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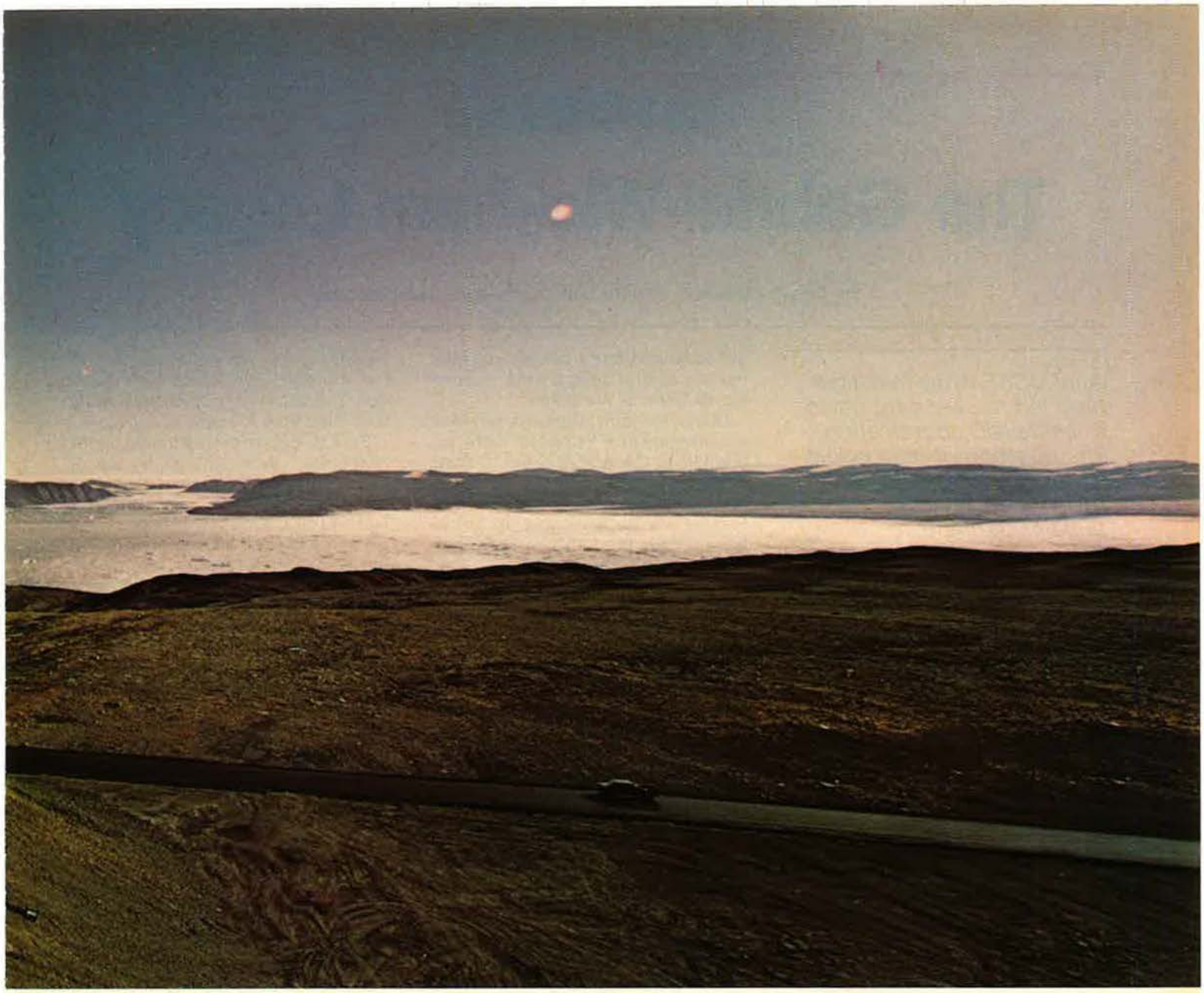

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IN FOCUS...

The Gabriel-Wickham Legacy

By Edgar Ulsamer, SENIOR EDITOR (POLICY & TECHNOLOGY)

Joint USAF-Army initiatives have led to sweeping gains in battlefield coordination. The question of responsibility for special operations helicopters, however, remains in limbo.

Washington, D. C., June 27

One of the legacies that USAF's former Chief of Staff, Gen. Charles Gabriel, will likely be remembered for in the years to come is a set of joint initiatives—thirty-five all told—that he and his opposite number, Army Chief of Staff Gen. J. A. Wickham, Jr., launched and implemented over a three-year period. The payoff from these initiatives—twenty-eight of which have become standard operating procedure—is an unprecedented degree of "jointness" between the two services and the prospect that this cohesion will soon extend to all the military services.

The comprehensive "scrubbing" of the two services' roles and missions that germinated these joint initiatives, General Wickham recently told this writer, has "led to substantial doctrinal" uniformity that enhanced "battlefield coordination, especially battlefield interdiction with ground maneuver." For good measure, just four of the joint initiatives reaped about $1 billion in cost avoidance for the two services, he added.

Among the fundamental benefits from these joint measures is the emergence of a "formalized process" whereby the two services—as a matter of course—coordinate plans and activities of mutual interest: "An Air Force general sits in on every Army budget meeting and the other way around. The Army and the Air Force [entered into a permanent arrangement whereby] each assigns seven staff officers to the other service," with the result that the service chiefs get fully and fairly briefed on joint matters several times a week, according to General Wickham.

One of the joint initiatives, however, is entangled in a "hangfire" state, according to the Army's Chief of Staff. Initiative Number 17 involves the rotary-wing SOF (Special Operations Forces) and is predicated on the rationale that "the rotary-wing SOF insertion capability ought to be [performed by] the service with the most rotary-wing birds, the Army. The Air Force, therefore, agreed that the Army should have this mission. After all, we have hundreds of helicopters and thousands of pilots, and it's our [Army] people who are going to be transported." An exception from this arrangement, he pointed out, is a small fleet of Pave Low helicopters that the Air Force retains to carry out search-and-rescue missions.

Congress, however, expressed reservations about this transfer of the rotary-wing SOF mission from the Air Force to the Army, with the result that "Initiative 17 still is not in final form." Among other things, Congress wanted to know whether the Army could "refuel the CH-47 Chinook from the air—and we demonstrated that we can—[as well as] whether it is possible to develop all-weather avionics for the Black Hawk and the Chinook. We did so, and we are acquiring all-weather birds to insert the SOF," the Army's Chief of Staff reported.

General Wickham suggested that the current stalemate with regard to the transfer of responsibility for rotary-wing SOF lift support to the Army is caused in part by the "myth that the services haven't done enough [in support of the] SOF community. I don't think this is fair. All of us have made major efforts in this regard."

The Air Force's position is that so long as implementation of Initiative 17 is in limbo, revitalization of USAF's long-range rotary-wing SOF assets must continue until the Army has the capability to assume the entire rotary SOF mission. Even a short-term degradation in SOF capability is unacceptable, in the Air Force's view. In line with this logic, the Air Force is modifying thirteen HH-53 aircraft to the MH-53H/J Pave Low III configuration. This will yield a total fleet of nineteen Pave Low aircraft.

Stressing the importance of "jointness," especially at the top of the military command structure, General Wickham firmly espoused the concept of having the service chiefs act as the backup for the Chairman of the Joint Chiefs of Staff on a rotational three-month basis rather than assigning that task to a Vice Chairman on a permanent basis. The opportunity to act as Chairman makes the service chiefs "jointer" by virtue of the ensuing obligation to represent the interests and requirements of all four services. He added that from his own perspective, the experience of acting as the Chairman's backup on an alternating basis "makes me a better service chief."

By occasionally attending National Security Council meetings, by working directly with the unified commanders, and by dealing in straightline fashion with crises and joint operations while serving as the acting Chairman, he feels encouraged "to go back to my service and drive more jointness into the Army program. [Conversely, by dint of being a] service chief, I can be a better JCS member [because] I understand the capabilities and limitations of my service and can bring [this knowledge] to bear in the deliberations of the Joint Chiefs and while functioning as the acting Chairman."

By contrast, the two relevant congressional bills tend to treat the new position of JCS Vice Chairman as the Chairman's alter ego. The Senate bill, S.2295, was passed by a 95–0 vote recently, while at this writing, the companion House bill is still in draft form. In the Chairman's absence, the Vice Chairman would act in his stead and, in effect, become the nation's second-highest-ranking military officer.

On the other hand, the Packard Commission, whose findings were incorporated into a Presidential Directive to the Defense Department, treats the issue more circumspectly, leaving the decision to the Secretary of De-

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fense on who is to be designated Acting Chairman, "subject to the direction of the President." The Commission recommends, however, that the Vice Chairman, among other functions, should cochair the Joint Requirements Management Board (JRMB) and that this organization "should play an active and important role in all joint programs and in appropriate service programs" with regard to requirements and cost vs. performance trade-offs.

General Wickham, in similar fashion, believes that the Vice Chairman's primary function should be "resource and equipments coordination." Because of the imperative of getting "the most for our [limited investment] dollars," optimizing the requirements and acquisition process emerges as the Pentagon's central management challenge. From this premise, General Wickham argues that the Vice Chairman should possess "skills and orientations" in resource management that complement the Chairman's broader stance.

The allegation keeps cropping up in congressional hearings that current efforts to strengthen the joint structure might lead to the creation of an all-powerful organization akin to the Imperial Prussian General Staff. General Wickham sees that as a "bit of a red herring."

Both congressional bills punctiliously avoid accretion of unwarranted power within the joint structure, but do seek to "make the [Pentagon's] Joint Staff and the joint staffs of the Unified Commands more professional," in General Wickham's view. The system at present is handicapped by "too much revolving-door, two-years-and-you-are-out-again" instability and by a "culture that says staying in [one's own] service is the way to get promoted and gain visibility rather than in joint billets." The current Chiefs, he added, applaud congressional efforts to "professionalize" the joint staffs and to man them with "higher quality people," because "we all had so much joint duty."

There are, however, indications of concern within the military establishment about some provisions in the House bill that might swing the pendulum too far toward joint service as a precondition for career advancement. Specifically, there is apprehension about the creation of a joint elite corps that might be incompatible with essential service career paths. There is also concern about proposals to have the offices of the service assistant secretaries absorb the corresponding military staff elements.

IN FOCUS...

General Wickham warned too that the move toward jointness, while essential and beneficial, should not be carried too far. "There probably is wisdom in having the service Secretary and the service chief defend their program in OSD and before Congress," because this makes the two top service leaders accountable for a coherent approach that balances short-range against long-range requirements and that melds general resource needs of the services with those of the CINCs. "To the extent that we [empower] the CINCs with too much programming authority, we potentially lose the single-manager [function] of the service chiefs," who then will be relegated to the role of record-keepers for unified command requirements rather than serving as "accountable" defenders of coherent strategies.

Turning to specific Army challenges, General Wickham emphasized the urgency of modernizing air defenses across the board. In this context, solving the "hovering helicopter" threat is paramount. Driving the need for improved air defenses is the fact that the Army's "$50 billion investment" in M1 tanks and Bradley armored fighting vehicles must be protected from aerial threats.

The Army, he explained, is working on a four-pronged approach to the problem. The four components of the Army's defense against helicopters are the FOG-M (fiber-optics-guided missile) concept for nonline-of-sight air defense; a combined line-of-sight gun/missile air defense weapon; modifications of the M1 tank, the Bradley armored fighting vehicle, and existing artillery rounds to provide them with reliable and effective anti-helicopter capabilities; and enhancement of C^{3}I and warning capabilities, including reliable IFF to bolster the effectiveness of Army air defenses, according to General Wickham.

The *pièce de résistance* of the Army's program is FOG-M, an in-house-developed test-bed that, in initial demonstrations, proved the feasibility of killing helicopters "hiding behind hills," according to General Wickham. "We have gone out to industry, [requesting proposals] to see if they can do what we demonstrated." The question is whether or not industry can design and produce defensive systems that can spot and kill copters not in their line of sight and do so while these copters are still too far away to threaten friendly forces with their standoff weapons, he explained.

The threat to ground forces that results from the combination of helicopters that hover in ambush—and that are thus hard to detect by radar—and standoff weapons cued by ground-based designators materialized faster than originally envisaged, according to General Wickham. Exacerbating this problem are the facts that the range of copter-launched standoff missiles is increasing rapidly, that "obscurances" on modern battlefields are proliferating, and that Soviet electronic countermeasure capabilities are mushrooming. Lastly, the Soviets may be stealing a technological march on the West with Hokum, the world's first fighter helicopter. This could net them a significant rotary-wing air-superiority capability. Hokum is about to enter the operational inventory.

The advantage of FOG-M stems from the fact that its relatively inexpensive guidance system "stays behind in friendly territory" while the system "sees" targets with a small TV camera carried at the front of the missile, according to General Wickham. Assuming that the capabilities demonstrated by the Army's FOG-M test-bed can be incorporated into production systems, the weapon should also have a comprehensive nonline-of-sight "tank-killing capability," General Wickham predicted.

Lengthy testing of the Army's canceled Sergeant York Division Air Defense system—which envisioned the use of the F-16's radar—led to the conclusion that effective line-of-sight systems must capitalize on the battlefield synergism of a hybrid gun/missile design. If properly configured, the gun element of such a hybrid weapon drives aircraft into the system's missile envelope while the missile element forces them back down into gunnery range. "Anyone who has ever flown in flak readily acknowledges the power of guns. Missiles reach out farther, but guns are harder to spoof," General Wickham asserts.

The axiom that "tanks can kill copters" provides the third dimension of the US Army's multifaceted air defense upgrade program, General Wickham explained. The Army's curriculum of tank gunnery already involves "killing hovering helicopters with the main gun. The Bushmaster gun on the Bradley [fighting vehicle] is equipped with a special sight for copters." Further improvements in

acquiring helicopters and in "cuing" make sense, at least for some elements of the armored force, he pointed out. In the same vein, the Army also plans to optimize artillery rounds for the antihelicopter mission.

Secretary Taft Outlines OSD Revamping

In line with a White House directive to implement the findings of the Packard Commission, Deputy Secretary of Defense William H. Taft IV told this writer that the Pentagon is about to make major organizational and procedural changes. Key here is the pending statutory creation of the post of Under Secretary of Defense for Acquisition (USDA). This official will probably supervise the Assistant Secretary for Acquisition and Logistics; the Assistant Secretary for Command, Control, Communications, and Intelligence; and the current Under Secretary of Defense for Research and Engineering. The latter position, Secretary Taft hinted, is likely to be changed to its former designation of Director of Defense Research and Engineering (DDR&E).

The USDA slot, he pointed out, will be at "Level II," the same as that of the Deputy Secretary and the service Secretaries, while the two Assistant Secretaries and the DDR&E slot will be kept at "Level III," he said.

In a procedural change engendered by the White House directive, Secretary Taft said that "we are going to a two-year budget and a two-year program review. It is conceivable that we won't have a program review at all next year." Among other changes brought on by the recommendations of the President's Blue Ribbon (Packard) Commission on Defense Management, Secretary Taft told AIR FORCE Magazine, will be increased emphasis on prototyping. "Beginning with the Advanced Tactical Fighter [ATF] program, which has just shifted to that format, you will be seeing more prototyping, [including LHX, the Army's new 'true hover' helicopter,] and a variety of other programs."

President Annuls SALT II, Urges Modernization

In a historic message to Congress on June 3, President Reagan announced that because of Soviet failure to comply with the terms of SALT, "in the future, the US will base decisions regarding its strategic forces on the nature and magnitude of the threat posed by the Soviet Union rather than on standards contained in expired SALT agreements unilaterally observed by the United States." The US, nevertheless, will retire two older Poseidons as the eighth Trident SSBN begins sea trials and, "thus, will stay in technical observance of SALT for some months."

The President pointed out to Congress that if the Soviets correct their erosion of SALT during that period, "I will take this into account." He added in the same conciliatory tone that "assuming no significant change in the threat we face, as we implement the Strategic Modernization Program, the US will not deploy more strategic nuclear delivery vehicles or strategic ballistic missile warheads than the Soviet Union." The primary task both countries face now is to work toward "significant, equitable, and verifiable reductions in the size of existing US and Soviet nuclear arsenals. This is what we are proposing in the ongoing Geneva negotiations."

In restating the need for the key elements of the strategic modernization program, he announced that he plans to "accelerate" the Advanced Cruise Missile (ACM) program; warned that halting the ATB (Advanced Technology, or "Stealth," Bomber) program would "undercut completely our capability to maintain an effective bomber force that could penetrate Soviet air defenses into the twenty-first century and ignore the enormous potential that Stealth adds to deterrence"; and reiterated that "the long-range viability of our strategic triad depends on the modernization of the land-based leg through the deployment of the Peacekeeper and the small, mobile ICBM."

In the case of the latter, the Defense Department is this fall to recommend to the White House "an appropriate best configuration in terms of weight, number of warheads, and production schedule." The significance of this Presidential comment is that the White House is seemingly leaving to the Pentagon the decision on whether the Small ICBM is to be a single-warhead or a MIRVed design. Existing congressional language mandates that the SICBM be a single-warhead weapon.

USAF Tops in Productivity

The Surveys and Investigations Staff of the House Committee on Appropriations recently completed an in-depth report on R&D, acquisition, and logistics patterns in the four services and concluded that the US Navy allocates about 205,000 manpower slots to programs costing almost $60 billion while the Air Force runs programs worth almost $80 billion with 119,000 military and civilian manpower slots. The study, launched in mid-1985, centered on the functions of Hq. Air Force Systems Command, with an eye toward determining whether or not that organization should be disestablished in the manner that the Navy eliminated its Naval Material Command in May of last year.

While the congressional study confined itself in the main to statistical findings, some of the statistics unearthed by the Committee seem to speak for themselves. Air Force Systems Command and Air Force Logistics Command together have about 119,000 full-time personnel assigned to carry out all the Air Force's R&D, acquisition, and logistics functions, endeavors that in the aggregate absorb almost $80 billion in annual funds. The Navy—which, following the disbanding of NAVMAT headquarters, relies on an agglomeration of smaller, specialized commands to carry out on a smaller scale functions worth not quite $60 billion—requires about 205,000 personnel, according to the House Appropriations Committee's staff study.

In focusing on Hq. AFSC, the Committee report concluded that Hq. AFSC's role was "to serve as the head of a corporate structure and to develop and maintain the corporate body in support of the systems acquisition mission. This entails specifically a host of planning and budgeting functions as well as acting as the Washington spokesman for the various SPOs [System Program Offices]," the report pointed out.

New Medium-Lift ELV

Air Force Secretary Edward C. Aldridge, Jr., announced recently that the Air Force is initiating a program to develop a "medium-lift" expendable launch vehicle (ELV). The new space-launch system, fitting in size and capability between the refurbished Titan IIs and the Titan 34Ds, would be acquired in sufficient quantities to handle about four launches a year. Industry will be urged to develop a commercial derivative of this launcher to provide a US counterpart to the European Space Agency's Ariane.

Secretary Aldridge also intimated that the Air Force will seek to acquire another ten CELVs (Titan 34D-7s) beyond the ten now authorized and seek to refurbish additional decommissioned Titan II ICBMs beyond the currently programmed thirteen. ■

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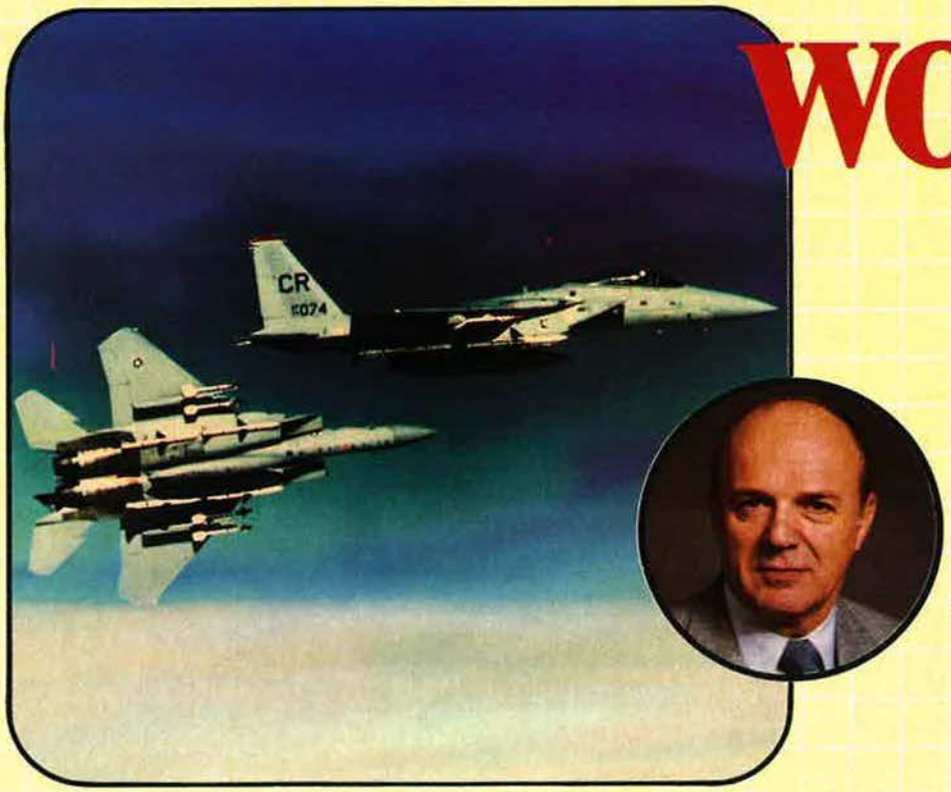

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CAPITOL HILL

By Brian Green, AFA DIRECTOR OF LEGISLATIVE RESEARCH

Washington, D. C., June 20

SALT II Resolution Passes

On June 19, the House of Representatives passed House Concurrent Resolution 350, a nonbinding measure calling for continued US compliance with SALT II numerical limits so long as the Soviets remain in compliance. The vote was 256–145. The Senate Armed Services Committee also attached a similar amendment to its defense authorization bill. These actions represent a clear setback for President Reagan, who has announced that the US will no longer be bound by SALT II limits.

