Jr., the keynoter of AFA's Symposium, "New Defense Horizons: Changing Strategies for a Changing World," in Los Angeles on October 26, 1979.

In General Allen's judgment, the momentum of the Soviet strategic buildup demands that the US move ahead rapidly with a series of programs that will maintain a clearly visible—hence credible—strategic nuclear deterrent as the foundation of US deterrent policy. On that foundation rest the forces developed to deter, or to prevail in, conflict at all lower levels. In combination, these strategic and tactical forces must be able to cope with "central strategic war between the US and the Soviet Union; tactical nuclear conflict; theater hostilities in Europe or Korea; and as a matter of growing concern . . . troubled areas worldwide which could erupt into a crisis requiring rapid projection of US power."

USAF Chief of Staff Gen. Lew Allen, Jr., was the keynote speaker at the AFA Symposium on October 26, 1979.

The Commander of Air Force Systems Command, Gen. Alton D. Slay, highlighted USAF's major weapons programs.

In parallel with its strategic buildup, the USSR has made major improvements in conventional forces to better adapt them to its "blitz-oriented doctrine for conducting theater warfare," while narrowing the technological lead the US and other NATO powers have enjoyed, General Allen said. "Consequently, the alliance now confronts sophisticated and numerically superior air and ground forces capable of conducting sustained, high-intensity combat operations. We must be prepared to cope with major attacks on our air bases, vigorous battles in the air, and the challenge of overcoming a wide array of mobile ground-based defenses."

General Allen rebuffed "well-intentioned observers" who argue that the technological sophistication required for tactical airpower to blunt a blitzkrieg attack under the cover of darkness or adverse weather drives up costs to a point where too few aircraft can be acquired. "My answer is that it makes no military sense to acquire greater numbers of less sophisticated aircraft whose limitations grant the enemy the advantage in the very conditions of warfare he is most likely to exploit. Conversely, we urgently need to carry through and extract the maximum advantage from our own [tactical airpower] modernizations program now nearing completion. The capabil-

ity and flexibility of systems such as the F-15, F-16, A-10, and AWACS have brought us into a new era. . . . We intend to further exploit these advanced aircraft through modifications which will both enhance their present capability and ensure their continued effectiveness against the evolving threat."

With rapid reinforcement emerging as the "critical limiting factor in US deterrent and war-fighting strategy at both the theater and contingency levels," USAF's responsibility for airlifting troops and equipment gains correspondingly in scope and importance. One reason for the increasing demands on airlift, General Allen said, is that "only a few years ago, our plans for reinforcing Western Europe were based on a twenty-three-day mobilization window. Today, in light of increased Warsaw Pact capability to mount a short-notice attack, our plans recognize that this mobilization window could shrink to ten days or less."

Also, modernization of the US Army's equipment continues to drive up the demand for airlifting "outsize" cargo—which today can only be carried by the C-5. The requirement for heavy airlift will increase fivefold between now and 1985, General Allen said. Finally, the increasing uncertainty of en-route basing and overflight rights places a "premium on range and independent operations in our airlift forces."

A series of programs under way to correct airlift shortfalls—C-141 modernization, extending the life of the C-5s and C-130s, modernizing commercial airlifters through CRAF, and adding the KC-10 tanker—will "double our current airlift capability, but that capability is still far short of our total air mobility requirements," he told the AFA Symposium.

A new airlifter designed to carry outsize cargo in both strategic and tactical missions, the CX, is needed to help close the gap: "The air-refuelable CX would vastly improve our ability to support Army and Air Force theater and contingency operations. We envision that [it would be used] for strategic airlift in the early stages of a deepening crisis . . . [then] shifted as necessary to assist intratheater requirements as sealift began to ease the burden of long-range mobility needs." The CX aircraft, in the Air Force view, should be provided with a short-field takeoff capability, General Allen said.

Because of the volatile political and military situation in the Middle East, US concerns about the availability of bases in Israel and the Sinai, the latter predicated on cooperative arrangements with both Egypt and Israel, are intensifying, according to USAF's Chief of Staff.

The increasing importance of the military space mission prompted the Air Force to set up a separate Space Division—apart from the Ballistic Missile Division of the Air Force Systems Command—which has been given a better "defined and more carefully structured role," reflecting specific directions by the Secretary of the Air Force to emphasize USAF's space responsibilities and "aggressive" exploitation of the Space Shuttle, General Allen said.

Turning to general management issues, he found it difficult to view with "equanimity" Congress's mounting trend toward "micromanagement: It is almost inconceivable to me . . . that the course of action the country is on in terms of the management of federal problems will be anything other than a management disaster." Congress's tendency to involve senior government and military managers in minute details to an "excruciating" extent creates "extraordinary inefficiency." But he conceded that the Air Force also is being driven to wasteful and inefficient micromanagement by higher echelons, which "I think is bad."

The Air Force Systems Command's Viewpoint

"The most serious conventional threat to NATO and our European allies is the Soviet bloc's ability to mass a vast amount of armor for a major thrust into Western Europe. . . . The [resultant] task is a tough one. . . . It involves ultra-low altitude penetration to avoid defenses, target finding and identification while flying at these low altitudes, and weapon aiming and accurate delivery against small moving targets while minimizing exposure to defenses" under various weather conditions.

In posing this technological challenge, Gen. Alton D.

General Allen urged speedy correction of current airlift shortfalls, to include modernization of the C-141s, extending the life of the C-5s and C-130s, CRAF enhancement, and acquisition of the KC-10.

Slay, the Commander of the Air Force Systems Command, said the Air Force's near-term solution would be confined to the night-attack part of the task. The required technologies are in hand: "For instance, we are developing more sensitive and smaller FLIRs [forward-looking infrared sensor systems] to decrease pod size and drag on the aircraft by about a factor of three or four. With this development, we can outfit aircraft with FLIR pods—and not unduly sacrifice range or weapons load," General Slay told the AFA Symposium. At the same time, AFSC is adding a terrain-following capability to the FLIR, using laser and radar technology for lower, more survivable penetration and weapons delivery in night clear air or under relatively low cloud cover, he explained. But this approach, even when augmented with sophisticated head-up displays and laser or radar terrain-following/avoidance capabilities, provides only a limited capability to see through battlefield smoke, haze, or precipitation over long enough ranges to assure reasonable aircraft survival.

Therefore, General Slay said, "for the larger, more demanding task we must depend primarily upon some form of radar. High-resolution synthetic aperture radar (SAR) is very high up on our list of required technological thrusts [because of] the advantage over FLIR of being able to penetrate weather with acceptable target resolution, and at longer ranges." An attendant drawback is that SAR maps can be made only to the side of the aircraft's flight path, thus requiring either new tactics for attacking ground targets or the use of off-bore sight smart weapons.

The Air Force also plans to combine SAR systems with terrain-following/avoidance radars, using the same radar for low-level penetration as well as finding, identifying, and attacking targets while the fighter is flying in or above clouds or fog, General Slay reported. The feasibility of such a multimode radar has been demonstrated, but "the trick is to exploit this testbed technology in fighters, which we plan to do under the Common Modular Multimode Radar program," he added. Parallel efforts are under way that will enable the Air Force to carry out air-to-air combat under all-weather conditions.

Gen. James R. Allen, Deputy Commander in Chief, United States European Command, focused on NATO-related topics.

Lt. Gen. Robert C. Mathis, Vice Commander of the Tactical Air Command, stressed the importance of adverse weather capabilities.

Almost everything USAF does depends on electronics, especially computers. A new, major AFSC study seeks to identify emerging computer technologies to match Air Force requirements discernible for the next two decades. This study, General Slay said, concludes that "computer hardware is advancing at the speed of light; computer software is proceeding at the speed of sound; and computer systems understanding evolves at the speed of human thought—and sometimes that is slow and defective."

Technological advance in computers revolves around "chip density," the determinant for doing more work faster. Over the next decade, this density will improve a thousandfold, the AFSC Commander predicted: "A single chip microprocessor capable of a million instructions per second—a 'MIP on a chip'—could appear within twenty-four months." By 1985, the AFSC study finds, single chips capable of doing the job of a full-size present-generation computer appear possible. Further down the road are so-called gallium arsenide devices that promise "at least an order of magnitude increase in computational speed over silicon devices and at the same time have much greater power efficiencies."

Another emerging technology—Josephson Junction Logic circuits—appears capable of operating hundreds of times faster while consuming only hundredths of the power of silicon memories, with the result that they "can switch functions between fifty and 100 trillionths of a second—about three orders of magnitude faster than the fast silicon device circuits available today."

A specialized technology of great importance to the Air Force focuses on fault-tolerant computer design techniques that could provide the extreme reliability needed by computers serving nuclear weapons control avionics, space systems, and flight control systems, General Slay pointed out. One Air Force objective here is to pack into about one cubic foot of space some two and a half times the computational capability available through standard means and do so in a manner that will enable a single computer aboard a spacecraft to function for about five years. At the moment, General Slay said, it is necessary to put an average of twelve computers aboard a satellite in order to assure that at least one of them lasts five years. First space test of a fault-tolerant computer is planned for 1984, the AFSC Commander said.

USAF's two-pronged ASAT (space weapon) program is being accorded the "highest priority [and] is in good shape," but for the time being is confined to testing. As yet USAF has no authority to deploy such a system in space, he said.

The ASALM (advanced strategic air-launched missile) project offers the only means for penetrating to "meaningful" ranges when confronted by a SU-AWACS, but is not being advocated vigorously. The project probably would gain impetus if the Soviets were to deploy a long-range interceptor, possibly a derivative of the Backfire strategic bomber, General Slay suggested.

In planning future defense suppression and ECM systems the Air Force is handicapped because "we need to know what we are ECM-ing against and here we have a deficiency. . . . We need both standoff and penetration systems. But we also need what is the best electronic

warfare [system] in the world; that is, something with a little steel in it" to neutralize the enemy's defenses, according to General Slay. He said the solution to the defense suppression problem depends in part on close cooperation with the US Army because it is easier to launch some of these weapons in the form of tube-launched projectiles rather than from aircraft.

The View From NATO

"The military-industrial complex of the Soviet Union . . . a complex which now contains the largest research and development manpower base in the world—receives almost twice the investment funds of any alliance nation, and is outproducing NATO at the rate of two or three to one, or more, in most major weapon systems," Gen. James R. Allen, Deputy Commander in Chief, United States European Command, told the AFA Symposium.

Over the past five years, that complex has produced more than 10,000 T-64 and T-72 tanks (which in 1974 were still undergoing troop trial). These tanks are rated "superior to any now fielded by NATO forces and . . . constitute a significant part of the approximately 20,000 tanks deployed by the [Warsaw] Pact against the Central Region," General Allen said. Over the same period, Soviet modern self-propelled artillery weapons went from zero to more than 3,000 while concurrently the number of modern attack helicopters stationed in East Germany and the Western Military District of the USSR went from none to more than a thousand. Also, the upgrading of Soviet air forces with third-generation fighters, which got under way in 1974, has progressed at such a rapid rate that "today, we face more than 2,500 of these third-generation aircraft . . . which have triple the payload and double the range of their predecessors," General Allen said.

Over the past five years the Soviet Union has produced more than 10,000 T-64 and T-72 tanks (shown above), both of which are superior to any US or NATO tank.

USEUCOM is concerned about improving and modernizing TNFs as rapidly as possible by introducing the Pershing II nuclear missile system shown here, and ground-launched cruise missiles.

Finally, in the past five years, the rapid modernization of Soviet theater nuclear forces has transformed the erstwhile Western lead in this weapons category into an "emerging Soviet advantage." Consequently, modernizing US TNF weapons takes on extreme urgency. The US Army's Pershing II missile system, he said, could reach operational status by 1983. Because "we need something quickly," USEUCOM favors a combination of Pershing II and ground-launched cruise missiles, rather than wait for the development of a medium- or intermediate-range ballistic missile. For the "foreseeable" future, USEUCOM will rely on Polaris SSBNs to backstop its theater nuclear capabilities in covering targets that are covered inadequately or not at all by other weapon systems, General Allen said.

The TAC Perspective

Improvements in electronic warfare and defense suppression as well as the development of night and/or all-weather capabilities, rather than boosts in speed or altitude of combat aircraft, "are the new frontiers of tacair," Lt. Gen. Robert C. Mathis, Vice Commander of the Tactical Air Command, told the AFA Symposium. He contended that doubling the productivity of combat aircraft makes more sense than merely doubling their number.

The solution to the problem of night operations may well be the LANTIRN program, which General Mathis

defined as "a podded, FLIR-laser system for detecting, acquiring, and targeting selected threats. . . . If the pilot desires [he can] also fire infrared guided weapons automatically." The LANTIRN pod provides the option to launch a full load of Maverick missiles—each one cued to a separate target—in less time than when released individually by the pilot. In addition, the pod functions as a laser designator for single-seat aircraft.

Another promising solution to both the current night and all-weather deficiencies is the Enhanced Tactical Fighter, or Advanced Tactical Air Warfare System (ATAWS), he said. ATAWS is expected to use advanced avionics to enhance navigation and FEBA penetration and will rely on sophisticated antiarmor cluster weapons to achieve high kill probabilities. For the moment, however, no decision to develop and produce such an aircraft has been made, General Mathis said.

TAC's central objective so far as readiness goes is to "train like we plan to fight," General Mathis told the AFA meeting. Specific training areas, over the past several years, have been dealt with in the form of "flag" training programs, best known of which is the by-now classic "Red Flag" air combat exercise conducted at Nellis AFB, Nev., for some 18,000 crew members annually. Other "flag" exercises involve command and control, maintenance, the transition of support personnel to combat-associated roles under crisis and war conditions, and a new all-encompassing training program known as "Checkered Flag." Its underlying purpose is to acquaint individual squadrons with those wartime operating areas and overseas bases that they are likely to be involved with. By concentrating training on their most likely wartime mission and locale, TAC expects individual units to arrive ready to fight immediately: "The program is keyed to periodic overseas visits by unit commanders to 'scout the terrain,' . . . squadron-sized overseas deployments, and [intensified] study at home [to give us squadron-by-squadron game plans for wartime deployment]," General Mathis explained. With the help of "Checkered Flag," he added, the Command will be able to deploy all its forces anywhere in the world, within three days from a no-notice start with most of TAC's units actually able to move out inside of twenty-four hours.

The payoff from TAC's intensified training over the past two years has been dramatic, culminating in a boost of the sortie rate equivalent to four work days of added productivity per month, General Mathis reported: "Over the past year, every one of TAC's twenty-four wings met its specified sortie goals. As a result, TAC fully met its allocated flying hours program in FY '79 for the first time in more than ten years—and at higher sortie and hour rates to boot."

TAC's ability to support NORAD in the air defense role is being strengthened through the assignment of F-15s and AWACS aircraft to bomber defense. TAC lacks the assets, however, to enforce adequately the sovereignty of US air space, General Mathis said.

The Challenge in the Pacific

"Roughly one-third of the Soviets' military forces are located in the Far East. These forces include approximately 350 Long-Range Aviation bombers and about 1,350 of their latest fighters, including the day/night, adverse weather MiG-23 Flogger. The Soviets have the capability to project significant airpower throughout the Pacific theater and on several occasions have operated long-range aircraft based in Vietnam—a move which greatly enhances their maritime surveillance capability in the Pacific," Lt. Gen. James D. Hughes, Commander in Chief of Pacific Air Forces, told the AFA meeting.

Growing Soviet airpower in the area gains in effectiveness because it works in concert with an increasing Soviet Navy presence in the Pacific and Indian Oceans, including the assignment of the aircraft carrier *Minsk* to the Soviet Pacific Fleet, General Hughes said.

Arrayed against these large Soviet forces is a shrinking contingent of US military personnel stationed west of Hawaii, "a number smaller even than the pre-World War II level of 160,000. Of this total, the Air Force has approximately 54,000 personnel stationed throughout the Pacific at major installations that range from support units in Hawaii, to forward-based combat units in the Philippines, Guam, Japan, and Korea," the CINC PACAF explained. The Command's fighter force is composed of approximately 200 aircraft, in the main F-4s but with a limited number of F-15s replacing some of them. PACAF's and PACOM's ability to perform two tasks of transcending importance—the defense of US bases in the Pacific and keeping the sea lines of communications open against all comers—is becoming problematical as force ratios tilt increasingly in favor of the Soviet Union, General Hughes said.

The severity of the threat was made clear by General Hughes with these statistics: "Ninety-five percent of all Persian Gulf oil passes through the Indian Ocean. This includes some sixteen percent of the oil for our own country as well as sixty percent of Western Europe's, sixty-seven percent of the Philippines', and seventy-five percent of Japan's oil needs. The ability to interrupt this oil flow—even for a short time—represents powerful political leverage. Deterring the Soviets from choosing such a dangerous course is a formidable challenge." Yet the importance of a viable US military posture is not confined to conflict in that region, he contended: "During a contingency in Europe the capability of Pacific Forces to deter, and, if required, effectively counter the Soviets in

Lt. Gen. James D. Hughes, Commander in Chief of Pacific Air Forces, warned of the growing North Korean threat.

the Pacific would have dramatic impact on the outcome of the conflict" in Europe.

While the Soviet Union remains the central threat to US forces in the Pacific as well as elsewhere, the expanding military might of North Korea is a serious localized challenge. Even though South Korea has twice the population and four times the GNP of North Korea, the two countries are spending about equal amounts on defense. The bulk of the North's military expenditure is going toward increasing mobility, survivability, and firepower of its ground forces, according to General Hughes: " . . . Pyongyang maintains about seventy-five percent of its ground forces within fifty miles of the DMZ, a fact not lost on the South Koreans residing in Seoul, a mere twenty-seven miles away. The loss of Seoul in a blitzkrieg-type attack would be a crushing psychological blow to the South Koreans and could lead to an untenable situation in the peninsula."

North Korea's lead over its southern neighbor is formidable, General Hughes pointed out: "The North Korean Army is at least twenty percent larger than the South's. They also have a two-to-one advantage in tanks, artillery, and aircraft, and four times as many ships. With this sort of advantage, the continued presence of US forces, especially air forces, represents an essential element [in] keeping the North Koreans at bay."

The North's undiminished belligerence was demonstrated anew with the recent discovery of a tunnel "cut through solid granite, some 200 feet below the surface. Just over a mile long, the tunnel took nearly three years to build and was sufficiently large to permit movement of a full division through it. Three tunnels have been located thus far, and more will likely be found in the future," General Hughes predicted.

The security of the Republic of Korea, he said, depends on a forward defense concept "primarily because we cannot afford to fall back and regroup. . . . Should North Korea choose to invade South Korea, the fighting in the Kaesong and Chorwon valleys—the two natural invasion routes that cut through the rugged central Korean terrain—will be more intense from the outset than any battle previously experienced. The military preparations in these corridors by both sides are extensive. . . . " North Korean artillery massed near the DMZ is capable of covering the invasion well into South Korea. These artillery pieces are located in hardened sites, making them very difficult to neutralize, General Hughes said.

The North Korean Air Force, although primarily air-defense oriented, is able to carry out strike operations and presumably will attack worthwhile military and industrial targets in South Korea during the initial stages of a surprise attack, according to General Hughes. To stop such an attack, USAF and the South Korean Air Force must defend against initial air attacks while at the same time gaining and maintaining air superiority in the battlefield area, he added. Air superiority is a prerequisite for close air support as well as for air strikes against military targets such as airfields, second and third echelon troop and supply concentrations, and lines of communication to slow North Korean reinforcements. Assuming that there will be little warning of a North Korean attack, tactical airpower must rely on "in-place forces" of the Republic of Korea and PACOM for both missions, at least at the outset. "We must be capable of holding the line until CONUS augmentation forces arrive," General Hughes pointed out.

Thus, readiness of the forward-based forces is of pervasive importance to PACAF, with improved mobilization, deployment, and deployment capabilities the central requirement, General Hughes said. PACAF's F-4s stationed at Kadena and Clark Air Bases now can begin deploying within six hours—as compared to the old standard of moving within seventy-two hours—and maintain a "steady flow into Korea where they would be quickly integrated into ongoing combat operations," he pointed out.

TAC and PACAF, he said, have streamlined the integration of CONUS-based augmentation forces with combat operations in Korea. Involved here is TAC's identification of specific squadrons and training requirements expressly for Korea. These squadrons study Korean scenarios at their home bases and deploy to their wartime Korean location during exercises. Conversely, PACAF has set up reception cadres specially trained to handle these forces as they arrive in the Pacific theater.

Also under way is an extensive facilities improvement program to support sustained combat operations. The Koreans are building additional storage facilities for munitions and jet fuel to permit increased prepositioning of war materiel. The survivability of aircraft on the ground is being improved by replacing revetments with hardened aircraft shelters.

PACAF, like TAC and USAFE, is concerned about deficiencies in night and all-weather tactical air capabilities. General Hughes also expressed concern about shortcomings in "our ability to take out heavily defended and hard structure targets," especially so far as precision-guided munitions are concerned: "Our potential adversaries are expending a lot of effort to improve the defense posture of their key military and industrial assets—defenses that call for improved guidance systems and improved single shot kill probability."

SAC's B-52 training missions flown over Korea are extremely reassuring to South Korea and exert a deterrent effect on the North, General Hughes said. Initiated by the US following the murder of two US Army officers by North Koreans during the infamous "tree-cutting" incident in the DMZ, the B-52 training flights over Korea—averaging two sorties per week—will continue for the time being, he said.

The Soviet military buildup in the Far East, including last fall's takeover of two offshore Japanese islands for military purposes, underscores the need for strong US-Japan defense cooperation, General Hughes stressed. From the US point of view, "bases and facilities provided by Japan are essential to our forward basing strategy and to our ability to honor our security commitments in the region."

Vietnam's well-equipped and highly experienced army—700,000 strong—which is occupying both Laos and Kampuchea (Cambodia) while at the same time defiantly confronting the People's Republic of China also is a major potential threat to US security interests in the Pacific. "We and our allies continue to closely monitor this troublesome situation," General Hughes reported.

AFA's next National Symposium on central defense issues will be held in Los Angeles October 23–24, 1980. ■

The author, who has written in good humor about the trials and tribulations of the World War II cannon-carrying B-25G, goes to Myrtle Beach for a look at its lineal descendant . . .

The A-10—Monstrosity With A Mission

BY LT. COL. JIM BEAVERS, USAF (RET.)
Cartoons by Bob Stevens

FIRST I could see smoke from the cannon in the nose of the airplane. Then the shock waves from the supersonic projectiles hit me, and, after that, the actual sound of the gun firing. The two noises were like a ragged clap of thunder followed by a deep, oddly euphonic bass chord. Put fifty shots together in one second, and the sound of the first is indistinguishable from the last, or any between.

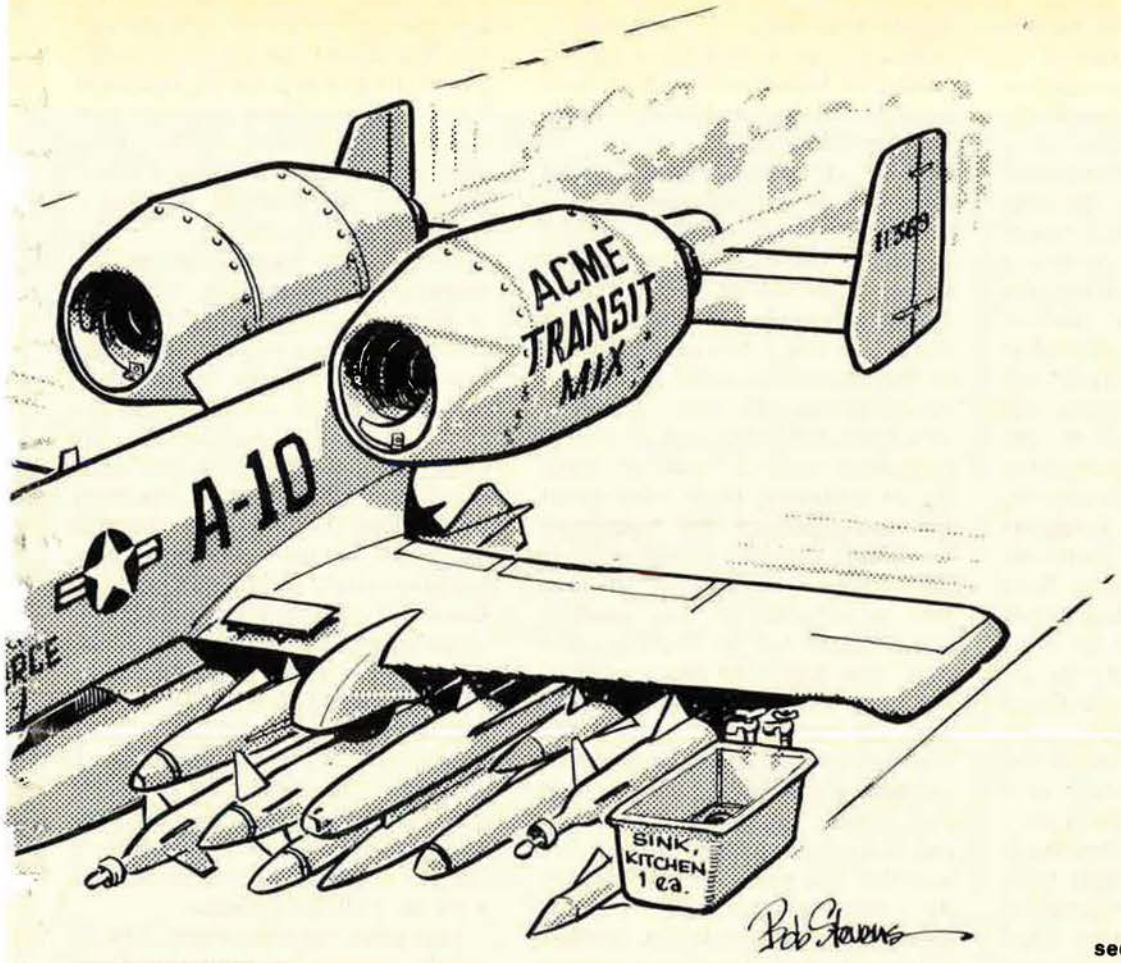
I found that if I wanted to watch the projectiles impact, I had to turn away from the airplane when I saw the big gun start to smoke, and look at the target while bracing myself for the shock waves. If I waited for the sounds and then looked, the dust was already settling.