The House, by a vote of 187–222, rejected an amendment offered by Rep. William Broomfield (R-Mich.) calling for continued adherence to all the provisions of SALT II so long as the Soviets do likewise. Another Broomfield motion, expressing support for US negotiators in Geneva, was adopted unanimously.

Authorization Work Continues

Work in both the House Armed Services Committee (HASC) and the Senate Armed Services Committee (SASC) proceeds apace on their respective versions of the defense authorization bill. The committees started work on the authorization bill without the guidance of a budget resolution, which remains hung up in a House-Senate conference in a dispute over new revenues and the size of the defense budget.

The HASC subcommittees marked to $285 billion in budget authority (including Department of Energy military programs), a cut of $35 billion from the Reagan Administration request. The subcommittees approved the following cuts (all dollars in billions): R&D, 18.1% ($7.6 cut out of $41.9 requested); military construction, 17.7% ($1.8 out of $10.2); procurement, 18.1% ($14.3 out of $78.8); military personnel, 5.0% ($3.7 out of $74.2); operations and maintenance, 5.0% ($4.3 out of $85.8); seapower, 17.7% ($3.0 out of $16.9); and DoE defense programs, 7.9% ($0.65 out of $8.2).

The House R&D subcommittee also linked future MX deployment to progress in the Small ICBM (SICBM). MX deployment would be limited to ten missiles until the SICBM enters full-scale development and has been flight-tested and the Secretary of Defense certifies that the SICBM will achieve initial operating capability (IOC) by 1992. The provision, sponsored by Rep. Dave McCurdy (D-Okla.), is an apparent attempt to force the Pentagon to accept a single-warhead missile, since the design modifications required for the missile to accommodate multiple warheads could delay IOC by up to two years.

The SASC subcommittees marked to $301 billion in budget authority (including DoE), which is the Senate budget resolution figure. The subcommittees approved the following cuts (dollars in billions): strategic, 7.6% ($4.1 cut out of $54.1 requested); tactical, 10.1% ($6.0 out of $59.3); seapower, 12.5% ($3.3 out of $26.5); preparedness, 5.3% ($4.9 out of $93.0); manpower, 1.2% ($0.9 out of $76.7); and military construction, 14% ($1.4 out of $10.0).

Turf Fight Truce

The SASC and the defense subcommittee of the Senate Appropriations Committee (SAC) agreed to a temporary truce in their long-simmering turf battle over "excess" appropriations.

The committee fight was intensified by an effort by SAC Defense Subcommittee Chairman Ted Stevens (R-Alaska) to repeal a key compromise contained in the FY '86 continuing resolution (CR) over the objections of SASC Chairman Barry Goldwater (R-Ariz.). The dispute revolves around defense money appropriated in excess of that authorized by the Armed Services Committee—$6.5 billion distributed throughout various line items of the FY '86 budget. While the SASC authorizes defense spending, the SAC approved the actual funding. The SASC felt that its power to authorize new programs and spending was being challenged. That concern led to an amendment passed in the FY '86 CR that said that all appropriations in excess of authorization must subsequently be authorized—an amendment that Senator Stevens sought to repeal when the SASC balked at authorizing all the "excess appropriations."

The "truce" involves SASC approval of virtually all "excess" FY '86 funds (except for the Mariner Fund to build commercial ships and the Air Defense Competition) and an agreement to disagree about the correct interpretation of the FY '86 compromise. The senior member of the SASC and SAC defense subcommittee may now also sit in the other's meetings as an *ex-officio* nonvoting member. Senators Goldwater and Stevens also agreed to fuller cooperation during authorization and appropriation markups.

SLC-6 Mothballed?

Sen. Jim Sasser (D-Tenn.) has called for a "fundamental reexamination of the military Space Shuttle program" and urged that the Vandenberg Shuttle launch facilities (Space Launch Complex-6, or SLC-6) be mothballed "until it can be proven such a facility is absolutely necessary." He cited reports of technical difficulties and cost overruns and argued that unmanned spaceflights could serve the military better than manned flights. He claimed that mothballing the site could save $400 million a year.

Secretary of the Air Force Edward C. "Pete" Aldridge responded by noting that construction at the site is complete and that only some testing and system checkout remain to be done prior to the first launch. He pointed out that the Air Force had identified all the technical problems cited by Senator Sasser and that only one—the potential buildup of hydrogen in the launchpad's Shuttle main engine exhaust ducts—was a source of concern. According to the Secretary, that problem can easily be solved by the projected date of the first launch in spring 1988. He did say, however, that the Vandenberg facility could be put in a "caretaker" status until the Shuttle program gets back on track. ■

Programmable software formats within a night vision system for helicopters allow new features to be added as needed to meet new threats. The Hughes Night Vision System (HNVS), developed by Hughes Aircraft Company, is a low-cost, forward-looking infrared system that provides excellent imagery and object detection day or night in all weather. It has extensive built-in test and fault isolation test capabilities. Among the features that may be modified to meet specific requirements are flight symbology, navigational data, automatic set-up mode, system status data, and push-buttons around the display face.

The Australian Army will use a radar simulator to train operators and maintenance personnel on the AN/TPQ-36 Firefinder weapon locating radar. The trainer, designed by Hughes and built by British Aerospace Australia, is a computerized system that trains personnel without using either the production radar or live artillery fire. The radar itself pinpoints the position of enemy mortar, artillery, and rocket launchers. It rapidly scans the horizon with a pencil-thin beam, forming an electronic curtain across the battlefield. After detecting incoming projectiles, the system backplots their trajectories and passes the data to friendly forces for counterfire.

Pilots of AV-8B Harrier II aircraft can score direct hits on targets on their first pass, thanks to a computerized weapon delivery system. The Angle Rate Bombing Set (ARBS), mounted in the nose of the U.S. Marine Corps aircraft, lets the pilot deliver guided and unguided weapons and direct gunfire with unprecedented accuracy. ARBS cuts the time an aircraft is exposed to enemy fire by helping the pilot hit a target on his first run and avoiding the need for other passes. The AV-8B, produced jointly by British Aerospace and McDonnell Douglas, is capable of short takeoffs and vertical takeoffs and landings. The Hughes ARBS also is installed on the Marine Corps' A-4M and the United Kingdom Royal Air Force GR Mk5 Harrier.

West German F-4F Improved Combat Efficiency Phantoms equipped with AN/APG-65 radars will enable the aircraft to remain effective through the end of the century. The APG-65 is the radar carried on all F/A-18 Hornet Strike Fighters. It is an all-digital multimode system designed for both air-to-air and air-to-surface missions. In air-to-air operations, the APG-65 will give the Phantom a clean radar scope in either look-up or look-down attitudes. It will also provide track-while-scan capability, long-range search and track, automatic acquisition of multiple targets, and several modes for close-in combat. Moreover, the all-weather sensor will give the F-4F ICE aircraft full capability for launching AIM-120 AMRAAM missiles. Hughes, which developed and builds the radar, is under contract from Messerschmitt-Boelkow-Blohm for the definition phase of the F-4F ICE program. Hughes will also work with AEG-Telefunken on the program.

A U.S. spacecraft orbiting Venus made the first close-up views of Halley's Comet, giving scientists valuable insights into the comet at a time when it was on the far side of the sun and direct observations from Earth were impossible. NASA's Pioneer Venus Orbiter, built by Hughes and circling Venus since 1978, conducted its investigation a month before five other spacecraft flew by the comet. The Orbiter was delicately repositioned with precise commands from Earth to observe Halley's at its closest point to the sun, a distance of about 55 million miles. The spacecraft measured changes in the comet caused by intense solar heating. It also provided an ultraviolet image of Halley's and its large surrounding hydrogen cloud. Data gathered by the Orbiter helped scientists determine the gas composition of the comet, the rate at which water vaporized, and the ratio of gas to dust in the comet.

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Compiled by Jeffrey P. Rhodes, DEFENSE EDITOR

Washington, D. C., July 3

★ The Presidential Commission on the Space Shuttle *Challenger* Accident (known as the Rogers Commission) submitted its final 256-page report to President Reagan on June 6, effectively closing the book on the January 28 accident. The recommendations made by the panel will be the roadmap for all future Shuttle missions.

The Commission did exemplary work. The thirteen-member panel completed the investigation in the required 120 days, they were able to pinpoint one cause of the accident beyond any reasonable doubt, and the public was kept abreast of the Commission's progress because most of the hearings were conducted in public.

The report states the cause as was pretty much expected. "In view of the findings, the Commission concluded that the cause of the *Challenger* accident was the failure of the pressure seal in the aft field joint of the Right Solid Rocket Motor. The failure was due to a faulty design unacceptably sensitive to a number of factors. These factors were the effects of temperature, physical dimensions, the character of materials, the effects of reusability, processing, and the reaction of the joint to dynamic loading."

The Commission made recommendations in nine areas of Shuttle operations and urged that the Administrator of NASA submit a report to the President in one year on progress that the space agency is making toward implementing the recommended fixes.

Highlights of the recommendations include:

• *Change of Joint Design*—Either a new design eliminating the joint or a redesign of the current joint and seal should be undertaken. Also, the establishment of an independent commission to oversee the design effort was recommended.

• *Shuttle Management Structure*—These proposals called for a redefinition of the Shuttle Program Manager's responsibilities, greater involvement of former astronauts in the management process, and establishing a Shuttle Safety Advisory Panel.

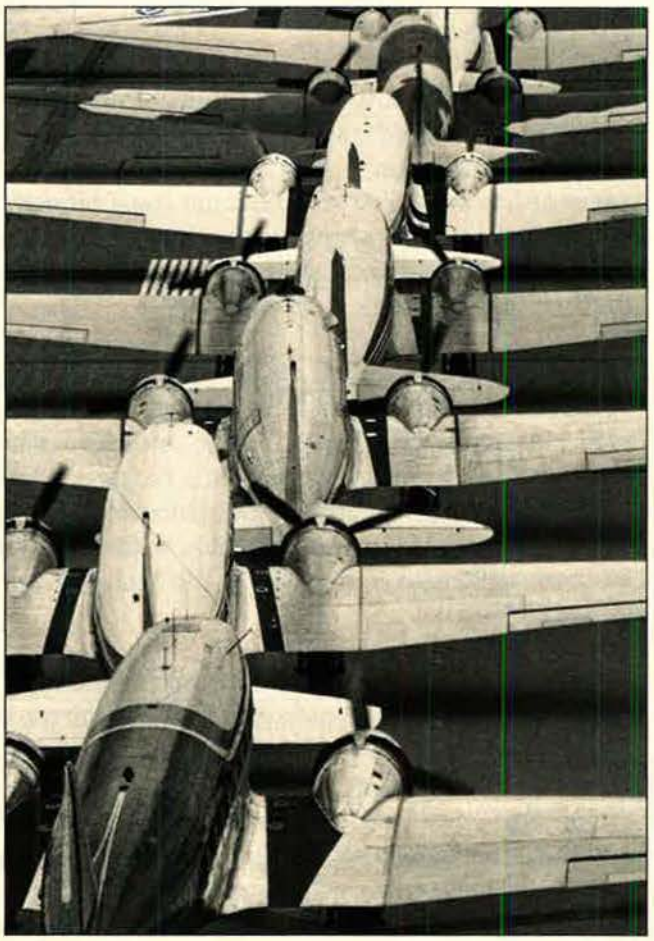
• *Criticality Review and Hazard Analysis*—NASA and primary Shuttle contractors should review and identify those items that must be improved prior to flight to ensure mission success and safety. An Audit Panel should verify the adequacy of this effort.

• *Safety Organization*—NASA should establish an Office of Safety, Reliability, and Quality Assurance that would have direct authority for these areas agency-wide.

• *Improved Communications*—NASA should take "energetic steps" to eliminate the tendency at the Marshall Space Flight Center in Alabama to manage in isolation, a policy should be developed that governs the imposition and waiver of launch constraints, and the flight crew commander should have greater involvement in acceptance of the vehicle for launch and should certify that the crew is properly trained.

• *Landing Safety*—Tire, brake, and nosewheel steering systems should be improved, and specific conditions of acceptability should be established for planned landings at the Kennedy Space Center.

• *Launch Abort and Crew Escape*—Efforts should be mounted to provide a crew escape system for use during controlled gliding flight, and there should be an increase in the range of flight conditions under which an



Looking as if they might be on an airfield in England on the eve of the Normandy invasion, eight DC-3s warm up on the ramp at Abbotsford Airport in Vancouver B. C., Canada. These aircraft are part of an armada of twenty-three DC-3s that participated in a fly-by on June 5 as one of Vancouver's EXPO '86 activities. EXPO '86, the world's fair, will continue through October. (Photo by Ed Long)

emergency runway landing would be successful early in the ascent stage.

• *Flight Rate*—NASA must establish a flight rate that is consistent with its resources, and a firm payload assignment policy should be established.

• *Maintenance Safeguards*—NASA should develop and execute a comprehensive maintenance inspection plan, perform periodic structural inspections when scheduled, and restore and support the maintenance and spare-parts programs along with stopping the practice of cannibalizing parts from one Orbiter to supply another.

NASA Administrator James C. Fletcher was expected to have provided President Reagan with a plan for implementing these recommendations by mid-July.

Copies of the Rogers Commission report are available from the Government Printing Office for $18 each.

★ President Reagan signed the new Federal Employees Retirement System (FERS) into law on June 12. The new plan is patterned after retirement systems found in the private sector. FERS consists of three parts—Social Security, a basic retirement plan, and an optional tax-deferred savings plan.

The basic retirement plan requires employees to complete at least five years of service to receive benefits and uses the "high three" average to compute benefits. Benefits will be based on one percent of salary for each year of service before age sixty-two and 1.1 percent if an employee reaches age sixty-two before retiring.

The retirement package also allows employees to retire with unreduced benefits at age sixty with twenty years of service and at age sixty-two with five years of service. Employees with thirty years of tenure may retire at age fifty-five until the year 2003, after which the age will rise to age fifty-seven by 2007. Employees with at least ten years of service may retire with reduced benefits at age fifty-five.

The plan does not provide a cost of living adjustment (COLA) for employees under age sixty-two. For those over age sixty-two, the COLA will be the consumer price index (CPI) less one percent in years when the CPI exceeds three percent. In those years when the CPI is less than three percent, the COLA will be two percent or the actual CPI increase—whichever is smaller.

The tax-deferred savings plan will allow employees to contribute up to ten percent of their salaries. The government will contribute up to five percent—one dollar for every employee dollar up to the first three percent. For the next two percent of salary, the government will contribute fifty cents for every employee dollar. Employees can also borrow on their contributions for such purposes as buying a home, for education, or for hardship cases. The plan also provides that employees will have their trust account invested in government securities, a fixed-income fund, or a common-stock investment fund.

The entire retirement system modifications apply to employees or staff members hired after December 31, 1983. It also allows employees who are enrolled in the present plan to join the new system between July 1, 1986, and December 31, 1987.

CMSAF James C. Binnicker is the Air Force's new top enlisted airman.

Binnicker Assumes Post as CMSAF

CMSgt. James C. Binnicker took office as the ninth Chief Master Sergeant of the Air Force on July 1, replacing CMSAF Sam E. Parish. Chief Parish, who had held the post since 1983, recently retired. Chief Binnicker, forty-eight, takes over the top enlisted spot in the Air Force after serving as Senior Enlisted Advisor to two major commands, Pacific Air Forces (1978–81) and Tactical Air Command (1985–86). A native of Orangeburg, S. C., Chief Binnicker has also served as SEA to Twelfth Air Force (1975–77), and he was selected in 1978 as the Air Force Enlisted Representative and Senior Enlisted Advisor on the President's Commission on Military Compensation. He joined the Air Force in 1957 and later served a tour of duty in Vietnam. Chief Binnicker is married to the former Jan Chambers, and the couple has two sons, Carmen and Michael.

★ Vice President George Bush made public in early June a declassified version of a new National Security Directive that will allow the Department of Defense to take a more active role in the fight to stop illegal drug traffic.

Until 1981, the *posse comitatus* act had prohibited the armed forces from all domestic law enforcement. That year, the act was amended to allow for indirect military involvement, such as radar controllers passing information to Customs and the Drug Enforcement Agency (DEA) about slow, low aerial traffic on known smuggling routes. Sea surveillance by Navy ships was later added.

After that, the Navy started carrying Coast Guard teams and began intercepting suspected vessels. The Coast Guardsmen would board the craft and make the actual arrests, and the Navy would tow the boats to port. The Air Force expanded its role by allowing DoD-trained DEA observers to man one or two consoles aboard AWACS aircraft while the E-3As were on radar training missions. Last year, 3,000 sorties totaling 10,400 flight hours and 347 ship-days were expended in direct support of the drug interdiction mission.

Under the new program, DoD will provide escalated support for law enforcement so long as the increased activity does not impede the primary defense mission. The armed forces will not be allowed to make arrests, seize materials, or apprehend suspects, but personnel and equipment, such as for secure communications, can now be dedicated for drug enforcement. Drug-related intelligence work will also be given a higher priority.

Other areas, such as providing very limited and tightly controlled military aid for civil law enforcement agencies abroad, allowing DoD to plan anti-drug operations with US and allied forces, and making drugs an issue in any new bilateral or multinational agreements, are also included in the new directive.

★ On May 19, the new lightweight fighter version of the British Aerospace (BAe) Hawk trainer, the Hawk 200, flew for the first time eleven days ahead of schedule at BAe's Flight Development Center at Dunsfold, England. Chief Test Pilot Mike Snelling put the single-seat fighter through its paces in a one-hour-and-eighteen-minute test flight.

The Hawk 200 was developed as a private venture by BAe and features an advanced avionics suite consisting of an inertial navigation system, a head-up display and weapon aiming

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computer (HUD/WAC), and a color multipurpose display (MPD). All essential controls are located on the throttle and stick grip. The HUD also features a keyboard for navigation and communications functions.

The plane also boasts an improved wing that produces a thirty percent increase in lift over earlier versions. The Hawk 200 retains much commonality with its predecessors, but with its redesigned nose and forward fuselage, a variety of sensors can be installed. Additionally, the plane has a built-in single or double high-velocity 25-mm Aden gun. Because of the internal gun, the centerline pylon is freed for additional ordnance, extra fuel, or an ECM pod. The Hawk 200 is capable of carrying 7,000 pounds of weapons.

British Aerospace's new single-seat lightweight fighter version of the Hawk trainer, the Hawk 200, made its first test flight on May 19. Test pilot Jim Hawkins was killed in the crash of the prototype on July 2. Another Hawk 200 will be built.

At press time, news was received that the Hawk 200 prototype crashed on July 2. BAe said the program will be delayed, but that another aircraft would be built.

Another version of the Hawk, the T-45A Goshawk, will be coproduced by McDonnell Douglas and BAe as the US Navy's new jet trainer. The Navy's initial requirement is for 302 aircraft, with a possible later order for additional aircraft.

McDonnell Douglas reports that it will go to the Air Force for discussions, once the T-46 situation is clarified, on a modified version of the T-45 for use either as a FAC (forward air controller) or as a possible new trainer for the Air Force. The Air Force T-45 would not require the strengthened landing gear, arresting equipment, or dual nosewheel of the Navy version, resulting in a substantial weight savings.

A large Air Force order early in the Navy's T-45 production run, such as for the 650 aircraft in the original requirement for the Next-Generation Trainer program or the 250 aircraft called for in the draft Request for Proposal (RFP) for a new FAC aircraft, would obviously result in great savings in unit aircraft cost for both services.

★ As Ronald Reagan nears the end of his term, he will most likely become the first President to fly in the new *Air Force One*—an executive-configured Boeing 747-200B. The 747 was announced as the winner of the competition with the McDonnell Douglas DC-10 by Air Force Secretary Edward C. Aldridge, Jr., in early June.

Pending congressional approval of the *Air Force One* Replacement Program, the Boeing Co., Seattle, Wash., will be awarded two contracts for acquisition and contractor logistics support for two aircraft. Congress authorized $280 million for procurement and an additional $20 million for research, development, test, and evaluation (RDT&E) under the FY '86 Continuing Resolution Authority.

The first contract will be for the two fully configured Presidential aircraft and for initial cadre training of the assigned maintenance and aircrew personnel. The second contract will provide for initial spare and repair parts and for the establishment of a Contractor Operated and Managed Base Supply (COMBS) facility at Andrews AFB, Md. Under the second contract, Boeing will be given five annual options to perform all intermediate and depot maintenance and to operate COMBS.

The two 747-200Bs will come from the normal assembly line process at Boeing's Everett, Wash., plant and will then be flown to the Boeing Military Aircraft Co.'s facility in Wichita, Kan., for installation of electronic and communications equipment and for interior modifications. Delivery of the first new *Air Force One* is expected in November 1988, and the second aircraft is scheduled to arrive at Andrews AFB in May 1989.

The Boeing 747-200B has been selected as the new Air Force One aircraft. Shown in an artist's depiction of it in its new livery, the 747 will replace the aging C-137C.

The two planes will feature secure voice terminals and cryptographic equipment along with an emergency medical treatment facility and work and rest areas for the President, his staff, agents of the Secret Service, and traveling news media. The 747s will have an unrefueled range of 6,000 nautical miles, and the planned passenger load is seventy passengers and a crew of twenty-three. The new *Air Force One* aircraft will be given a military designation by early fall.

Once the 747s are delivered, the C-137C aircraft currently used as the Presidential aircraft will be used in the near term for transporting the Vice President and Cabinet-level officials. Eventually, the current backup aircraft (serial number 26000), which brought President John F. Kennedy's body back from Dallas in 1963, will go to the Air Force Museum, while the current primary aircraft (serial number 27000) will go to the National Air and Space Museum.

One of the many events in which C-130s participate at Volant Rodeo, the annual airlift olympics, is short-field landings. This US Marine Corps Hercules is stirring up dust at one of the unimproved airstrips at Pope AFB, N. C.

★ By finishing in a tie for first in the Best C-130 Maintenance category and coming in second in the Best C-130 Aircrew event, the 136th Tactical Airlift Wing, represented by the 145th Tactical Airlift Group in Charlotte, N. C., accumulated enough points to win the Best Overall Wing Award at MAC's eighth annual Volant Rodeo competition held at Pope AFB, N. C., the first week of June.

The 136th TAW, based at Hensley Field in Dallas, Tex., is the first Air National Guard unit to win the annual airlift olympics, which showcases the aerial and ground operation abilities of active-duty Air Force, Guard, Reserve, and allied air force units. There was also one US Marine Corps airlift unit competing.

Another Air National Guard unit, the 133d TAW's 167th TAG based at Martinsburg, W. Va., was third in the overall competition, while the team from Portugal was second.

The fourteen Air Guard and Reserve teams acquitted themselves well, winning two of the eleven events and taking seven second or third places. Overall, thirty-nine teams, including seven from allied nations, competed in the five-day event.

Other winners by event included: Best C-141 Aircrew—438th MAW, McGuire AFB, N. J.,; Best C-130 Aircrew, Best Allied Team, and Short Field Landing competition—Portugal; Best C-141 Maintenance Unit—315th MAW (AFRES), Charleston AFB, S. C.; Best C-130 Maintenance Unit—136th TAW and 94th TAW (AFRES), Dobbins AFB, Ga., tied; C-141 Engine Running On- and Off-Load (ERO) competition—62d MAW, McChord AFB, Wash.; C-130 ERO—Australia; Aerial Delivery competition—439th TAW (AFRES), Westover AFB, Mass.; Best Overall Security Police Unit—314th TAW, Little Rock AFB, Ark.; and Combat Control Team competition—1st Special Operations Wing (SOW), Hurlburt Field, Fla.

★ The 25th Tactical Fighter Squadron and its sister unit, the 6151st Consolidated Aircraft Maintenance Squadron at Suwon AB, South Korea, have written a new definition for a "long day." In one thirteen-hour period on May 13, forty-three pilots flying twenty-one aircraft launched 160 A-10 sorties—a production rate twice as good as the previous record.

Based on the availability of twenty-four aircraft, the surge rate record set in "Determined Draggin '86," as the exercise was called, was 6.67 (number of sorties divided by available aircraft). The actual rate, though, based on the number of A-10s flown, comes out to a phenomenal 7.6.

Ground crews turned aircraft around to fully loaded status in an average of twenty to thirty minutes each. The exercise was carried out as a realistic wartime scenario, with the only difference being that hot-pit refueling and weapons reload functions were done as two separate operations. Eight three-man weapons crews were involved in the surge.

The pilots flying in the exercise were also kept busy. A total of 486 BDU-33 practice bombs and 8,000 rounds of 30-mm ammunition was expended on the Koon-Ni Range. Simulated close air support missions were also carried out with 19th Tactical Air Support Squadron forward air controllers at locations near Camp Casey Army post and near the Yoju Range.

★ The latest modification to the revolutionary McDonnell Douglas NOTAR (No Tail Rotor) system for helicopters completed a sixteen-hour test program in late May at the Company's Mesa, Ariz., test center.

The test vehicle, a modified OH-6A Cayuse, is the only single rotor conventional helicopter that has flown without a tail rotor. During the test program, the helicopter reached an altitude of 8,000 feet and a forward speed of 125 knots. The test helicopter also reached speeds of forty knots in sideways flight and thirty knots backwards.

The NOTAR system provides antitorque and directional control through the use of an enclosed variable-pitch fan driven by the main transmission and located at the boom/fuselage juncture, a low-pressure circulation system in the vented tail boom, a direct-jet thruster at the boom tip, and a vertical fin. The system provides increased safety (no moving blades), lower maintenance cost, improved survivability and reliability, and less noise.

This latest modification to the NOTAR system involved the addition of a smaller diameter fan with composite blades that are two-thirds the length and nearly twice as wide as the metal blades originally installed. The new fan operates more effectively on less power and is also quieter than the original.

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If it looks like something's missing from this OH-6A Cayuse helicopter, there is. The McDonnell Douglas NOTAR (No Tail Rotor) helicopter is the only single-rotor conventional helicopter that flies without a tail rotor. By the use of a fan-driven air-circulation system in the boom for antitorque and directional control, the NOTAR can fly without the tail rotor. The NOTAR test vehicle recently completed a sixteen-hour flight-test program.

This company-funded project first flew in 1981. The aircraft completed more than thirty hours of ground and flight test using the original fan.

★ In early May, the Luftwaffe twice successfully bombed Eglin AFB, Fla. Of course, it was just as a part of a joint exercise to test a German airfield attack munition and to give US and German Explosive Ordnance Reconnaissance, Explosive Ordnance Disposal, and Rapid Runway Repair teams some "real world" experience.

The tests of the *Starbahnbombe,* or STABO, runway cratering bomblets were carried out on the Eglin range because of the unavailability of a German range with sufficient size.

The Germans flew their multirole swingwing Tornado aircraft over a simulated runway target to disperse submunitions from the MW-1 Conventional Multipurpose Weapon Dispenser. The dispenser and the bombs performed as expected on the 200-foot by 700-foot plot.

Initial production of the MW-1 dispenser with airfield attack submunitions will begin in October, and delivery to the Luftwaffe is expected late next year.

★ Martin Marietta, Orlando Aerospace Div., received an $83 million contract in mid-June for production of the Low-Altitude Navigation and Targeting Infrared for Night (LANTIRN) targeting pod.

The contract was awarded after the Air Force reviewed performance data gathered during 600 hours of initial operational test and evaluation (IOT&E) flight tests that covered more than 200,000 miles. The targeting pod, which can designate targets for both guided and unguided munitions, exceeded Air Force reliability requirements by more than thirty percent.

Plans call for eventual delivery of 700 of the targeting pods, an equal number of navigation pods that will be tied into the head-up display of F-16 and F-15E aircraft, and twenty-nine sets of computerized test and maintenance equipment. Each of the pods is warranted for two years or 400 operating hours. The initial contract calls for delivery of two targeting pods and production tooling and test equipment.

The navigation pod, which did not encounter many of the developmental difficulties that the targeting pod overcame, has been in production since April 1985.

★ United Technologies Corp.'s Pratt & Whitney division recently received a $191 million contract from the Air Force for full-scale development (FSD) of the F100 Increased Performance Engine (IPE). The IPE will be a higher-thrust derivative of the F100-PW-220 engine that will start going in F-15Cs and Ds this year and F-16Cs and Ds next year.

Another contract for the development of the General Electric F110-GE-100 IPE is scheduled to be issued before fall.

The FSD contract calls for fabrication and delivery of six equivalent engines for extensive testing that will include 100 hours of flight tests in F-15s and F-16s. The three-year test program will also include 10,000 cycles of durability testing. The first production Pratt & Whitney IPE will be delivered in early 1990.

The IPE program is designed to get a substantial increase in thrust (from roughly 25,000 pounds of thrust to 29,000 pounds) while maintaining the same levels of operability, durability, and reliability and maintainability expected to be obtained by the F100 and F110 engines.

★ The 2d Marine Light Armored Vehicle (LAV) Battalion recently "hitched a ride" from Robins AFB, Ga., to MCAS Cherry Point, N. C., aboard two C-5As from the 436th Military Airlift

A-7 STRIKEFIGHTER

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Wing at Dover AFB, Del., as part of an interservice training exercise.

The 2d LAV Battalion had just completed six weeks of training at Fort Benning, Ga., and was ready to return to its base. The 130 Marines, twenty-nine LAVs, jeeps, trailers, and other support equipment first motor-marched to the Marine supply depot at Albany, Ga. From there, the entourage made its way to Robins AFB for the airlift. Arriving at Cherry Point, the caravan then motor-marched to its home base at Camp Lejeune, N. C.

The C-5s shuttled back and forth between Robins and Cherry Point, carrying four or five of the 25,000-pound LAVs, along with the three operators and six-member assault teams for each vehicle, on each trip. A KC-10 tanker from Seymour Johnson AFB, N. C., refueled the C-5s in flight.

★ A B-52H assigned to the Air Force Flight Test Center flew from Carswell AFB, Tex., to its station at Edwards AFB, Calif., on May 10 while armed for the first time with twenty AGM-86B Air-Launched Cruise Missiles.

As part of the planned test program, the B-52 carried six of the nearly twenty-one-foot-long missiles on two underwing pylons and eight more mounted internally on a common strategic rotary launcher (CSRL), which is now being produced for the Air Force.

All twenty of the missiles were targeted while the plane was airborne, and simulated launches of the whole group were also made. The fail-safe system on the three on-board Offensive Avionics Systems (OAS) computers was also exercised when one of the systems was intentionally disabled. The other two computers automatically picked up the work load, proving the entire system.

Additional flight tests with the full complement of the missiles were carried out during the remainder of May. Once fully operational, the B-52Hs modified with CSRLs will be assigned to Carswell AFB, Tex., Fairchild AFB, Wash., K. I. Sawyer AFB, Mich., and Minot AFB, S. D.

★ Bitburg AB, West Germany, has a new F-15. No, it is not the F-15E dual-role fighter, or even a new C or D model. Instead, this F-15 is made of pierced steel planking and sits in the middle of the prototype fire training pit for all US Air Forces in Europe (USAFE) units.

Technicians install a unicorn-like refueling probe to the top of one of the commercial Lockheed L-1011 TriStars that Marshall of Cambridge (Engineering) Ltd. is converting into tanker/freighter aircraft for the Royal Air Force.

The fire training pit is a thirty-foot-diameter concrete circle that is surrounded by paved approaches. A tank truck parked at a distance feeds fuel into the pit by means of an underground conduit, and then the pit and the steel F-15 are set on fire, thus providing realistic training from both a fire-fighting and a crew rescue procedure standpoint.

The new pit can be used in all types of weather and allows training with both water and foam. The previous training aid was a plot of ground with a hole dug in it. After use, the area surrounding the old pit would naturally get very muddy, and the fire trucks would have to be washed.

The Bitburg fire department is also the first in USAFE to have a full complement of the relatively new P-19 fire trucks. The P-19 is smaller and lighter than previous vehicles and can be airlifted or sealifted. It can reach speeds up to sixty mph and will run on diesel or JP-4 jet fuel.

This "F-15" will live to see another "crash." Four P-19 fire trucks from the Bitburg AB, West Germany, Fire Department put out a fire in the base's prototype training pit, a thirty-foot-diameter concrete circle with paved approaches.

★ **NEWS NOTES—Capt. Thomas E. Sawner,** an F-4 pilot from the 307th Tactical Fighter Training Squadron at

Homestead AFB, Fla., was recently selected as the **recipient of the Lt. Col. Anthony C. Shine Award for 1985.** The Shine Award is presented annually to the Air Force's outstanding fighter pilot. All Air Force fighter pilots are eligible for the award, and the pilots are graded on character, conduct, leadership, flying professionalism, and community involvement. Captain Sawner, an Air Force Academy graduate, comes from an Air Force family. His grandfather served in the 1940s, and his father flew in the first operational F-100 squadron.

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On May 17, the **149th Tactical Fighter Group** at Kelly AFB, Tex., became the **second Air National Guard unit to receive the F-16.** The unit is receiving its F-16As and Bs from the 50th TFW at Hahn AB, Germany, which is converting to the uprated C and D models. The former F-4C unit was expected to complete its transition to the F-16s by July. The 169th TFG at McEntire ANGB, S. C., was the first Air Guard unit to receive the F-16. The 419th TFW at Hill AFB, Utah, is currently the only Air Force Reserve unit to fly the aircraft.

SENIOR STAFF CHANGES

PROMOTIONS: To be **General:** Robert H. **Reed.**

To be **Lieutenant General:** George L. **Monahan,** Jr.; Carl R. **Smith.**

To be **ANG Major General:** Gene A. **Budig,** KanANG; Wayne O. **Burkes,** MissANG; Charles W. **Harris,** ArkANG.

To be **ANG Brigadier General:** Patrick S. **Boab,** MinnANG; John D. **Campbell,** PaANG; Wallace P. **Carson,** Jr., OreANG; Robert J. **Dwyer,** NevANG; Timothy T. **Flaherty,** TexANG; Frank B. **Holman,** NJANG; Harvey D. **McCarty,** ArkANG; Edward E. **Parsons,** Jr., IdahoANG; Edward J. **Philbin,** DCANG; Thomas J. **Quarelli,** ArizANG; LeRoy **Thompson,** TexANG.

RETIREMENTS: B/G Edsel R. **Field;** M/G Donald P. **Litke;** L/G Thomas H. **McMullen;** M/G Robert E. **Messerli;** B/G Gerald C. **Schwankl.**

CHANGES: Col. (B/G selectee) Robert M. Alexander, from Ass't for General Officer Matters, DCS/Personnel, Hq. USAF, Washington, D. C., to Cmdr., 19th AD, SAC, Carswell AFB, Tex., replacing B/G Loring R. Astorino . . . **B/G James S. Allen,** from Dep. Dir., Regional Plans and Policy, and Dir., GLCM Planning Gp., DCS/P&O, Hq. USAF, Washington, D. C., to Mil. Ass't to SAF, OSAF, Washington, D. C., replacing B/G William T. Williams IV . . . **Gen. John T. Chain,** from C/S, SHAPE, Mons, Belgium, to CINCSAC, and Dir., JSTPS, Hq. SAC, Offutt AFB, Neb., replacing Gen. Larry D. Welch . . . **B/G Richard L. Craft,** from Dep. Dir., Ops., NMCS, J-3, OJCS, Washington, D. C., to Dep. Dir., Regional Plans and Policy, and Dir., GLCM Planning Gp., DCS/P&O, Hq. USAF, Washington, D. C., replacing B/G James S. Allen . . . **Col. (B/G selectee) Gerald A. Daniel,** from Spec. Ass't to Cmdr., 9th AF, TAC, Shaw AFB, S. C., to IG, Hq. USAFE, Ramstein AB, Germany, replacing B/G Lawrence E. Huggins . . . **M/G Chris O. Divich,** from DCS/Ops., Hq. ATC, Randolph AFB, Tex., to Cmdr., AFMTC, ATC, Lackland AFB, Tex., replacing M/G (L/G selectee) Carl R. Smith.

M/G Robert D. Eaglet, from Dep. Cmdr., RD&A, Armament Div., AFSC, Eglin AFB, Fla., to Dep. Cmdr. for F-16, ASD, AFSC, Wright-Patterson AFB, Ohio, replacing M/G Ronald W. Yates . . . **M/G Bradley C. Hosmer,** from Vice Dir., Joint Staff, OJCS, Washington, D. C., to Ass't DCS/P&R, Hq. USAF, Washington, D. C., replacing retired M/G Robert E. Messerli . . . **B/G Lawrence E. Huggins,** from IG, Hq. USAFE, Ramstein AB, Germany, to Cmdr., 316th AD, and Cmdr., Kaiserslautern Area Community, Hq. USAFE, Ramstein AB, Germany, replacing B/G (M/G selectee) Cecil W. Powell . . . **B/G James D. Kellim,** from Vice Cmdr., MTMC, Falls Church, Va., to IG, Hq. MAC, Scott AFB, Ill., replacing B/G William H. Sistrunk . . . **B/G Vernon J. Kondra,** from Vice Cmdr., 21st AF, MAC, McGuire AFB, N. J., to Dep. Dir., Ops., J-3, NMCC, OJCS, Washington, D. C., replacing B/G Charles A. Vickery . . . **Col. (B/G selectee) Paul E. Landers,** from Cmdt., SOS, Hq. AU, Maxwell AFB, Ala., to Ass't DCS/Plans, Hq. MAC, Scott AFB, Ill., replacing retired B/G Edsel R. Field.

M/G Thomas A. LaPlante, from DCS/Log., Hq. PACAF, Hickam AFB, Hawaii, to Dir., Log. Plans and Prgms., DCS/L&E, Hq. USAF, Washington, D. C., replacing M/G Charles P. Skipton . . . **Col. (B/G selectee) Nathan J. Lindsay,** from Cmdr., ESMC, SAMTO, SD, AFSC, Patrick AFB, Fla., to Dep. Cmdr., Launch & Control Systems, SD, Los Angeles AFS, Calif. . . . **M/G (L/G selectee) George L. Monahan, Jr.,** from Dir., Development and Production, DCS/RD&A, Hq. USAF, Washington, D. C., to Vice Cmdr., Hq. AFSC, Andrews AFB, Md., replacing L/G William E. Thurman . . . **M/G Stanton R. Musser,** from Ass't DCS/L&E, Hq. USAF, Washington, D. C., to Dep. Dir., DLA, Cameron Station, Va., replacing retired M/G Donald P. Litke . . . **B/G (M/G selectee) Cecil W. Powell,** from Cmdr., 316th AD, and Cmdr., Kaiserslautern Area Community, Hq. USAFE, Ramstein AB, Germany, to Dep. Cmdr., RD&A, Armament Div., AFSC, Eglin AFB, Fla., replacing M/G Robert D. Eaglet . . . **L/G (Gen. selectee) Robert H. Reed,** from Ass't Vice C/S, Hq. USAF, Washington, D. C., to C/S, SHAPE, Mons, Belgium, replacing Gen. John T. Chain, Jr.

B/G Alan V. Rogers, from Cmdr., 96th BW, SAC, Dyess AFB, Tex., to Spec. Ass't to Vice CINCSAC, Hq. SAC, Offutt AFB, Neb. . . . **B/G Ervin J. Rokke,** from Dean of Faculty, Hq. USAFA, Colorado Springs, Colo., to Defense Attaché, USSR, USDAO, Moscow, USSR . . . **Col. (B/G selectee) John F. Sievertson,** from Dep. Dir., Bases and Units, DCS/P&R, Hq. USAF, Washington, D. C., to Vice Cmdr., 21st AF, MAC, McGuire AFB, N. J., replacing B/G Vernon J. Kondra . . . **B/G William H. Sistrunk,** from IG, Hq. MAC, Scott AFB, Ill., to Vice Cmdr., 22d AF, MAC, Travis AFB, Calif., replacing B/G Larry D. Wright . . . **M/G Charles P. Skipton,** from Dir., Log. Plans & Programs, DCS/L&E, Hq. USAF, Washington D. C., to Ass't DCS/L&E, Hq. USAF, Washington, D. C., replacing M/G Stanton R. Musser . . . **M/G (L/G selectee) Carl R. Smith,** from Cmdr., AFMTC, ATC, Lackland AFB, Tex., to Ass't Vice C/S, and Senior USAF Member, Military Staff Committee of the UN, Hq. USAF, Washington D. C., replacing L/G Robert H. Reed.

B/G Roger C. Smith, from Command Dir., NORAD Combat Ops., NORAD/ADCOM/AFSPACECOM, Colorado Springs, Colo., to JCS Rep. to Defense and Space Talks, OJCS, Washington, D. C., replacing B/G Earl S. Van Inwegen . . . **B/G Joseph K. Spiers,** from Cmdr., AFALC, Hq. AFLC, Wright-Patterson AFB, Ohio, to DCS/Log., Hq. PACAF, Hickam AFB, Hawaii, replacing M/G Thomas A. LaPlante . . . **Col. (B/G selectee) Victor S. Stachelczyk,** from Cmdr., Airlift Information Systems Div., Hq. AFCC, and DCS/Information Systems, Hq. MAC, Scott AFB, Ill., to Dir., C^3 Systems, J-6, Hq. USEUCOM, Vaihingen, Germany . . . **L/G William E. Thurman,** from Vice Cmdr., Hq. AFSC, Andrews AFB, Md., to Cmdr., ASD, AFSC, Wright-Patterson AFB, Ohio, replacing retired L/G Thomas H. McMullen . . . **B/G Earl S. Van Inwegen,** from JCS Rep. to Defense and Space Talks, OJCS, Washington, D. C., to DCS/Ops., AFSPACECOM, Colorado Springs, Colo., replacing retired M/G Thomas W. Sawyer . . . **B/G Charles A. Vickery,** from Dep. Dir., Ops., J-3, NMCC, OJCS, Washington, D. C., to Vice Cmdr., MTMC, Falls Church, Va., replacing B/G James D. Kellim.