The airplane shooting the cannon and then whining past me as I stood in the tower at a South Carolina gunnery range was an A-10 from the 354th Tactical Fighter Wing at Myrtle Beach AFB, S. C. Its cannon was the seven-barrel, 30-mm Gatling-type GAU-8/A, and it was a lot more impressive than its nomenclature, which sounds like a Ugandan zip code.

Waiting for the next A-10 to begin its run on a slightly hazy, warm morning in June, I reflected on the fact that Myrtle Beach was where I first fired another airborne cannon. That one was a 75-mm, and it was mounted in the nose of a brand-new B-25G. The date was almost exactly thirty-six years and one month earlier.

It was Myrtle Beach Army Air Field then, and it had the usual—for the times—aggregation of tarpaper shacks. Among other things, they housed the hotrocks who taught low-level gunnery to pilots and crew members of a number of World War II bombardment groups. As a part of the unofficial curriculum, that training included demonstrations of subsurface flying. The bombing and gunnery range contained a series of wide, deep drainage canals. With a Myrtle Beach instructor at the copilot's controls, visiting trainees were given a tour of the area in their own airplanes via the canal route. The drill that was intended to impress us was flying below the level of the banks and, if only by a foot or two, at a negative altitude with respect to the adjacent terrain.

I could have done without all that, but I had a gunnery instructor aboard despite the fact that he knew absolutely nothing about the cannon. His presence in the right seat was only to satisfy a local jurisdictional policy, which consisted of four words: "It's *my* gunnery range." Emerging from the canals, I got on the controls and wasted dozens of rounds of 75-mm ammunition without learning anything except that there was something wrong either with me or with the cannon. A popular bit of sarcasm of those



"When it's loaded up . . . it looks for all the world like the display window of a second-hand auto parts store."

times had something to do with the posterior of a bull and bomb bay full of BBs. Whatever it was, it aptly described my marksmanship with the 75-mm cannon that day, and long afterward.

B-25G: Monstrosity Without a Mission

Col. Mike Carns commands the 354th Tactical Fighter Wing, which flies the A-10 Warthog. An A-10 pilot is a hog driver or a wart person. The airplane is called the Warthog because it is the most supremely ugly flying machine ever built. It constitutes visual pollution. It's even uglier than the B-25G, and I didn't think that was possible.

"An A-10 pilot is a hog driver."

Actually, the B-25G might have sired the A-10, for all the similarities between them. They're about the same size. Both are midwings. The twin rudders of the A-10 are almost identical in shape to those of the B-25G. Both have two engines, the A-10's bypass turbofans and the B-25G's bygone props. The two airplanes would resemble each other even more if the A-10's engines, which look nauseously like the external gill bladders on an exotic fish I once saw, were moved from aft fuselage pylons to the wings. Both the A-10 and the B-25G were designed for low-level operation, each with a cannon in the nose. Both use eyeball range estimation to aim them. The A-10 is advertised as a tank-buster. So was the B-25G, at one time—by a public relations type who suffered from other hallucinations, too.

So what can a hog driver do that I couldn't do thirty-six years ago? For starters, a wart person cannot only hit a tank with the cannon, but can literally puree it—turn it into instant junk. On the other hand, neither I nor anybody else I knew could hit a big barn broadside with a boatload of ammunition, using the 75-mm cannon and the gunsight for it.

Ironically, the gunsight itself could be blamed, in a perverse way, because its very presence in the B-25G was proof positive to most people that the cannon could be aimed. It wouldn't be there otherwise, right? Would Uncle Sam buy an airplane with a cannon in it and a gunsight for it if it couldn't be aimed? Would your old Uncle do that?

It would seem that he would, and did, and if he was wrong, you couldn't have proved it by me at the

time. Army Air Forces in the Pacific immediately put the airplane to good use in an existing tactic—sweeping an enemy-held island with unaimed gunfire in advance of a formation of conventional bombers. It was in Africa, where the first B-25Gs were deployed and where there was no such tactic because it was a different kind of war, that the gunsight created a mental block—one that was never overcome. After many months of fruitless experimentation, further training, and actual low-level combat in the Mediterranean, all of it based on the presumption of an aimable cannon, the B-25Gs reverted to flying as wingships in ordinary medium-altitude missions, dropping their bombs when the conventional lead ship dropped his. It was all over, and nobody that I know of ever understood at the time why the flying cannon couldn't be aimed.

If it had been taken out of the airplane, sighted perfectly at a target a thousand yards away on a windless day and then embedded in concrete, the mystery might have cleared up. A hundred rounds of armor-piercing ammunition fired from the fixed gun would have produced not one hole in the target but a cluster of them, bunched together to some extent at the center but a lot of them spreading out in decreasing numbers on all sides. If the target had been the size of a highway billboard, most shells would have missed it entirely to one side or the other, over or short. The reasons are tedious but real: minor variations in the burning rate of the explosive propellant, upsetting moments on the projectile from muzzle blast, differences in propellant temperature from shell to shell—even changes in the temperature of the gun barrel itself as the gun fired. The list is long, and it all adds up to that most fundamental of all gunnery matters, which nobody in my part of the world understood: ballistics.

The World War II artilleryman had an answer to all that, and it was, "Don't fire one shot—fire a whole bunch." He unloaded round after round at the same target to increase the chances that at least one would hit it. But if you had asked him to bet on his chances of holing a target dead center at any real distance with his first shot, he'd have asked for mighty long odds. It's a common situation even with a fixed gun—a matter of ballistics resulting in a familiar statistical distribution of shell impact points.

The A-10's cannon has a one-mil dispersion as a fixed gun, but five times that when installed in the airplane. The B-25G was no different except that its 75-mm cannon was breech-loaded by the navigator and hence had a rate of fire limited by his manual dexterity and physical endurance. The "G" added its own source of variations by having its cannon move at velocities ranging on a random basis from about 195 mph to perhaps 260. Nothing in the simple gunsight asked whether the cannon was moving, or how fast, or whether it was accelerating—which for me was the usual case. And since the gun was moving, each shot took place at a new distance from the target, and hence was that artilleryman's first. If the airplane was skidding a little, that was another variable. If it was turning, that was another. The net result was that the moments and vectors on a departing projectile were as mixed as a dog's breakfast. It was a minor miracle that we never ran into the shell coming back to ask for a road map. That there was no way to estimate range in the first place made the total aiming problem a matter of multiplying the improbable by the impossible and hoping for the incredible.

In practical terms, the airplane was in trouble from the beginning because there was no clearly defined mission for it. To someone it just seemed like a good idea, after which came an attempt to find a mission for it, after which came the evolution of tactics for it, after which came the realization of what it was up against. Somebody had to guess at what the airplane's purpose was, and then to guess further at tactics for it. In Africa, whoever that somebody was guessed wrong—and I'm sure I could have done no better. Still another consequence was that we were forever encountering the unexpected. I like them on my birthday, Christmas, and Father's Day, but I can do without surprises in combat.

Where the Similarities End

When I first heard about the A-10, learned that it had a cannon, and read the claims touting it as a tank-buster, I was a little jolted. I decided I was in a time-warp that had cast me ashore in 1943. I couldn't help thinking of Jim Backus's classic line, "By George, Magoo—you've done it again!"

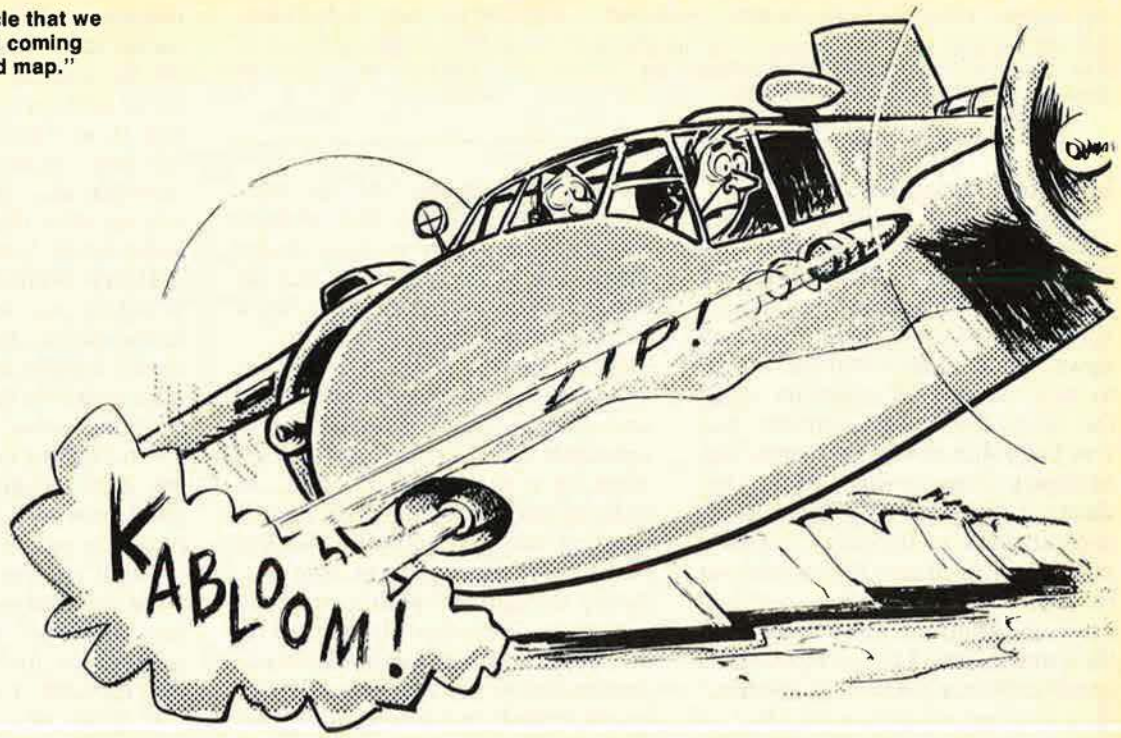
I wanted to know whether the airplane was another dog, but living in Winter Park, Fla., isn't conducive to learning a lot about anything new. Much as I love it, the town thinks the B-1 is a vitamin and the F-4 is a draft classification for backward people with physical problems. All I could do was read about the A-10 in AIR FORCE Magazine, but no belaboring of performance data, armaments, and the like tells a pilot anything meaningful about an airplane. He needs to fly it, and to try to make it do the things it's supposed to do. Then he knows, and what's said in print about it is of no consequence to him thereafter. I would have liked to fly the A-10 and make my own judgments, but that was patently out of the question. I put the airplane out of mind and went on with other things.

Last year, out of nowhere, I had a totally unexpected invitation from the Air Force to visit Myrtle Beach and learn everything a body could know about the A-10—today's version of the B-25G. Catch-22 was that the trip had to be at no expense to the government.

To have any compassion for the revolting apparatus, it's necessary to recall that it's the first airplane in Air Force history to be designed from scratch for the close-air-support role—and nothing else. That requirement dictated many things, and among them was simplicity. Except for the cannon, all the ordnance it carries is festooned on racks beneath the wings. When it's loaded up with assorted pods, dispensers, bombs, and miscellaneous garbage, it looks for all the world like the display window of a second-hand auto parts store. But it's simple. The racks are easy to get to, easy to load and unload.

My main interest, of course, was the cannon, and beyond that, tactics for its use. The first question on my mind was how it solves the problem of ballistics, and there are solutions to that other than the artilleryman's answer. However, it was im-

"It was a minor miracle that we never ran into a shell coming back to ask for a road map."



mediately obvious from the cannon's rate of fire (4,200 rounds per minute, or half that, if the pilot chooses) that it uses that solution. It gets off fifty rounds in the first second of firing as it gets up to speed, and if that isn't a whole bunch, I'll eat my socks.

The next most important question was how it is aimed, and the answer was by fixed crosshairs on the head-up display. That's about on a par with the ring and cross used by Eddie Rickenbacker, and I had doubts about it until I considered the cannon's average muzzle velocity, which is 3,300 feet per second or 2,250 mph. That's Scram City, is what it is, and it makes for a very flat trajectory. With apologies to Flip Wilson's Geraldine, what it pretty much boils down to is that what you see is what you hit.

From the tower at Poinsett Range, near Shaw AFB, I watched A-10 after A-10 do gunnery practice with the cannon. Starting at about 3,500 feet, each went into a shallow dive and began shooting just before passing the tower, which is situated on the foul line less than a mile from the target. I never saw what could be categorically scored as a miss, although I'm sure it happens.

If that was superficially impressive, so was the 75-mm cannon in the B-25G back in 1943. The bottom line for it was—and for the A-10 is—its ability to do its job in combat. The way to resolve that matter in 1943 was to send the airplane off to the wars and hope for the best. That's the hard way, but since the B-25G was born without a clear purpose in life, there was little alternative. The A-10 doesn't have that excuse. *Can* it do its job?

The Warthog's very existence presumes a conventional war as a real possibility, and the training scenario it uses is set in north central Europe. The airplane's mission is to help the Army stop the anticipated mass movement of armored vehicles, including and especially tanks, that could be expected to comprise the first phase of such a war.

There is little question that the A-10 can kill a Russian tank if it hits it, and it doesn't have to put more than half a dozen of the fifty slugs fired in the first second's burst into the tank to accomplish that. The cannon's five-mil dispersion is an asset rather than a liability, because it broadens the impact pattern and allows for some slop-over in aiming. A 30-mm slug weighing slightly less than a pound seems like sending a boy to do a man's job, but even from a distance of 4,000 feet, that slug can arrive at the tank with nearly 100,000 foot-pounds of kinetic energy. That's the energy required to lift fifty tons one foot, if you're not familiar with the term, and that too is a whole bunch. Put five or six of those—half a million foot-pounds or so—on a tank, and it unglues itself very violently.

All that kinetic energy takes on some real meaning when you see that massive, squat aggregation of steel and cast iron jump as if goosed, start crumbling like a tin can used in street hockey, and finally burst into flames as incendiary slugs find the fuel tank. I saw that in film clips of actual firing tests on real tanks—just as they might be encountered on the battlefield. It's nothing short of awesome.

Hitting a tank on a US gunnery range is one thing, but I suspect that hitting one in north central Europe in a hot war is another. The first chore confronting the A-10 pilot is to attack the threat to himself—most conspicuously the Soviet ZSU-23/4 track-driven, quad-mounted antiaircraft artillery system with four radar-directed, computer-fired, 23-mm cannons aboard. It has a well-earned reputation for effectiveness. However, that reputation was earned against the kinds of fighters the A-10 isn't, using tactics the wart person won't, and flown by pilots who didn't know as much about that Soviet weapon as the hog driver knows now. After studying a detailed analysis of the chore, I'm convinced that the ZSU-23/4 is anything but invincible in confrontation with an A-10 flown by a smart wart person—but he'd

Jim Beavers's humorous stories about the air war in North Africa, learning to fly jets, and the life of an Air Staff planner have appeared in AIR FORCE *Magazine more or less regularly since 1976—all illustrated by "There I Was" Bob Stevens. Colonel Beavers, who hung up his blue suit in 1963, now lives in Winter Park, Fla.*

better be a genuinely smart one.

So if the ZSU can be coped with effectively, what else does the A-10 pilot have to worry about? Well, I'd bet that the ZSU won't be the only thing shooting at him. The bad news is that about 4,000 feet seems to be some sort of optimum range for firing the A-10's cannon, and I've been shot at with discomforting accuracy from several times that distance, by guns nowhere near as sophisticated as the ZSU's. That's problem Alfa. Bravo is that without rangefinding equipment, the hog driver is going to have somewhat the same enigma I had in the B-25G, namely: Where the hell's 4,000 feet? But the good news is that it shouldn't be nearly as tough identifying 4,000 feet as it was 4,000 yards, which I had to do because the gunsight for the cannon was calibrated in thousand-yard increments.

The good news also is that the Warthog is a hard airplane. The pilot sits in a tub of two-inch-thick titanium that will stop a 23-mm slug cold, although I suspect that being in the tub when a slug hits it would be like sitting inside Big Ben next to the clapper at the stroke of one. The bad news is that if the slug impacts the airplane at an angle that allows it to enter the tub from above, it can't get out, either, and could clean out the cockpit while expending its kinetic energy. And, of course, the canopy will withstand columns of marching butterflies, light hail, and a sharp rap with the knuckles. The good news is that the A-10 will allegedly fly on one engine with one side of the double tail missing and a large section of one wing blown away, and can be flown by direct mechanical linkage—without boost.

Putting the Warthog In Perspective

Capt. Harry Walker, the 354th's wing weapons officer and an articulate student of such matters, neither minimizes nor blows them out of proportion.

"We're not going to win the war by ourselves," the young Air Force Academy graduate told me candidly. "Some things the artillery can do better than we can. Some things the Army's Cobras can do better. What we can do best, we'll do, but we can't do everything."

He made the point that the Army's task of stopping massed armor was divisible into a number of recognizable subtasks that can be dealt with on a businesslike basis, in order of priority, using all the help at hand. It sounded carefully thought out, but, more important, was evidently thought out with a stubborn insistence on realism. It dawned on me, as he was putting the A-10 into perspective with every other friendly gun at the forward edge of the battle area, that I hadn't understood what close air support is. I had tended to view it as a single-handed dominance of the battlefield by airpower, but that isn't what he was describing. *Support* evidently means what it says—to help.

I showed Captain Walker a fairly recent article deploring close air support in modern war as a waste of limited resources. Did he agree or disagree? His observation was that we have always used for close support airplanes that were either designed for something else or were compromises between that role and some other—that we had never tried it with an airplane designed exclusively for the close-support mission. How could we say with any authority that it was a waste of resources when we've never done it right?

Some things seem incontrovertible, though. One is that if we rule out conventional war in north central Europe, the alternatives can be worse. Another is the *de facto* existence of the A-10 in the inventory. Still another is that close air support of the Army is one of the assigned roles and missions of the Air Force. I wouldn't draw any conclusions from the first or last of those, because I think the conclusions are obvious.

But I did draw some about the A-10. It's one of the few airplanes I've seen that didn't have its basic purpose scragged up to make it all things to all people. I wouldn't bet on its staying that way forever. Some klutz is sure to insist on making it at least a dual-purpose airplane, sooner or later, in the interest of "flexibility"—which among other things is the quality of being easily bent.

Harry Walker tells me that the Warthog can help the Army stop Soviet tanks, and I believe him. But what I believe doesn't matter. What matters is that Harry believes it, and so does every other pilot of the 354th I talked to. I also believe that the A-10's chances of survival are good now and getting better. For once, the people evolving tactics for it know exactly and in great detail what the airplane's job is because it has only one—the one it was designed to do—and they know exactly what it's up against.

If those of us in the Mediterranean had known that the B-25G's mission was going to be the destruction of enemy shipping, and if we had known what we were up against, and if we had been blessed with a few hardheaded realists and intelligent analysts in our midst—in short, if we'd had going for us what the A-10 pilots have going for them—I think we could have made that airplane a success.

In the last analysis, of course, there is no really meaningful comparison between the B-25G and the A-10 other than the fact that both operate—or operated—at low level in a hostile environment. Almost every other similarity is obviously superficial, and I would certainly hope so, considering the disparity in their ages. The B-25G couldn't do the job that was invented for it because the airplane preceded the mission, but I think the A-10 can do the job it was invented for because the mission preceded the airplane. I believe that's the most significant comparison between the two.

I'd still like to fly the Warthog, and when the two-seater version comes along, I want to be invited to Myrtle Beach again. I want a keen IP in the back seat to keep me out of trouble while I head for Poinsett Range. I want to go through a gunnery run and bust a tank wide open. I want to kill something. After the B-25G, the Air Force owes me that. ■

The author over Vietnam in a VNAF L-19, 1962. Above his head is the PRC-10 radio pack used by the Vietnamese observer to communicate with ARVN ground forces.

Reinventing the FAC: Vietnam, 1962

In January 1962, the function of the airborne Forward Air Controller was almost a lost art. The author learned some subtleties and peculiarities of the trade as practiced in Vietnam from VNAF airmen and was instrumental in establishing USAF's FAC program in Southeast Asia.

BY MAJ. DOUGLAS K. EVANS, USAF (RET.)
Photos by the Author

WHEN I went PCS to Japan in 1961 to continue flying F-100s, I didn't expect a most unusual flying transition within a few months. That transition later became common for a lot of Air Force pilots. I was to trade my afterburner for a propeller and my nosewheel for a tail wheel after many years into the Jet Age, and nearly two decades removed from those misty beginnings in World War II PT-19s and -17s.

It all began at Misawa AB, Japan, during a Christmas blizzard, when I got word to pack and stand by for a lengthy TDY at a classified destination. Having heard that the conflict in South Vietnam was becoming serious, I expertly deduced the destination. There might be some excitement down south that would make up for my leaving the F-100 cockpit. So, right after New Year's Day 1962, I departed by train, due to another snowstorm, from what was known by PACAF pilots as "the garden spot of the north."

The initial buildup of our forces in South Vietnam (SVN) opened up some intriguing operations in an assortment of vintage aircraft. The Vietnamese Air Force (VNAF) 1st Fighter Squadron at Bien Hoa AB was equipped with ex-Navy AD-6s (A-1Hs). The 2d Liaison Squadron was operating out of Tan Son Nhut AB with L-19s (O-1s), and the 1st Liaison at Da Nang and 3d Liaison at Nha Trang were training in L-19s. The USAF Air Commandos had just set up shop at Bien Hoa with ex-Navy T-28Bs and USAF B-26s and C-47s. They began a program to train VNAF pilots in the T-28 in preparation for a large shipment of those planes to equip their 2d Fighter Squadron, which was to be at Nha Trang.

A unit of USAF C-123s came in to shuttle cargo from base to base and lived up to its code name—Mule

Train. The US Army had put the 57th Transportation Co., a large helicopter unit with H-21s, into Tan Son Nhut. They were carrying troops of the Army of Vietnam (ARVN) and supporting isolated defense outposts. Later, in April 1962, the US Marine Corps helicopter squadron, HMM-362, moved into Soc Trang, equipped with HUSs (H-34s) for the same kind of work.

My assignment was to operations staff work in the new Joint Operations Center (JOC). Shortly after arriving, I volunteered for several heliborne missions with the Army. On the very first one, I encountered a serious problem: The choppers couldn't communicate with the T-28 escort, so a strike couldn't be directed on the target, a well-defined Viet Cong (VC) establishment pointed out by a VC defector on board the H-21 I was riding. And ground contact couldn't be established until the choppers landed at a friendly outpost. After so much milling about over the target, the VC were long gone by then.

On studying this problem, two of us fighter pilots—Capt. Tom Cairney and myself—discovered the great variations in communications equipment installed in aircraft and helicopters belonging to ground units. There was UHF, VHF, AM, FM, and more. Not being communications or signal officers, we had to physically check each piece of radio gear to record the type and number, and crank through each set to find the complete frequency spread.

Then there was another problem. The USAF Air Commandos were experiencing a language barrier when operating with VNAF, especially with the L-19 crews. Under the rules of engagement at that time, air strikes were controlled by Vietnamese on targets they designated. It was most important *not* to have any misunderstanding in the cooperative effort.

Cairney and I also compiled a list of ordnance capabilities for each carrying station of each strike aircraft (AD-6, B-26, T-28). The consolidated data was then available for planning by the JOC and 2d ADVON. These activities gave both of us the opportunity to live at Bien Hoa and operate with the Air Commandos. In the process we got to know a number of VNAF pilots. The needs for coordination and liaison led logically to the idea of flying VNAF L-19s to act as go-between for air/ground operations. The VNAF was delighted, but selling the idea all around was another thing.

Above, the author, Major Evans, doing some last-minute coordination between aircrews of L-19s at Tan Son Nhut AB, Saigon. The twisting arms of the Mekong and the patchwork fields (right) made navigation somewhat of a puzzle.

A New FAC Environment

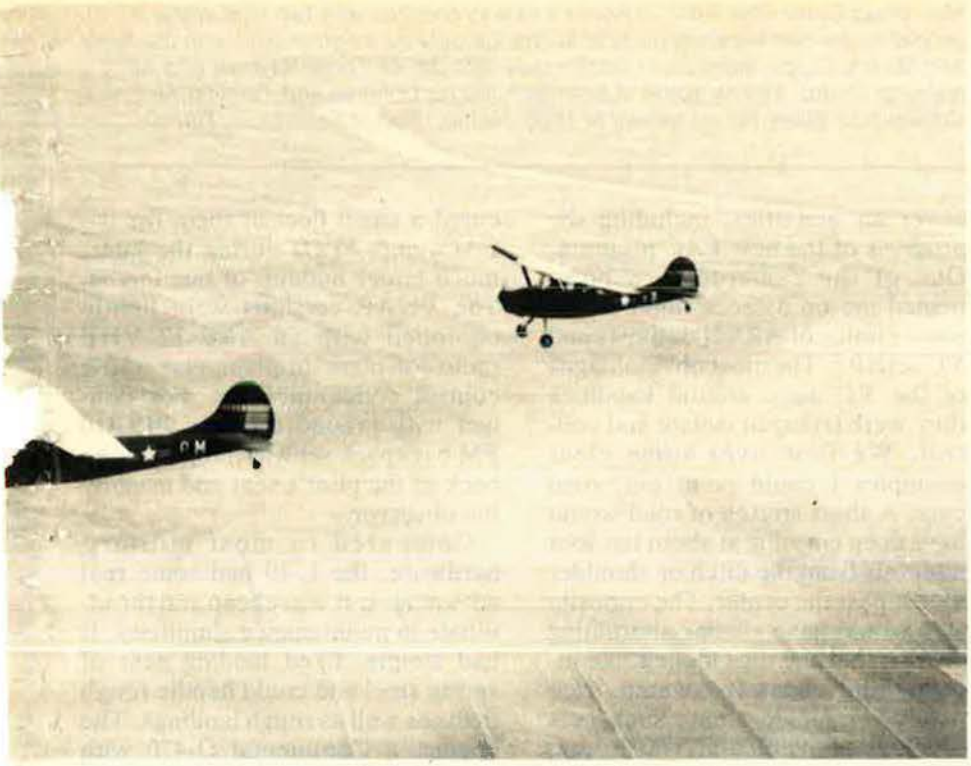
Forward Air Controllers (FACs) were in our organization charts, but just how to use them was an undetermined issue. There was no clear-cut front line or FEBA (forward edge of the battle area). A FAC on the ground, in a guerrilla-friendly mix-up or obscured in the dense jungle, would have no better view—if any at all—of the situation than an ordinary rifleman. We pushed to have the FAC not only in the air, but piloting himself to oversee an operation. Our persistence in the FAC employment matter paid off. Orders for Tom Cairney and me to fly with VNAF came out in both languages, and with that authorization we became the first American FACs in SEA.

As fighter pilots we were familiar with conventional operations and the role of close air support for well-defined ground forces. The VNAF L-19 crews were familiar with the terrain and the peculiarities of their guerrilla war. Most of their flying up to that time had involved liaison and area surveillance. In briefing officers of ARVN regiments on the air/ground system, I was surprised to discover that only one had talked to an aircraft by radio and few had any experience at all with close air support.

To provide this support the JOC was established for the southern region and Air Support Operations Centers (ASOCs) were set up in the northern Corps areas. That was the beginning of the air request net to speed response to the needs of ground units or isolated communities under attack. When we got into the FAC business, Americans were active in all phases of the air/ground system. The job was tailoring tactics to fit the existing situation.

As a first step to ease the language problem, I made up a short list of key words from the air defense Brevity Code and took copies to the Air Commandos, VNAF 1st Fighter Squadron, 2d Liaison Squadron, and the Control and Reporting Center (CRC). We believed that clear, simple, common phraseology such as "Say again," "Bingo," and "Tallyho" would help.

My checkout flight in the L-19 was with a very young VNAF second lieutenant as IP. In spite of a considerable language problem, I



worked out the necessary procedures, and we combined the transition with a recce for signs of Viet Cong activity west of Saigon. All of my landings were extremely gratifying three-pointers, and I became a qualified L-19 pilot.

Except for the more involved missions of combined operations with heliborne troops and prop fighter support (T-28s, AD-6s, and B-26s), all flights, even trips to other towns to visit units or compounds, included area recce and constant surveillance for VC activity. There also were visual recce missions over wide expanses of the Mekong River delta and the communities west and south of Saigon.

It Pays to Know the Territory

It was on one of those low patrols that I witnessed an example of surprising ingenuity by the VC. In the backseat of my "Birddog" was my favorite VNAF observer, a lieutenant who reminded me of Sabu of movie fame, and who really knew his stuff. The early situation in SVN resembled accounts of the Indian Wars in the American West where, if you really wanted someone who could read sign and tell what the Indians were doing, you used an Indian scout.

Anyway, we were cruising between 1,000 and 1,500 feet and coming over a T intersection of two canals where I noticed three thatched, low huts with about a dozen people busy around them. It looked fishy to me as there were no other signs of habitation for some distance and the site was in the midst of heavy foliage rather than the usual small clearing.

I turned my head and asked, "What are they doing way out here?"

My observer (for simplicity, let's call him Sabu) had been scanning the other side of our flight path. He took a look and said, "Make wide slow turnaround. We watch."

He said that perhaps if we appeared to be flying around casually, the strangers below would continue whatever they were doing. But the strangers were alert, their conical coolie hats tilted back and their faces shining in the sunlight—the dead giveaway of groundlings who can't resist a look upward. Their activity became almost frenzied. Palm fronds were quickly cut in armloads, placed on the brown thatched huts, and within five minutes, as if by magic, the huts and people were obliterated from view; the site appeared as one unbroken tangle of greenery. If I hadn't seen for myself such camouflage cunning, I wouldn't have believed it.

Sabu said the strangers were VC setting up an ambush point where they could waylay government boats or farmers moving their goods by road or canal.

"Should we go down and buzz them for a close look?" I asked.

"No, they are ready now. We are alone here. If they shoot us . . .?" He shrugged his shoulders.

Sabu marked the site on his map and we climbed to a higher altitude to establish radio contact and report the incident to Paris, the CRC and radar site at Tan Son Nhut. I had already found out in visits to Paris Control that beyond a few miles their radar could not paint an L-19, and communication was not possible at our usual low altitudes. If we had an emergency, we couldn't tell anybody, and an air rescue system was only in the planning stage at that time. The steady drone of the engine was the best insurance on single-plane operations. For those reasons the helicopters never went on less than two-ship missions.

Sabu told me of an earlier mission, in which his pilot had been struck a glancing blow in the head by a bullet and knocked out. Fortunately Sabu had some pilot training before being washed out and trained as an observer.

"We go into steep dive at the ground. I yell at my pilot to pull out, but his head is rolling around. Then I see the blood. I stand up and pull the pilot back, then reach over him and pull stick back."

They recovered just above the trees and Sabu somehow steered the plane toward their airfield, all the while stretched over and holding up his pilot, calling to him to wake up and try to fly. When they got to the field in this hair-raising fashion, Sabu made a last strenuous attempt to wake the pilot by shaking him and shouting, "Wake up and land, *now*, or we crash!"

The pilot recovered enough of his senses to set the plane down, then passed out again.

"We make it OK," Sabu concluded and smiled at me. He was a cool one.

A Career of War

Convincing proof of the advantages of having a native observer came on a mission over heavy jungle. Sabu and I had dropped down from comfortable altitude, where we could get an overview, to

skim the treetops for an angled look under the high forest canopy. That also gave us a chance to pick up faint wisps of smoke that sometimes filtered up from campfires on the jungle floor. Sure enough, we sighted a trace that barely showed before being dissipated by the upper breezes. As we approached the smoke trace, the jungle opened up in a sort of bowl with only small trees and brush. The smoke rose from among the tall trees on the far side.

With our tremendous ninety mph airspeed, we were quickly across the opening. I zoomed up and whipped back in a dive that put us inside the bowl.

Sabu called out, "We look for camp."

We made several diving passes and even while hopping bushes and snags I had time for short glances and a limited survey of the site. Sabu, however, absorbed an amazing amount of detail that only he could interpret.

Back on patrol, he asked, "You see campfire and cooking pots?"

I nodded. He explained that there was something different about the way the fire was built, about certain cooking pots, and the odd arrangement of clothing hanging near the shelters. Also, the thatched shelters were not woven as they would be by people of that region.

"You mean," I asked, "that is a camp of outsiders who don't belong here?"

"Yes. I think maybe twenty or more," and he plotted it on his map so a welcome could be arranged for the insurgents.

As I got to know more VNAF pilots I found among the senior ones some surprising backgrounds. Some had been trained in France, had seen action in North Africa, and even flown French jets. VNAF flyers were living with a "career" of war; long after I left, some went on to accumulate well over 5,000 combat missions. They really appreciated our personal participation. The Executive Officer of the 2d Liaison Squadron gave me his wings off his own uniform, and I value them most highly.

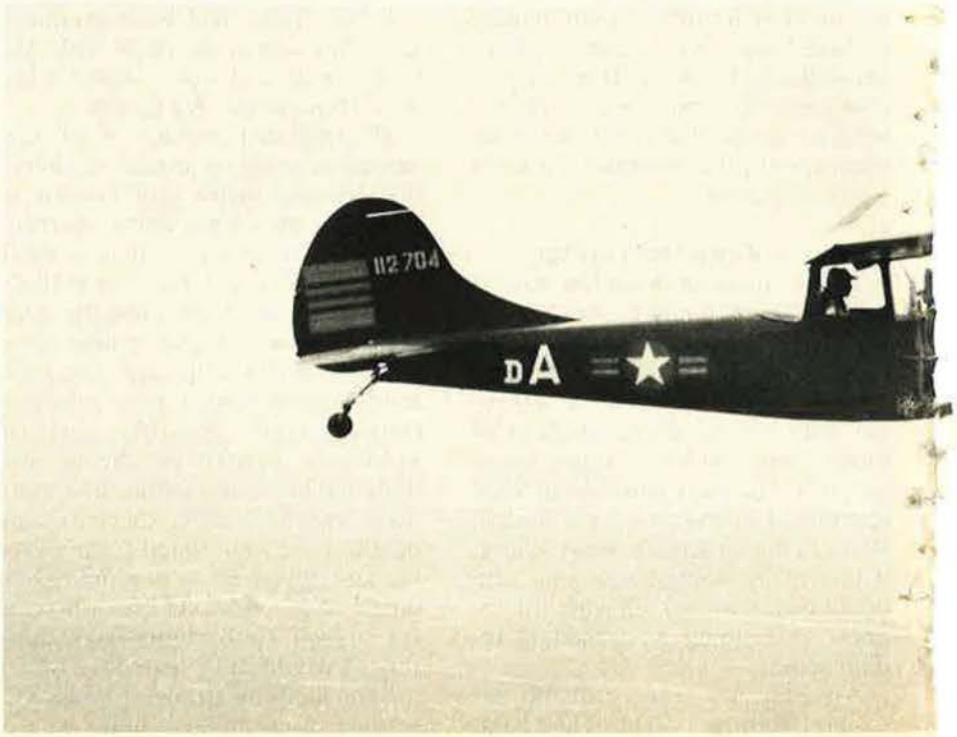
In Praise of the L-19

In March 1962, a USAF team of photographers arrived in SVN to cover air activities, including the progress of the new FAC program. One of the cameramen accompanied me on a recce flight to get some photos of ARVN outposts and VC activity. The most obvious signs of the VC were around localities they were trying to isolate and control. We flew over some clear examples I could point out: road cuts. A short stretch of road would have deep cuts dug at about ten-foot intervals from the ditch or shoulder to just past the center. The opposite side would have similar alternating cuts so that the digs looked like interlocking cogs. In swamp, rice paddy, or jungle areas, such cuts blocked all vehicular traffic and permitted only a winding foot or bicycle path. The digging was a simple job, done during the night by the local people who provided forced labor for the armed insurgents.

Bridges were either blown by the VC or weakened so they would support only foot traffic.

In early 1962, the only L-19s available for FAC work were in VNAF. They were so practical that the US Air Force eventually procured a small fleet of them for the FACs and ALOs during the later, much larger buildup of our forces. The VNAF versions were lightly equipped with an ARC-12 VHF radio for plane-to-plane and traffic control communication. For contact with ground forces a PRC-10 FM backpack set was hung over the back of the pilot's seat and used by the observer.

Compared to most military hardware, the L-19 had some real advantages: It was cheap and the ultimate in maintenance simplicity. It had simple, fixed landing gear of spring steel and could handle rough fields as well as rough landings. The engine, a Continental O-470 with the odd-ball rating of 213 hp, swung a simple fixed pitch propeller. Normal cruise speed was ninety to 100 mph, and with flaps it had a stall speed as low as fifty-five mph. With that combination, if you knew the plane well you could work off a 1,000-foot strip or dirt road without much sweat, which adds up to what STOL is all about. I knew of no L-19 abort in the VNAF 2d Liaison Squadron while I flew with them



Maj. Doug Evans flew F-86s in Korea and was credited with two kills and a probable. He had separate tours of exchange duty as a fighter pilot with the Navy and Marine Corps, served on inactive duty with the Air Force Reserve and Air National Guard, and on active duty in both the Air Defense and Tactical Air Commands. Since his retirement in 1968, he has lived at Fort Myers, Fla.

and they put up a variety of missions on some days.

Back to World War I

Early in May 1962, I went out with a gaggle of VNAF L-19s and AD-6 (A-1H) Skyraiders, US Army H-21s, and US Marine Corps H-34s carrying ARVN Rangers on a real shootout. We went to work in the area south of Moc Hoa near the Cambodian border west of the Parrot's Beak. I had one of the "old head" VNAF observers with me, and while I was keeping our place in all this mix, he was busy studying his maps and making contacts on the PRC-10. The troops had been put down by the choppers and were engaged with the VC. There was a bedlam of voices on the radios. The shooting part was an all-Vietnamese show, and I became somewhat confused. All the talking was in Vietnamese! The VNAF pilots in the L-19s and AD-6 Skyraiders were having excited exchanges on VHF, and my observer sounded like an auctioneer using the mike of the PRC-10. I thought I'd better get some clues.

"How are the troops doing down there?"

"We go to help at the village over there," he replied, "the one between the canals." He pointed and then made a diving motion with his open hand, "Go down low."

His hand next appeared by my shoulder with two white phosphorus rifle grenades and he said, "OK, level now, I mark for air strike."

The observer held the rifle grenades outside of the window and released them together. I watched them fall away, looking, with their fins, like little bombs. That was our normal method of marking targets in those days—by hand, with smoke or white phosphorus grenades. Back to World War I!

When the AD Skyraiders came whistling down we went around in a right-hand pattern, leaving the left pattern to the fighters (an important procedure worked out in Korea, but forgotten by most people) and met the fighters on each attack run. The rockets and 20-mm shells really tore things up. After more talk on the PRC-10, my observer marked a cluster of sampans in the canal by the village. He used red smoke grenades that time and the VNAF AD's cannons turned the sampans into matchwood and scuttled the VC fleet. Of course, we couldn't match the speed of the Skyraiders, but trailed each run close enough to confirm that those ADs of VNAF's 1st Fighter Squadron were piloted by real sharpshooters.

A break came in the operation and the L-19s went to the town of Moc Hoa where the helicopters had already landed. The airstrip looked more like a broad avenue thrusting into the town itself and was as busy as a beehive. Choppers were densely parked along both sides of the landing area, the remaining path considerably narrowed by rotor blades bobbing in the wind and bristling out, as I viewed it, like two thorny hedgerows. Vehicles were darting across on errands and the other L-19s were parking on the rollout end of the strip.

The approach end was right in Moc Hoa, and necessitated skimming the housetops to drop down on the path through this beehive. I felt I was about to run the flails of a gauntlet and thought, "Now comes the moment of truth for hot jet jockeys." To have a ground loop or some other clumsy performance in the midst of that packed flying machinery would certainly have been unthinkable, especially with my Vietnamese friends looking on with big grins. Decidedly unlike a by-the-numbers approach to a 10,000-foot runway in an F-100.

In late April and early May 1962, when the first increments of USAF fighter pilots came in specifically for FAC duty, I took them up to familiarize them with the procedures and locale. Those pilots then began working with all the VNAF L-19 squadrons to augment FAC participation in increased air/ground operations against the VC. By the end of May, just when things were rolling after several TDY extensions, along came another problem. An unusual debilitating feeling turned out to be a serious case of amoebic dysentery, and as a result my Southeast Asia tour ended in the hospital at Clark AB, in the Philippines.

Compared to my familiar environment in fighters, much of it high in the blue in air-superiority tactics while on exchange duty with the Navy and Marines, the FAC business was a different world. Getting back down to mingle with the birds was a refreshing exposure to elementary aviating. The experience did two things for me. It gave me a deep respect for the skill and courage of VNAF airmen, and it reaffirmed a feeling that I believe any pilot must retain: Flying is still an art rather than a computer science. ■

The photo at left depicts the swampy maze of the Mekong Delta. "It was a terrible place for a forced landing—too thick to swim in and too thin to walk on." Above, the author watches servicing of an L-19 between missions.

Three times winner of the Mackay Trophy, holder of several aviation "firsts," and an honoree of the Aviation Hall of Fame, he was one of the leading Air Service test pilots of the 1920s. His work with experimental aircraft and techniques helped lay the foundation for today's airpower.

Col. John A. Macready

BY JOSEPH A. VENTOLO, JR.

ANYONE flying nonstop, coast-to-coast, in the pressurized comfort of a modern airliner or military transport would do well to remember one of the men whose pioneering flights helped to make it possible: Col. John A. Macready. At one time, while he was Chief of the Flight Test Section at McCook Field, Ohio, Macready simultaneously held world records for altitude, endurance, and distance flights. Between 1921 and 1926, he tested airplanes, equipment, and piloting techniques that made possible what is now regarded as routine flying.

In the late 'teens and early twenties, nearly all the significant military aviation research in the United States was done at McCook Field, a small Air Service flying field located not far from Dayton. McCook was an experimental station where airplanes were brought for modification and testing. In many cases, airplanes and their accessories were designed and built by the Engineering Division there. The experiments conducted with this equipment were destined to shape the future of American military and commercial aviation.

The heroes of the McCook Field era were the pilots, and their adventures in the air captured the imagination of the public. In much the same way as present-day astronauts, these men were working at the fringes of technology. Their names may not be as widely remembered today, but they were well known to the public of the 1920s: Harold Harris, "Shorty" Schroeder, Leigh Wade, Louis Meister, Oakley Kelly, Wendell Brookley, and Eugene Barksdale, to name a few—and, of course, Macready.

Lt. John Macready with the experimental LePere LUSAC-11 plane in which he set a world altitude record in September 1921.

John Macready, then a lieutenant, was one of the most highly respected and best-known test pilots of the day. He was a modest, unassuming man—almost naïve—with a quiet, dry sense of humor. For three of his flights, Macready was awarded the Mackay Trophy, making him the only person in history to receive the trophy three times—first, in 1921, for setting the open-cockpit altitude record; second, in 1922, with Lt. Oakley G. Kelly, for their joint endurance flight of thirty-five hours, eighteen minutes; and third, in 1923, again with Lieutenant Kelly, for their nonstop transcontinental record flight. Despite all the recognition he received at the time, Macready was never noticeably impressed with his own accomplishments. Many years after his record-setting flights, he remarked to his good friend, Royal Frey, Curator of the US Air Force Museum at Wright-Patterson AFB, Ohio, "All I ever did was fly the plane—it's the engineers who deserve all the credit."

John Macready was born in San Diego, Calif., on Oc-

On May 2–3, 1923, Lieutenants Macready (left) and Oakley Kelly made the first nonstop transcontinental flight, in a Fokker T-2 transport, averaging ninety-four miles an hour.

tober 14, 1887. In 1912 he graduated from Stanford University. He was living in the small mining town of Searchlight, Nev., when the United States entered World War I. As Justice of the Peace of the little community, Macready had spent much time in the saddle and, after war was declared, he left Searchlight, fully expecting to enlist in the US Cavalry. On the train to Reno, where he was to enlist, Macready happened to read a newspaper article about the Aviation Section of the Signal Corps. He decided then and there to become a flyer. After several weeks of red-tape delay, Macready was accepted, sworn in, and sent to ground school at Berkeley, Calif., then to North Island at San Diego for flight training. After receiving his wings and commission, Lieutenant Macready was sent to Gerstner Field, La., and then on to Brooks Field, Tex., where he served as Officer in Charge of Flying.

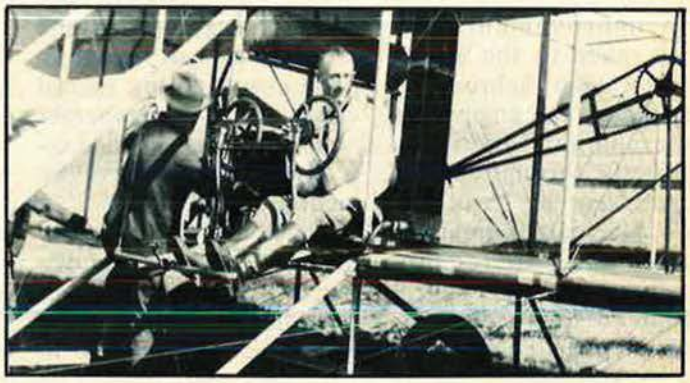
In 1919, the Army ordered Macready to McCook Field to test some of the foreign combat aircraft that had been sent from Europe for evaluation. He was also to test new airplanes, some of them developed by the Engineering Division at McCook Field, and others built by various American aircraft companies.

Test piloting was a hazardous business. To survive in the environment that prevailed during the infancy of aviation, one had to be deliberate, resourceful, careful—without being timid—and lucky. John Macready did not figure himself to be any kind of hero. He looked upon test piloting as an interesting and challenging job, and to that job he brought an extra measure of maturity and good judgment, as well as skill. At age thirty-three, he was somewhat older than most of his fellow airmen. It was probably those qualities, as much as luck, that helped keep him alive.

Perhaps both luck and skill were demonstrated in March 1921. Lieutenant Macready was at Ithaca, N. Y., testing three Thomas Morse MB-3 airplanes for the Air Service. He had flown two of them and was taking the third up for its acceptance flight. At about 9,000 feet he put the plane into a dive. Suddenly, the entire leading edge of the upper wing collapsed, sending the MB-3 out of control. With the upper wing useless, the stalling speed of the airplane was not much less than its maximum speed. Macready recognized this and regained control of the MB-3 in time to make an extremely fast—and definitely rough—forced landing on the Cornell University campus. The airplane flipped over, but Macready crawled out, amazingly without serious injury.

Macready had not been at McCook Field very long when another test pilot, Maj. Rudolph W. "Shorty" Schroeder, almost died on a high-altitude flight. His aircraft was a LePere LUSAC-11 biplane with a Liberty engine, which was equipped with a Moss-designed supercharger. Major Schroeder was well above 30,000 feet when he suddenly passed out as he was attempting to adjust some balky oxygen equipment. The airplane fell out of control for nearly 30,000 feet before Schroeder regained consciousness. He finally landed safely at McCook, although he was nearly frozen and partially blinded by the high-altitude cold. One of the men to help Schroeder from the airplane was John Macready. Not long after the near-tragedy, Macready was given the job of continuing the high-altitude test flights.

The primary purpose of the high-altitude test program was to perfect the supercharger, a device that compresses thin air to sufficient density to maintain the right air-fuel mixture for proper engine operation at extreme heights. The General Electric-built Moss supercharger was very sophisticated for its time. Its turbine wheel, driven by exhaust gases from the LePere's Liberty 12 engine, operated at speeds above 25,000 rpm and at temperatures that made it incandescent. Not surprisingly, it often failed, as did other engine components from time to time.



Lieutenant Macready flew the Wright Modified "B" at the Dayton Air Races in 1924. This plane now is on display at the US Air Force Museum at Wright-Patterson AFB, Ohio.

On many flights there were mechanical malfunctions that forced Macready to make dangerous descents, challenging his skill as a pilot. When at altitude, he simultaneously tested the protective clothing and oxygen equipment that sustained life. Even when well prepared, Macready faced the physical rigors of low atmospheric pressure, lack of oxygen, and the terrible, numbing cold (minus 80°F) on his frequent flights above 30,000 feet. He took great pride in the fact that he had never ". . . descended from an altitude test for lack of physical endurance or for any reason

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other than the breakage of some important part of the plane or engine, or its failure to function, or simply because the plane would go no higher."

On September 28, 1921, Macready took off from McCook Field to attempt a world altitude record in the same old LePere used by Major Schroeder. It had the same type engine and supercharger, although certain improvements had been made to the supercharger after Schroeder's last flight. The engine and supercharger functioned perfectly throughout the flight. Near his peak altitude, Macready's breathing tube began to ice up, depriving him of oxygen. Mindful of Schroeder's experience, he transferred to his backup oxygen supply and continued his hour-and-forty-two-minute flight to an altitude that no man had reached before. The Fédération Aéronautique Internationale verified the altitude as 34,509 feet, a new world record.

Lieutenant Macready continued his high-altitude flights for another five years. In 1924, he set a new American altitude record of 35,239 feet. In January 1925, he went still higher, to 37,569 feet, again in the LePere. A year later, he reached 38,704 feet in the XCO-5, a high-altitude airplane especially built by the Engineering Division. It was his highest test flight.

Macready's altitude flights were important milestones in the development of modern aviation. They proved that properly equipped airplanes and crews could routinely fly at stratospheric altitudes. The real significance of this became apparent in World War II, when turbosupercharged bombers and fighters made possible the successful Allied strategic bombing campaigns against the enemy on both fronts. Furthermore, there are similarities between turbosuperchargers and jet engines that cannot be ignored. The turbines of both rotate at high speeds and are subjected to high temperatures requiring special alloys. Turbosupercharger technology was applied directly to the early development of the jet engine.

The ability of an airplane to fly reliably for long distances was also a matter of considerable interest to the Air Service in the 1920s. In 1922, Macready teamed up with his colleague, Lt. Oakley G. Kelly, in an attempt to fly nonstop, coast-to-coast. The transcontinental flight was Kelly's idea, but he had no trouble getting Macready's enthusiastic support and participation. Their plane, a new Army Air Service Fokker T-2 transport, was powered by a single Liberty 12 engine of more than 400 horsepower. The open cockpit of the T-2 was set so far forward that the pilot sat beside the engine, which was literally at his right elbow.

Since there was no room for a conventional copilot's position, a second set of controls, placed back in the fuselage, was added so that one of the pilots could fly the airplane whenever they exchanged places in the cockpit.