Col. (B/G selectee) Robert V. Woods, from Spec. Ass't to Cmdr., 22d AF, MAC, Travis AFB, Calif., to Ass't DCS/Ops., Hq. MAC, Scott AFB, Ill., replacing B/G Donald C. Smith . . . **M/G Ronald W. Yates,** from Dep. Cmdr. for F-16, ASD, AFSC, Wright-Patterson AFB, Ohio, to Dir., Development and Production, DCS/RD&A, Hq. USAF, Washington, D. C., replacing M/G (L/G selectee) George L. Monahan, Jr. ■


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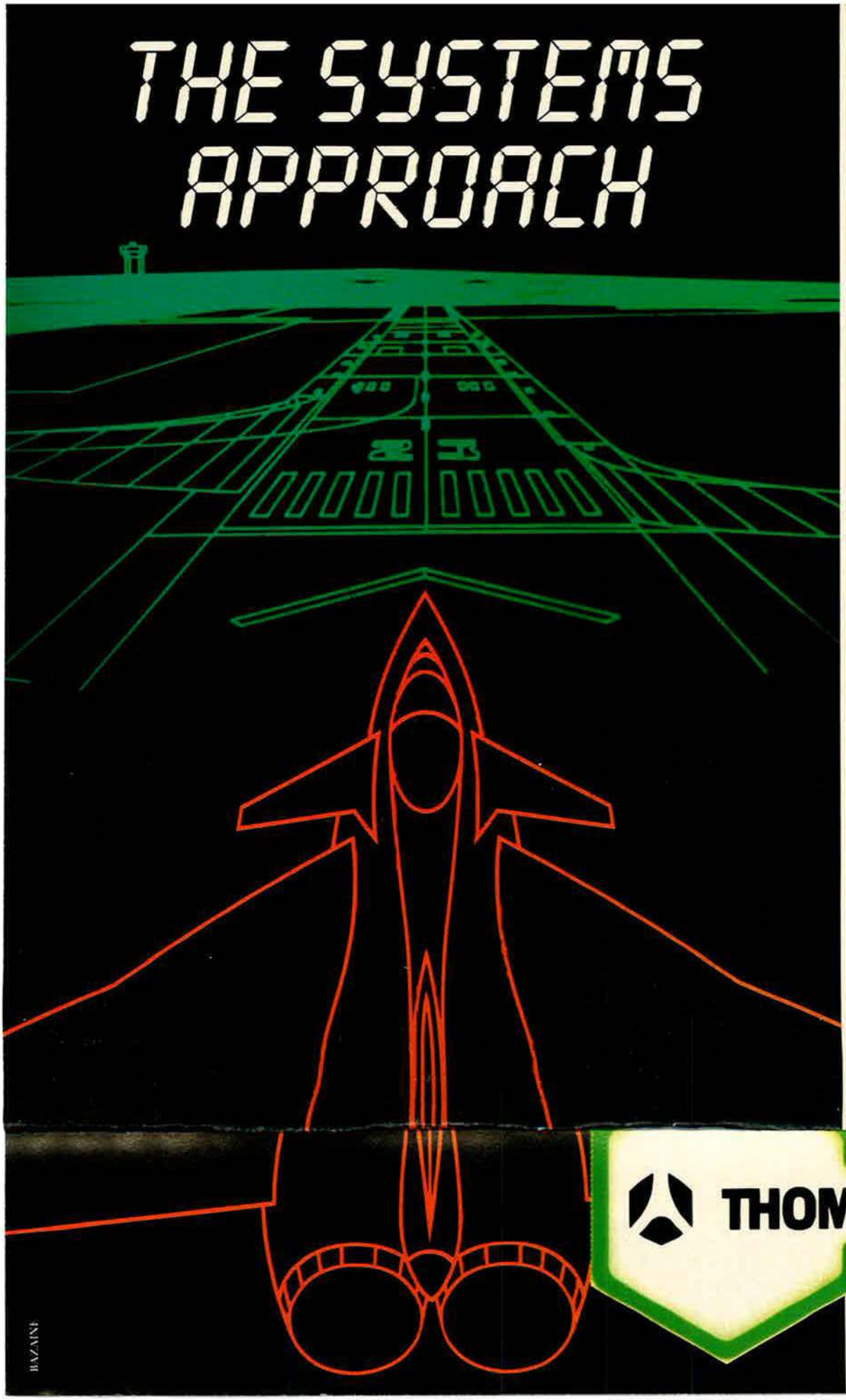

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AEROSPACE WORLD

George H. Heilmeier, former director of the Defense Advanced Research Projects Agency (DARPA) and now Senior Vice President and Chief Technical Officer of Texas Instruments, recently said that **"the electronics industry is one of five biggest industries** in the world today. Back in 1960, it was roughly a $30 billion business. By 1990, we expect it to be $670 billion. At the same time, the semiconductor revolution, which fueled the end equipment market, started as a market of roughly $1 billion in 1960. By 1990, we feel it will grow to $70 billion."

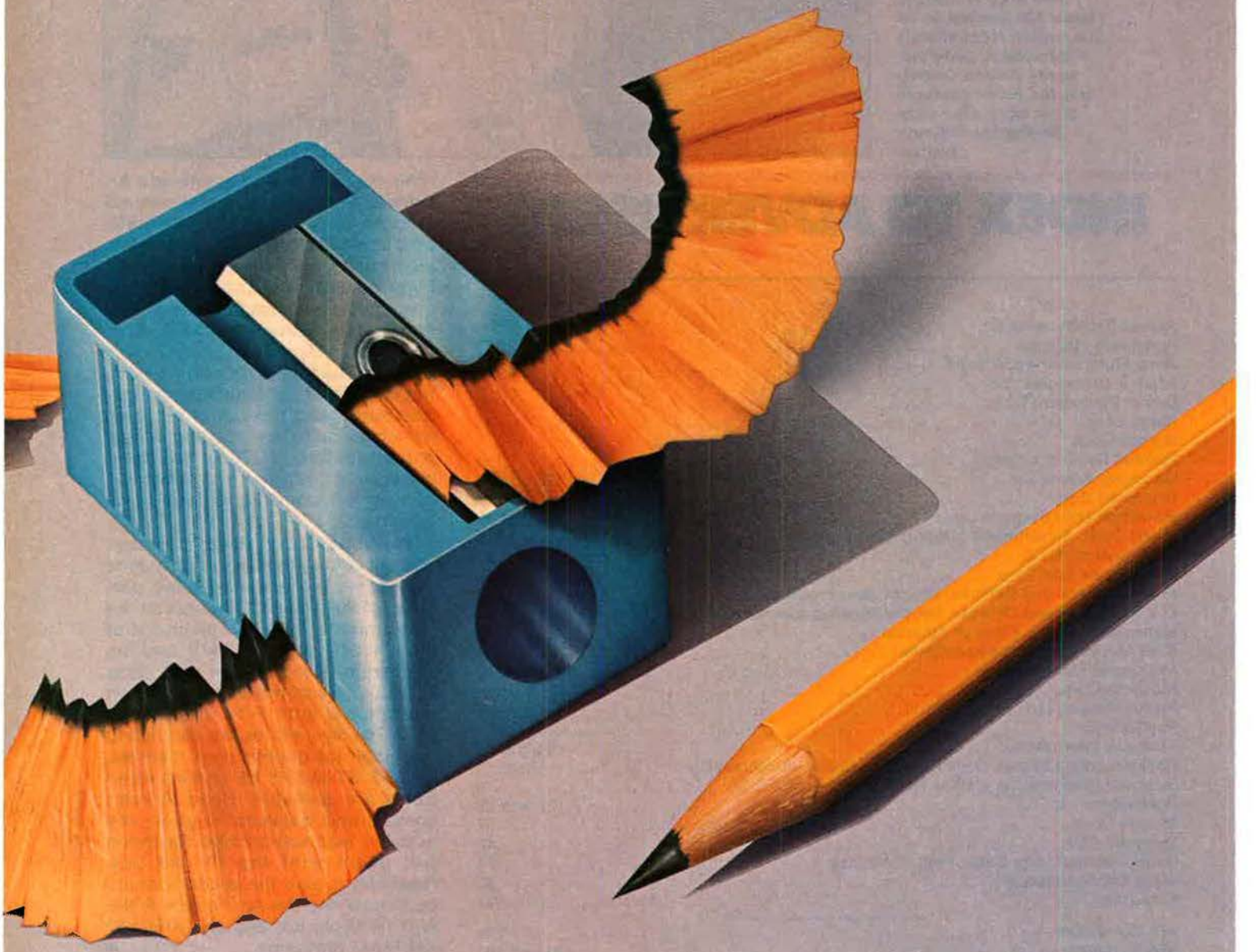
A1C Vernon C. Daniels (left) is congratulated by his recruiter, TSgt. Rick Rogers (right). Airman Daniels, an Oklahoma Air Guardsman, is the only graduate of the Fabrication and Parachute Course at Chanute AFB, Ill., ever to score 100 percent on all the written requirements at the school. Quite naturally, Airman Daniels was the honor graduate of his class after completing the 455-hour course.

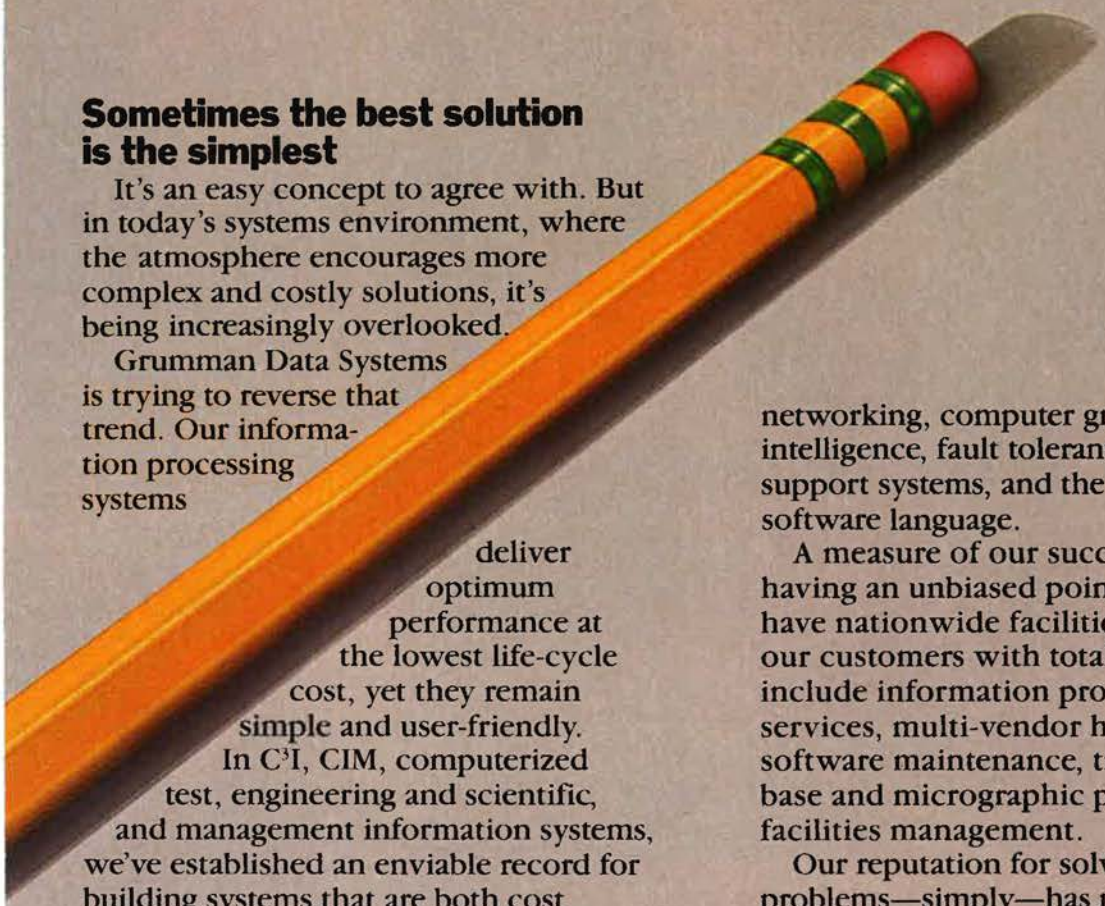
INDEX TO ADVERTISERS

Air Force Systems Command's Armament Division recently transferred program responsibility for the **GBU-24/B Low-Level Laser-Guided Bomb, also known as Paveway III,** to Air Force Logistics Command. AFLC will manage the program from the Ogden Air Logistics Center at Hill AFB, Utah. The GBU-24/B program began in May 1980. Production verification testing was completed last August, with eighteen successful hits out of nineteen launches. Follow-on operational test and evaluation (FOT&E) was completed in March, with the weapon scoring forty-four hits in forty-seven launches.

Raytheon Co. of Bedford, Mass., was selected by the Navy in early June to become the **second-source producer of the AIM-54C Phoenix** air defense missile. Initial development of the AIM-54C began in 1979, and the thirteen-foot-long missile with close to a 120-nautical-mile range has been operational with F-14 units since 1981. The Navy will issue a contract to Raytheon for qualification missiles, with FY '87 and FY '88 options when funds are available. Head-to-head competition between Hughes, the missile's lead source, and Raytheon will begin with the FY '89 buy. Raytheon is also the second-source contractor for the Air Force's AGM-65D IR Maverick and the AIM-120 AMRAAM programs. ■

A GREAT SOLUTION DOESN'T HAVE TO BE COMPLICATED





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Project Forecast II explores the technologies that will shape the Air Force of the future.

USAF in the Twenty-first Century

BY JAMES W. CANAN
SENIOR EDITOR

Tom Swift of the long-ago, fictionally famous "flying machine" and many other marvelous inventions would have loved USAF's Project Forecast II.

He would have been right at home with antiproton propulsion, computers that "think," aircraft that double as spacecraft, space satellites that work together in clusters and are defended by others, supersleek airframes with microsensors studded throughout their skins and built of materials with artificially aligned molecules, and missiles so smart that they need no external guidance and can hardly miss.

The Project Forecast II study came up with all this and much more in opening the curtain on the Air Force of the future.

Forecast II gives star billing to thirty-nine technologies and thirty-one advanced systems concepts that it says "will revolutionize the way the Air Force carries out its mission in the twenty-first century, guaranteeing continued technological supremacy over any potential adversary."

In promulgating Forecast II, the Air Force is not fooling around with fanciful notions. It has officially established the study's chosen technologies and systems concepts as no-nonsense "initiatives" for Air Force Systems Command to pursue and for operational commands to support.

Forecast II does more than foreshadow the makeup of USAF's machines to come in air and space, however. It serves notice, in the face of increasing pressure on the US military to revert to simpler, presumably cheaper systems, that the Air Force will continue to be committed to high technology as the touchstone of combat capability and to footing the bill for it even under increasing budgetary duress.

Forecast II also signals USAF commanders to look ahead to the reorientation of force structures and missions that its initiatives are expected to make possible if brought to fruition wholly or in part.

By and large, those initiatives smack of realism. Some may be of the gee-whiz genre or may border on it, but most shape up as solid stuff.

In fact, many are far enough along to be put into effect fairly soon if the funding that AFSC intends to devote to them holds up and if operational commands stand fast with requirements for them.

There is at least a fighting chance that this will happen. Gen. Lawrence A. Skantze, Commander of AFSC and the leader of Forecast II, has succeeded in establishing most-favored-funding baselines and projections for the project's research

endeavors. Moreover, the operational commands were Forecast II insiders and are more likely to remain its boosters as a result.

The Forecast II team was made up of eighteen technology, mission, and analysis panels composed of 175 military and civilian members from AFSC, the Air Staff, and the operational commands. Over eight months, they sifted more than 2,000 ideas originated by Air Force laboratories, industry, academia, and the Forecast II participants themselves.

The upshot, says the Forecast II report, is "a menu of the 'art of the possible' in future warfare."

Tomorrow's Air Force

Forecast II was the focus of a symposium, "Designing Tomorrow's Air Force," at the Air Force Association's Gathering of Eagles in Las Vegas, Nev., earlier this year. General Skantze and his product division commanders made up the panel.

"From time to time," the General said on that occasion, "we must reconfigure the science and technology baseline to focus on emerging technologies that have the potential for a revolutionary leap forward. We, in effect, can reposition science and technology advancements for the greatest technical leverage. This was our purpose in Project Forecast II."

The Forecast II report assorts the study's initiatives into the broad categories of propulsion and power; vehicles, structures, and materials; electronics and optics; weapons; information, computation, and displays; and systems acquisition and support.

All across that spectrum of technologies and systems, the makings are there for the maturation of even the most exotic. The reason is that the Air Force R&D community has already done the necessary spadework.

Many Forecast II initiatives involve microstructures of one kind or another, as in electronics and materials.

One example is "smart skins." The Forecast II report comments on them as follows:

"We believe the Air Force will be able to build aircraft with 'smart skins'—outer skins containing embedded phased arrays to permit the aircraft to sense and communicate in optical and other frequency bands and in any direction from any aircraft attitude."

This, says the report, would "enhance stealth by allowing the elimination of pods and domes on aircraft" and would be "remarkably survivable to all but catastrophic damage to the aircraft."

Far out? Not at all. Advances in microelectronics and in aircraft-fabrication technologies may make smart skins as attainable tomorrow as very-high-speed integrated circuits (VHSIC) chips, now in production, were considered to be just yesterday.

As to advanced structures and materials, the Forecast II report notes that the Air Force will capitalize on improvements in aluminum and titanium alloys and on the development of lightweight metallic compounds, heat-resistant carbon/carbon materials, and damage-tolerant ceramic materials.

Then comes the *pièce de résistance*. "Another important development," says the Forecast II report, "is in the creation of ultralight, ultrastrength materials that are tailored at the molecular level to achieve required mechanical, thermal, and electrical characteristics."

Arranging molecules (maybe even atoms) to create unique, special-purpose materials is not so fanciful as it may seem. It is somewhat analogous to what goes on in genetic engineering. Microelectronics researchers have already modified silicon at the molecular level to give it conductive properties that they sought.

As another example of precedence that is even more to the point, Aeronautical Systems Division's Materials Laboratory is developing a family of "ordered polymers." In this effort, the huge, stringy, tangled molecules characteristic of polymeric materials are "ordered" into chains and spun into fibers of surpassing properties.

Beyond Brainstorming

Breakthroughs in materials technology are among those that have transformed the National Aerospace Plane from a farfetched idea into a practical project.

"Of all the ideas offered," General Skantze told AFA's Gathering of Eagles symposium, "the National Aerospace Plane program dramatizes the rationality and utility of Forecast II. Forecast II confirmed that the enabling technologies to support the demonstration of large, transatmospheric vehicles are now within our reach."

The NASP is also seen as the eventual repository of a host of Forecast II technologies. Along with materials, these include supersonic-combustion ramjets, supercomputers, and all such technologies to be explored in the NASP program's concentration on hypersonics.

General Skantze described the NASP as an example of some Forecast II initiatives that are "larger than life." Others, he noted, "are less glamorous but have tremendous ramifications—an example is the initiative for smart, built-in test devices for electronics that could eliminate false alarms in electronic equipment."

The development of such devices depends in great measure on the use of VHSIC chips and microprocessors and is well under way.

Many other Forecast II initiatives are also beyond the brainstorming stage and approaching likelihood.

One is the "super cockpit," in which pilots would see their computer-generated displays on the screens of their helmets and would not have to look at scopes and dials while flying and fighting.

The super cockpit is seen as the culmination of all the research that ASD has done in recent years on cockpit technologies, much of which has focused on replacing dials with cathode-ray tubes and head-up displays. Research on helmet-mounted sights is also a leg up for the super cockpit.

Aimed at helping aircrews manage their increasingly demanding work loads in high-performance aircraft on ever-tougher missions, research on cockpit technologies is now being concentrated in ASD's program to develop USAF's Advanced Tactical Fighter for deployment in the mid-1990s.

Lt. Gen. Thomas H. McMullen, who retired as ASD's Commander last month, told the audience at the Gathering of Eagles symposium that ASD is "excited about being a big

part of the Forecast II implementation process" and is "enthusiastic about the high payoff of the technology and its potential for influencing future systems."

New Ideas for Space

Space plays a big part in the Forecast II study. Among systems envisioned there are "distributed arrays," meaning coveys of relatively small, inexpensive satellites, all embodying phased-array sensors and communicating with one another in a multinode network that would be tough to put out of action in an attack.

The deployment of such systems would enable the US to quit relying on small numbers of extraordinarily capable, multipurpose, increasingly expensive, and—because they are so few—overly vulnerable satellites.

Each of the satellites in the formations envisioned by Forecast II would be less capable than each of those now in space. Combined, however, they would be at least a match for each existing satellite and would have many other advantages.

Says the Forecast II report: "One very interesting idea . . . involves placing large phased arrays in space with major components of the arrays not rigidly connected to each other.

"If we can achieve electronic coherence among those components, phased arrays can be spread out over very large volumes in space, giving them an unprecedented degree of survivability.

"It therefore may be possible to create a phased-array device (a space-based radar) that we can place into space and enhance simply by adding more relatively inexpensive elements whenever the threat increases and budget pressures permit."

This would be "a totally new way of doing business in space," declares the Forecast II report.