Macready and Kelly took the T-2 to Rockwell Field in San Diego, for their first attempt to fly to New York on October 3, 1922. They were forced back, unable to gain enough altitude to cross the mountains. Instead of landing, Macready and Kelly kept the T-2 in the air over California for thirty-five hours and eighteen minutes, setting an unofficial world endurance record.

A month later they tried again. This time they cleared the mountains, flew through storms and darkness into the new day, only to be forced down by engine trouble at Indianapolis. They returned to McCook Field to plan the next attempt.

By May 1923, Macready and Kelly were ready to give it another try. They had decided to reverse their direction of flight. On May 2, they lifted their heavily loaded T-2 off from Roosevelt Field, N. Y., and kept it in the air until, on May 3, after flying for twenty-six hours and fifty minutes and nearly 2,700 miles, they landed at Rockwell Field. Aviation writers soon were predicting that such flights would someday become commonplace.

The altitude, endurance, and distance flights were John Macready's most notable contributions to aviation, but he did more. In 1921, he became the first pilot to successfully demonstrate the use of the airplane in crop-dusting.

In 1924, he and Lt. A. W. Stevens, a pioneer of aerial photography, conducted the first aerial photographic survey of the United States. They covered 10,000 miles and made some 2,000 photographs.

Lieutenant Macready chalked up another first, quite unintentionally, on the night of June 18, 1923, when he became the first person to make a successful nighttime emergency parachute jump. The engine had quit on his DH-4 as he was nearing Dayton on a flight back to McCook. He was too far from the field to glide in, and in the darkness he could see no other safe place to land the plane, so he bailed out. The DH-4 burned when it hit, but Macready came down safely. As he descended, he badly startled several people on the ground as he called to them from above. The next morning he reported for work at 8:00 o'clock, as usual.

John Macready resigned from the Air Service in 1926 and joined the Frigidaire Division of General Motors. Later, he went to San Francisco to head the Aviation Department of the Shell Oil Co. In 1933, he retired to his cattle ranch in the High Sierras of California.

Macready was called back to active duty during World War II and served in North Africa as Inspector for the Twelfth Air Force. He served as a colonel in the Army Air Forces until October 1946, then returned to cattle ranching. He lived quietly in California until his death on September 16, 1979, at the age of ninety-two.

Col. John A. Macready played a crucial part in the development of modern aviation. He never claimed to be anything other than a test pilot, but he was recognized for his accomplishments, both at the time of his record flights and later, in 1968, when he was enshrined in the Aviation Hall of Fame. Still, he did not seek recognition. Perhaps he should be remembered for something he wrote in 1924: "It is lonely work fighting the elements at the earth's ceiling, but I hope my years spent in high-altitude experimental work have produced something of value to our country." ■

The US began the new year in an atmosphere of crisis that could put heavy demands on the military. One question that needs to be considered at the highest civilian and military levels is . . .

What's Happening to the Military Profession?

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

THE other day I was leafing through some old *Life* magazines, circa 1939. It is entertaining, if a little sad, to be reminded how much we, and the world at large, have changed in forty years.

There was the story, for instance, of an admiral who reached the statutory retirement age one day back there in 1939 and thus had to relinquish command of the United States Asiatic Fleet. Admiral Yarnell had attracted *Life*'s attention because of his performance in facing down the ever more aggressive Japanese along the China coast. He had been given, according to *Life*, "the most sweeping authority to act as he sees fit." Harry Yarnell, in those months before Pearl Harbor made any kind of diplomacy redundant for a spell, was clearly a far more important instrument of US policy than our ambassadors to China and Japan.

Well, that was a while ago. No admiral or general these days is given sweeping authority to do anything. Computers, instant communications, and layer upon layer of managers—a term the old admiral would have associated with department stores—have led to the centralization of decisions at what used to be pretty remote levels. Crises are now managed from Washington rather than dealt with on the spot. The space-age gear lends itself just as readily to the management of mundane, and even piddling, things. Scientific management is well on its way toward replacing that old and mysterious skill known as judgment, which led, in turn, to something called command decisions.

So long as the crises are small and isolated, as in the *Mayaguez* affair, or bizarre and unprecedented, as in Tehran, this omniscient eye-on-the-sparrow approach will probably serve. It may even be a logical way to operate in a world where we are apparently afraid of our enemies and unsure of our friends. If, that is, there is any logic in a great power having that attitude.

However, logical or not, this centralization of authority is doing bad things to the profession of arms. That, along with the seemingly calculated assault on the quality of military life, is leading to disenchantment among our career people. There is discontent in the senior ranks because getting there is too often proving to be a disappointment. Both responsibilities and privileges have been eroded away. The serious thing about unhappiness in the senior ranks is that it filters down. If that is all there is to reaching the top, muse the bright young career people, why stick around?

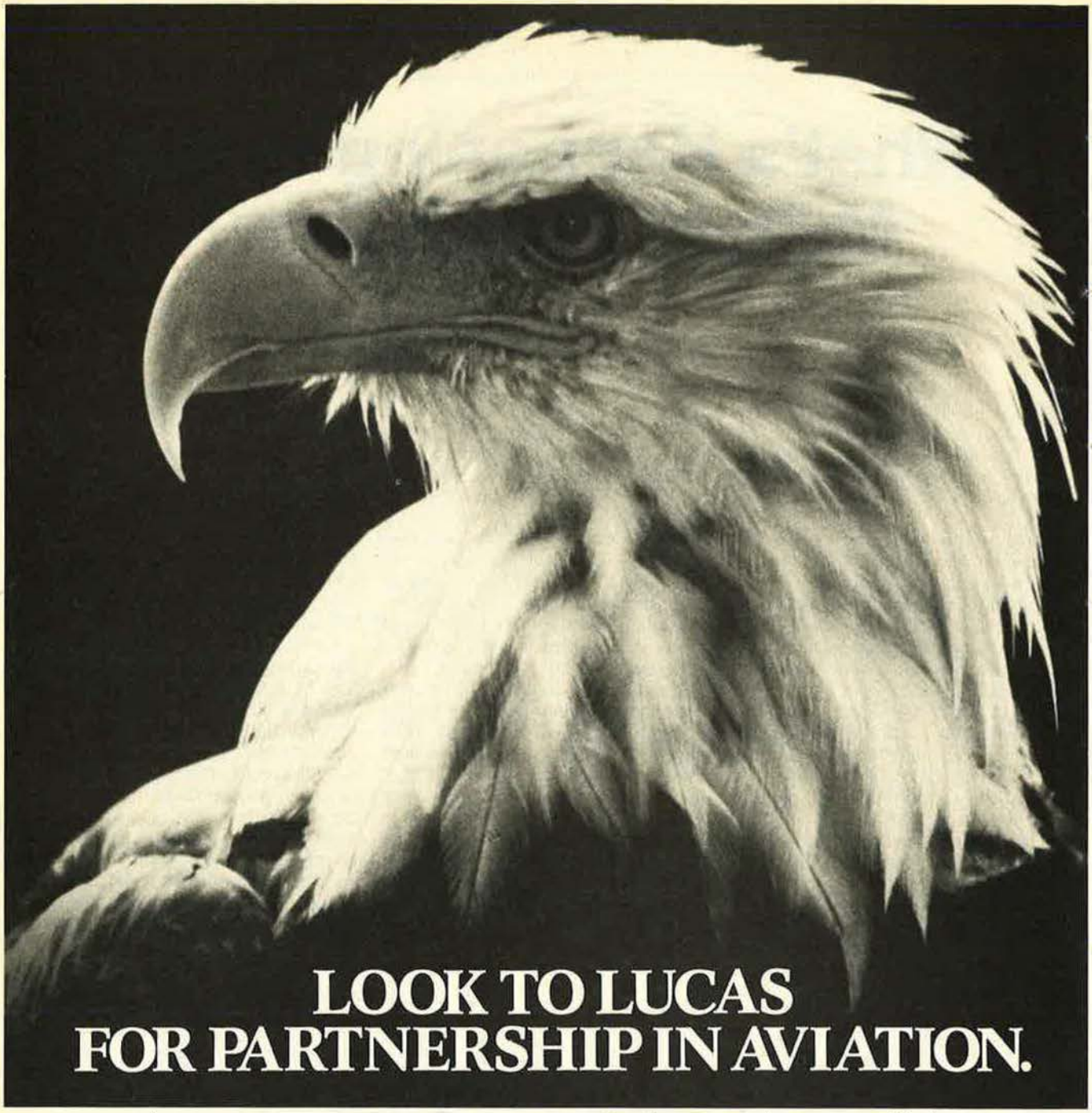
In the junior ranks, and adding to the disenchantment, there is a feeling that the senior people are not standing up for them. The generals are viewed as going along with decisions to chip away at the things that have made military life different from the civilian world outside. It is probably an unfair view, but it appears to be widespread.

All of the services are suffering from a lack of senior noncommissioned officers, as well as a steady departure of some of the best-qualified junior officers. Pay is a reason. Military pay and allowances have just not kept up with inflation. Still another reason can be found in the almost mindless behavior of this Administration—well, some parts of this Administration—toward its military forces. The parking lot fee, for example. Some people who ought to know better see nothing wrong in putting the military on the same basis as the civilian world when it comes to paying for the privilege of parking a car at work. Besides, they say, it will save energy. What they do not say is that airmen, sailors, and soldiers put in hours of overtime, working nights and holidays with no increase in pay, nor do they have any say over when or where they are going to work.

There are other small harassments, none vital in itself, but all part of a pattern of apparent indifference to the special nature of military life.

There are a lot of people worried about the state of our defenses, with the All-Volunteer Force now considered a failure by a great many influential citizens. Perhaps it is a failure, but in all fairness, it has scarcely been given a chance. When the opportunities, the responsibilities, and the rewards do not match those in civilian life, then the All-Volunteer Force idea is an obvious loser.

We need to hear more voices, loud and clear, from the active military leadership. While it is not easy, or politic, for a senior military man to criticize the way his civilian masters are behaving, it very much needs doing. These same voices might, while they are at it, take a little of the blame themselves. The force structure is important, and so are new weapon systems, but people, good people, are more important yet, and there has not been much said, publicly at least, about the reasons enough good people no longer find service life attractive. ■



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ALL THE WORLD'S AIRCRAFT SUPPLEMENT

FEBRUARY 1980

The laminated glassfibre chin pod replacing the original gun fairing is seen clearly in this head-on view of the F-4G Advanced Wild Weasel

MCDONNELL DOUGLAS

MCDONNELL AIRCRAFT COMPANY (A Division of McDonnell Douglas Corporation); Headquarters: Box 516, St. Louis, Missouri 63166, USA

MCDONNELL DOUGLAS F-4 PHANTOM II

In 1979, more than two decades of continuous production of the F-4 Phantom II came to an end with the delivery of the 5,057th US-built example; a further 138 were built under licence in Japan by Mitsubishi.

Details of all known variants of the Phantom can be found in the 1979–80 *Jane's*, together with a shortened description and specification of the most numerous version, the F-4E for the US Air Force and several foreign air forces. The additional information which follows concerns some of the major and most recent refit programmes involving versions currently in use by all three US services.

RF-4B. Multi-sensor reconnaissance version of F-4B for US Marine Corps. Reconnaissance system originally as for RF-4C; J79-GE-8 engines; no dual controls or armament; HF/SSB radio; overall length 19.2 m (63 ft). First flown 12 March 1965; total of 46 built. Thirty being updated from late 1978 by addition of Honeywell AN/AAD-5 infra-red linescan, Goodyear AN/APD-10 side-looking radar, Litton AN/ASN-92 carrier inertial navigation system, AN/ASW-25 carrier automatic landing system, AN/ALE-39 stores dispenser, AN/APR-43 Compass Sail/Clockwise warning receiver, AN/ALQ-126 jamming system, and Honeywell AN/APN-222 high altitude radar altimeter. Prototype updated to this configuration in 1977.

EF-4C and EF-4D. The USAF's Wild Weasel programme is concerned with the suppression of hostile surface-to-air weapon and radar guidance systems. The provision of airborne equipment able to fulfil such a role, and modification of the necessary aircraft to create an effective force for deployment against such targets, had first priority in tactical Air Force planning in the Spring of 1975. The requirement for such a weapon system had been appreciated by Tactical Air Command as early as 1968, during the war in Viet-Nam, and as an interim measure sufficient F-4Cs were modified to equip two squadrons for an initial Wild Weasel defence

suppression role. These aircraft, designated EF-4C, were fitted with ECM warning sensors, jamming pods, chaff dispensers, and anti-radiation missiles. Feasibility studies for an improved version were initiated in September 1968, following which eight sets of equipment were acquired for development, qualification testing, and flight testing. The two F-4Ds in which this equipment was qualified were designated EF-4D; the first of them made its initial flight on 6 December 1975. As a result of this testing, 116 F-4Es are being converted to F-4G Advanced Wild Weasel configuration, as described in the following paragraphs.

F-4G (Advanced Wild Weasel). In the interests of force standardisation and airframe life, the F-4E Phantom (see 1979–80 *Jane's*) was selected for modification to fulfil the Advanced Wild Weasel role, technical studies of the F-4D and F-4E having shown the latter aircraft to be easier to modify. External changes include the addition of a torpedo-shape fairing to the top of the tail fin to carry APR-38 antennae; removal of the M61A-1 gun system and its replacement by a chin pod containing APR-38 subsystems (receiver, homing and warning computer, computer interface system); and the addition of other APR-38 antennae, of which there are 56 in all on the fin-tip and fin sides, along the upper surface of the fuselage, and elsewhere. The new chin pod is of laminated glassfibre construction, and there are new fairing doors in place of the gun muzzle fairings. Internal modifications consist of a number of added and revised systems, chief of which is the McDonnell Douglas AN/APR-38 radar homing and warning system (RHAWS) itself. Changes have been made to the LCOSS (lead-computing optical sight system) amplifier in the upper equipment bay, and the computer interface system (CIS) installations in the front and rear cockpits; suitable cockpit displays have been provided. Additional equipment is installed in the compartment vacated by the ammunition for the M61 gun, and there is provision for further electronics packages if required. The gun purge scoop and entire gun hydraulic system of the F-4E are removed; pitot-static system drains are relocated in the chin pod; and a 7.5 cm (3 in) extension is added to the pitot-static nose boom. The radar cooling duct is modified, to provide open ducting for the APR-38 components on the equipment shelves in the nose. All gun control and APR-36/37 wiring in the F-4E is replaced by new wiring and co-axial cables for the APR-38 system in the radome, nose, inboard wing panels, and forward/centre/aft fuselage locations. New wiring uses F-15 assembly techniques and materials, and additional wiring provides interface with new weapons launchers. The Advanced Wild Weasel F-4G is cleared for operation with AGM-45 Shrike, AGM-78 Standard ARM, and AGM-65 Maverick (including IIR: imaging infra-red version) air-to-surface missiles. Use of the IIR Maverick greatly enhances night and adverse weather capability. Testing with AGM-88 HARM is under way. For self-defence, AIM-7F Sparrow and/or AIM-9L Sidewinder air-to-air missiles can also be carried.

A digital computer receives, processes, and displays emitter information to the crew in the form of CRT presentations, digital readouts, advisory/warning lights, and aural tones. Computerised information is also provided to the weapon system for use in munition delivery, and to various instruments used by the crew to perform delivery manoeuvres. This frees both the pilot and the electronics warfare officer (EWO) of many of the analytical and manual duties once required, presents them with an accurate view of the enemy's defence environment, and allows them an unprecedented flexibility in seeking out and destroying those defences. The AN/APR-38 beam receivers (23 cm; 9 in arrays) which obtain range and azimuth information are located on the front and each side of the chin pod, and on the vertical fin looking aft. The range and azimuth information for all ground threats received is displayed on the plan position indicator (PPI), which is one of three scopes in the rear cockpit. There is a repeater PPI in the front cockpit. Priorities are assigned to the top 15 targets by the computer. Threats are indicated by letter and number symbols. A triangle is placed around the highest-priority threat, which is determined by the computer classification table. If desired, the EWO may override and designate a threat for the Weasel to work: this threat is designated by a diamond around the symbol. The homing and warning computer (HAWC) is one of the most important parts of the system. It can be re-programmed to include new or changed threats. The optical sight, which has been modified, indicates the radar emitter position with its red reticle. Ground track of the aircraft in azimuth is indicated by a green cross caged in elevation to the radar boresight of the aircraft. The Weasel pilot can bomb 'blind' by positioning the green cross over the reticle, depressing the bomb button, and starting a recovery. The selected store will release automatically at the correct point. The mission recorder provides the capability to play back the mission on the ground for training and study purposes.

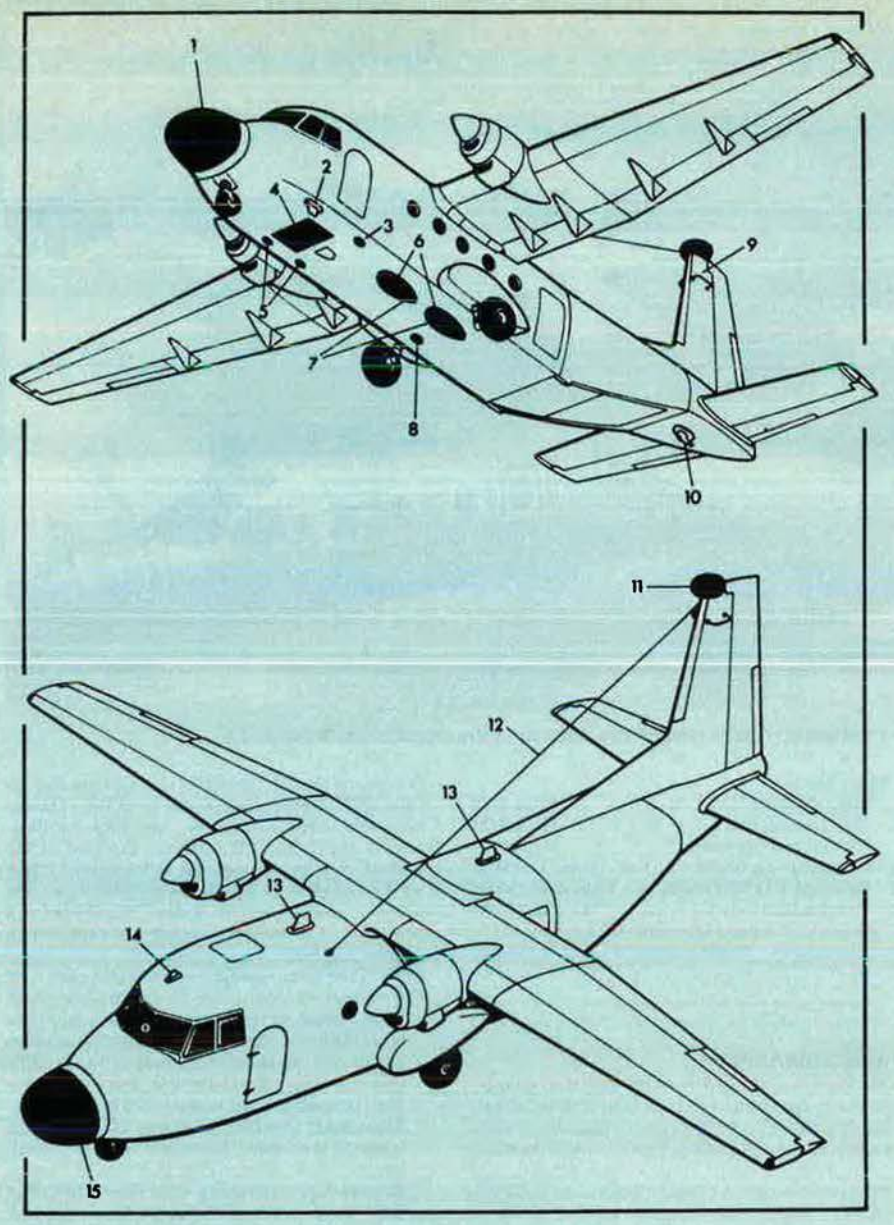
Although the Advanced Wild Weasel F-4G aircraft would be able to operate independently in a hunter/killer role, their main utilisation is likely to be as a component of a strike force, where they would detect, identify, locate, and warn of hostile electromagnetic emitters, and deploy against them suitable weapons for their suppression or destruction.

The USAF sought funding in FY 1976 for the Advanced Wild Weasel concept, in order to provide an expansion in memory capability of the airborne processor and to extend coverage of low-frequency emissions. The programme provided for the first F-4G operational kit installation in the Spring of 1976 and the second in the Autumn of that year, followed by 15 installations in 1977, 60 in 1978, and 39 in 1979, to provide a force of 116 aircraft (96 for combat units, 20 for training and testing). The first F-4G was delivered on 28 April 1978, and the type entered service with the 35th Tactical Fighter Wing (39th Tactical Fighter Squadron, for training) at George AFB, California, in October 1978. The first two F-4Gs of 24 for the 81st TFS, USAFE, at Spangdahlem, Federal Republic of Germany, were delivered in the Spring of 1979.

APR-38 antennae in a rear-facing fin-tip pod help to distinguish the F-4G

F-4J. Development of F-4B for US Navy and Marine Corps, primarily as interceptor but with full ground attack capability. Powered by J79-GE-10 turbojets. Fitted initially with 16½° drooping ailerons and slotted tailplane, to reduce approach speed in spite of increased landing weight; Westinghouse AN/AWG-10 X-band pulse-Doppler fire-control system; Lear Siegler AJB-7 bombing system; and 30kVA generators. First flight of a production F-4J was made on 27 May 1966; production of 522 examples was completed in January 1972. Before the end of the war in Viet-Nam, production F-4Js underwent a series of retrofit programmes, aimed chiefly at improving the aircraft's electronic warfare equipment. Under a programme named Shoehorn, the F-4J was equipped with an AN/APR-25 warning receiver, AN/APR-27 missile launch warning system, and an AN/ALQ-100 jamming system. Also incorporated at this time was an update of the AN/APX-76 IFF system, known as AIMS (Air traffic control radar beacon IFF Mk XII System). In 1971, the APR-25 and -27 were replaced by improved AN/ALR-45 and AN/ALR-50 warning receivers, which provided better threat response and displayed a letter/number readout instead of coded vectors. During 1973–74, an I-band AN/ALQ-126 jamming system replaced the earlier ALQ-100. In 1979 the Applied Technology Inc AN/APR-43 Compass Sail/Clockwise warning receiver and the AN/ALQ-162 Clockwise jamming system were being considered for installation in the F-4J, the former to replace the ALR-50, the latter as a complement to the ALQ-126. Other avionics in the F-4J included originally an RT-793 UHF com transceiver and AN/ARR-69 UHF auxiliary receiver, replaced later by two Collins AN/ARC-159. It is planned to replace the latter, in the early 1980s, with Collins AN/ARC-182 VHF (AM/FM) and UHF (AM/FM) sets. Similarly, the earlier AN/ARN-86 Tacan is scheduled to be replaced from 1980 by the newer Collins AN/ARN-118 system. These new com/nav installations will permit relocation of the AN/APX-76 in a position more accessible for maintenance and overhaul. The original AN/APN-141 radar altimeter has been replaced by a Honeywell AN/APN-194 system.

F-4S. The US Navy plans to modify up to 265 F-4Js, possibly more, under this designation. Changes include replacement of the original wing leading-edge flaps by highly-cambered, bulbous-nosed leading-edge slats; addition of an inboard leading-edge flap (similar to that on the F/RF-4B); and structural strengthening, including the fitting of steel fatigue straps under the lower skins of the inboard wing panels, at the main spar. Outer wing panels are of entirely new construction. Internally, the aircraft is completely rewired, using lightweight Kapton wiring; and has an improved Westinghouse AN/AWG-10A digital weapon control system. Modifications are undertaken jointly by McDonnell Douglas and the Naval Air Rework Facility at North Island, California. Deliveries of the F-4S began, with aircraft serial number 155565, to the Naval Air Test Center at Patuxent River, Maryland, on 26 May 1978.



Special equipment on the projected ASW version of the CASA C-212 Srs 200 includes: 1. Search radar; 2. IFF; 3. Sonobuoys; 4. Doppler; 5. Radar altimeter; 6. ADF loop; 7. ADF sense; 8. Marker beacon; 9. VHF Nav, VOR/LOC; 10. Omega; 11. Electronic warfare; 12. HF com; 13. UHF/VHF com; 14. DME; 15. Glideslope *(Michael A. Badrocke)*

CASA

CONSTRUCCIONES AERONAUTICAS SA; Head Office: Rey Francisco 4, Apartado 193, Madrid 8, Spain

CASA C-212 SERIES 200 AVIOCAR (ANTI-SUBMARINE WARFARE VERSION)

The C-212 Series 200 is the current standard version, since 1979, of this twin-turboprop STOL utility transport aircraft. Earlier models are in service with the Spanish and several other air forces, for a variety of military duties, and with a number of civil operators in various parts of the world.

For service with the 22nd Wing of the Spanish Air Force, and for certain foreign countries, CASA has proposed a version of the C-212 Srs 200 equipped for anti-submarine and maritime patrol duties. As can be seen from the accompanying illustrations, the principal external differences from the transport version are the addition of a nose radome, and various antennae on the fuselage and tail-fin. Underwing pylons are provided for the carriage of torpedoes, rocket pods, bombs, and other weapons.

TYPE: Twin-turboprop ASW/maritime patrol aircraft.

AIRFRAME: Generally similar to standard C-212 Srs 200 (see 1979–80 *Jane's*), except for addition of nose radome and various external antennae.

POWER PLANT: Two Garrett-AiResearch TPE331-10-501C turboprop engines, each flat rated at 634 kW (850 shp) and driving a Hartzell HC-B4MV-5AL four-blade constant-speed propeller.

ACCOMMODATION: Pilot and co-pilot on flight deck, with OTPI and additional central console for radar repeater; AFCS repeater; repeater control for radio-navigation, Doppler, DME, ADF, UHF/DF, Omega, and VOR/ILS; searchlight control; weapons delivery controls; and intervalometer for rockets. Avionics rack on port side, aft of pilot, for com/nav equipment; second rack on starboard side, aft of co-pilot, contains avionics for mission equipment (radar, sonobuoys, MAD, and ESM). Immediately aft of the latter, along the starboard side of the cabin, are control consoles for the other two crew members, with a third, central console between these two containing the sonobuoy delivery controls, torpedo pre-setter, and attack plotter. The console for the tactical operator (TACCO) includes ICS, OTPI, MAD recorder and control, IFF control, AFCS mode control, radio-navigation control and display, navigation computer control and display, radar control and display, PPI, and TM. The ASW operator's console (the rearmost of the three) includes ICS, manual control for communications, hard copy unit, receiver control unit, acoustics control panel, Jezebel unit, and ESM display. Behind the ASW operator, on the port side of the central cabin area, is the main weapons delivery control panel.

AVIONICS: Communications equipment includes two HF and two VHF transceivers, single UHF, and interphone. Navigation equipment includes automatic flight control system, navigation computer, flight director, VOR/ILS (including VOR/LOC, glideslope and marker beacon receiver), DME, two ADF, UHF/DF, radar altimeter, Doppler radar, VLF/Omega, autopilot, and compass.

OPERATIONAL EQUIPMENT: APS-700(V)X1 search radar in nose, with 360° scan; OTPI; MAD; IFF/SIF transponder; searchlight; sonobuoys and launcher; smoke markers; electronic support measures (ESM); and torpedoes, rockets, or other weapons for attack.

DIMENSIONS (standard C-212 Srs 200):

Wing span	19.00 m (62 ft 4 in)
Wing area, gross	40.00 m² (430.56 sq ft)
Length overall	15.16 m (44 ft 9 in)
Height overall	6.68 m (21 ft 11 in)
Cabin volume (between flight deck and rear-loading door)	22.00 m³ (776.9 cu ft)

WEIGHTS (standard C-212 Srs 200):

Weight empty, equipped	4,115 kg (9,072 lb)
Max payload	2,250 kg (4,960 lb)
Max T-O weight	7,300 kg (16,093 lb)

PERFORMANCE (standard C-212 Srs 200, at max T-O weight):

Max cruising speed at 3,050 m (10,000 ft)
210 knots (389 km/h; 242 mph)

Service ceiling	8,535 m (28,000 ft)

Range at max cruising speed, no reserves:
with max payload
410 nm (760 km; 472 miles)
with max fuel 928 nm (1,720 km; 1,070 miles)

MBB

MESSERSCHMITT-BÖLKOW-BLOHM GmbH; Head Office: Ottobrunn bei München, 8000 München 80, Postfach 80 11 09, Federal Republic of Germany

MBB BO 105 L

Latest version of this established light utility helicopter, the BO 105 L is equipped with more powerful Allison turboshaft engines and an uprated transmission, permitting operation at a higher gross weight. Basic equipment is identical to that of the BO 105 CB, described in the 1978–79 *Jane's*, except for some minor changes to engine instrumentation. There are several deletions of optional equipment, doubtless to ensure adequate payload capacity.

The description of the BO 105 CB applies also to the BO 105 L, except as detailed below:

ROTOR DRIVE: As for BO 105 CB, except main transmission, type ZF-FS 112, is rated for a twin-engine input of 294 kW (395 shp) per engine, or a single-engine input of 368 kW (493 shp) continuous, or 404 kW (542 shp) for 2.5 min.

POWER PLANT: Two Allison 250-C28C turboshaft engines, each rated at 410 kW (550 shp) for 2.5 min, and with a 5 min take-off or max continuous power rating of 373 kW (500 shp). Fuel system generally as for BO 105 CB, but max standard capacity 380 kg (838 lb). Auxiliary fuel tanks are not included among the list of optional equipment.

SYSTEMS: As for BO 105 CB, except 24V battery is of 25Ah capacity.

WEIGHTS:

Weight empty	1,250 kg (2,756 lb)
Max T-O weight	2,400 kg (5,291 lb)
Max T-O weight with external load	2,500 kg (5,512 lb)

PERFORMANCE (at max T-O weight):

Never-exceed speed at S/L
145 knots (270 km/h; 168 mph)

This photograph shows well the 'skeletal' paint scheme and winglets of the prototype IAI Westwind 2

Max cruising speed at S/L
136 knots (252 km/h; 157 mph)
Max rate of climb at S/L 600 m (1,970 ft)/min
Max operating height 6,100 m (20,000 ft)
Service ceiling, one engine out
2,880 m (9,450 ft)
Hovering ceiling IGE 4,000 m (13,120 ft)
Hovering ceiling OGE 3,440 m (11,290 ft)
Range at S/L, standard fuel, max internal payload, no reserves
248 nm (460 km; 286 miles)

IAI

ISRAEL AIRCRAFT INDUSTRIES LTD; Head Office and Works: Ben Gurion International Airport, Lydda, Israel

IAI WESTWIND 2

At the US National Business Aircraft Association Convention, in September 1979, Israel Aircraft Industries displayed the prototype of the new Westwind 2 (4X-CMK), which will supplement the Westwind 1 in production. It flew for the first time in the Spring of 1979 and was expected to receive certification by early 1980, enabling deliveries to begin during the second half of this year.

The Westwind 2 has IAI's new 'Sigma' wing of advanced aerodynamic profile and fitted with winglets above the tip-tanks. The elliptical cabin section increases seated headroom and allows a flat rather than 'trenched' cabin floor, an airline-type flushing toilet, and improved placing of the overhead passenger service units. Standard features and equipment include thrust reversers, a lift-dump system, fully-modulated anti-skid brakes, wide-profile tyres, single-point refuelling, strobe lights, dual batteries, digital weather radar, radio altimeter, Collins APS-80 autopilot, and a full range of Collins Pro-Line solid-state avionics.

Standard seating is for a crew of two and 10 passengers. The Garrett-AiResearch TFE731 turbofans of the Westwind 1 are retained on the Westwind 2.

WEIGHTS:
Basic empty weight 5,820 kg (12,830 lb)
Operating weight empty, excl fuel
7,258 kg (16,000 lb)
Max T-O weight 10,660 kg (23,500 lb)
Max landing weight 8,618 kg (19,000 lb)

PERFORMANCE:
Max operating Mach No. Mach 0.80
Max cruising speed Mach 0.76
Normal cruising speed Mach 0.74
Initial cruising height 11,275 m (37,000 ft)
Balanced T-O field length 1,600 m (5,250 ft)
Landing field length 747 m (2,450 ft)
Range with 4 passengers and NBAA/VFR reserves 2,900 nm (5,370 km; 3,337 miles)

MBB/KAWASAKI

MESSERSCHMITT-BÖLKOW-BLOHM GmbH; Address: Ottobrunn bei München, 8000 München 80, Postfach 80 11 09, Federal Republic of Germany; and KAWASAKI HEAVY INDUSTRIES LTD; Address: World Trade Center Building, 4-1 Hamamatsu-cho 2-chome, Minato-ku, Tokyo, Japan

MBB/KAWASAKI BK 117

Following nearly two years of negotiations, an agreement was signed on 25 February 1977 between MBB and Kawasaki to develop jointly an 8/10-seat multi-purpose helicopter known as the BK 117. This superseded two earlier, separate projects known as the MBB BO 107 and the Kawasaki KH-7.

Both civil and military applications are foreseen, and the BK 117 has many components and accessories interchangeable with those of the MBB BO 105. Its four-blade rigid main rotor is scaled up from that of the BO 105, from which aircraft the hydraulic boost system is also adapted. The transmission is based on that developed by Kawasaki for its earlier KH-7 design. The two-blade tail rotor is mounted on the central fin, forward of which is a horizontal stabiliser carrying twin endplate fins.

Development costs of the BK 117 programme are being shared equally between the two companies, with support from the German and Japanese governments. MBB is responsible for the main and tail rotor systems, tailboom and tail unit, skid landing gear, power-amplified controls, and systems integration; Kawasaki is responsible for the fuselage, transmission system, and smaller items of equipment.

Four prototypes are being built, one each for airframe tests and FAR ground testing, plus a flying prototype in each country. First flight was made, by the second aircraft (D-HBKA), in Germany on 13 June 1979, at which time a total of 48 BK 117s had been sold. German, Japanese, and FAA certification for the initial VFR version is expected in late 1980, with IFR certification to follow; certification will be to FAR Pt 29, Categories A and B. There will be two production centres, at Munich and Gifu, and deliveries of production aircraft are expected to begin in late 1981.

TYPE: Twin-turbine multi-purpose helicopter.

ROTOR SYSTEM: Four-blade 'System Bölkow' main rotor, scaled up from that of BO 105, and two-blade tail rotor. Main rotor has a titanium head, to which are attached hingeless, fail-safe GRP blades of NACA 23012/23010 section with a stainless steel anti-erosion strip on each leading-edge. Rotor brake standard; provision for folding two blades of main rotor. Main rotor rpm: 383. Semi-rigid tail rotor, mounted on port side of vertical fin and rotating clockwise when viewed from that side. Blades are of GRP construction, with high impact resistance and an MBB-S102E performance/noise-optimised section. Tail rotor rpm: 2,169.

ROTOR DRIVE: Each engine has separate drive input into Kawasaki KB 03 main transmission (see 'Power Plant' paragraph for transmission ratings), via single bevel gear and collector. Auxiliary drives for accessories. Dual redundant lubrication system.

FUSELAGE: Of typical pod-shaped configuration, comprising flight deck, cabin, cargo compartment, and engine deck. Structure, designed to fulfil requirements of FAR Pt 29, is generally similar to that of BO 105, main components being of semi-monocoque riveted aluminium construction with single-curvature sheets and bonded aluminium sandwich panels. Secondary components are compound-curvature shells with sandwich panels and Kevlar skins. Floor extends throughout cockpit, cabin, and cargo compartment at same level. Engine deck forms roof of cargo compartment and, adjacent to engine bays, is of titanium to serve as a firewall.

TAIL UNIT: Semi-monocoque tailboom, of tapered conical section, attached integrally to engine deck at forward end. Rear end, which is detachable, carries main fin/tail rotor support, and horizontal stabiliser with smaller, endplate fins. General design similar to that of BO 105, except for shape of outer fins.

LANDING GEAR: Non-retractable tubular skid type,

of aluminium construction, similar to that of BO 105. Skids are detachable from cross-tubes. Ground handling wheels standard. Emergency flotation gear, settling protectors, and snow skids available optionally.

POWER PLANT: Two Avco Lycoming LTS 101-650B-1 turboshaft engines, each rated at 447 kW (600 shp) for take-off, 485 kW (650 shp) for 2½ min, and 410 kW (550 shp) for max continuous operation. Transmission rated at 632 kW (848 shp) for twin-engine take-off and max continuous operation; and, for single-engine operation, at 441.5 kW (592 shp) for 2½ min, 405 kW (543 shp) for 30 min, and 368 kW (493 shp) max continuous. Fuel in four flexible bladder-type tanks (forward and aft main tanks, with two supply tanks between), in compartment under cabin floor. Two independent fuel feed systems, each able to supply both engines. Total standard fuel capacity 603 litres (132.5 Imp gallons). Provision for two 200 litre (44 Imp gallon) auxiliary tanks, raising total capacity to 1,003 litres (220.5 Imp gallons).

ACCOMMODATION: Pilot and up to five (executive version) or seven passengers (standard or offshore IFR-equipped versions). High-density layouts available for nine or eleven passengers in addition to pilot. Provision for two-pilot operation. Jettisonable forward-hinged door on each side of flight deck, each with openable window. Jettisonable rearward-sliding passenger door on each side of cabin, lockable in open position. Fold-down steps on port side. Two hinged, clamshell doors at rear of cabin, providing access to cargo compartment. Rear cabin window on each side serves as emergency exit. Aircraft can be equipped, according to mission, for offshore, medical evacuation (pilot, four stretchers, and two attendants), firefighting, search and rescue, law enforcement, cargo transport, or other operations. Cabin floor hatch (0.40 × 0.50 m; 1 ft 3¾ in × 1 ft 7¾ in) optional.

SYSTEMS: Ram-air and electrical ventilation system. Fully redundant tandem hydraulic boost system (one operating and one standby) for flight controls. Main DC electrical power from two 150A 30V starter/generators (one on each engine) and a 24V 22Ah nickel-cadmium battery. AC power provided by two independent inverters. Emergency busbar provides direct battery power to essential services in event of a double generator failure. External DC power receptacle.

AVIONICS AND EQUIPMENT: Basic aircraft has instrumentation for single-pilot VFR operation, including airspeed indicator, electrically-heated pitot tube, altimeter, rate of climb indicator, 10 cm (4 in) attitude direction indicator with turn and slip indication, directional gyro, RMI, and magnetic compass. Dual controls and dual VFR instrumentation available optionally. Com/nav and other avionics available to customer's requirements, including VHF and HF transceivers; nav, RNav, ADF, and VLF/Omega systems; radar altimeter; encoding altimeter; DME; ATC transponder; multi-mode radar; IFR instrumentation packages; and stability augmentation system. Standard basic equipment includes annunciator panel, master caution light, rotor rpm/engine fail warning control unit, fuel quantity indicator and low level sensor, free air temperature indicator, clock, engine and transmission oil pressure and temperature indicators, dual exhaust temperature indicators, dual torque indicators, instrument panel lights, cockpit/cabin/cargo compartment dome lights, position lights, anti-collision warning lights, retractable landing light, portable flashlight, ground handling wheels, pilot's windscreen wiper, floor covering, interior panelling and sound insulation, ashtrays, map/document case, tiedown rings in cabin and cargo compartment, engine compartment fire warning indicator, engine fire extinguishing system, portable fire extinguisher, engine fire handle, first aid kit, and single-colour exterior paint scheme. Optional equipment includes high-density seating arrangement, bleed air heating system, fuel dump valve, two long-range fuel tanks, emergency flotation gear, snow skids, main rotor blade folding kit, non-retractable landing light, co-pilot's windscreen wiper, stretcher installation, cargo hook, rescue winch, search-light, external loudspeaker, and sand filter. Special optional equipment includes self-sealing fuel feeder tank, multi-purpose pylon, wheel-type landing gear, naval and anti-tank equipment, and mission kits for reconnaissance, rescue, law enforcement, and VIP transport roles.

Prototype of the MBB/Kawasaki BK 117 twin-turbine multi-purpose helicopter

DIMENSIONS, EXTERNAL:

Main rotor diameter	11.00 m (36 ft 1 in)
Tail rotor diameter	1.90 m (6 ft 2¾ in)
Main rotor blade chord	0.31 m (1 ft 0¼ in)
Tail rotor blade chord	0.18 m (7.1 in)
Length overall, main and tail rotors turning	13.00 m (42 ft 8 in)
Length of fuselage	9.88 m (32 ft 5 in)
Fuselage: Max width	1.53 m (5 ft 0¼ in)
Max width, main rotor folded (span over endplate fins)	2.57 m (8 ft 5¼ in)
Height overall, main and tail rotors turning	3.84 m (12 ft 7¼ in)
Height to top of main rotor hub	3.30 m (10 ft 10 in)
Height to top of main fin	3.30 m (10 ft 10 in)
Tail rotor ground clearance	1.93 m (6 ft 4 in)
Width over skids	2.50 m (8 ft 2½ in)

DIMENSIONS, INTERNAL:

Passenger cabin: Length	2.02 m (6 ft 7½ in)
Max width	1.43 m (4 ft 8¼ in)
Max height	1.29 m (4 ft 2¾ in)
Volume	3.22 m³ (113.7 cu ft)
Cargo compartment:	
Length	1.10 m (3 ft 7¼ in)
Max width	1.23 m (4 ft 0½ in)
Max height	1.23 m (4 ft 0½ in)
Volume	1.34 m³ (47.3 cu ft)

AREAS:

Main rotor disc	47.52 m² (511.5 sq ft)
Tail rotor disc	1.42 m² (15.3 sq ft)

WEIGHTS:

Weight empty, equipped	1,520 kg (3,351 lb)
Fuel: standard	480 kg (1,058 lb)
incl auxiliary tanks	800 kg (1,764 lb)
Max T-O weight	2,800 kg (6,173 lb)

PERFORMANCE (estimated, at max T-O weight, ISA):

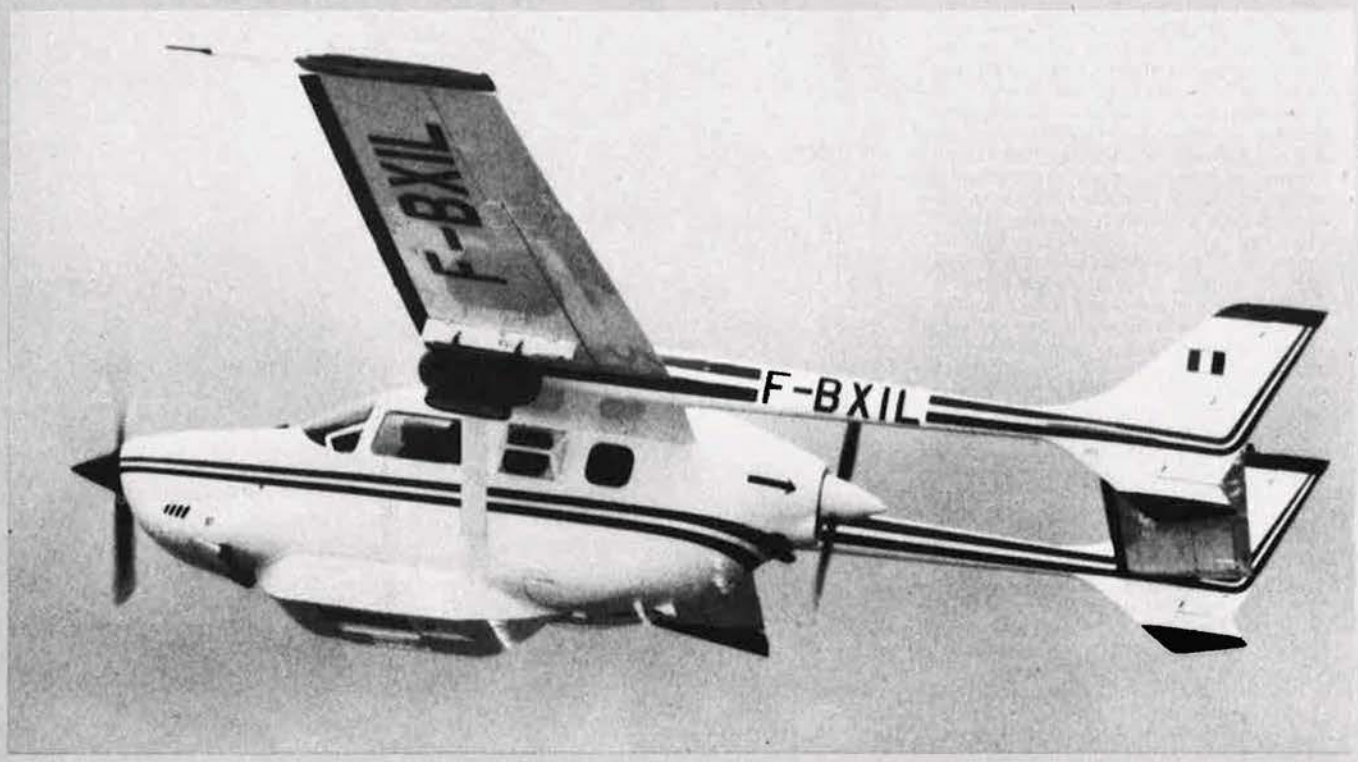
Never-exceed speed at S/L	148 knots (275 km/h; 171 mph)
Max cruising speed at S/L	142 knots (264 km/h; 164 mph)
Econ cruising speed at S/L	126 knots (234 km/h; 145 mph)
Max forward rate of climb at S/L	600 m (1,968 ft)/min
Max vertical rate of climb at S/L	420 m (1,378 ft)/min
Max operating altitude	5,180 m (17,000 ft)
Hovering ceiling IGE	4,100 m (13,450 ft)
Hovering ceiling OGE	3,150 m (10,335 ft)
Service ceiling, one engine out, 46 m (150 ft)/min climb reserve	3,000 m (9,845 ft)
Ferry range at S/L with two 200 litre auxiliary tanks, no reserves	491 nm (910 km; 565 miles)
Range at S/L with pilot and 7 passengers, standard fuel, no reserves	294 nm (545 km; 338 miles)
Endurance, conditions as above	3 h 0 min

REIMS AVIATION

REIMS AVIATION SA: Office and Works: Reims-Prunay Airport, BP 2745, 51062 Reims Cédex, France

Reims Aviation began the assembly under licence of the Cessna 337 Super Skymaster six-seat twin-engined light aircraft in 1969. Primary structures were supplied by Cessna and engines by Rolls-Royce; smaller components and equipment were French-built.

Assembly of the standard F 337 and pressurised FT 337P versions has ended, but Reims Aviation continues to produce the FTB 337, which it developed in 1974 at the request of various government agencies. Details of the latest special version of this aircraft follow:



Reims Aviation FTB 337 equipped with Supercyclope remote sensing system

REIMS AVIATION FTB 337/SUPERCYCLOPE

The airframe of this five/six-seat, push-and-pull light twin is basically similar to that of the Reims/Cessna F 337, but embodies STOL modifications, comprising high-lift trailing-edge flaps, and is fitted with two 168 kW (225 hp) Rolls-Royce Continental TSIO-360-D turbocharged engines. The FTB 337 is not pressurised but can be equipped for maritime or overland patrol duties, sea or land rescue, or other specialised tasks by day and night, with four underwing pylons for containers of food and medicine, dinghies and locator beacons, radar, or equipment to detect illegal oil jettison and slicks at sea, or forest fires. The rear of the cabin can be cleared to carry cargo or two stretchers. The aircraft can also be equipped for navigation and IFR training.

Since 1975, a succession of experimental operations has been performed, on behalf of French official agencies, to develop and evaluate an airborne remote sensing system known as Supercyclope. This is a modular system, able to accept a variety of peripheral units and optional extras to suit particular missions. A typical airborne installation includes: an infra-red head, manufactured by SAT, which performs single-line scanning of the area overflown, perpendicular to the aircraft axis, within a 90° field (±45° from the vertical, with automatic compensation for roll up to ±15°); electronics able to record or display the infra-red signal; a photographic transcriber which exposes a film 70 mm wide and 45 m (148 ft) long, giving coverage of a track 693 nm (1,285 km; 798 miles) long from an altitude of 100 m (330 ft), with a picture resolution of 2,000 points per line and 32 shades of grey; a magnetic recorder with cassettes which can be changed in a few seconds and which record for 20 minutes, with sound track; a real-time display system employing a small conventional TV monitor screen; a transmitter and antenna to transmit the signals to a ground station. The standard two-man crew (pilot and navigator) can be assisted by an additional observer if desired.

A typical operation was that performed by a company-owned FTB 337 on behalf of the Secrétariat Général de la Marine Marchande between 22 August and 8 December 1977. In 77 days, a total of 235 h 50 min were flown along the entire French coastline. Of 1,115 ships inspected, 17 were caught in the act of dumping hydrocarbons in the sea; 16 of them were identified, including two at night.

Other missions performed by the FTB 337, equipped with Supercyclope and added Hasselblad electric cameras, include a study of the flow of hot water from a nuclear power station; study of the movement in the sea of waste emissions from large towns; discovery of relatively deep subterranean cavities (10 m; 33 ft below the surface); and counting large wild animals in a forest.

By the beginning of last year, Reims Aviation had delivered 61 FTB 337s, and expected to build two or three more during 1979.

DIMENSIONS, EXTERNAL:
- As standard Cessna 337, except:
- Wing span: 12.10 m (39 ft 8½ in)
- Height overall: 2.84 m (9 ft 4 in)

AREA:
- Wings, gross: 18.81 m² (202.5 sq ft)

WEIGHTS AND LOADING:
- Weight empty: 1,454 kg (3,206 lb)
- Max T-O weight: 2,100 kg (4,630 lb)
- Max wing loading: 113 kg/m² (23.2 lb/sq ft)

PERFORMANCE (at max T-O weight):
- Max level speed at S/L: 205 knots (380 km/h; 236 mph)
- Cruising speed (75% power):
  - at 3,000 m (10,000 ft): 186 knots (344 km/h; 214 mph)
  - at 6,000 m (20,000 ft): 200 knots (370 km/h; 230 mph)
- Stalling speed, power reduced, wheels and flaps up: 67 knots (124 km/h; 77 mph)
- Max rate of climb at S/L: 375 m (1,230 ft)/min
- Rate of climb at S/L, one engine out: 100 m (328 ft)/min
- Rate of climb at 3,000 m (10,000 ft): 346 m (1,135 ft)/min
- Service ceiling: 7,300 m (23,950 ft)
- Service ceiling, one engine out: 6,000 m (20,000 ft)
- STOL T-O to 15 m (50 ft): 245 m (804 ft)
- STOL landing from 15 m (50 ft): 260 m (853 ft)
- Max range, no reserves:
  - 75% power at 6,000 m (20,000 ft): 955 nm (1,770 km; 1,100 miles)
  - econ power at 3,000 m (10,000 ft): 1,085 nm (2,012 km; 1,250 miles)
  - econ power at 6,000 m (20,000 ft): 1,150 nm (2,132 km; 1,325 miles)
- Max endurance at 120 knots (222 km/h; 138 mph), no reserves: more than 5 h

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BELL

BELL HELICOPTER TEXTRON (Division of Textron Inc); Head Office: PO Box 482, Fort Worth, Texas 76101, USA

BELL MODEL 301
US Army designation: XV-15

Bell Helicopter announced in May 1973 that it had been chosen by NASA and the US Army to build and test two twin-engined tilt-rotor research aircraft. Estimated cost of the six-year programme is $45 million.