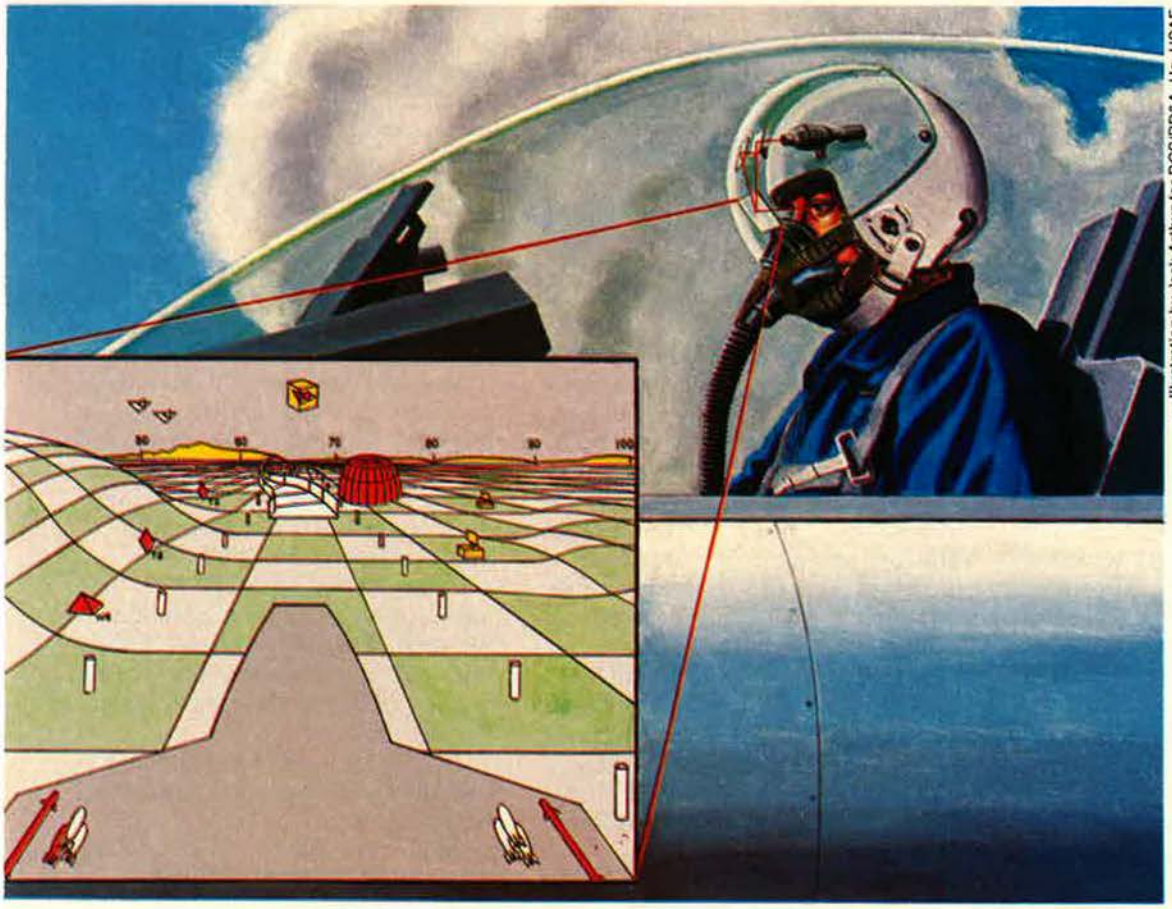
After all, why not? The main thing that space offers as an operating medium is plenty of room, and Forecast II figures that the Air Force might as well take advantage of it.

The various phased arrays distributed throughout the clusters of satellites in the Forecast II system concept "could be dedicated to specific tasks, such as radar, navigation, or communications, and their panels could be synchronized for autonomous, survivable operation," explains a Forecast II-related document.

As with many other Forecast II ideas, there is nothing all that dream-worldly about this one. AFSC's Electronic Systems Division has been working on it for some time and in fact was instrumental, as a prime Forecast II participant, in promoting it as one of the study's select system concepts.

The Air Force Space Technology Center is also at work on active and passive "sparse aperture" infrared sensors.

At AFA's Gathering of Eagles symposium, Lt. Gen. Forrest S. McCartney, Commander of Space Division, ascribed "near-term potential" to "a radar system that we envision could consist of a distributed, sparse array of satellites" and to "a space-based surveillance system that we envision would use medium-orbit satellites with long-wave infrared sensors—as well as perhaps visible light sensors—that would allow us to detect, identify, track, and catalog space objects."



—Illustration by Jack Arthur for DCS/RD&A, Hq. USAF

In the "super cockpit" of tomorrow, computer-generated images will be displayed on the pilot's helmet visor, eliminating the need to look down into the cockpit to check dials and instruments. The aim is to help pilots manage their increasingly demanding cockpit work load. Research is being concentrated in this area to aid in the development of the Advanced Tactical Fighter.

Brilliant Guidance

The concept of smaller, more numerous satellites operating as surveillance teams in space is also said to have been buttressed by research performed by the Strategic Defense Initiative Organization (SDIO) on optimum numbers and capabilities of satellites that will be needed for all ramifications of space defense.

The Air Force is the workhorse in SDI research on space-based and space-oriented weaponry. The synergism of the potential benefits to be reaped by USAF and SDIO is suggested in the unclassified executive summary of the Forecast II report, as follows:

"We will also pursue the weaponization of directed energy, especially high-power microwaves and lasers, and we anticipate breakthroughs in long-range, high-altitude, very-high-velocity impact weaponry for use against a variety of hardened targets.

"The close-to-zero flight times of such systems offer particular advantages in conceptual simplification of fire-control systems.

"High-power directed-energy weapons give special benefits in defensive space applications, allowing for further investigation of spacecraft-defender and on-orbit ASAT [antisatellite] system concepts.

"Taken together, these technologies will result in highly effective, very lethal point and area weapons for global use."

Forecast II officials foresee space-defender satellites armed with directed-energy or kinetic-energy weapons escorting constellations of distributed-array satellites in the same manner as warships escorted troopships and cargo ships in convoys during World War II.

Future weapons in more familiar domains are also the business of Forecast II.

Maj. Gen. Gordon E. Fornell, Commander of AFSC's Armament Division, told AFA's Gathering of Eagles symposium that "the bottom line" of the study from AD's standpoint "is what I will call brilliant guidance."

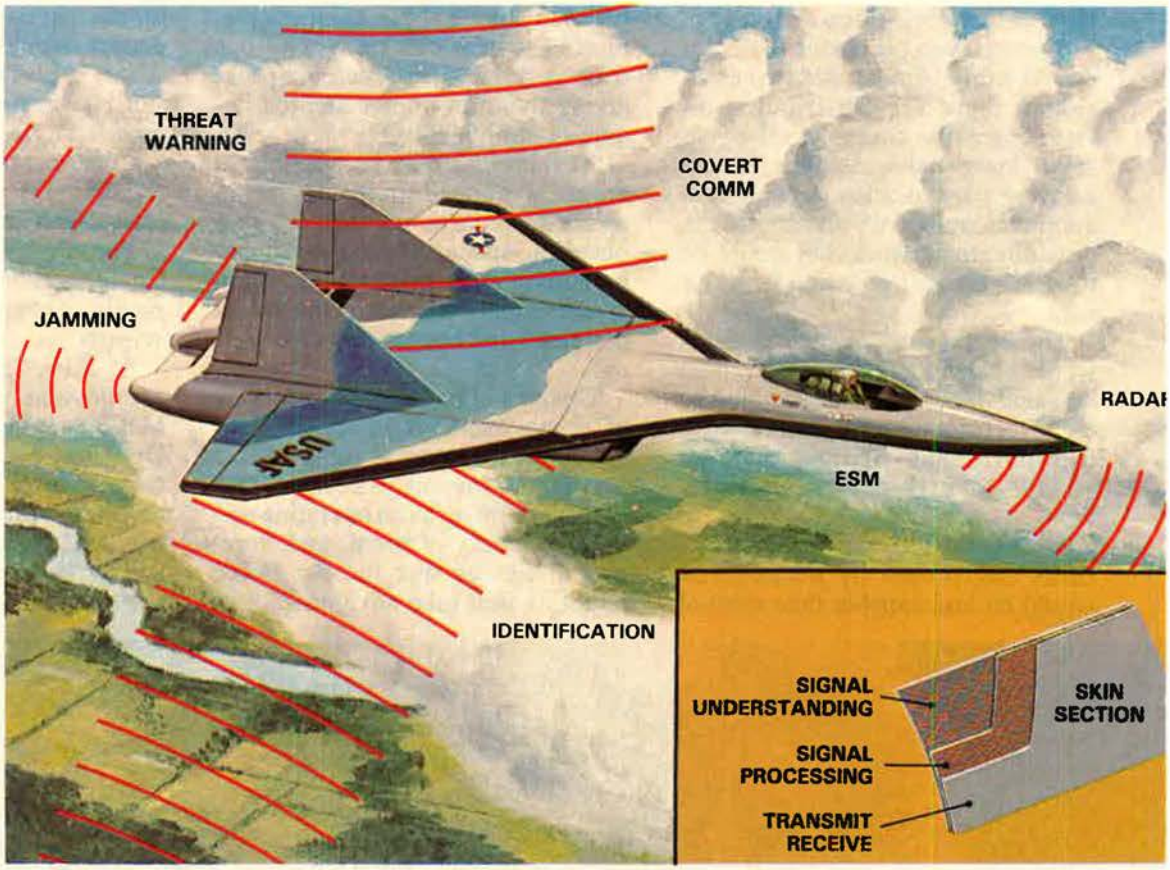
"By that," General Fornell continued, "I mean the ability of a weapon to autonomously guide, acquire, track, drop, find—all those things—[against] a wide spectrum of targets, both air-to-air and air-to-ground, independent of the standoff distance, in any environment, and without any postlaunch communications from the launch aircraft."

Forecast II's emphasis on the need to develop such brilliant weapons should serve to stimulate AD's work on them. General Fornell noted that such work still faces "formidable technical challenges" in the development of the high-speed processing, high-resolution imagery, and robust, sophisticated software that brilliant weapons require. Moreover, he said, USAF must make such weapons "affordable," which is no small task.

Even so, the General said, "We have done a lot. We have found that we cannot fight tomorrow's wars with today's weapons. The enemy won't, and we shouldn't be expected to."

According to Forecast II, technological help is on the way. The study is bullish about brilliant weapons.

"One very exciting technology," says the Forecast II executive summary, "involves monolithic integrated circuits that will combine electrical, optical, analog, and digital capabilities with signal processors and micromechanical devices on single chips.



With the use of VHSIC (very-high-speed integrated circuit) chips, the concept of "smart skins," or airframe skins that can sense and communicate in optical and other frequency bands in any direction, will be feasible. "Smart skins" will also enhance stealth by eliminating pods and domes.

"We believe we will be able to produce very effective, less-expensive chips that will allow us to convert almost any 'dumb' weapon into a 'smart' weapon."

Taking note of great advances in sensor technologies "across the entire electromagnetic spectrum, particularly in the infrared and millimeter-wave areas," the report said that these, when combined with progress in optical-processing and pattern-recognition technologies, "will give us truly brilliant weaponry that can be launched with total autonomy."

RVs and Antiprotons

Strategic weapons have their day too in Forecast II. Many of the technologies identified in the study are conducive to future air-breathing and ballistic strategic systems.

A striking example is the technology of reentry vehicles, having to do with their maneuverability and terminal guidance.

At the Gathering of Eagles symposium, Maj. Gen. Aloysius Casey, Commander of AFSC's Ballistic Missile Office, noted that solving the "random errors of reentry" is a "dominant" R&D challenge.

"We have been measuring [such errors] for years on our instrumented reentry vehicles," General Casey said. "The next step is to take them out.

"We also understand how to further confound defenses by employing stealth technology. Now, if you add the capability to maneuver the RV, using some of that tremendous energy that is already there [in its glide], that allows evasion of defenses as well as providing the ability to remove those random errors.

"So enhanced effectiveness of the ICBM is certain. The only question is who will do it and when."

General Casey also declared: "Maneuvering reentry vehicles with terminal guidance and, perhaps, earth penetrators can erode the effectiveness of superhardened silos in the long run."

Given the many years of research on Advanced Maneuverable Reentry Vehicles (AMARVs) that predated Project Forecast II, their technology would seem ripe for application.

In his talk at the AFA symposium, Space Division's General McCartney concentrated on the "exciting" work, pegged to Forecast II, that lies ahead for SD's Rocket Propulsion Laboratory on varieties of high-energy, high-density chemical propellants.

"But even those fuels pale in comparison to something farther out that's known as antimatter," General McCartney declared. "I kind of smiled when they told me about it, but the more you think about it and the more you see the research that has been done on it, particularly overseas, the more you can see that, indeed, it is not beyond the imagination."

In the propulsion research community, "antimatter" is currently synonymous with "antiprotons."

Unless USAF explores antiproton propulsion, it "will never get there or never know," General McCartney declared. Forecast II makes such exploration a certain bet.

"We are enthusiastic," says the Forecast II report, "about an admittedly high-risk search for ways to use antiprotons. These unusual particles, currently produced at several locations throughout the world, will, when combined with protons, release enormous amounts of energy—far greater than that produced from any other energy source."

Propulsion systems driven by antiprotons would cut the time needed for a trip to Mars from two to three years to two to three months, the report predicts.

In such propulsion, negatively charged hydrogen particles called antiprotons would be joined with positively charged—their natural state—hydrogen protons. They would annihilate one another and produce pure energy for rip-roaring rocket thrust.

There is no doubt that antiprotons can be made, and Forecast II officials warily note that the Soviet Union is hard at work on them.

One of the challenges in such work is storing the antiprotons in a medium that will maintain their unnaturally negative charges. Magnetic bottles may be the answer, and it wouldn't take many such bottles to go to the stars.

Size of an Oil Barrel

In this time of public skittishness about the safety of nuclear power,

Forecast II at a Glance

The Technologies

High-energy-density propellant
Particle-bed nuclear propulsion
High-performance turbine engine
Combined-cycle engine
Space power
Advanced deception
Rapidly reconfigurable crew station
Acoustic charge transport
Wafer-level union of devices
Photonics
Full-spectrum, ultraresolution sensors
Fail-soft, fault-tolerant electronics
Survivable communications network
Adaptive control of ultralarge arrays
Smart skins
High-temperature materials
Broad-spectrum signature control
Satellite protection
Ultrastructured materials
Cooling of hot structures
Ultralight airframes
STOL/STOVL/VSTOL technology
Hypersonic aerothermodynamics
Brilliant guidance
Directed-energy technology
Advanced manufacturing technology
Unified life-cycle engineering
Smart built-in test (BIT)
Robotic telepresence
Knowledge-based systems
Virtual man-machine interaction
Distributed information processing
Antiproton technology
Ultrahigh software quality and productivity
Aircrew combat mission enhancement (ACME)
Nonlinear optics
Antiterrorism technology
Plasma defense technology
Low-cost, high-speed military computer technology

The Systems Concepts

Direct-ascent antisatellite system (ASAT)
Manned space station
Reusable orbit transfer vehicle
Spacecraft defender
Distributed sparse array of spacecraft
Space-based surveillance system
Multistatic surveillance system
Airborne surveillance system
Theater air warfare command control communications and intelligence (C^3I)
Super cockpit
Artificial ionospheric mirror
Space object identification system
Multirole conventional weapon
Battle management processing and display system
Imaging system
Intratheater VSTOL transport aircraft
Multirole global-range aircraft
Supersonic VSTOL tactical aircraft
High-altitude, long-endurance unmanned aircraft
Hypersonic interceptor aircraft
Special operations aircraft
Autonomous antiarmor weapons
Autonomous high-value target weapons
Long-range air-to-air missile
Hypervelocity weapons
Long-range boost-glide vehicle
Tactical low-cost drones
Multimission remotely piloted vehicle (RPV)
Hypervelocity vehicle
Advanced heavy-lift space vehicle
Advanced antisatellite system (ASAT)

the Forecast II report makes a bold statement. "We believe," it declares, "that we can now produce a nuclear propulsion system that is both safe and compact."

Called a "particle-bed nuclear reactor," the system would encapsulate nuclear fuel in small ceramic pellets. Hydrogen would then be passed over them. Heated in the resulting nuclear reaction and driven through an ordinary nozzle, the hydrogen would provide prodigious thrust.

"The system has two key safety features," says the report. "The moderator [hydrogen] can be transported into space independently of the nuclear fuel pellets and mated [with them] while in orbit, and the spent nuclear fuel [would be] retained inside the ceramic pellets instead of being released through the nozzle with the hydrogen working fluid."

This "very simple technology" is worth cultivating, because it "may produce a 50,000-pound-thrust engine about the size of an oil barrel," the report proclaims.

All propulsion technologies singled out in Forecast II have meaning for future aerospace vehicles. Along with the National Aerospace Plane, several such vehicles are postulated, including heavy-lift launchers and "swift aircraft with inherent VTOL [vertical takeoff and landing] capabilities for special operations and other missions."

With respect to such missions, Forecast II also touches on technologies and prospective systems for countering terrorism. Guns that would radiate electromagnetic energy are sometimes mentioned in this regard.

As a result of its likely pervasiveness in a plethora of Forecast II's projected systems, artificial intelligence gets big play in the study. *(See also "Machines That Think," p. 70, July '86* AIR FORCE *Magazine.)*

AI systems "are critical to almost every situation where large quantities of information are being managed—in areas such as battle management, training, aircrew operations, and manufacturing," says the report.

"One extremely important area," it continues, "is in the guaranteed preservation of very large data bases and functions—for example, our strategic warning and strike management systems."

Forecast II also sets store by machines that will be able to respond to voice commands and eye-motion signals.

"Man and machine must interact to share the sense of touch," the report also declares.

"Robots with good eyes and strong arms but virtually no brainpower" are seen as the solution to operating in environments unsafe for humans—chemical/biological/radiological environments, for example—and in remote regions, most definitely including space.

Keys to the Kingdom

The Forecast II report identifies the keys to the technological kingdom that it seeks for USAF.

"Electronics and optics provide the technological underpinning for virtually all our aerospace systems," the report asserts.

USAF, it says, should "substitute photonic devices for electronic devices wherever feasible to defeat electromagnetic pulse (EMP), radiation, and electronic warfare threats.

"The goal is to produce systems—like strategic or tactical battle-management work stations—that employ photons instead of electrons to sense, compute, process, and transmit signals."

Taking note of Forecast II's penchant for photonics, Lt. Gen. Melvin F. Chubb, Commander of ESD, told AFA's Gathering of Eagles symposium that ESD "has already started the work to build what we call 'optical jukeboxes' " for processing data.

General Chubb said that they would be the next step beyond electronic processors and that they would give ESD "the ability to literally process ten trillion bits of data in a few seconds."

"We have digitized the entire world and put it on 50,000 magnetic tapes, and it takes us a few days, sometimes, to recover data," General Chubb said. "With this optical jukebox, we'll be able to put all that data on a console right on your desk, and you will be able to retrieve the data in a few seconds."

Mastering photonics will be no easy trick. It will require, says the Forecast II report, "the integration of optical fibers, optical materials, optical sensors, and optical kill mechanisms, plus a significant investment in optical processing."

As an Air Force captain, General Skantze was a member of the team that carried out USAF's original Project Forecast in 1964 under Gen. B. A. Schriever, the first Commander of AFSC.

"Our recommendations addressed materials, propulsion, flight dynamics, nuclear weapons, and major systems concepts," General Skantze recalls. "Eventually, Project Forecast helped to produce large cargo aircraft like the C-5 and commercial jumbojets, reusable space-launch vehicles like the Space Shuttle, and improved ICBM guidance.

"I have little doubt that our next-generation Air Force will be built around the technology and systems highlighted in Project Forecast II."

General Skantze has laid the groundwork for channeling a full ten percent of USAF's science and technology budget into Forecast II projects each year through Fiscal Year 1993. The S&T budget now accounts for 1.6 percent of USAF's total obligational authority and is projected to climb to and remain steady at 2.3 percent of TOA by FY '88, courtesy of the additional funding for Forecast II research.

The going may be difficult. General Skantze acknowledges that the Air Force, up against tightening budgets, will naturally want to devote hefty funding to sustaining the procurement of systems and spare parts that have had the benefit of the big defense budgets of recent years.

In this context, AFSC has its work cut out in keeping its Forecast II projects sufficiently solvent.

In the early 1970s, the late Gen. George S. Brown, then the Commander of AFSC and later to become USAF Chief of Staff and, finally, Chairman of the Joint Chiefs of Staff, expressed a thought that is pertinent to the problem of finding the money to follow through on Forecast II.

It was this: "The impact of science and technology on strategy is almost infinite, since no strategy can really be postulated at all, or carried out, except in terms of the instruments that science and technology make available." ■

USAF's new Chief says our primary strategic shortfall is limited capability against hardened targets.

The Long and Short of Combat Capability

BY EDGAR ULSAMER
SENIOR EDITOR (POLICY & TECHNOLOGY)

US STRATEGIC deterrent forces lack capability to retaliate promptly against hardened Soviet nuclear forces and command and controls assets. That is their primary and pervasive shortfall, USAF's new Chief of Staff, Gen. Larry D. Welch—who was Commander in Chief of the Strategic Air Command at the time—told an AFA symposium in Las Vegas on April 30.

The only solution to that shortfall is the Peacekeeper ICBM, with the deployment of 100 of these missiles representing "the essential, rational foundation for an affordable force to deal with Soviet offensive forces." Any other approach, General Welch said, "costs more and provides less," adding that "Peacekeeper is here, it works, it's affordable."

General Welch said that the US at present has only "about half the capability we need against [hardened Soviet targets], while the Soviets have about twice the capability they need against our hardened nuclear forces." The resultant imbalance, he explained, "is clearly the most destabilizing factor in the current strategic equation, and correcting that problem demands first priority."