The company has been working on tilt-rotor technology since the mid-1950s, proving the concept feasible with its XV-3 prototype, described in the 1962–63 *Jane's*. Since that time development of tilt-rotor systems has progressed steadily, leading to the Model 301 which Bell proposed to meet the NASA/Army requirement. The two research aircraft, on which design work was started in July 1973, have the official designation XV-15. The fuselages and tail units were built under subcontract by Rockwell International's Tulsa Division.

The airframe structure is basically that of a con-

First prototype of the Bell XV-15 in hovering mode, with wingtip pods tilted vertically

ventional fixed-wing aircraft. However, the hover lift and cruise propulsive force is provided by low-disc-loading rotors located at each wingtip. These rotors, together with their wingtip-mounted turboshaft engines, rotate from a vertical position for hover and helicopter flight, to horizontal for the conventional propeller-driven flight mode. Hover control is provided by rotor-generated forces and moments: in the conventional mode of flight, control is provided primarily by the use of the normal aerodynamic control surfaces of a fixed-wing aircraft. A cross-shafting system interconnecting the rotors precludes a complete loss of power to either rotor due to the failure of one engine, permits power transfer for transient conditions, and achieves rotational speed synchronisation. A conversion system interconnect shaft caters for rotor axis tilt synchronisation.

The Lycoming turboshaft engines are mounted in rotatable wingtip nacelles to minimise the operational loads on the cross-shaft system. The use of a free-turbine engine permits the reduction of rotor turning speed for conventional forward flight, thus improving rotor performance and reducing cruise noise. The gimbal-mounted stiff-in-plane three-blade rotors have elastomeric flapping restraints to increase helicopter mode control power and damping. The forward-swept fixed wings provide blade clearance which is adequate to cater for blade flexion resulting from gusts or manoeuvres while operating in an aeroplane flight mode. Wing/rotor/pylon stability is accomplished by selecting a stiff wing and pylon-to-wing attachment, and by minimising the distance of the rotor hub from the wing.

For hover flight the wing trailing-edge flaps and flap/ailerons (flaperons) are deflected downward to reduce the wing download, thereby increasing hovering efficiency. Hover roll control is provided by differential rotor collective pitch, pitch control by cyclic pitch, and yaw control by differential cyclic pitch. Dual controls for use in the helicopter mode are similar to those of a conventional rotating-wing aircraft. Thus, dual collective control sticks provide power and collective pitch for height control, and dual control columns provide longitudinal and lateral control: the dual rudder pedals provide directional control.

In the aeroplane flight mode, the control columns and rudder pedals are employed conventionally, while the collective stick/power lever continues in use for power management. An H-tail configuration, with twin endplate fins and rudders, was selected to provide optimum aircraft directional stability around a zero yaw angle. Control authority for the power lever, blade pitch governor, cyclic, differential cyclic, differential collective, and flap/flaperon relationship, are phased with rotor mast angle by mechanical mixing linkages.

At intermediate rotor axis tilt angles (between 60° and 75°) the aircraft can perform STOL operations at weights above the maximum VTOL gross weight of 5,897 kg (13,000 lb). The XV-15 is fitted with a stability and control augmentation system to improve the handling qualities and enhance pilot efficiency. Ejection seats are installed as a safety feature during flight trials.

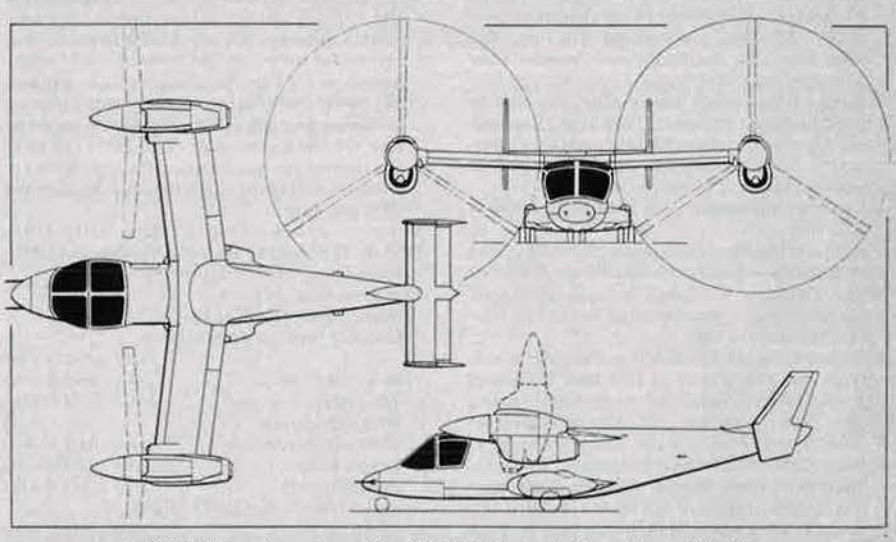
Future commercial and military aircraft which might be derived from the XV-15 would have a wing span of about 10.67 m (35 ft) and fuselage length of 12.50 m (41 ft). They would carry 15 troops in military service or 12 passengers as civil transports.

Initially the programme was funded and managed jointly by the NASA Ames Research Center and the US Army's Air Mobility Research and Development Laboratory: but it was announced in August 1979 that, in order to accelerate and expand the test programme, additional funding had been provided by the US Navy. The two XV-15s are being used in a research programme intended to prove the concept, explore the limits of the operational flight envelope, and assess its application to military and civil transport needs.

The first aircraft (702) made its first free hovering flight on 3 May 1977. The second aircraft (703) was transferred to Bell's Arlington, Texas, flight test facility for systems checks in late August 1977. Wind tunnel tests of the first XV-15 were carried out at NASA's Ames Research Center in June/July 1978, up to tunnel maximum speeds of 180 knots (333 km/h; 207 mph). Flight tests of the second XV-15 in helicopter mode began on 23 April 1979. The first full in-flight conversion to aeroplane mode was made by this second XV-15 (N703NA) on 24 July 1979. Testing carried out since that date has included flights at 1,525 m (5,000 ft) with in-flight conversions at speeds up to 207 knots (384 km/h; 238 mph), and roll-on landings at maximum speeds of 60 knots (111 km/h; 69 mph) with a 95° pylon angle. Emergency operation of the aircraft was also tested by simulated systems and engine failures, including autorotative descents. Noise and vibration levels were found to be lower than had been predicted.

Following completion of that phase of testing, N703NA underwent a planned 100-hour inspection. Flight testing was scheduled to resume in early November 1979, and it is planned to demonstrate high-speed cruising flight at up to 261 knots (484 km/h; 300 mph).

Bell Helicopter announced in July 1979 the receipt of a contract from NASA-Ames to carry out a preliminary design study of an advanced rotor blade for the XV-15. The purpose of the study is to select a design concept for a composite rotor blade of 0.43 m (17 in) blade chord, that will offer improved performance and extended life expectancy compared



Bell XV-15 (two Avco Lycoming LTC1K-4K turboshaft engines) *(Pilot Press)*

Second prototype of the Bell XV-15 tilt-rotor research aircraft in conventional aeroplane cruising configuration

with the existing metal blades of the XV-15.

TYPE: Tilt-rotor research aircraft.

ROTOR SYSTEM: Two three-blade rotors, stiff in plane and gimballed, with an elastomeric hub spring to increase control power and damping. Stainless steel blades of high-twist design, suitable for both helicopter and high-speed aircraft flight modes. Blade section is Bell-modified NACA 6-series. Blades attached to titanium hub by tension-torsion straps and roller pitch bearings.

ROTOR DRIVE: Each rotor is driven by individual engine via reduction gear, engine coupling, rotor planetary gear and shaft centrebox. Rotor/engine rpm ratio 1 : 35.11. Interconnected drive shafts and redundant tilting mechanisms permit single-engine operation and fail-operative tilt capability.

WINGS: Cantilever high-wing monoplane. Wing section Bell-modified NACA 64A223. Dihedral 2°. Incidence 3°. Forward sweep at quarter-chord 6° 30'. All-metal conventional structure, with light alloy ribs and honeycomb panels. Flap/aileron of light alloy construction on outer two-thirds of each wing trailing-edge, powered by HRT hydraulic actuators. Plain light alloy trailing-edge flap on inboard third of each wing, operated by SPECO electrical control box, with Curtiss-Wright power hinges. No tabs.

FUSELAGE: Semi-monocoque fail-safe structure of light alloy.

TAIL UNIT: Cantilever structure of light alloy, with endplate fin and rudder mounted at each tailplane tip. Tailplane incidence ground-adjustable. Elevators and rudders powered by HRT hydraulic actuators. No tabs.

LANDING GEAR: Hydraulically-retractable tricycle type, with twin wheels on each unit. Main units retract forward into fuselage-mounted landing gear pods, nose unit aft into the fuselage. Menasco oleo-pneumatic shock-absorbers. Nosewheel unit of self-centering type. Goodyear magnesium main wheels with Goodyear tyres size 6.50-8, pressure 3.8 bars (55 lb/sq in). Goodyear magnesium nosewheels with Goodyear tyres size 5.00-4, pressure 3.8 bars (55 lb/sq in). Goodyear hydraulic disc brakes.

POWER PLANT: Two 1,156 kW (1,550 shp) Avco Lycoming LTC1K-4K turboshaft engines, each with a two-minute contingency rating of 1,343 kW (1,800 shp), wingtip-mounted with tilt mechanism. Two fuel tanks in each wing, total capacity 867 litres (229 US gallons). Refuelling point on upper surface of each wing. Oil capacity 11.4 litres (3 US gallons).

ACCOMMODATION: Pilot and co-pilot on ejection seats, side by side on flight deck, with access to cabin. Currently in austere test configuration for research equipment, cabin could accommodate nine personnel. Door on starboard side. Accommodation heated, ventilated, and air-conditioned. Overhead and side windows jettisonable ballistically in emergency.

SYSTEMS: AiResearch air-cycle environmental control unit. No pressurisation. Triplex hydraulic system, pressure 207 bars (3,000 lb/sq in): dual system for rotor and flight controls, with utility system as backup. Pneumatic system, pressure 207 bars (3,000 lb/sq in), for emergency actuation of landing gear. DC electrical system supplied by two 30V 300A generators. Two 28V 13Ah nickel-cadmium storage batteries. Oxygen system at pressure of 124 bars (1,800 lb/sq in). Engine inlet strut anti-icing.

AVIONICS AND EQUIPMENT: King VHF, UHF, VOR, ILS, marker beacon indication, and DME. Blind-flying instrumentation fitted.

DIMENSIONS, EXTERNAL:

Diameter of rotors (each)	7.62 m (25 ft 0 in)
Distance between rotor centres	9.80 m (32 ft 2 in)
Rotor blade chord	0.36 m (1 ft 2 in)
Wing span	10.72 m (35 ft 2 in)
Wing aspect ratio	6.12
Wing chord, constant	1.60 m (5 ft 3 in)
Length overall	12.83 m (42 ft 1¼ in)
Height overall	4.67 m (15 ft 4 in)
Wheel track, c/l of shock-absorbers	2.64 m (8 ft 8 in)
Wheelbase	4.80 m (15 ft 9 in)
Cabin door (stbd): Height	1.37 m (4 ft 6 in)
Width	0.81 m (2 ft 8 in)
Height to sill	0.56 m (1 ft 10 in)

DIMENSIONS, INTERNAL:

Cabin (excl flight deck):	
Length	4.53 m (14 ft 10½ in)
Max width	1.52 m (5 ft 0 in)
Max height	1.52 m (5 ft 0 in)
Floor area	5.40 m² (58.1 sq ft)
Volume	8.50 m³ (300 cu ft)

AREAS:

Rotor blades (each)	1.36 m² (14.6 sq ft)
Rotor disc (each)	45.61 m² (491 sq ft)
Wings, gross	15.70 m² (169 sq ft)
Flap/ailerons (total)	1.88 m² (20.2 sq ft)
Trailing-edge flaps (total)	1.02 m² (11.0 sq ft)
Fins (total)	3.99 m² (43.0 sq ft)
Rudders (total)	0.70 m² (7.5 sq ft)
Tailplane	3.46 m² (37.25 sq ft)
Elevators (total)	1.21 m² (13.0 sq ft)

WEIGHTS AND LOADINGS:

Weight empty	4,341 kg (9,570 lb)
Design T-O weight	5,897 kg (13,000 lb)
Max T-O weight (STOL)	6,804 kg (15,000 lb)
Max disc loading, design T-O weight	64.65 kg/m² (13.2 lb/sq ft)
Max wing loading, design T-O weight	375.6 kg/m² (76.9 lb/sq ft)

PERFORMANCE (estimated, at design T-O weight):

Never-exceed speed	364 knots (675 km/h; 419 mph)
Max level speed at 5,180 m (17,000 ft)	332 knots (615 km/h; 382 mph)
Max cruising speed at 4,970 m (16,300 ft)	303 knots (562 km/h; 349 mph)
Econ cruising speed at 6,100 m (20,000 ft)	200 knots (371 km/h; 230 mph)
Max rate of climb at S/L	960 m (3,150 ft)/min
Service ceiling	8,840 m (29,000 ft)
Service ceiling, one engine out	4,570 m (15,000 ft)
Hovering ceiling OGE	2,635 m (8,650 ft)
Range with max fuel	445 nm (825 km; 512 miles)

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

Battle for Benefits Intensifies

The services last year made little headway in their drive to improve compensation and benefits, though late in the year they did persuade Congress not to pass several adverse people moves. The battle for pay and benefits, meanwhile, is intensifying. Air Force officials have vowed to sound off more frequently to secure sweeteners that might improve retention.

"Retention is the byword for 1980," Air Staffers declare. "Look for the Chief [Gen. Lew Allen, Jr.] and other leaders to hit the retention issue—in posture and budget hearings, speeches, etc.—much harder than ever before," one said. This means continuous pressure on the Administration and Congress to improve people programs.

Some informed quarters are not encouraged, however. They note that the White House has already rejected recommendations by a Defense Department pay study group to add $650 million in special military pay raises. However, some additional funds for improved travel pay, per diem, reenlistment bonuses, and housing are being included in the Pentagon's FY 1981 budget. But critics contend these additional funds fall far short of monies necessary to improve manning significantly.

Defense Secretary Harold Brown in late December put it this way: "We are committed to solve the recruiting and retention problems, and it clearly will take money. However . . . we will try to solve it gradually." He indicated it may take five years.

Late last year, the Senate rejected by a whisker, 44 to 40, a measure to increase the recent seven percent military pay raise to 10.41 percent. Another vote on the proposal was slated for late January 1980. AFA, strongly supporting the increase, sent letters signed by President Victor R. Kregel to the senators from all fifty states urging them to approve the measure.

The Pentagon last year sent Congress what it called four "priority" people-type legislative proposals: (1) a bachelor COLA overseas; (2) a family separation allowance for lower-ranking members; (3) an improved trailer allowance; and (4) payment of overseas station housing allowances in advance.

The lawmakers approved the housing allowance item, though it doesn't provide any extra dollars for members—they just receive the allowance earlier and have to repay it. The other three proposals got nowhere. The Pentagon is expected to propose them again this year, but service insiders say what is needed is heavy DoD pressure on the lawmakers for action.

The government in 1979 failed on several other important points: to extend junior enlisted travel (JET) benefits to low-ranking families in the States; to correct deficiencies in the survivor benefits program; to extend subsistence and quarters allowances to bachelor members; and to provide severance pay for enlisted members. Continued refusal of Uncle Sam to bless these and other "retention builders" can only further erode the services' manning programs, many service authorities insist.

Late last year, Congress, in passing the FY 1980 military appropriations bill (nearly three months late), came close to severely limiting the number of service dependents abroad and barring noncommand-sponsored families from most benefits such as commissaries and exchanges. This would have been disastrous to retention, observers feel, but the fact that the lawmakers even seriously considered the move has its negative effects.

Furthermore, in that same FY '80 appropriations measure, Congress:

- Nearly torpedoed USAF's physician assistant (PA) program by denying commissions to future PAs (other than the NCOs already promised commissions) and said officer PAs (there are close to 400 on active duty) cannot advance beyond major.
- Eliminated the program that allowed colonels and generals to reserve space-available travel seats up to thirty days before departure. The limited amount of SA travel will be offered "on an equal basis to all military personnel regardless of rank," the legislators ordered. They also called for a general reduction in air passenger terminal activity.
- Told the Pentagon to phase out, starting March 31, 1980, the USAF Veterinary Service. The Army becomes executive agent for all DoD veterinary functions, and the number of vets will be reduced.
- Retained for another year the tough curbs on use of government money for abortions in military hospitals.
- Reduced USAF funds for graduate education and for recruiting officer trainees for scientific and technical berths.
- Reduced from four to three the number of years an ROTC unit can go below minimum enrollment and remain operative. However, Air Force did get the 6,500 AFROTC scholarships it wanted, an increase of 740 over last year's allocation.
- Barred retired service people already drawing disability retirement from later retiring from federal civilian service on the same disability. Among the 15,000 Defense Department civilians who have been retiring for disability each year, about 300 were also disability retired from the military.
- Told the services to stop letting civilian employees awaiting disability retirement to "use up" their sick leave before retiring.

Dramatic Rise in Military Couples Seen

When USAF began expanding its female force, about 10,000 of them had military husbands, mostly Air Force members. Late last year these "military couples" numbered 18,300, including about 600 USAF women married to soldiers, sailors, and Marines.

By FY 1985, when USAF's female buildup is slated to reach nearly 100,000, some 40,000 of them will be married to military men, predominately USAF, service authorities believe.

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So what does that mean for such decisions as keeping couples together, remote and overseas tours, and caring for children, AIR FORCE Magazine asked the Manpower and Personnel Center. The Center responded that right now it does not consider military couples a big problem; some ninety percent of them are together at the same location.

But as their numbers grow and their ranks increase, "it will become more difficult to keep them together," the Center reported. Authorities explained that it's easy to assign two low-ranking airmen to the same base, but, because of fewer authorizations, joint assignments for two E-7s or higher present problems. This could become more evident as more USAF women attain higher rank.

Center officials said increased military couple population "should have a minimal effect" on remote and overseas tours because both members must pull their fair share of such tours, and neither is routinely excused on the basis of their marriage. Furthermore, USAF cannot guarantee they'll serve remote tours together, though it tries so that "they do not incur two years of family separation, unless there are children involved and parents prefer to go remote separately."

Meanwhile, under a new procedure just announced, when one member of an Air Force couple receives a new assignment, the spouse will automatically be identified to the Center's assignment office. This, officials say, should improve the chances of couples being assigned and moving together.

What about Air Force couples with children? The service, in a new regulation, AFR 35-39, directs them to make dependent care arrangements that allow both members of a military couple to be available to comply with all military alerts, deployments, and other obligations. The same applies to the estimated 6,300 single USAF members with dependents.

Those failing to meet the tough rules in 35-39 will face "remedial action" which, Center officials said, could range from counseling to dis-

AFA Believes . . .

'The All-Volunteer Force Is in Trouble'

AFA's 1979–80 policy on Defense Manpower Issues states: "We must face up to the problems that pervade the All-Volunteer Force. A return to some form of Selective Service System is necessary."

It is reassuring to know that some members of Congress share AFA's concern and are actively working to solve All-Vol problems. This month's "AFA Believes" is a guest editorial by Sen. William L. Armstrong (R-Colo.), which addresses one element of the issue—the continuing military pay caps:

It's hard to imagine in this day and age that an employer in the United States could get away with:

—paying new employees less than the minimum wage;

—paying skilled journeymen who have been with the firm eight to ten years so little that they have to get food stamps in order to feed their families; and

—holding cost-of-living increases below the rate of inflation for six out of the last seven years.

Surely, if the government ever found out about such a latter-day Simon Legree, it would fall upon him like a ton of bricks. There would be lawsuits and OSHA inspectors everywhere, and denunciations on the floor of Congress.

Yet it's the government itself that is doing this. The examples above are not hypothetical horrors. They are the actual state of affairs in the armed forces today.

The All-Volunteer Force is in trouble. One reason . . . is because Congress has not kept the promises it made to our servicemen and women at the time the AVF was created. Congress pledged to keep pay and benefits for the military comparable to those in the private sector. But Congress has reneged on that pledge.

The armed forces are smaller in number today than at any time since 1950, yet they are having grave difficulty meeting their peacetime manpower requirements. Last year, for the first time ever, *all* of the services . . . failed to meet their recruiting goals. Now that base pay for a recruit has fallen to eighty-three percent of the minimum wage, it isn't difficult to understand why.

Most of us have suffered from inflation, but none so severely as servicemen and women. From December 1972 to October 1978, the cost of living rose 59.9 percent. But the regular military compensation—base pay plus allowances for housing and subsistence—rose by only 40.8 percent.

Hardest hit have been the career noncommissioned officers, the bone and sinew of our armed forces. The average salary for all enlisted personnel, including all allowances, is $9,900. The Bureau of Labor Statistics (BLS) says the minimum income necessary for a lower standard of living for a family of four is $11,546. More than 100,000 military families are eligible for food stamps.

The result of this erosion of pay and benefits is that many qualified, motivated, patriotic men and women are discovering that they, literally, cannot afford to serve their country. And they're leaving the service. The Navy lacks 17,000 skilled petty officers with nine to sixteen years of service. The Army is short more than 46,000 NCOs, the Air Force more than 3,000. . . .

Survey after survey . . . makes it clear that the principal reason so many noncommissioned officers, formerly on career tracks, are leaving the service is because of erosion of pay and benefits.

Sen. Spark Matsunaga (D-Hawaii) and I recently offered an amendment to the Defense Appropriations bill to begin to reverse the erosion of pay and benefits.

Our amendment, which was cosponsored by twenty-three senators, would give our servicemen and women the full 10.4 percent increase required for these families to have a fighting chance against rising inflation. This would be a 3.4 percent raise effective January 1, 1980, above the seven percent pay cap President Carter imposed October 1.

The estimated cost of the Armstrong-Matsunaga amendment was $470 million, . . . within the $129.9 billion budget ceiling for defense spending.

Opponents, in a contorted dance around Senate procedure, managed to defeat our amendment forty-four to forty. Had a vote on the merits been permitted, I believe the pay cap amendment would have passed.

But the setback is only temporary. Senator Matsunaga and I plan to offer our amendment again, to another bill against which the procedural objection will not apply.

The previous debate has made the stakes clear: The alternative to passage of the pay cap amendment is reinstitution of the military draft.

To reinstate conscription for any reason would be unfortunate. But to go back to the draft simply because Congress is unwilling to pay our servicemen and women a living wage would be unconscionable. ■

charge. Authorities don't see the couples-with-dependents as a problem yet, because less than four percent of the total active-duty population is involved.

"However," the Center continued, "we expect this number to increase and because any avoidable loss in readiness is unacceptable, we are examining this area very closely to determine if additional changes in policy may be required."

While about 18,300 USAF women are married to military men, an estimated 6,200 have civilian spouses. This adds up to wedlock for forty-six percent of the distaff contingent. Among Air Force men, 329,700, or about sixty-five percent, are married, according to official statistics.

Board	Rating: Pilot	Navigator	Nonrated	Total
Jan. '78 Temp Captain	4	9	28	41
June '78 Temp Major	11	20	101	132*
June '78 Perm Major	33	38	94	165
July '78 Temp Captain	6	9	23	38
Aug. '78 Perm Captain	1	0	3	4
Total 1978	55	76	249	380
Jan. '79 Temp Captain	1	3	6	10
June '79 Temp Major	0	1	151	152**
July '79 Perm Major	37	27	70	134
July '79 Temp Captain	0	0	9	9
Sept. '79 Perm Captain	1	0	1	2
Total 1979	39	31	237	307

*Another 450 Reserve officers who failed to make temporary major on their first try were separated, though under rules then in effect they could have remained on active duty to compete in 1979; they elected not to.

**In addition, twenty officers invited to continue on active duty rejected the offer and separated.

NCO Experience Level Dips, Tenure Extended

Though the Air Force fell short of its recruiting goal last year, it exceeded its FY '79 career force entry objective by reenlisting 16,823 airmen for their second hitches. Since the goal was 15,500, that's good news, though the overall recruiting-retention picture remains bleak.

One new Hq. USAF response to the problem, slated for early 1980 implementation, is to offer skilled NCOs service beyond their normal retirement dates—an extension of the "high year of tenure."

Heretofore, service beyond the normal HYT has gone mainly to a few E-9s. To maintain a youthful and vigorous force, keep promotions flowing, etc., NCOs in other grades have been retired mandatorily at the following service points: E-5s, twenty years; E-6s, twenty-three years; E-7s, twenty-six years; and E-8s, twenty-eight years.

The HYT liberalization program calls for offering about 1,000 E-6s, E-7s, and E-8s, mostly critically needed specialists, two additional years of active duty. One official expects about half to accept. While the move should help shore up the lagging NCO experience level, it is not large enough to create promotion stagnation, authorities said.

Force-Outs Down, Promotions Up

Only 307 USAF officers have been or will be separated because of their second promotion failure by 1979 selection boards. And the number is expected to decline even further this year.