In urging that the full complement of 100 MX ICBMs be fielded promptly, General Welch did not slight the requirement for a follow-on ICBM, however. In the longer term, the Small ICBM will provide "enduring survivability and . . . add much to stable deterrence." He acknowledged that the Small ICBM is caught up in contentious arguments within the defense community and Congress with regard to size and whether it should be a single-warhead or MIRVed design. At the same time, he pointed out that "controversy is par for the course for strategic systems."

Full Steam for the Air-breathing Component

In assessing the air-breathing component of the strategic triad, General Welch praised the B-1B as a "superb bomber [that] will serve us well for years to come, first as our most capable penetrating bomber and then as a cruise-missile carrier." The Advanced Technology

The B-1B will play a pivotal role in America's strategic defense, first as a penetrating bomber and later as a cruise-missile carrier.

Bomber (ATB, or "Stealth"), he added, will continue that bomber penetration role into the next century. The ATB program is "doing well in development, and I expect to see it fielded on schedule."

Defense Secretary Caspar W. Weinberger has announced that the ATB program is "on schedule, the technology is well understood and working, and we expect the system to be operational in the early 1990s. In terms of mission capability, the ATB's unique low-observable characteristics make it far more survivable than the B-1B. This superior survivability, combined with the ATB's payload and range, substantially increase its effectiveness over that of the B-1B." Secretary Weinberger disclosed in the same announcement that the total estimated cost for R&D and procurement of 132 operational Stealth bombers, expressed in FY '81 dollars, is $36 billion, with the result that the estimated average cost of the "far more capable ATB is $277 million for each aircraft," compared to $265 million for the B-1B.

While there is strong support for the Stealth bomber within the Defense Department and on Capitol Hill, current and growing trends to cut back all defense spending might slow down the tempo of the ATB program, General Welch cautioned at the symposium.

An important, ancillary element of the air-breathing leg of the strategic triad that General Welch singled out is SRAM II: "SRAM-A is eleven years old and had an engine life that was guaranteed for five years." Replacing the aging SRAMs, the new Chief of Staff pointed out, is one of the Air Force's top priorities. "SRAM II does have the capabilities we need and will be a tremendous addition to our future bombers," he declared. The Air Force set specifications for SRAM II, General Welch explained, that "are modest but adequate. We are not pushing the state of the art, and we are not pressing for all the capabilities that we could have built into [the weapon system], because we are so interested in getting SRAM II fielded as quickly as possible." This urgency results from "our concerns about the age of SRAM-A," General Welch told the AFA symposium.

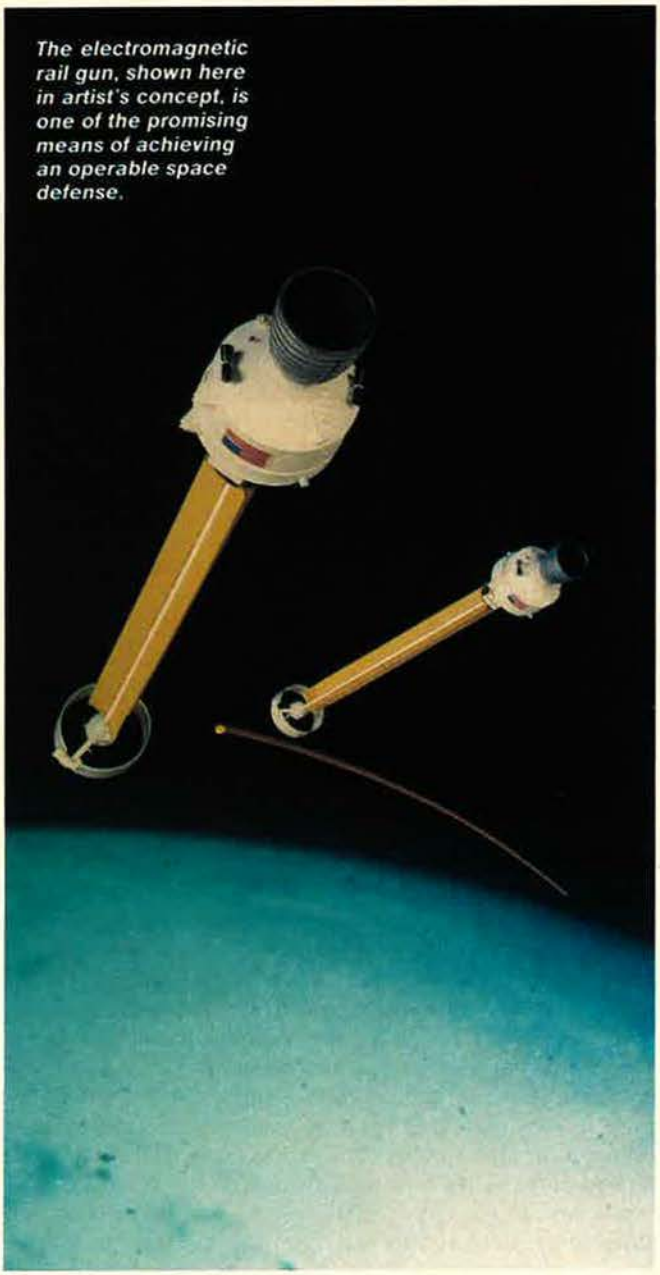
On the plus side of the strategic ledger, General Welch said that "we now have a well-conceived national strategy for dealing with the Soviets, and we now have programs planned to produce the forces to underwrite that strategy." He added that "the current strategy of flexible response with counterforce capabilities is the right approach to credible deterrence, [with the Administration's strategic modernization blueprint providing] the right set of programs to underwrite that strategy."

At the outset of this decade, US strategic nuclear forces "were poorly suited to a flexible response strategy," but by upgrading existing forces and developing new systems, "the Air Force over the past few years has corrected some of these deficiencies." Upgrades to the B-52s and the Minuteman IIIs over the past six years have "doubled the capabilities of those systems against Soviet hardened targets, despite increasing hardness and more sophisticated defenses."

The B-52 fleet's average daily mission-capable rates have gone up over the same period from about forty percent to about seventy percent, while the ICBM alert rates held steady at a high ninety-eight-plus percent, General Welch reported. Return on investment from upgrading operational systems has been "superb," according to the Chief of Staff, with the Minuteman ICBMs, for instance, providing "over half of the country's daily alert force for twelve percent of the total cost of strategic offensive forces."

The Impact of SDI

The Strategic Defense Initiative (SDI), General Welch told the AFA meeting, is bound to make a major long-term contribution to deterrence: "We need continued strong support for that initiative" because of its potentially synergistic effects in terms of overall strategic deterrence capabilities. Since the Soviets deploy about seventy-five percent of their strategic nuclear warheads on ICBMs—in contrast with a more balanced US approach that relies to a more or less equal measure on SLBMs, ICBMs, and air-breathing systems—it is not surprising that Moscow views SDI with concern. SDI, General Welch suggested, might render the monumental Soviet investment in ICBMs "less useful" and hence



The electromagnetic rail gun, shown here in artist's concept, is one of the promising means of achieving an operable space defense.

create conditions where "we can reduce our reliance on strategic systems."

But reduced reliance on strategic nuclear offensive capabilities, USAF's new Chief of Staff suggested, does not mean the elimination of such forces and weapons in their entirety: "I can't share the feeling that, someday, strategic offensive systems will go away. [It's not a] matter [of] how successful SDI is. I would remind those few who believe in defense only that the Maginot Line [built by France to keep the Nazi Wehrmacht at bay] was not a failure. The failure was that the builders of the Maginot Line did not preserve any offensive capability to take advantage of what [these fortifications in depth] did for the defense." SDI, in concert with strategic offensive capabilities, can make possible a strong, stable deterrent, General Welch emphasized.

Shifting to the human factor undergirding all Air Force capabilities, General Welch stressed that "much of our attention over the past several years has been on quality performance by quality people in the most motivating atmosphere we can produce." Programs oriented toward people, he added, "continue to be a high-leverage investment in productivity, resulting in increased readiness and more credible deterrence." The Air Force, according to its new Chief of Staff, is manned by "bright, dedicated people who can and do produce extraordinary results. We can't buy that kind of performance, [which] we count on to do our daily work. But this country owes our people fair and adequate compensation. Failure to provide that is the most foolish kind of shortsighted nonsense."

Space and Deterrence

While the effectiveness of the US strategic deterrent stands or falls with the capabilities of the forces that make up this deterrent, the ability "to put those forces in motion" is also of key importance, the Commander in Chief of the US Space Command, Gen. Robert Herres, told the AFA symposium. It is reasonable, he suggested, to "think of deterrence as preventing an attack on the US by threatening unacceptable retaliation against a rational foe." At the same time, he argued, it is important to recognize that deterrence, in effect, is not a simple, single act of retaliation but "a series of events—a process that obviates the need to engage in retaliatory action."

A potential aggressor, he pointed out, obviously must assess the capabilities that reside in the bomber force on alert, the ICBMs poised in their silos, and the Tridents patrolling the oceans, but "the credibility of these forces depends on a process that begins at the far-flung sites and stations of Space Command and NORAD [and that] comes together at the National Command System at Cheyenne Mountain."

Among all the missions of the armed forces, none is more central than the ability to deter a strategic attack and "to be able to provide warning to our nation's leadership that such an attack is under way and [what its] purpose is. Unless we can do that—and do that well, swiftly, and accurately—the credibility of our nuclear deterrent forces is greatly diminished."

Telling the National Command Authorities (NCA) and "my fellow CINCs that we are under attack and characterizing the nature of the attack is a process that depends heavily on space-based assets. The first sensor that would detect a nuclear attack is based on satellites. We receive the sensor data at Colorado Springs over a communications link that uses another satellite. After we make assessments of the indications provided, we pass the information of what is happening to the National Military Command System over communications links that use, among other things, yet more satellites," according to General Herres.

Not only are the US Space Command's space-based C^3 satellites the nation's only fully survivable warning system, but some of these satellites would also be used to communicate the President's decision to employ US strategic nuclear forces, General Herres pointed out. "Our space assets thus are absolutely essential to react to a nuclear attack on the US," he told the AFA meeting, adding that this factor introduces a "new dimension in the configuration of our strategic forces." Because the support provided by space-based systems to terrestrial forces across the spectrum of conflict is becoming indis-

TAC is making significant improvements in readiness. Maintenance is better, and training sorties and weapons inventory are up. (Photo by Bob Simons)

pensable, the need to expand the capabilities and size of the orbital support forces is imperative, General Herres emphasized.

Changing Organizational Structure

Until the formation of the US Space Command in September of last year, the only space system under control of a unified command had been the Satellite Early Warning System, General Herres disclosed. The Aerospace Defense Command controlled that operational space system. But the formation of the US Space Command "gives us the opportunity to arrange for the orderly transfer of [operational space] systems from the R&D to the operational force structure."

Comprehensive technological advance tends to make it possible to perform a host of critical support functions better with space-based assets than with terrestrial systems, he suggested. He cited three broad functional areas that fall into this category: "For one, surveillance, including environmental and geodetic; second, navigation; and third, C^3I." In the case of the latter, he pointed out that nearly half of the US military satellites currently in orbit are communications satellites.

The head of the US Space Command took pains to dispel the myth of lagging Soviet military space technology: "Everything we do in space they do, plus a lot more. For instance, they [carry out] radar ocean reconnaissance with their RORSATs, and they do electronic intelligence with their EORSATs." The US, he pointed out, has no counterparts to these important Soviet systems, which can track and hence threaten the forces of the US maritime CINCs at a time when this nation is investing "billions of dollars in projecting force across the seas—such as [with] our carrier battle groups."

He pointed out in this context that the Soviets, in support of major exercises, routinely launch such satellites as RORSAT. Last summer, for instance, the Soviets launched two RORSAT systems for that very reason, he pointed out.

While some US military satellites appear to have a technological edge over their Soviet counterparts, "this gap is closing." As a result, the fact that the Soviets deploy more satellites than the US takes on added significance: "Two years ago, we operated roughly the same number of satellites in orbit as the Soviets, about 125 each. Today, we still operate 125, but the Soviets now have more than 160 operational satellites in orbit. Three of these 160 satellites on orbit can function as man-habitable systems. Salyut 7 and Soyuz T-15 are doing so right now. [The Soviets] continue to find new ways to use space and to use satellites on orbit longer."

The head of the US Space Command explained that the high Soviet launch rate "exercises their launch facilities regularly and on a [continual basis]. Their launch inventory includes eight different boosters that collectively have demonstrated a very high launch success rate, with only three failures since the beginning of 1984." In terms of manned space time, the Soviets have piled up an aggregate total of more than eleven man-years, compared to only four years for the US. That lead "is widening with every passing day." This kind of experience, he added, "pays big dividends for the Soviets" in terms of such capabilities as repairing satellites on orbit.

The Need for ASAT

Because of the broad and widening Soviet military space capabilities, the importance of producing and testing operational US ASATs is growing. The vexing problem at this time is that the US ASAT program "is still on hold because of the congressional moratorium against further testing. We need more testing to develop more confidence," according to General Herres. This setback notwithstanding, he said that "we plan to develop [an operational ASAT] system by 1990, with an inventory of satellites that can challenge the highest priority targets that we have been [instructed] to deal with."

The US Space Command's mission of space defense is somewhat analogous to the maritime task of sea control, General Herres said. But in the absence of an operational ASAT, "we don't have much capability to carry out that mission." He acknowledged that "it would be nice if we never had to carry out this mission, or never needed the [associated] capabilities, but that is unlikely."

It is of cardinal importance—in a deterrent as well as an operational context—that the US develop and maintain forces that can hold at risk those Soviet military satellites that are essential elements of the threats facing US terrestrial and naval forces. "Furthermore, I don't see how we can tolerate a situation under which the Soviets can threaten our own near-earth orbiters and we don't have the capability to respond in kind." He admitted that it is impossible to know the precise circumstances under which the Soviets would choose to attack US satellites in near-earth orbit, but warned that if "they ever take one out, we might find that the most viable option would be to respond in kind." Such a form of reciprocity, he suggested, "might be the cheapest response, whatever the circumstances. The nation needs this capability."

The US Space Command's comprehensive, "noncooperative" space surveillance system that is now in place represents a precondition for an operational ASAT-based space defense strategy, according to General Herres. "We track more than 6,100 objects in space," he noted, "including the [some] 320 satellites that are operational all the time." He emphasized the paramountcy of "knowing what is going on up there," not merely in terms of the ASAT mission but for a range of other operational reasons.

TAC's Progress Report

The elusive goal of building up USAF's tactical airpower to forty fully equipped and fully manned fighter wings is slipping, even though significant progress is being made, Gen. Robert Russ, the Commander of Tactical Air Command, told the AFA meeting. "Since 1980, we have increased the TAF [tactical air forces] by over two combat wings, but that's not the whole story. Aircraft deliveries lag funding by about two years, and congressional funding for fighters through 1986 will bring us within almost two wings—meaning about thirty-eight wings—of our forty-wing tactical Air Force goal," he said.

While this tentative schedule delays attainment of the forty-wing goal, USAF's tactical air forces are experiencing significant improvements through the acquisition of such first-line aircraft as the A-10, F-15, and F-16, he pointed out. Similarly, he added, "We have made progress in our weapons. The inventories of our new infrared missiles are up 500 percent, [and] radar missiles are up 150 percent." Also, weapons quality is up: "Our infrared missiles can now be fired from all aspects, and we have doubled the size of the launch envelope for our radar missiles." With regard to air-to-surface operational capabilities, he said, "It now takes one aircraft and one bomb to do the same job it used to take half a squadron of aircraft and some sixteen tons of bombs to accomplish."

Hand in glove with the hardware advances is increased aircrew proficiency. Since 1980, the number of various training sorties has gone up anywhere from forty-five percent to 127 percent, while "our major accident rate decreased fifty-eight percent." Stressing that the TAF's aircraft maintenance level has advanced to the "straight A" category, General Russ reported that mission-capable rates scored a forty-four percent increase over the past six years while standdowns due to maintenance requirements or unavailable spare parts declined by better than sixty percent.

Citing a host of examples of brilliant performance by TAF crews during recent exercises, General Russ suggested that the TAF's overall combat capability is increasing appreciably: "We have been able to revise tactics and improve our weapon systems performance by fine-tuning our training and software, [which translates into] better survivability and more lethality." With results like this, "when critics wonder if we have our money's worth from defense expenditures, I can only say, 'Look around, there is plenty of proof.' "

Turning to the research and development field, General Russ suggested that, in the aggregate, the US is maintaining a technological edge that is becoming manifest in the Air Force's proposed Advanced Tactical Fighter (ATF) program. In spite of difficult technology tradeoffs, ATF, he predicted, will be both a "very stealthy and a very maneuverable aircraft." Such a combination, he explained, would represent the performance optimum in new fighters—"an aircraft that is maneuverable against any other type of aircraft yet [that] also incorporates the maximal amount of stealth."

Increased Emphasis of SOF

Three years ago, the Air Force, and especially Military Airlift Command, started emphasizing "our Special Operations Forces [SOF], even though we had been involved in this field for much longer," MAC's Commander in Chief, Gen. Duane Cassidy, told the AFA symposium. Special operations, he added, are hard to define and, under some circumstances, involve almost all of the Air Force's combat elements.

MAC, he stressed, is unambiguously committed to broad improvements of USAF's organic special operations capabilities: "We are acquiring twenty-one new MC-130 Combat Talon II aircraft; we will buy twelve C-130Hs for conversion to AC-130 gunships; we expect to purchase eighty CV-22 Osprey tilt-rotor aircraft, the first of which is [slated for] delivery to MAC in 1993; and we will modify another twelve HH-53s for the Pave Low [mission] on top of the nine we already have."

The bottom line is that "we have a great deal of involvement in special operations." A total of eighty-eight programs is under way—and "fully funded"—to enhance the Special Operations Forces. Nevertheless, he acknowledged that "we are playing catch-up ball [in this field], which is a fact that I think the Air Force has [allowed for] with some of its funding profiles." One of the most important consequences of playing catch-up ball, he suggested, is to "use what you have right now effectively while planning future [remedies]. The two most pressing and critical fields are command control and communications [C^3] and [boosting] the maintenance reliability of some systems that are difficult to maintain."

In the first instance, he said, the solution is to mold the SOF command and control requirements "right into the upgraded MAC C^3 system." In the second instance, current SOF aircraft are handicapped significantly in terms of reliability and maintainability because of aging and piecemeal tailoring of individual aircraft.

MAC, he said, is trying to standardize the thirteen aircraft of the Combat Talon fleet: "Each one is differ-

The field of Special Operations had been lagging, but there are now eighty-eight fully funded programs under way.

ent, because these aircraft have been brought into the system in a not very disciplined manner [because of the need to optimize individual] aircraft against various threats. We need to get some commonality into those aircraft." This type of *ad hoc* approach, he pointed out, will not be permitted in the acquisition of new systems.

Another means for getting higher utilization from the existing sparse SOF resources is to adjust some programmed depot maintenance (PDM) cycles, involving in some instances cutting the cycle by nearly fifty percent. The long-term solution to enhanced force effectiveness, General Cassidy suggested, is to buy systems that are intrinsically more reliable and maintainable. To compensate for inadequate reliability, commanders have to assign two SOF aircraft to missions where one, in theory, would suffice: "We expect to remedy this through greater reliability and maintainability."

In the airlift field, MAC's central requirement is the C-17, "the program that will take airlift into the twenty-first century. . . . I believe our nation needs this aircraft, and so does our Air Force," General Cassidy said. Acknowledging that the term "new [program] start is a dirty word in Washington this year," he nevertheless stressed that "now is the time to modernize [airlift] and not flinch over money."

Explaining that the C-17 "was designed by its users," ranging from the Air Force's major commands to the US Army and the Marine Corps, General Cassidy emphasized that no airlift program in the past has ever enjoyed the enthusiastic, total support that is being accorded the C-17. "We have been talking about the C-17 for at least six years. We have cleverly compressed a twelve-year program into eighteen years and stretched it out so far now that it has become very expensive. . . . Now is the time to get on with producing this airplane," MAC's Commander in Chief argued.

Logistics and Manpower Issues

The Air Force's Reliability and Maintainability 2000 Plan, Gen. Earl T. O'Loughlin, Commander of Air Force Logistics Command, told the AFA symposium, represents "our commitment to creating systems we can operate in any combat environment and deploy with the minimum combat support. Through it, we are working to help shape the technologies we inherit from industry and the labs, we are becoming more literate in technologies, and we are developing business strategies to exploit technological advances."

AFLC, General O'Loughlin indicated, is boosting productivity through capital investments: "This fiscal year alone, we are spending $160 million on new equipment and repair technology." The payoff from these investments, he said, is the ability to "repair and modify our systems quicker and better [which results in greater] readiness and sustainability."

Increased funding for spares over the past six years has resulted in dramatic improvements in readiness, the AFLC Commander pointed out. The availability of spare engines, for instance, is up by 362 percent over what it was in 1980, he said. The AFLC Commander acknowledged that some funding reductions seem unavoidable this year, which necessitates that "we . . . spread those reductions as carefully and as wisely as we know how."

Gen. Andrew Iosue, Commander of Air Training Command, predicted that the Air Force will continue to do well over the next two to three years both in terms of recruiting and retention. Over the longer term, he told the AFA symposium, a shrinking manpower base could create problems. The present pool of some 2,000,000 eighteen-year-olds, for instance, will go down to 1,700,000 within a few years. This means that the pool of males in this age group goes down by about thirty percent while the total DoD recruiting requirement remains constant at between 300,000 and 325,000.