A few years ago, force-outs based on promotion passovers totaled about 1,000 annually. But promotion opportunity has improved, and more officers are being asked to stay on. Despite some uncertainties on the horizon, the generally favorable promotion-separation picture is expected to be repainted this year.

One uncertainty is the Senate-passed version of DOPMA calling for sharp cuts, over a ten-year period, in field-grade billets and promotions. The Senate's DOPMA is unacceptable to the Air Force, whose officials expect the House Armed Services Committee to restore the grade authorizations proposed in the Pentagon's version of DOPMA. How that will work out in the eventual House-Senate compromise of DOPMA is unclear. Several senators, such as Strom Thurmond (R-S. C.), who usually are supportive of military people programs, expressed concern about the grade cuts in the Senate measure but voted for them anyway.

In any event, Air Force officials don't envision final action on DOPMA in time to affect this year's promotion plans.

Another uncertainty emerged recently when the US Court of Claims ruled that a 1975 USAF board that selected temporary majors was illegal because its members included too few Reserve officers. A similar ruling earlier affecting Army promotion boards in 1974–75 led to recall and promotion of some soldiers who had been separated because of promotion failure. The ultimate outcome of the Claims Court's new ruling is probably many months away and unlikely to affect promotions in 1980.

Headquarters, meanwhile, is going ahead with this year's program, which highlights the following generally favorable "promotion opportunity":

To temporary and permanent O-3, fully qualified (near 100 percent); to temporary O-4, ninety percent; to temporary O-5, seventy-five percent; to permanent O-4, ninety-five percent of the new eligibles; and to permanent O-5, ninety percent of the new eligibles.

Congress, in passing the FY '80 military appropriations bill, told the services to "selectively retain" officers in short skills even though they have been passed over twice. USAF, of course, has already been doing this for captains not making major. It chose ninety-five such O-3s last year, mostly rated, and all but twenty accepted. This year's continuation list, following the temporary major's board, which convenes in April, is expected to be larger and give nonrateds a better chance of staying aboard. Virtually all rated passovers again can expect continuation bids.

The accompanying table shows official figures on line officer force-outs due to two promotion failures from boards convened between January 1, 1978, and December 31, 1979. Not included are officers eligible to retire or be retained in the "sanctuary" until retirement.

DoD to Track Health Care Eligibles, Frauds

The services, in what the Pentagon calls a "massive undertaking," are starting to identify the estimated nine million-plus persons—service members, retirees, dependents, and survivors—eligible for military health

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care. When completed in 1982, the project will enable the services to identify promptly, and take action against, persons ineligible for medicare and those deliberately trying to cheat the system.

The new recording program is called the Defense Enrollment/Eligibility Reporting System, or DEERS. For the next three months, DEERS will be under way at test sites in the Southeast. Later, it will go country- and worldwide, picking up members of the military community wherever they are located.

Each person's eligibility for military health care will be certified and entered into a computerized data bank. So, when a person presents an ID card at a medical facility, the receptionist or clerk will check his eligibility via a telephone computer hookup with the DEERS central data bank located in Monterey, Calif.

Enrollment of active-duty and retired members will be automatic. Dependents and survivors will have to fill out enrollment forms, which will be available at military installations. This applies whether or not they already have ID cards in their possession.

Defense sees the new program reducing fraudulent practices, helping in planning health-care budgets, and providing better health care. The first 400,000 eligibles, all from Virginia and North Carolina, are expected to be enrolled by April 1980.

Long-range plans call for DoD to apply the DEERS treatment to eligibles for exchange, commissary, and other military projects.

Academy, ROTC Language Studies Ordered Revamped

Should service academy cadets and ROTC students be required to study languages like German, which they might use extensively in future assignments, rather than languages they might not find of much value?

"Definitely," said Congress, in effect, recently. In budget hearings the House Appropriations Committee noted that twenty-two percent of the West Point graduates pull their first active-duty tours in Germany. Over a twenty-year period, 100 percent of the West Pointers can expect duty in that country. Yet, academy cadets can elect their language courses, and nearly half study French and Spanish.

Additionally, the committee complained, "the services subsidize the education of thousands of ROTC students and place no requirement to study language as a condition of subsidization."

The services don't like being told how to run such programs. But Congress, in the final FY '80 military appropriations measure, ordered the services to increase the "emphasis . . . upon relevant languages and decrease the offerings in those . . . less useful to a career military officer." Similarly, the lawmakers told the Pentagon to make "an appropriate language a required condition of acceptance of an ROTC scholarship. . . ."

The services are working on implementing directives.

Short Bursts

The government in late 1979 raised both **disability compensation** and **widows' Dependency-Indemnity Compensation** 9.9 percent and made it retroactive to October 1, 1979. More than 2,250,000 vets with service-connected ailments, 235,000 surviving spouses, and 85,000 children of deceased veterans are the recipients.

Ed Gates . . . Speaking of People

A Home With Much to Offer

Most Air Force and Army people stationed at the dozen-odd military installations in and around Washington, D. C., never get around to checking out one service location that could someday play a major role in their lives.

This little publicized site, a scenic, 300-acre plot almost in the center of the District of Columbia, is the United States Soldiers' and Airmen's Home. Currently 2,228 residents, or "members," live there, though there is room for about 300 more.

Just why the facility is not filled to capacity—this has been the case throughout nearly all its 129-year history—is something of a mystery. Home authorities cannot explain it, nor can this reporter, who has examined many military and civilian residences for the elderly.

The USSAH has much to offer, particularly if you're a retired or former Air Force or Army member with limited means, divorced, widowed, otherwise alone, or perhaps disabled. Contrary to popular belief, you don't have to be retired military to enter the USSAH. And a number of former commissioned officers are also members.

Automatically eligible for Home membership are regular enlisted and warrant officer retirees of the two services, and nearly 2,000 present residents fall in this category. Also eligible are honorably discharged enlisted and warrant officer nonretirees with service-connected disabilities that prevent them from earning a living. Admission is also open to certain elderly former enlisted people and WOs with honorable wartime service.

Total eligibles, including perhaps 700,000 Air Force and Army retirees, probably top the 2,000,000 mark. Interestingly, according to the Home's Administrative Officer, Charles R. Walker, thirteen residents have commissioned officer service. They retired in enlisted or WO status but then assumed their Reserve commissioned grades on the retired list or advanced to the highest grade held after completing thirty years of active and retired list service. This accounts for the fact that three retired lieutenant colonels, four majors, and six captains and lieutenants are Home members. In addition, the present membership also includes 135 retired warrant officers.

The highest ranking persons on the reservation are the Governor, Lt. Gen. George H. McKee, and Deputy Governor Maj. Gen. John L. Locke, both retired USAF officers who were appointed by the President.

Average age of the 2,228 residents—that figure includes seventy-nine women—is 65.3 years, the spread ranging from a mere thirty to 102. Mr. Walker explained that the thirty-year-old has a severe service-connected disability that precludes his working. The 65.3 average age figure, of course, is well below the norm for elderly havens generally.

That fact is underscored when observing the majority of the members as they stay active—at golf on the Home's own nine-hole course, bowling on its six first-rate lanes, fishing in the stocked pond, gardening at assigned plots, playing basketball, badminton, and a host of other conditioners at the gym, taking day-long sightseeing trips, and at hobby-shop activities (including an auto shop where members can work on their own cars).

The Home's recreational program also includes current movies four times a week, large-screen TV, card and poolrooms, stamp and coin clubs, bingo, barbecues, libraries, and stage shows. And

Typical increases: a fifty percent disability case, from $232 to $255 per month. Widow of an E-7, from $368 to $404. Widow of an O-3, from $416 to $457.

An even $2.8 million is what the 1980 **Air Force Assistance Fund campaign** is seeking from its drive to be conducted in March. That's $116,000 below last year's receipts. As usual, there are no individual quotas, though USAF's "guide" suggests specific amounts ranging from $1 to $40, depending on a person's basic pay. Example: If your basic is $12,000, your contribution should be $8. Beneficiaries are the **Air Force Aid Society, Air Force Village,** and the **Enlisted Men's Widows Home.**

AFA Executive Director **James Straubel** was recently named to the Honorary Board of Directors of **Bob Hope Village,** a facility of the Enlisted Widows Homes, Fort Walton Beach, Fla. He was named because of his personal support for the activity and the recognized support of AFA for Air Force enlisted programs.

Fifty-two runners, including USAF's **1st Lt. Steven A. Simon** of Warren AFB, Wyo., were slated to run in a torch relay early this month from Langley AFB, Va., to Lake Placid, N. Y., and to arrive there just before the Winter Olympics start. Simon, who averages three hours and forty-five minutes for standard marathon events (twenty-six-plus miles), will rotate with the other fifty-one runners in carrying the torch five kilometers during each turn. They'll travel by bus and camper, march in the Games' opening day spectacle, and stay for all the events.

Senior Staff Changes

PROMOTIONS: To **Major General:** John W. **Ord;** John R. **Paulk.**

RETIREMENTS: B/G Robert G. **McIver;** M/G John R. **Spalding,** Jr.

CHANGES: M/G Max B. Bralliar, from Surgeon, Hq. SAC, Offutt AFB, Neb., to Surgeon, Hq. USAFE, Ramstein AB, Germany, replacing M/G John W. Ord . . . **M/G Murphy A. Chesney,** from Cmdr., Air Force Medical Svc. Cen., & Dep. Surg. Gen. for Ops., Brooks AFB, Tex., to Dir. of Med. Plans & Resources, OTSG, Bolling AFB, Washington, D. C., replacing B/G Herbert V. Swindell . . . **M/G Jay T. Edwards III,** from DCS/Log., Hq. USAFE, Ramstein AB, Germany, to Cmdr., Oklahoma City ALC, AFLC, Tinker AFB, Okla., replacing M/G Cecil E. Fox . . . **L/G James V. Hartinger,** from Cmdr., Twelfth Air Force, TAC, Bergstrom AFB, Tex., to CINC/NORAD/ADCOM, Peterson AFB, Colo., replacing retiring Gen. James E. Hill.

B/G (M/G selectee) Waymond C. Nutt, from Dir., Maint. & Supply, DCS/L&E, Hq. USAF, Washington, D. C., to DCS/Log., Hq. USAFE, Ramstein AB, Germany, replacing M/G Jay T. Edwards III . . . **M/G John W. Ord,** from Surgeon, Hq. USAFE, Ramstein AB, Germany, to Cmdr., AMD, AFSC, Brooks AFB, Tex., replacing retiring B/G Robert G. McIver . . . **M/G John R. Paulk,** from DCS/Log., J-4, NORAD, & DCS/Log., Hq. ADCOM, Peterson AFB, Colo., to Cmdr., Warner Robins ALC, AFLC, Robins AFB, Ga., replacing retiring M/G John R. Spalding, Jr. . . . **B/G Thomas S. Swalm,** from Cmdr., 57th TTW, & Cmdr., USAF Ftr. Wpns. School, TAC, Nellis AFB, Nev., to Cmdr., TAC Trng. Holloman, TAC, Holloman AFB, N. M., replacing B/G Charles E. Bishop.

SENIOR ENLISTED ADVISOR CHANGES: CMSgt. Jack E. Roberts, to active duty as Senior Enlisted Advisor, Hq. AFRES, Robins AFB, Ga., replacing CMSgt. Jackie Farley, returning to Reserve status. ■

tennis? The Home has no courts of its own, but members use the nearby Catholic University courts.

Almost everything, from golf carts to bowling to checkout of bicycles, is free to members. Even shoe repairs, dry cleaning, and laundry are provided courtesy of the USSAH. One exception is haircuts, which are available at the Home's Army-Air Force Exchange Service Store at regular AAFES prices (a fraction of local outside-the-gate charges).

The USSAH has a 385-bed hospital, and members also receive care at nearby Walter Reed Army Medical Center. Three Home ambulances are on constant alert, should a member require medical aid.

Most members live in single and double rooms in the Scott and Sheridan Buildings, built in 1954 and 1962, respectively. They also house the dining hall, bank, auditorium, and other facilities. Three additional dormitories and numerous support buildings, including Anderson Cottage, built in 1811, make up the remainder of the Home's layout. Anderson Cottage, used as a summer White House by Presidents Buchanan, Lincoln, and Arthur, now serves as a guest house for members' friends and relatives. The fee is only $5 per night.

The facility's operating budget has reached the $19 million-plus mark, but officials note that none of this is appropriated money although Congress does review and approve the budget. This year's anticipated income includes about $7 million from the automatic fifty cents per month deduction from soldier-airman pay; $7 million in interest from the Home's trust fund; $2.2 million from fines and forfeitures levied on errant soldiers and airmen; and $2.7 from "user's fees."

For years, Home residents paid no rent; residence was virtually free. But with costs soaring in recent years—it takes a crew of 1,000 paid employees to run the facility—Congress laid on a monthly charge, or user's fee, effective November 1, 1976. It is a percentage of military retired pay, VA disability compensation, or VA pension.

The user's fee is currently 17.5 percent. Thus, a member drawing $650 per month in retired pay is charged a fee of $114. That fee will automatically rise to twenty percent next year and increase by 2.5 percent per year until it reaches the present legal maximum of twenty-five percent.

VA disability and pension checks generally are smaller than military retired checks, so VA beneficiaries normally pay less. For example, a Home member rated fifty percent disabled and drawing $255 per month in VA compensation pays a $44.62 user's fee.

Some 250 of the Home's 1,000 employees are live-in members. They are electricians, guards, clerks, etc. Newcomers are encouraged to join the in-house work force, if physically able and qualified. Pay for members taking Home jobs is pegged at one half the normal Civil Service rate for the particular job.

Another 250 residents hold full- or part-time jobs in town. Still others leave the Home for varying periods of time; some go to Florida for the winter. "Members don't have to apply for leave, they just tell us they're going away for awhile," Walker said. Home management generally "is lenient" with the members, he explained, though extended absences without notifying Home officials can result in expulsion. Each year a handful of members, guilty of chronic rule-breaking, are asked to leave for good.

The average turnover, including deaths, is about forty persons a month, so it is obvious that some residents are not sold on USSAH membership as a permanent arrangement. But institutionalized living, wherever it takes place, has some inherent drawbacks.

However, the fact that Home eligibles pay no entrance stipend (other than the $6 per year active-duty pay deductions) and are charged only token rent for room, board, medical care, activities, recreation, and hopefully camaraderie and a sense of belonging, suggests that many eligibles might find a real home here.

They can check it out while stationed in the area. Or, the Home will send information and application forms on request. The address is United States Soldiers' and Airmen's Home, Washington, D. C. 20317. The phone number is (202) 726-9100. ■

AFA's Committees for 1980

Much of the Air Force Association's business is carried out by committees, whose members are appointed by the National President. Committee members are selected for their experience and professional knowledge in areas of concern to AFA. Advisors to the National President and members of AFA's Junior Officer Advisory and Enlisted Councils will appear in the April Issue.

Executive Committee


Kregel


Callahan


Clark


Gross


Douglas


Keith


McBride


Ostrow


West


Straubel

The Executive Committee acts in behalf of the Board of Directors between Board meetings. It is chaired by National President **Victor R. Kregel,** an industry executive from Dallas, Tex. The Committee includes AFA Board Chairman **Daniel F. Callahan,** a self-employed engineering and management consultant, Nashville, Tenn.; AFA National Secretary **Earl D. Clark, Jr.,** President of the Collins Construction Co. and the Earl D. Clark Architectural Firm, Kansas City, Kan.; **Jack B. Gross,** AFA National Treasurer and a businessman and civic leader, Hershey, Pa.; **George M. Douglas,** Permanent AFA National Director and General Manager of Marketing, Mountain Bell Telephone Company, Denver, Colo.; **Sam E. Keith,** Permanent AFA National Director and industry executive, Fort Worth, Tex.; **William V. McBride,** AFA National Director and a retired Air Force Vice Chief of Staff, San Antonio, Tex.; **Martin M. Ostrow,** Permanent AFA National Director and attorney, Beverly Hills, Calif.; and **A. A. "Bud" West,** Permanent AFA National Director and industry executive, Newport News, Va. **James H. Straubel,** AFA Executive Director, is an ex-officio, nonvoting member of the Committee.

Finance Committee


Gross


Kregel


Callahan

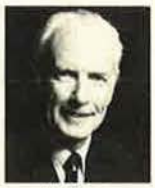

Calliham


Chabbott


Church


Ewing


Field


Nettleton


Shutt


Webb

Chaired by AFA Treasurer **Jack B. Gross,** businessman and civic leader from Hershey, Pa., this Committee reviews AFA's fiscal policy and makes appropriate recommendations to the Executive Committee. AFA National President **Victor R. Kregel** joins AFA Board Chairman **Daniel F. Callahan** as an ex-officio, nonvoting member of the Committee. Members are: **Edith E. Calliham,** South Carolina State AFA President and Vice President of the First National Bank of South Carolina, Charleston; **George H. Chabbott,** former AFA National Vice President, Central East Region, and a self-employed management consultant, Dover, Del.; **Charles H. Church, Jr.,** former President of AFA's Harry S. Truman Chapter and Chairman of the Board and Chief Executive Officer, United Missouri Bank of Hickman Mills, Kansas City, Mo.; **Dwight M. Ewing,** AFA National Vice President, Far West Region, and realtor/property manager, Merced, Calif.; **Alexander C. Field, Jr.,** AFA National Director and Vice President for Public Affairs, WGN-TV, Chicago, Ill.; **J. Gilbert Nettleton, Jr.,** AFA National Director and industry executive, Washington, D. C.; **James Shutt,** Vice President of AFA's Alamo Chapter and a civilian executive, Kelly AFB, Tex.; and **William N. Webb,** Oklahoma State AFA President and a civilian executive, Tinker AFB, Okla.

Membership Committee


Blankenship


Carr


Faust


Henderson


Isabelle


Ramos


Ritchie

This group advises AFA's President on ways and means of promoting membership. Members, appointed by the President, are: **David L. Blankenship,** AFA National Director and an industry executive, Tulsa, Okla., Chairman; **Robert L. Carr,** former AFA National Director and realtor, Pittsburgh, Pa.; **E. F. "Sandy" Faust,** AFA National Director and Senior Vice President, National Bank of Fort Sam Houston, San Antonio, Tex.; **H. B. "Buzz" Henderson,** Virginia State AFA President and industry executive, Seaford, Va.; **Leonard W. Isabelle,** former President of AFA's James H. Straubel Chapter and marketing executive, Ford Motor Co., Detroit, Mich.; **Salvador Ramos,** President of AFA's Wright Memorial Chapter and an electronics engineer, Wright-Patterson AFB, Ohio; and **R. Steve Ritchie,** AFA National Director and Special Assistant to the President of Adolph Coors Co., Golden, Colo.

Science and Technology Committee


Weinbrenner


Athas


Fulgham


Kane


Thomas


West

Established this year and chaired by **George Weinbrenner,** Texas State AFA Secretary and a foreign technology consultant and military historian, San Antonio, Tex., this Committee will draw on military and civilian expertise in developing policy suggestions in high technology areas and will serve to advise the National President on scientific and technical matters. Members are **William C. Athas,** Utah State AFA President and industry executive, Salt Lake City, Utah; **Dr. Dan Fulgham,** scientist, Technology, Inc., San Antonio, Tex.; **Dr. Francis X. Kane,** industry executive, Redondo Beach, Calif.; **Dr. Richard Thomas,** Director, Center for Strategic Technology, Texas A&M University, College Station, Tex.; and **Herbert M. West, Jr.,** AFA National Director and a self-employed environmental engineer, Tallahassee, Fla.

Resolutions Committee


Clark


Chandler


Donnelly


Thayer


Wilkins

Policy suggestions submitted by a variety of sources (particularly AFA field units and individuals) for inclusion in the Association's annual policy papers are coordinated through the Resolutions Committee. Ultimately, policy input is reviewed by the Board of Directors and submitted with Board recommendations to the Convention. Chairman is **Earl D. Clark, Jr.,** AFA National Secretary and President of the Collins Construction Co. and the Earl D. Clark Architectural Firm, Kansas City, Kan. Members are **William P. Chandler,** AFA National Director and insurance broker, Tuscon, Ariz.; **Jon R. Donnelly,** AFA National Vice President for the Central East Region and journalist, Richmond, Va.; **Kenneth C. Thayer,** former New York State AFA President and civilian executive, Griffiss AFB, N. Y.; and **Sherman W. Wilkins,** AFA National Director and industry executive, Bellevue, Wash.

Constitution Committee


Harris


Jones


Mazer


Newcomer


West

Members review AFA's National Constitution and By-Laws and recommend amendments. Chairman is **Martin H. Harris,** Permanent AFA National Director and industry executive, Winter Park, Fla. Members are **Francis L. Jones,** AFA National Vice President, Southwest Region, and property manager, Wichita Falls, Tex.; **Nathan H. Mazer,** Permanent National Director and industry executive, Salt Lake City, Utah; **Henry C. Newcomer,** New York State AFA President and industry executive, Williamsville, N. Y.; and **Herbert M. West, Jr.,** AFA National Director and a self-employed environmental engineer, Tallahassee, Fla.

Convention Site Committee


Kregel


Callahan


Rapp

This Committee recommends suitable sites for AFA National Conventions. It is chaired by AFA National President **Victor R. Kregel,** an industry executive from Dallas, Tex. Members are AFA Board Chairman **Daniel F. Callahan,** a self-employed engineering and management consultant, Nashville, Tenn.; and **William C. Rapp,** AFA National Director and District Manager of Toll Services, New York Telephone Company, Buffalo, N. Y.

Audit Committee


Dean


Copeland


Devoucoux


Haug


Stearn


Stewart

This Committee meets periodically with AFA's independent and internal auditors and reports to the Chairman of AFA's Board of Directors. Committee Chairman is **Hoadley Dean,** AFA National Director and President of Western South Dakota Development Company, Rapid City, S. D. Members are **William L. Copeland,** former Georgia State AFA President and President of CICI, Inc. (financial); **R. L. Devoucoux,** AFA National Director and Account Executive with Dean Witter Reynolds, Inc., Portsmouth, N. H.; **Roy A. Haug,** former National Vice President, Rocky Mountain Region, and telephone company executive, Colorado Springs, Colo.; **Edward A. Stearn,** AFA National Director and industry executive, San Bernardino, Calif.; and **Hugh W. Stewart,** attorney, Tucson, Ariz.

A TOAST TO A GRAND COUPLE

We would sit out on the patio at El Rancho Feliz—her happy home in the Valley of the Moon in Sonoma, Calif.—watch the hummingbirds dive-bomb a feeder suspended from an overhang, and talk by the hour of her beloved "Hap," the only US airman ever to wear five stars.

For sixty-five years, since their marriage in 1913, no concern shaped the life of Eleanor Pool Arnold more than her husband's place in history. She saved every scrap of paper, every fragment of memorabilia associated with his distinguished career, and she found places on the ranch for papers, letters, pictures, programs—and a very special bottle of Old Fitzgerald that came to light only after her passing in June 1978.

An inscription on the bottle, "Presented to Gen. Arnold by Pres. Harry S. Truman, Jan'y 8, 1946," was recorded in these circumstances:

General Arnold was given to throwing wild parties—wild game parties, that is—at Bolling Field for visiting dignitaries. Winston Churchill, Charles de Gaulle, Lord Trenchard, and, not least, President Truman, were so honored. The Presidential menu, preserved at the ranch, listed entrees served up for the gastronomically daring, featuring "Buck Chop, Pan Fried," then "Moose Hind Quarter, Braised," topped off with "Venison Stew in a Pot Pie." For your conventional gourmets, "Stuffed Pheasant."

After the party in his honor, President Truman sent over the liquid token of his appreciation, duly inscribed as above by Hap Arnold, and stored, probably forgotten, in a special place. That bottle aged for thirty-two more years before it was opened on July 3, 1978, in the kitchen of William Bruce Arnold, son, at a small reception for close relatives and friends after his mother had been laid to rest in Arlington Cemetery alongside her husband and little John Linton Arnold, victim of acute appendicitis in July 1923, two weeks before his second birthday. The child's remains had been brought down from Pennsylvania in response to his mother's last will and testament.

Hank, Bruce, and David Arnold, the surviving sons, stood in a circle, ceremoniously broke the seal on that bottle, poured a round of just three, extended arms, and touched glasses. It was David, the youngest, who came up with a fitting epitaph: "Here's to Mother and Dad. They were apart for a short while. They will be together for a long time."

—Contributed by Murray Green

(AIR FORCE *Magazine will pay $20 for each anecdote accepted for publication.)*

AIR FORCE MAGAZINE PROUDLY PRESENTS THE

Keith Ferris Military Aviation Calendar for 1980

AIR FORCE Magazine has commissioned noted aviation artist KEITH FERRIS to do twelve paintings of outstanding events in the history of military aviation for an AIR FORCE Magazine calendar.

The aircraft involved in these historic events are:

P-12 biplane
F-4C Phantom
FW-190 vs. B-17 Flying Fortress
B-24 Liberator
Battle of Britain Hurricane
Jets in Korea: F-80 vs. MiG-15
WW I Fokker Dr.1 Triplane
Loening Amphibian
F-16
T-6 Texan trainer
B-47 Stratojet
Navy F-8 Crusader

Keith Ferris, son of an Air Force career officer, grew up around airplanes. He has been painting them for more than 25 years and is one of the best known aviation artists. He is a member of the Union-Morris (New Jersey) Chapter of the Air Force Association.

Renowned for technical accuracy and attention to detail, Ferris has a unique ability to portray his subject as if seen through the eyes of a pilot.