This condition adumbrates some recruiting problems in the future, he suggested. As a result, sentiment in Congress to revive the draft might acquire a new head of steam. The draft, he argued, would not help the Air Force, which "never had a draft, gets better quality from the All-Volunteer Force, and would find the draft more expensive because it gets us into a revolving-door [situation]. . . . They come in, but you can't keep them in." ■

THE F-15: KEY PLAYER ON THE USAF TEAM.

THE SITUATION: AIR FORCE FIGHTER PILOTS MUST BE ABLE TO SEE, IDENTIFY AND RESPOND FAST.

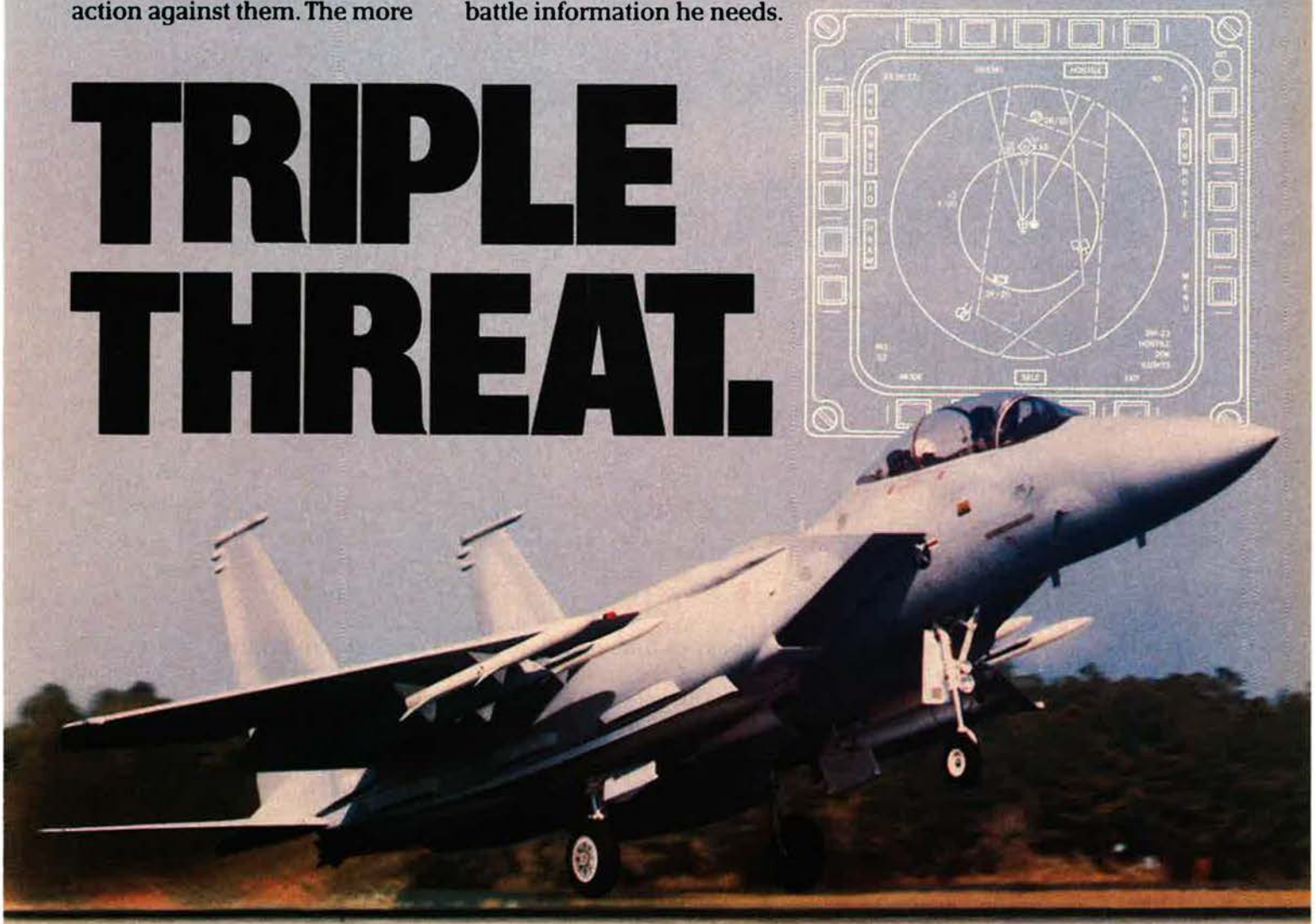
Air Force fighter pilots need the right information and the right weapons. Day or night, in any weather, they must be able to locate and identify aircraft, air bases, ground forces and missile sites, and when necessary, take action against them. The more quickly and accurately they can do this, the greater their chances for success and survival.

That's why the Air Force developed three new weapons systems. The first fighter to carry them all is the F-15 Eagle. So the world's foremost air superiority fighter is about to become even more formidable.

With JTIDS (Joint Tactical Information Distribution System), an Eagle pilot will have instant access to the detailed battle information he needs. With LANTIRN (Low Altitude Navigation and Targeting Infra-Red for Night), he'll be able to navigate and target with pinpoint accuracy, at night and in adverse weather. And with AMRAAM (Advanced Medium Range Air-to-Air Missile), he can fire and forget from substantially longer ranges.

For a strong defense, America counts on the Air Force. And the Air Force counts on the F-15 Eagle.

TRIPLE THREAT.



MCDONNELL DOUGLAS

The defensive alliances are reasonably effective at the strategic and theater levels. The next job is to join forces against terrorism.

Allied Airpower at the Fighting Fronts

BY JOHN T. CORRELL
EDITOR IN CHIEF

Not long ago, the air chief of a Latin American nation launched large numbers of his aircraft in response to a natural disaster. The country next door might have mistaken this for a beginning of hostilities, relations between the two governments being what they were. Instead, the air chief called his counterpart in the other nation and defused the situation with a prompt but unofficial explanation.

This incident—a small reminder that the world's military professionals often work together more fluidly than their governments do—was recounted by Gen. Charles A. Gabriel, then USAF Chief of Staff, at the "Global Aerospace" symposium April 29 during AFA's Gathering of Eagles. In attendance were seventy air chiefs, air attachés, and senior representatives from fifty-three different nations.

International cooperation is evident in such collateral military actions as search-and-rescue, the Chief said. Free world nations also take a reasonably unified approach to strategic and theater defense. Now, General Gabriel said, the community of nations must "hang tough together" against the newer threats of terrorism, surrogate warfare, and low-intensity conflict.

Terror groups can count on support and sanctuary—and often outright sponsorship—from Soviet client states and renegade Third World regimes. The options that the target nations have for reducing their vulnerability to terrorism are fast dwindling down to the use of military force.

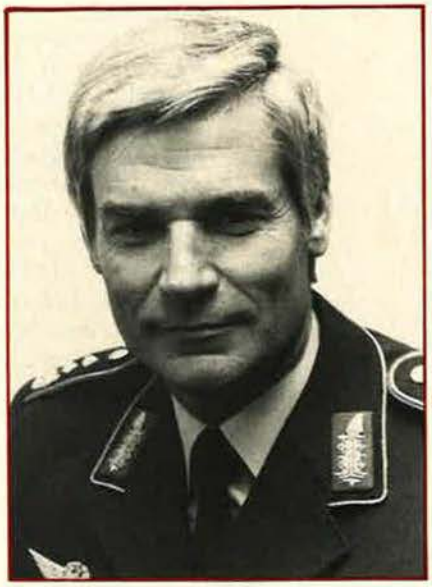
Countering terrorism requires that air forces be ready to conduct operations over long distances, delivering ordnance with great accuracy, General Gabriel said. As an example, he cited the US strike against Libya in April. Air Force F-111s, flying out of bases in Britain, teamed up with Navy aircraft from carriers in the Mediterranean to make that strike.

The antiterror mission, however, comes in addition to, not instead of, the traditional roles of the defensive alliances. The more substantial threat is still the one mounted by the regular military forces of the Soviet Union and its major allies.

For the past forty years, the classic East-West standoff has been in Europe, but over the past decade, the Soviet Union has also been

building with determination onto its power base in the Pacific. Top airmen from Germany, Korea, the United Kingdom, and Japan told the symposium audience that conditions in both the Atlantic and Pacific theaters are starkly worrisome, especially when the threat is seen as they see it—at close quarters.

Geography and circumstances have made Germany and Korea the two places the world watches most intently for signs of superpower trouble.



Eimler: Concerns About Sustainability

Threats at the Borders

"Two-thirds of all Soviet forces are stationed in central Europe or in the western part of the USSR," said Lt. Gen. Eberhard Eimler, Chief of Staff of the German Air Force. "There is no other part of the globe where so many military bases, troops, weapon systems, and nuclear weapons are concentrated as at this line dividing the two power blocs. The Federal Republic of Germany extends from south to north over 625 miles, so that we have the longest common border with the Warsaw Pact. The average width of the Federal Republic of Germany from east to west is not more than 135 miles, a distance that any modern aircraft from the Warsaw Pact can cover in less than fifteen minutes. About eighty percent of our industries are situated in a strip no more than 100 miles deep along the Iron Curtain."

This immediacy of the threat focuses European minds on preparing for a forward defense. "For the highly industrialized and densely populated countries of the Central Region, it would have disastrous consequences if we were not capable of halting an aggression of the Warsaw Pact before it had penetrated into the depths of our area," General Eimler said.

Halfway around the world, the concerns of the South Koreans parallel those of the Germans in several striking respects.

"We have some seventy percent of our economy and thirty percent of our population centered within the capital area of Seoul," said Gen. Kim, In Ki, Chief of Staff of the Republic of Korea Air Force. Twenty-eight miles to the north is the Demilitarized Zone, along which the belligerent and unpredictable North Koreans have massed sixty-five percent of their military resources. General Kim said the North is in position to mount a preemptive surprise attack without further mobilization or redeployment.

"The likelihood of the North coming south in the next few years is very high," he said. The strategy for such an attack would be the "Five-to-Seven Plan." The North Koreans would strike quickly, hoping to win the war before the South Koreans could mobilize or reinforcements could arrive from abroad. According to the plan, Seoul would be in their hands within five to seven days.

The distances separating the British and the Japanese from their armed adversaries are not enormous, but they are enough to be significant in defense planning. Moreover, both are island nations, so attacks on them would require substantial investments of enemy airpower and seapower. These physical characteristics influence the approaches that Britain and Japan take to structuring their military forces and the kinds of contributions they would make to allied defense of their respective theaters.

The United Kingdom has been called an unsinkable aircraft carrier

off the coast of Europe, but it is much more than that, said Air Marshal Sir David Craig, Chief of Staff of the Royal Air Force. In wartime, more than 1,700 NATO aircraft and a substantial portion of NATO's nuclear weapons would be based in the UK. Many communications sites and support facilities are there. Britain's role in ensuring safe passage of reinforcements would be crucial to the Alliance. For these reasons—and because of its 327,000-member military establishment—the UK would be a prime target for attack.

"Concentrated and accurate air attacks on key points and installations could rapidly degrade forces and facilities and have a devastating effect on our contribution to NATO," the Air Marshal said. Consequently, air defense has a high priority for the Royal Air Force. "Every link in the air defense chain has been examined, replaced, or strengthened," he said. An attacker would find it tough going through the RAF's all-weather Tornado interceptors and its layered missile defenses.

The Japanese emphasize defense and, to the displeasure of their allies, will accept no military mission except direct defense of the homeland and its peripheral airspace. The Soviets have begun to breathe hard on Japan's northern flank, and Soviet penetrators cause the Japan Air Self-Defense Force (JASDF) to scramble three times as often as it did ten years ago. Still, Lt. Gen. Atushi Tani, Vice Chief of Staff of the JASDF, told the symposium, "We would never make a preemptive attack on an opponent, even though its invasion [of Japan] is presumed beforehand."

Kim: Attack From the North Likely

Cooperation and Reinforcement

Most of the forty-three nations allied with the United States make strictly local or regional contributions to mutual defense. The heavy-duty job of strategic nuclear balance with the Soviet Union is essentially left to the United States. The US has not been very successful in persuading its allies—Japan, for example—to assume broader regional responsibilities. Even NATO, strongest of all the free world alliances, has been disinclined to involve itself in matters outside of Europe. Within these prevailing local and regional limits, however, the alliances are healthy and work quite well.

A war in Europe would be fought by NATO forces, not by national forces, said Gen. Charles L. Donnelly, CINCUSAFE, at the symposium. All of the plans and preparations are for combined defense. This is reflected in training, exercises, division of theater responsibilities, and the integration of NATO's command and control structure.

The situation is different in the Pacific, where US alliances are bilateral. "As I visit prominent civilian and military leaders throughout the Pacific region, I find more cohesion and coincidence of view than I would have thought possible [this soon] after the Southeast Asian conflict," said Gen. Robert W. Bazley, CINCPACAF. What is lacking, he said, is a NATO-style multinational structure with combined headquarters, command and control, and routine procedures exercised daily. "That's probably our single biggest problem, and we work it to the best of our ability," he said. "We have good forces, but we're not as readily prepared to transition from peace to war as NATO is."

The defensive alliances do not have sufficient forces in place, either in Europe or in the Pacific, to contend for long with a major attack. Success would depend on efficient reinforcement and resupply from outside the theater and rapid redistribution of resources within the theater.

"I'm confident we'll be there when called," General Gabriel said in response to a question from Air Marshal Craig about US capability to reinforce Europe. "We'll be ready to fight when we get there. I think what SACEUR [Supreme Allied Commander, Europe] worries about most is whether we'll get there with enough. Our balance in Europe today is weakest when you compare the land forces. It would be up to the augmenting air forces to take over some of the responsibility in the early days of an attack, when the land forces are not fully in position."

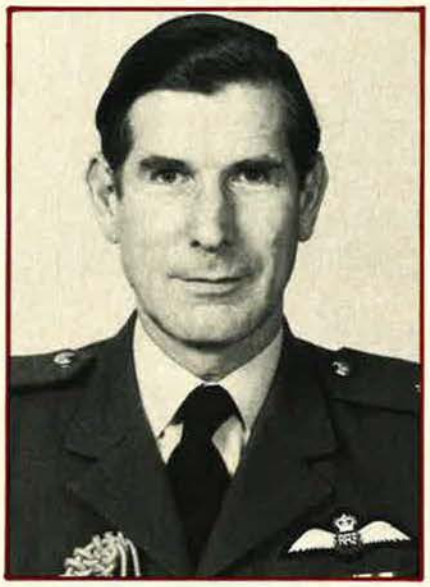
General Eimler said he is bothered by the prospect of insufficient war materiel in Central Europe. "Even if we are well-trained and

well-equipped, we need ammunition for sustained operations," he said. General Gabriel agreed: "Sustainability could be the Achilles' heel for us in Europe."

In the opening rounds of conflict, reinforcement and resupply would be up to combat squadrons and airlifters from the United States. Soon thereafter, though, the allies would begin looking to sealift to sustain them. General Donnelly asked Adm. Wesley L. McDonald, recently retired as Commander in Chief of the US Atlantic Command, about the probable dangers to shipping.

"The submarine threat is not as great as it was in World War II," Admiral McDonald said. "We don't think the Soviets will be going out and marauding the Atlantic and leaving the bastions [of] the Norwegian Sea and the Barents Sea open to US submarine forces. But there will be some submarines out there. We will have to convoy or run our ships in protected lanes and let the fast ones run alone." Destroyer escorts, he said, can barely keep up with some of the fast new merchantmen, which are capable of speeds up to thirty-three knots.

"What I'm really worried about is the ports of reception," he said. "It doesn't take a whole lot to knock out the ports at Amsterdam and Le Havre and other places along the Channel." Admiral McDonald said that the allies today have enough sealift to resupply Europe, but that if the decline in merchant shipping continues for another ten years, a shortage is inevitable.



Craig: Every Link Strengthened

Improvements for Allies

Individually and collectively, the defensive alliances have improved their preparations on the fighting fronts. Thanks largely to support from host nation military forces, General Gabriel said, the program to furnish collocated operating bases in Europe for some 1,500 fighter aircraft deploying from the United States is proceeding well.

As previously reported in this magazine, US tactical squadrons in Europe and the Pacific are appreciably better equipped, better supplied, and more proficient than they were five years ago. *(See "Tactical Warfare High and Low," April '86 issue.)* The allied air forces are making progress, too.

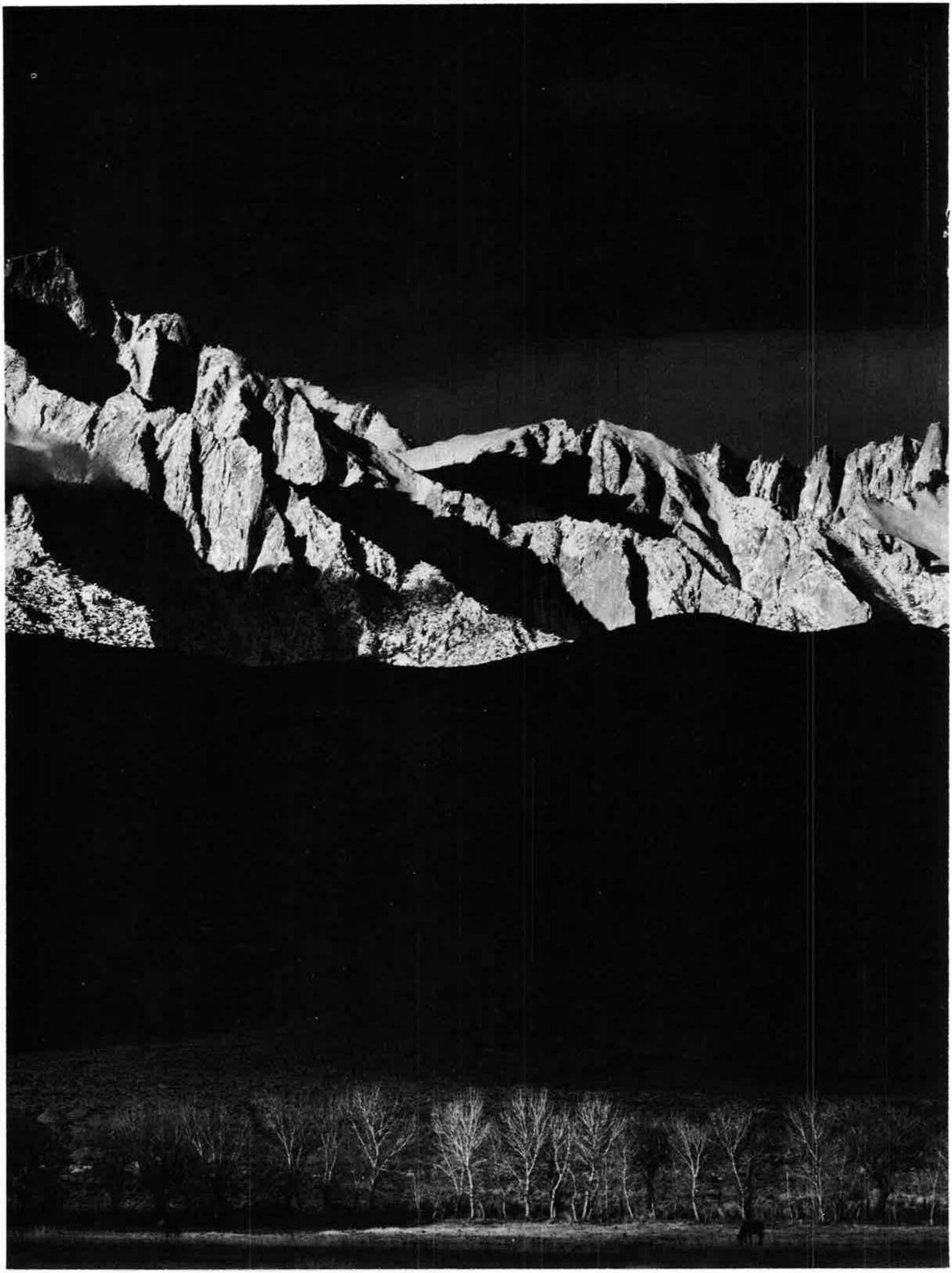
In its most recent assessment of the military balance, the International Institute for Strategic Studies rates the military prowess of the two Koreas as "roughly equivalent." The North has the advantage of numbers and the world's fifth largest army, but that and a Five-to-Seven plan are far from enough to ensure quick consolidation of the peninsula under Pyongyang. "From a historical perspective, it is rare that an invading force has been the ultimate victor in any protracted conflict," General Kim said.