In addition to many one-man shows, Ferris has more than 20 paintings in the permanent Air Force Art Program collection. He painted the dramatic mural of a B-17 in the World War II gallery of the National Air and Space Museum, Washington, D.C.

The full-color calendar reproductions measure 12" x 9" and are appropriate for framing.

This unique calendar is certain to become a collector's item. It will make a thoughtful gift for aviation enthusiasts everywhere.

Order your calendar now.

"Werner Voss Stalks His Prey"

"Arizona Barrel Roll"

"F-16 Is Here"

"Rauhbautz, Marie, Special Delivery* and *Bonnie B"

The Keith Ferris Calendar

c/o AIR FORCE Magazine
1750 Pennsylvania Ave., N.W., Washington, D.C. 20006

Please send me _____ copies of the 1980 KEITH FERRIS Military Aviation Calendar at $7.95 each for AFA members ($8.95 for non-AFA members), postpaid.

☐ Enclosed is $_____
I am ☐ am not ☐ an AFA member

☐ Charge my credit card as follows:
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The Eighth Annual Air Force Ball

THE eighth annual Air Force Ball in Los Angeles, sponsored by AFA, attracted more than a thousand guests to a star-filled evening. This event, the only function of its kind sponsored by a military-oriented organization in the Los Angeles area, added almost $100,000—for a total of more than $400,000—to the charity fund for dispersal to two worthy organizations. One of them, Scholarships for Children of American Military Personnel (SCAMP), has now committed more than $271,000 in four-year scholarships to children of US servicemen killed in action, missing in action, or held prisoner-of-war in Southeast Asia.

The other—the AFA-affiliated Aerospace Education Foundation—uses its share, now in excess of $164,000, for its work of improving and expanding occupational education throughout the nation by transferring courses and teaching techniques from military to civilian classrooms.

These pictures tell the story of the 1979 event. This year's Ball will take place October 24 at the Century Plaza in Los Angeles.

—JAMES A. McDONNELL, JR.

AFA President Victor Kregel (center) with (from left) Emmett C. McGaughey, 1979 General Chairman of the Ball; USAF Chief of Staff Gen. Lew Allen, Jr.; Chairman of the Joint Chiefs of Staff Gen. David C. Jones; and former USAF Chief of Staff and a member of the Ball Executive Advisory Council, Gen. Curtis E. LeMay, USAF (Ret.).

Charlton Heston, an avid supporter of the SCAMP program, is shown here with four of this year's SCAMP scholarship winners who received their awards from him. From left, Gregory Nakagawa, Amelia Crittenberger, Deanna Gapp, and Sherrill Standerwick.

Gen. and Mrs. Jimmy Doolittle share a moment with Lorne Greene, who served as master of ceremonies for the event.

SCAMP winner Sherrill Standerwick meets with Marty Ostrow, left, former AFA President and Board Chairman, the man who founded SCAMP and now serves as its president and board chairman; and Air Force Secretary Hans M. Mark.

AFA Board Chairman, Maj. Gen. Dan Callahan, discusses the SCAMP program with two of the winners and cochaperone Bob Lawson, at the right.

Lt. Gen. Richard C. Henry, Commander of AFSC's Space Division, one of the military cohosts for the Ball, is shown here with CMSgt. Sean E. Prosser, the Division's Senior Enlisted Advisor, and some of the other enlisted couples who were guests at the Ball.

General Jones discusses the evening with Los Angeles Mayor Tom Bradley and Mrs. Bradley. Mayor Bradley served as Honorary Chairman of the Ball.

Lt. Gen. Richard C. Henry (left), Commander of AFSC's Space Division, and Lt. Gen. James P. Mullins (right), Commander of SAC's Fifteenth Air Force, the two military cohosts for the Ball, shown with AFA President Kregel and Ball Chairman Emmett C. McGaughey.

The Michael Paige Orchestra (shown here) and the Fifteenth Air Force Band provided music for the more than 1,000 guests at the Ball.

General and Mrs. Jones share a light moment with Charlton Heston during the evening.

AFA News

By Vic Powell, AFA AFFAIRS EDITOR

Paul Thayer, center, LTV Board Chairman, was guest speaker at a recent luncheon meeting of the Hawaii Chapter. At the left is William Taylor, President of the Hawaii Chapter, and on the right is Maj. Gen. Hoyt S. Vandenberg, Jr., Vice Commander in Chief, Pacific Air Forces, Hickam AFB, Hawaii.

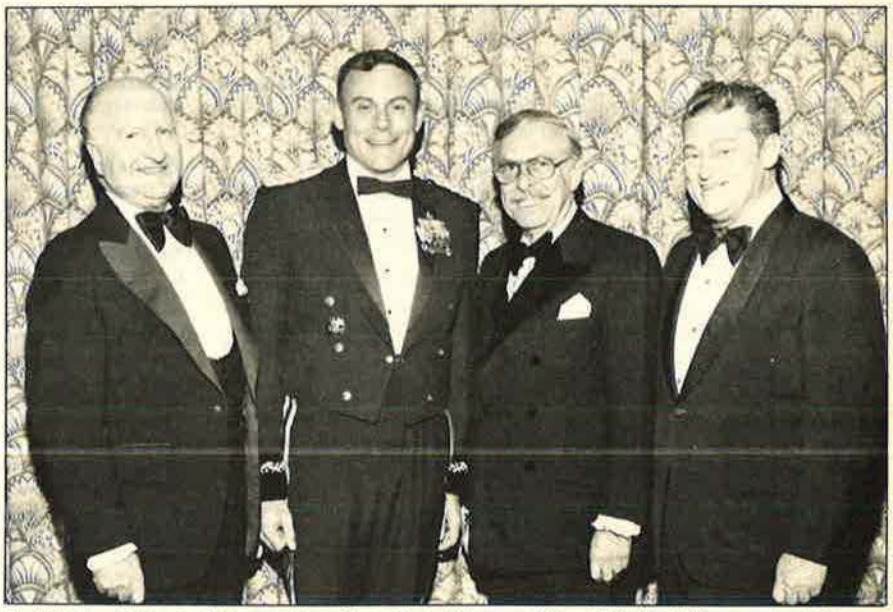
Gen. Russell E. Dougherty, USAF (Ret.), holding plaque, was the guest speaker at a recent Commander's Dining-In of the Ogden Air Logistics Center and the Utah Air Force Association. From left to right are William C. Athas, President of the Utah State AFA; Maj. Gen. John J. Murphy, Commander, Ogden Air Logistics Center; General Dougherty; AFA National Directors Nathan Mazer and Jack Price; and Verl Williams, President of the Gold Card Chapter.

Gen. Robert E. Huyser, Commander in Chief of the Military Airlift Command, was the speaker at a recent luncheon meeting jointly sponsored by the Albuquerque, N. M., Chapter and the Military Affairs Committee of the Greater Albuquerque Chamber of Commerce. V. R. Woodward, right, is Chapter President and chairman of the Military Affairs Committee of the local Chamber of Commerce.

AFA's West Suburban Chapter, Wheaton, Ill., is actively supporting the Bolingbrook, Ill., High School AFJROTC Squadron. Fifty-five cadets have had orientation briefings and forty-five minute familiarization rides in aircraft provided by local owners. The flights have been made in cooperation with members of the Antique Aircraft Association and the Experimental Aircraft Association. From left in the picture are Cadets Bruce Sherman, Juan Ceballos, and Andrew Rajca; pilot/owner Ken Whitehouse; and West Suburban Chapter President Lee E. Webster. The Bolingbrook Squadron's enrollment increased by thirty-five members in the year since the program began.

chapter and state photo gallery

Langley AFB, Va., Chapter President H. W. "Rocky" Jones presents a $400 check to D. N. Masone, left, executive director of the Air Force Enlisted Men's Widows and Dependents Home Foundation. The check represents proceeds from a golf tournament held by the Langley Chapter to support the Foundation.



The H. H. Arnold Chapter, N. Y., recently conducted its twelfth annual Military Ball, attended by more than 300 people. Frank Battersby, left, chairman of the Chapter Executive Council, welcomed Army Brig. Gen. Homer Johnstone; Congressman Lester Wolff (D-N. Y.); and Thomas O'Brien. Congressman Wolff and Mr. O'Brien are AFA Life Members and members of the Chapter Executive Council.

COMING EVENTS

Mississippi State AFA Convention, Feb. 8–9, Keesler AFB, Miss. . . **AFA Board of Directors Meeting,** March 1, Fort Walton Beach, Fla. . . **AFA Midwest Symposium,** "The Crisis of the '80s . . . A Time for Decision," March 1, O'Hare Inn., Park Ridge, Ill. . . . **Iron Gate Chapter's 17th National Air Force Salute,** Sheraton Center, New York, N. Y., March 22 . . **Tennessee State AFA Convention,** April 18–19, Alcoa, Tenn. . . **Washington State AFA Convention,** May 16–17, Tacoma, Wash. . . **California State AFA Convention,** May 16–18, Merced, Calif. . . **AFA Golf and Tennis Tournaments,** May 23, The Broadmoor, Colorado Springs, Colo. . . **AFA Nominating Committee and Board of Directors Meetings,** May 24, The Broadmoor, Colorado Springs, Colo. . . **Twenty-first Annual Dinner Honoring the Air Force Academy's Outstanding Squadron,** May 24, The Broadmoor's International Center, Colorado Springs, Colo. . . **Ohio State AFA Convention,** May 31, Wright-Patterson AFB, Ohio . . **Pennsylvania State AFA Convention,** June 6–8, State College, Pa. . . **New York State AFA Convention,** June 13–15, Rome, N. Y. . . . **Oklahoma State AFA Convention,** June 20–21, Tinker AFB, Okla.

A proclamation by the Mayor of Pittsburgh was presented by former AFA Director Robert Carr to Brig. Gen. William J. Mall, Jr., during Veterans Day ceremonies held by the western region of the Pennsylvania State Air Force Association. Mayor Richard Caliguiri declared Saturday, November 10, 1979, as General Mall Day. General Mall, a native of Pittsburgh, is Deputy Chief of Staff for Personnel, Military Airlift Command.

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): **David W. Robinson,** P. O. Box 1120, Anchorage, Alaska 99510 (phone 907-274-3561).

ARIZONA (Phoenix, Tucson): **R. C. Olson,** 8313 E. Encanto, Scottsdale, Ariz. 85258 (phone 602-991-4208).

ARKANSAS (Blytheville, 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, Marysville, Merced, Monterey, Novato, Orange County, Palo Alto, Pasadena, Riverside, Sacramento, San Bernardino, San Diego, San Francisco, San Mateo, Santa Barbara, Santa Monica, Tahoe City, Vandenberg AFB, Van Nuys, Ventura): **Edward A. Stearn,** 15 Cardinal Lane, Redlands, Calif. 92373 (phone 714-889-0696).

COLORADO (Aurora, Boulder, Colorado Springs, Denver, Fort Collins, Grand Junction, Greeley, Littleton, Pueblo, Waterton): **Stephen L. Brantley,** 1089 S. Buchanan St., Aurora, Colo. 80011 (phone 303-370-7153).

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WASHINGTON (Seattle, Spokane, Tacoma): **Jack Gamble,** 7010 Turquoise Dr., SW, Tacoma, Wash. 98498 (phone 206-584-1610).

WEST VIRGINIA (Huntington): **James Hazelrigg,** Rt. 2, Box 32, Barboursville, W. Va. 25504 (phone 304-755-2121).

WISCONSIN (Madison, Milwaukee): **Charles W. Marotske,** 7945 S. Verdev Dr., Oak Creek, Wis. 53154 (phone 414-762-4383).

WYOMING (Cheyenne): **Lloyd A. Flynn,** 1907 Laurel Dr., Cheyenne, Wyo. 82001 (phone 307-634-5901).

AFA News photo gallery

Lt. Gen. Ira C. Eaker, USAF (Ret.), received a plaque highlighting his aviation achievements at a meeting of the Andrews Area Chapter, Md., from President Robert Beatson, right. General Eaker, World War II Commander of the Eighth Air Force, and Col. John Dramesi, seven-year POW in Vietnam, were guests of honor at the Veterans Day ceremonies. Representatives of the famous Tuskegee Airmen, who served with General Eaker in the Fifteenth Air Force, also attended the event.

The outstanding ROTC Cadets in the Tacoma, Wash., Chapter area were recently honored. Rickie B. Mattson and Kristine S. Crossett each received a $500 award, a citation recognizing their accomplishments, and a one-year membership in AFA. Robert H. Campbell, Tacoma Chapter President, left, and Joseph E. Tucker, right, chairman of the Chapter's Scholarship Program, joined in the presentation. Cadet Mattson of Pacific Lutheran University and Cadet Crossett of the University of Puget Sound are members of AFROTC Detachment 900.

AFA Director Hoadley Dean, left, was "roasted" recently by the Rushmore Chapter in Rapid City, S. D. Participating in the event were: Maj. Gen. John J. Murphy, Commanding General, Ogden Air Logistics Center, second from left; AFA Director Nathan Mazer of Roy, Utah; former AFA President Joe Foss of Scottsdale, Ariz.; and AFA Director Jack Price of Clearfield, Utah. The program featured an address by Lt. Gen. Edgar Harris, Commander of the Eighth Air Force.

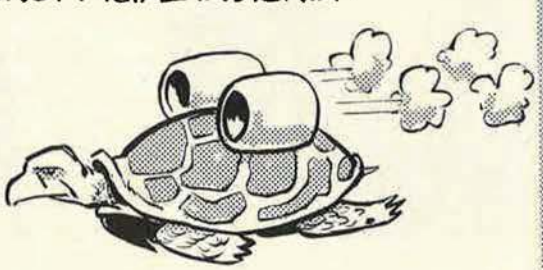
Bob Stevens'

"There I was..."

ELSEWHERE IN THIS ISSUE THE A-10 "THUNDERBOLT II" IS COMPARED WITH AN EARLIER CANNON-TOTING BIRD, THE B-25G. THE A-10, DUBBED THE WART HOG (AMONG OTHER THINGS) BY ITS PILOTS, IS AN ***UGLY*** - BUT EXCEEDINGLY EFFECTIVE - WEAPON SYSTEM!

THE "BIONIC TURTLE" IS SO UGLY PILOTS ON CROSS-COUNTRY FLIGHTS LAND AT OFF-THE-BEATEN-PATH AIRPORTS TO AVOID NASTY COMMENTS-

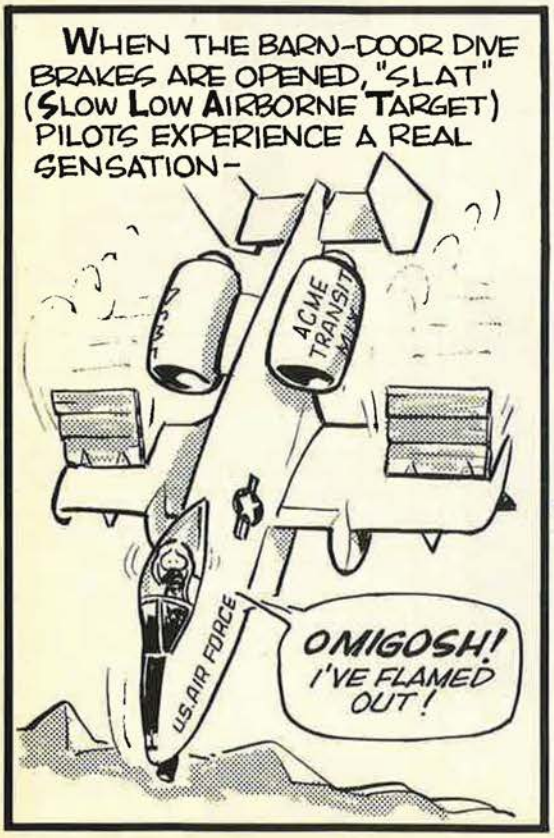
"THUNDER TURTLE" CREWMEN HAVE COME UP WITH THIS HIGHLY UNOFFICIAL INSIGNIA:



- SLOW, UGLY & PLODDING*
- BOXY WITH TOUGH SHELL
- NON-AERODYNAMIC
- HARD & DEADLY BITE
- HELPLESS ON ITS BACK
- LAYS A GREAT NO. OF EGGS
- HATCHED ON A REMOTE ISLAND
- TENACIOUS WITH STAYING POWER
- PREDATES PRESENT TECHNOLOGY
- DIVES FOR ITS PREY
- RETRACTS LEGS WITH TOES PROTRUDING
- EMERGES FROM ATTACK COVERED WITH MUCK

*SO SLOW IT GETS BIRD STRIKES FROM THE REAR!

WHEN THE BARN-DOOR DIVE BRAKES ARE OPENED, "SLAT" (SLOW LOW AIRBORNE TARGET) PILOTS EXPERIENCE A REAL SENSATION-



THE BIRD IS A CREWMAN'S DREAM! *EVERYTHING* OPENS UP, and TURN-AROUND TIMES ARE THE FASTEST THING ABOUT THE A-10.

(FROM CREWMAN'S FTD GRADUATION CERTIFICATE)

Bob Stevens

Next generation Air Force trainer engine is already fired up in Toledo.

Actually, we've been working on new trainer engine technology for more than a decade... directly with major airframers for most of that time. When you work in the world of the next generation of turbofan engines, you have to start early and stay late.

So it should be no surprise that we've already fired up the advanced technology turbofan engine of the 1980's and 90's...a demonstrator engine that's on test. This investment looks good... for example, if the latest Teledyne CAE 455 series turbofan were to replace the existing engine in the Cessna T-37, twice as many training hours could be flown on the same amount of fuel. And in today's energy short world, that's a significant advancement in the state-of-the-art.

Teledyne CAE is committed to this kind of creative R&D. The 455 series, for example, is the most heavily instrumented engine of its size ever tested (to date). To see what we're all fired up about, check the results. Call Bob Schiller, V.P. Marketing, Teledyne CAE. (419) 470-3283.

Ideas With Power

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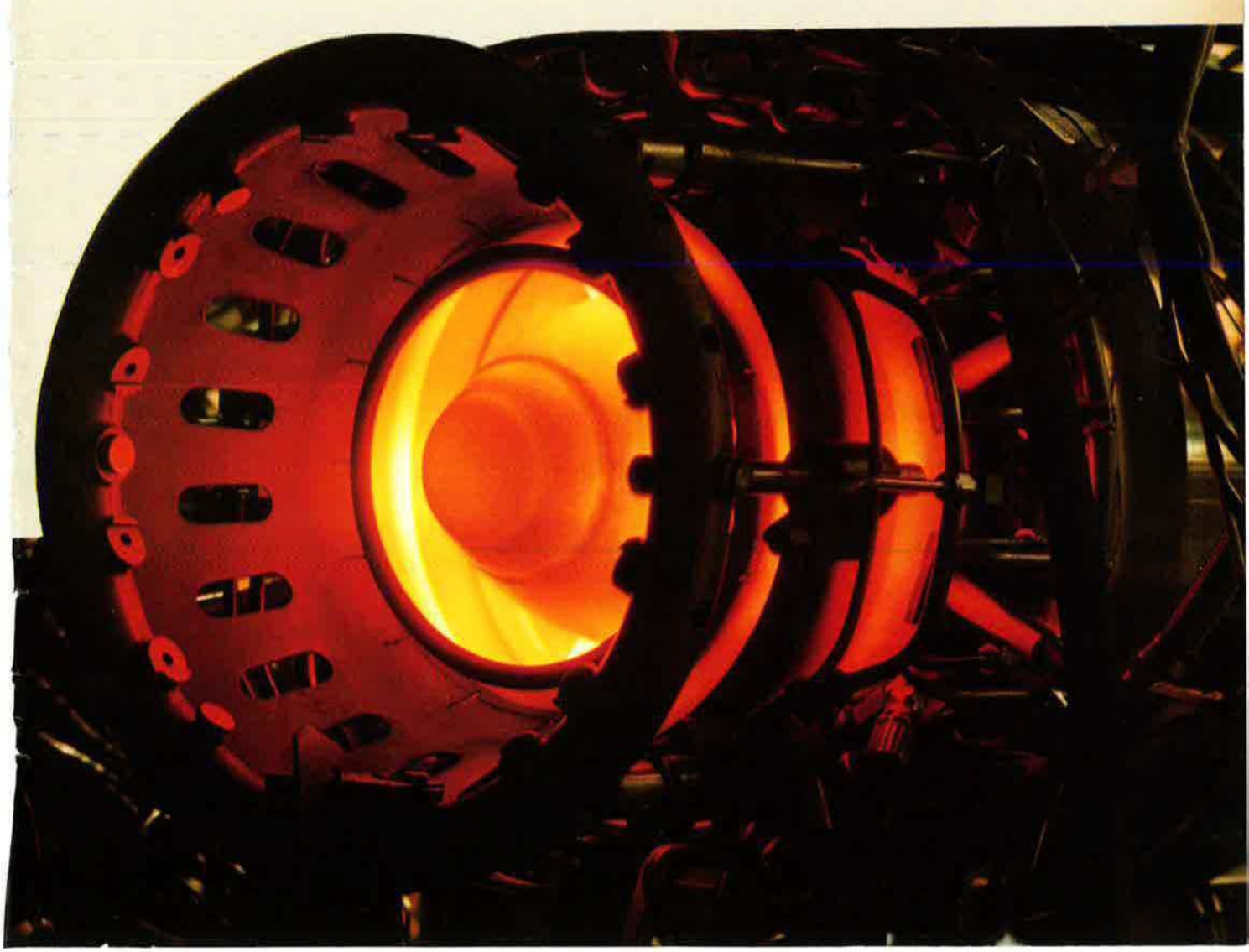
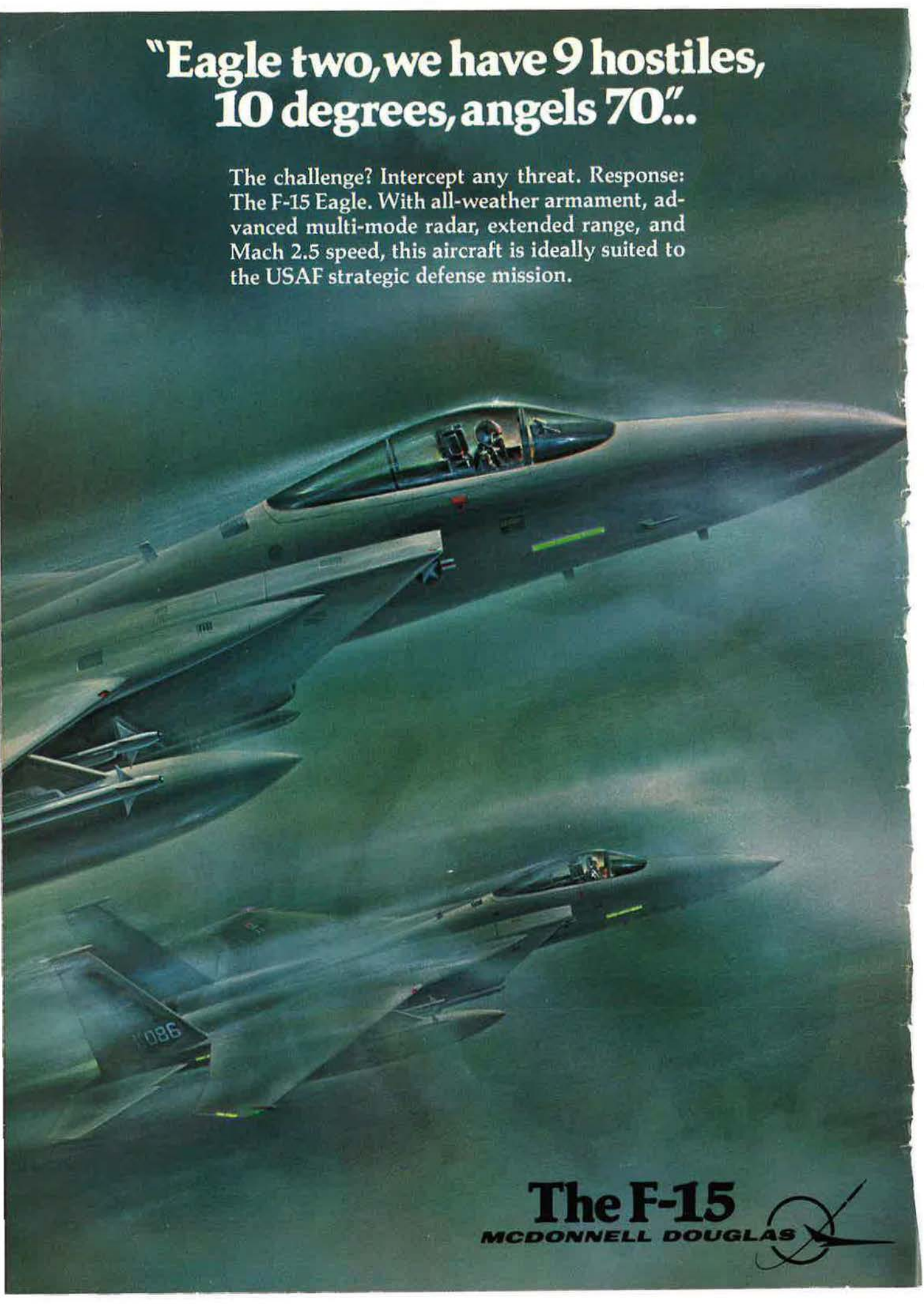


"Eagle two, we have 9 hostiles, 10 degrees, angels 70"...

The challenge? Intercept any threat. Response: The F-15 Eagle. With all-weather armament, advanced multi-mode radar, extended range, and Mach 2.5 speed, this aircraft is ideally suited to the USAF strategic defense mission.



The F-15

MCDONNELL DOUGLAS