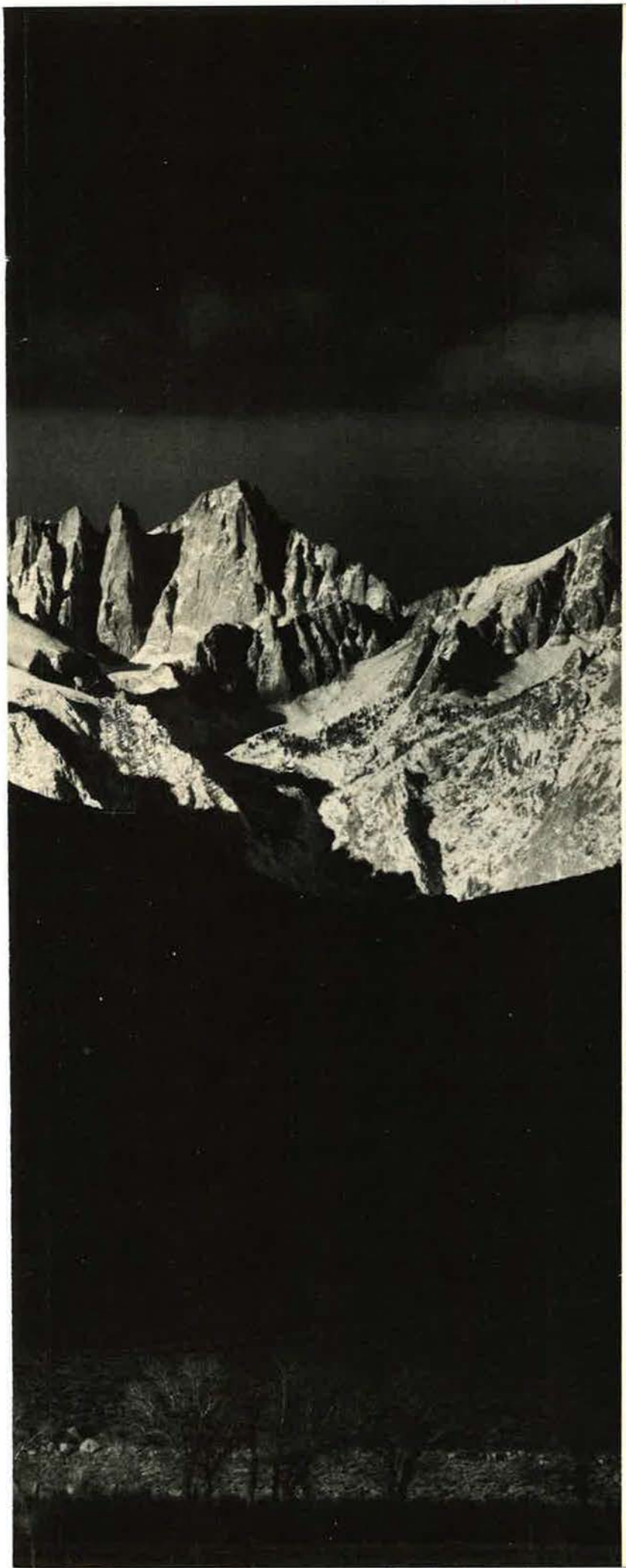
On their way south, the invaders would run into the tough South Korean army, US air and ground units superbly equipped and trained, and the Republic of Korea Air Force (ROKAF). ROKAF fighter/attack squadrons fly F-5s, manufactured in Korea under a coproduction agreement. The line is still open, and more F-5s are on order. This spring, the Koreans received the first of thirty-six F-16s they are buying from the US. Four squadrons of F-4s perform air defense.

The Japanese Self-Defense Forces are also well regarded, their main limitations being political ones. Public opinion in Japan reflects both postwar pacifism and a desire to hold down military spending. As a result, the nation's military posture does not even approximate its economic interests and position. Proposals for Japan to extend its defensive coverage farther out to sea are still controversial. Soviet expansionism in the Pacific has lit something of a fire under Japan's relative feeling of security, though. Permission for the United States to base F-16s at Misawa—the first American fighters on the main Japanese island of Honshu in fifteen years—is an indication of that concern.

Naturally enough, the JASDF is long on interceptors, including F-15s, produced under license in Japan, F-4EJs, and F-104Js. General Tani said that the defense program between now and 1990 will seek to modernize and improve the intercept combat capability, replace Nike-J surface-to-air missiles with Patriots, and upgrade the Base Air Defense Ground Environment (BADGE). Japan is also exploring a follow-on aircraft to its Mitsubishi F-1 support fighter.

The Royal Air Force has laid out a modernization plan that includes expanding its all-weather fighter





Winter Sunrise, The Sierra Nevada, From Lone Pine, California. Photograph by Ansel Adams. Courtesy of The Trustees of The Ansel Adams Publishing Rights Trust. All Rights Reserved.

ANOTHER AMERICAN ASSET:

B-1B. THE U.S. AIR FORCE LONG-RANGE COMBAT AIRCRAFT.

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force by twenty percent by the early 1990s. The excellent Tornado Air Defense Variant, now entering service, will eventually equip all except two of the RAF's home-based fighter squadrons. The British look forward to arming their interceptors with the US Advanced Medium-Range Air-to-Air Missile (AMRAAM) when it is ready.

The Tornado, which comes in several configurations, won trophies at Strategic Air Command bombing competitions in 1984 and 1985. Air Marshal Craig expressed hope that the European Fighter Aircraft program—which, like the Tornado, is a multinational venture—would produce "another world-beater in the even more operationally demanding role of air superiority."

The RAF, he said, is still committed to replacing its Shackletons and improving its airborne early warning of low-level intruders. "Another essential task has been to improve our sustainability," he said. "Weapons and other stocks have been increased. We have acquired VC-10 and TriStar tankers that will eventually more than treble our fuel offload capability and increase the reach and patrol time of our fighters."

Luftwaffe Capabilities

Looking at the aggregate capabilities of the eight allied air forces in Central Europe, General Eimler noted that the German Luftwaffe provides approximately fifty percent of the surface-to-air missiles, thirty percent of the operational combat aircraft, thirty-five percent of the missile weapon systems, and eighty percent of NATO's air defense ground environment. The swingwing Tornado is now the backbone of the German fighter-bomber force and will completely replace the F-104G by 1989. The Luftwaffe also has F-4Fs and AlphaJets in fighter/attack roles. Replacement of Nike air defense missiles with Patriot is imminent, General Eimler said, and air bases will be protected with the Roland short-range air defense system.

Another function of the Luftwaffe, he said, is to provide realistic training for allied air forces "in the probable areas of operations. The Warsaw Pact's area-covering air defense system is continually modernized and improved. It is a necessity for our own air attack forces to train in low-level flying, employing all available avionic and electronic aids. This is a problem in the densely populated area of the Federal Republic of Germany. More and more, military training has become a subject of discussion and controversy. There are steadily mounting complaints about aircraft noise and interventions against low-level flying."

Taking note of the emphasis on air defense in the symposium presentations, Air Marshal Craig observed that this is "a very reactive business. Air defenders are always

Tani: Defense Is the Only Mission

black on the chessboard. We must respond quickly to the enemy's move and seek to wrest the initiative from him."

The same principle is true for defensive alliances. It imposes special requirements for alertness, quick reaction, and preparation to respond to any number of ways in which conflict might unfold. Moreover—unlike the Soviet Union and its allies—the US and its allies do not have the advantage of compact internal lines of communication. This puts a premium on long-reaching airpower that can be dependably effective upon arrival.

The defensive alliances have their flaws and differences, but at least in their major missions, they demonstrate a solid capability to meet General Gabriel's admonition to "hang tough together." ■

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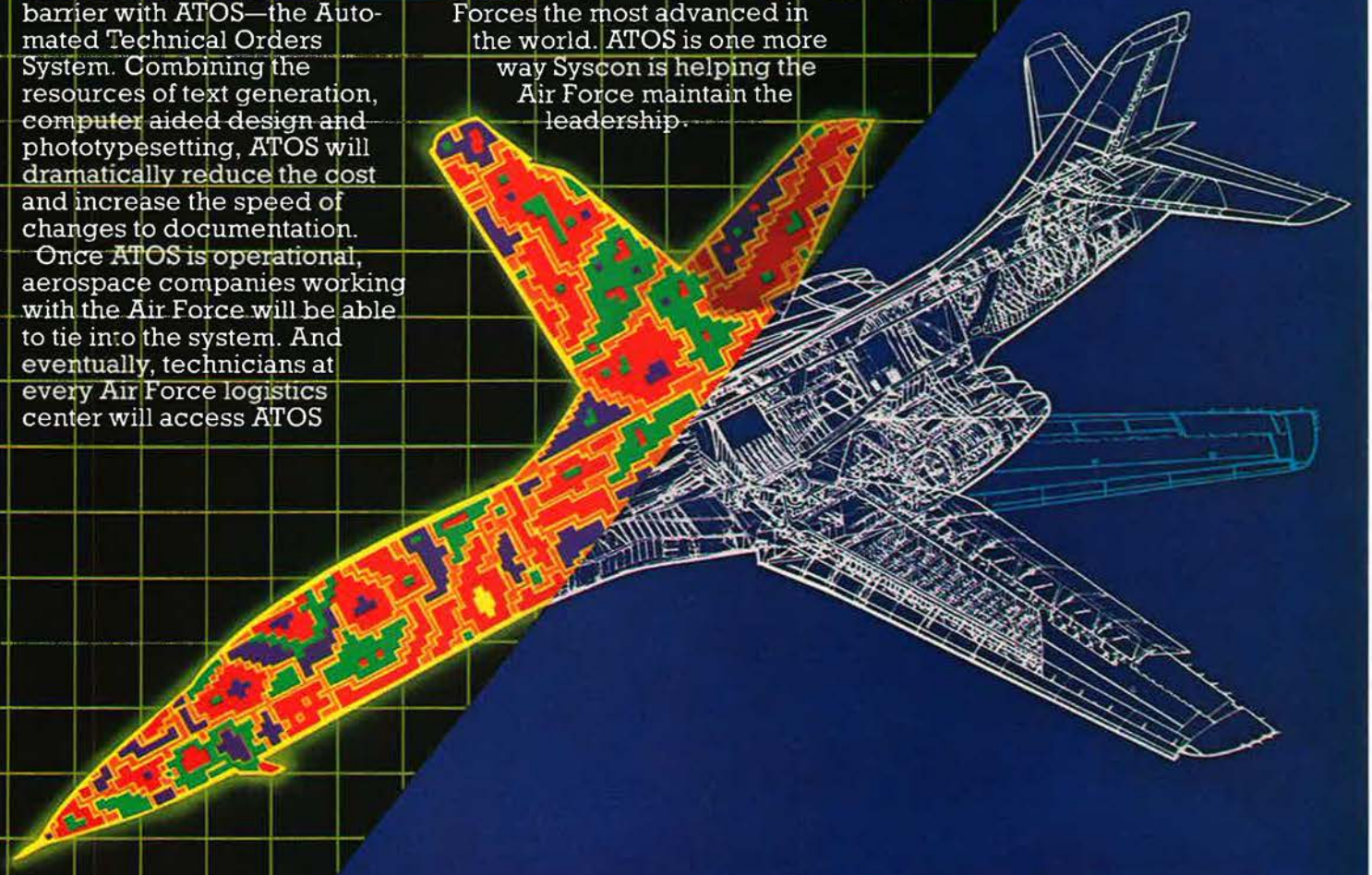


&SYSCON

Europe's oil needs and political inhibitions thwart an effective Mediterranean strategy.

Perplexities

BY GEN. T. R. MILTON, USAF (RET.)
CONTRIBUTING EDITOR

DR. Samuel Johnson once remarked that the object of all travel was to see the shores of the Mediterranean. Today, what with one thing and another, Dr. Johnson might get an argument. The beaches probably teem, as always, with sun-starved northern Europeans, but terrorism has eroded much of the Mediterranean's charm. Added to that ugly threat is the political turmoil around the Mediterranean basin and the unpleasantness associated with it. All in all, travel in a region where airport security verges on paranoia is not what Dr. Johnson had in mind.

Nevertheless, that nearly landlocked sea has an undeniable fascination for a large portion of humanity. Christianity, Islam, and Judaism all have deep roots in the eastern Med, a circumstance contributing both to the fascination and the problem. Turkish/Greek antipathy dates from the aggressive days of the Ottoman Empire and its 400-year hold on Greece, along with all of a great crescent around North Africa. Tel Aviv still resembles a Turkish city, except that part that looks like Miami Beach, and southern Spain and Portugal bear the high-water marks of Islam.

—Sygma photo

LEFT: Libya's Col. Muammar Qaddafi is one of the most destabilizing factors in the Mediterranean basin. This picture, taken shortly before the US Navy retaliated against Libyan aggression by sinking several torpedo boats, shows Qaddafi pontificating from a tractor. RIGHT: The US regularly holds joint and combined exercises with Egyptian forces. This F-16 from the 388th Tactical Fighter Wing at Hill AFB, Utah, is flying over the Great Pyramid during a recent Bright Star exercise.

The Med was a principal scene of action in Britain's long war with Napoleon. Wellington defeated the French in Spain and, finally, at Waterloo, but the British fleet achieved dominance in the Mediterranean. With Nelson's great victory at Trafalgar, Napoleon was reduced at last to a land strategy. Britain could no longer be overcome, or even threatened, at sea. Mediterranean trade was at the sufferance of the Royal Navy.

Seamen have always been particularly fascinated by the Med. In the days of sail, when battleships advanced at the rate of four or so knots, the 2,300 miles between Gibraltar and the Levant was a formidable distance. Islands, such as the Balearics, Malta, Corsica, Sicily, and the several thousand outcroppings in the Aegean, made life interesting for surface-ship navies, but they posed no real problem. Seamanship and firepower were the decisive factors in those simpler times.

These days, life is vastly more complicated for the Mediterranean strategist. Submarines, for one reason or another, are devilishly hard to locate in the Med. Even in the World War II era of the noisy diesel sub, life aboard surface ships was made uneasy by the undersea threat. Nuclear submarines are quieter, faster, and distinctly more menacing. Then, we have airpower as the final, and most decisive, element in modern Mediterranean strategy. It is almost banal to say that whoever controls the air controls the Med, but, banal or not, it is true. It was true in World War II, and it is ever so much truer today. With the advent of modern reconnaissance and jet speeds, the Mediterranean has become a medium-sized and highly visible lake.

Carrier aviation, free of political basing restrictions, has proven an immensely valuable asset in the current Mediterranean power struggle, but in wartime, carriers would be hard put to operate in a Med with hostile land-based air stationed along its shores, to say nothing of the long-range threat from the USSR itself. The question, then, is what will be based along those shores in the years to come? The answer lies in the political destiny of the countries situated around the Mediterranean basin.

in the Med

The Northern Rim

Beginning with Spain, there appears to be little doubt as to its future reliability as a Western ally. The outcome

of the recent referendum on NATO membership was proof enough of that, even taking into account the caveat on military integration. That, we can hope, will come in time. While Gibraltar continues to be a point of contention, and possible friction, between the British and Spanish allies, its importance is diminishing both militarily and as a reason for strained relations. Someday, NATO may well establish a maritime headquarters there with a Spanish admiral in command, a move that would do much to ease Spanish pain over a British colony on the Iberian peninsula. So Spain—a key to any Mediterranean air and naval strategy—appears, in all probability, secure.

France, for all its waywardness with regard to NATO, is undoubtedly a reliable ally should matters ever come to a showdown in the Mediterranean. Although the French government, as was the case in Spain, put relations with Arab countries ahead of those with the United States when it came to the Libyan raid, that behavior was—however distasteful—understandable. Parisian Monday-morning quarterbacks have even claimed that the US action against Libya should have been tougher, and the polls, once more confounding the politicians, have shown the French electorate heavily in favor of the US attack.

The French, as always, have their own agenda. If, however, a real threat—with its consequent effect on oil supplies and trade routes—to Mediterranean security arises, French interests would almost certainly coincide with those of the rest of the NATO nations.

Italy, for all its nominal Communist influence, has, from the outset, provided a headquarters in Naples for the principal NATO Mediterranean commander, the Commander in Chief, South. The US Sixth Fleet has its home port in nearby Gaeta, and there has never been any serious agitation, even in as volatile a city as Naples, against this military presence. The Italians have developed an advanced form of democracy, one in which elected officials have become almost irrelevant. An entrenched bureaucracy provides continuity and direction, the *Carabinieri* prevents mobs from getting out of hand, and Italy remains a dependable ally. There are no longer any pretensions, as there were in Mussolini's day, of the Med's being *Mare Nostrum,* but it would be hard to imagine a viable Mediterranean posture without Italy on our side.

Yugoslavia, six years after Tito's death, remains both outside the Soviet bloc and an ethnic curiosity. How a nation consisting of such disparate elements can resist not only Soviet pressures but internal strife is a tribute to Tito's management. Alarm over what might happen when Tito left the scene has now largely disappeared. The collective presidency appears to be working, although inflation approaching three digits has not contributed to a contented populace. Still, there is no current indication that Yugoslavia is drifting back toward the Soviet bloc. Nevertheless, it is a Communist country of undeclared intentions, should war come to the region.

Nestled along the Adriatic between Yugoslavia and Greece is Albania, perhaps the world's strangest nation. Were it not so strange, and so utterly xenophobic, Albania would pose a definite security problem in the midst of NATO's southern flank. But Albania's communism is like that of no other country, a fundamentalist brand that rejects the backsliders in Moscow and Beijing—or, at least, that is how it was under the forty-year iron-fisted rule of Enver Hoxha, who died in 1985. Whether Albania's new leaders will carry on that nation's self-imposed isolation and nonalignment remains to be seen. All things considered, we should probably hope Albania continues to occupy its own private little world.

Greece is next door not only to the nonaligned Communist states of Yugoslavia and Albania but also shares a border with the Warsaw Pact country of Bulgaria. From a military lookout post on the Greek northern frontier, one can see well into the fertile Bulgarian plain. During the tenure of Colonel George Papadopoulos and his military junta, the Greeks took defense of that mountainous frontier very seriously while, at the same time, getting along better than usual with the Turks. That temporary truce came to an abrupt end during the last days of the junta when the shadowy Brig. Gen. Dimitrios Ioannidis deposed Papadopoulos and engineered the botched grab at Cyprus. In recent years, Greek concern

about the Warsaw Pact appears to have been replaced by concern about its neighbor and theoretical ally, Turkey. The Aegean has become a scene of tension, and the two NATO members avoid any pretense of allied cooperation or harmony.

Centuries ago, Greeks, faced with a thin and rocky soil and too many mouths to feed, took to the sea. The result is a Greek population on the thousands of Aegean islands. Some of these, like Khios and Samos, are almost part of the Turkish mainland. Many others are within sight of the Turkish coast and are, in any case, a

long way from Athens. Cyprus, the cause of the last Greek/Turkish falling out, is only fifty miles from Turkey, a geographic fact that stands firmly in the way of any settlement based on the island's preponderantly Greek population.

Prime Minister Andreas Papandreou, after a period of erratic behavior toward his NATO partners and the United States in particular, seems to be coming around to a more rational stand on mutual security. The realities of life in a troubled world may have offset, to some extent, his apparent animus toward the United States, a country that once gave him citizenship, an education, and indeed, a US Navy commission.

Greek memories of President Truman's decisive intervention in their bloody civil war seem to have dimmed in recent years. The last time I saw it, a few years ago, Truman's statue in Athens had a forlorn and neglected look about it.

Simmering Relations

In any case, the worst period of relations between Greece and the US seems now to have passed. Even tantly allowed Mr. Ozal to assume office. The presidency remains firmly in hand, however, in the person of General Kenan Evren. Turgut Ozal may be head of government, but President Evren is the dominant Turkish figure. The Turkish Army, incorruptible and conscious of its role as guardian of Atatürk's legacy, hovers in the background.

If the number of new mosques is any indication, Turkey is undergoing something of a religious renaissance. There is no evidence that Islam is beginning to affect the secular principles laid down by Kemal Atatürk, but the fact remains that Turks are Moslems and are keenly aware of it. Theirs is a relaxed approach to the teachings of Muhammad, one that allows for raki, a powerful anise-flavored liqueur, and a thriving wine industry. Islam, however, does have significance in Turkish attitudes toward the eternal Mideast standoff between Israel and its enemies. While Turkey has never given any support, moral or material, to Israel's foes, it is almost a certainty that the US can never count on using Turkish bases to bring aid to Israel in the event of another Arab/Israeli conflict.

Navy A-7 Corsair II aircraft played a significant role in recent events in the Gulf of Sidra. The venerable A-7s were first used in Vietnam and have grown in lethality with the use of AGM-88A High-speed Anti-Radiation Missiles (HARMs). Now nearing the end of their shipboard service life, the A-7s will eventually be replaced with F/A-18s. These aircraft are assigned to the USS Midway (CV-41) in the Pacific.

Greek hostility toward Turkey appears to be at a simmer. It is by no means over, nor will it ever be, but things are better than they were a few years ago.

Across the Aegean, the Turkish government of Premier Turgut Ozal is attempting economic reforms under the wary eye of the Turkish Army. The election that brought Ozal to power was contested, somewhat obliquely, by the army. A retired soldier and former NATO acquaintance of mine, General Turgut Sunalp, ran hard for the premiership, but the voters soundly rejected him and his party. And so, the soldiers reluc-

Truck traffic to and from Syria passes by the Turkish base at Incirlik, site of a modern USAF installation. It is clearly understood that the Americans are there for NATO purposes and for nothing else. With that understood, the Turkish-American joint NATO endeavor is on solid footing; what the US is up to elsewhere in the Med is US business. The Turks keep a watchful eye on their Mideast neighbors, but the USSR is the official potential enemy. Turkey, in short, is not ambivalent as to the identity of the Mediterranean threat.

Trouble begins to develop across the next border.

Syria, along with Libya, is a Soviet client and a source of much of the terrorism in the Med. The Soviets wasted no time in rearming Syria after Israel's 1982 pasting, with the result that, on paper at least, Syria now appears a more formidable opponent for Israel than ever. War between these two implacable enemies seems to be at least a possibility. Certainly, there is sufficient provocation: the continuing humiliation of Israel's occupation of the Golan Heights and Lebanon's steady disintegration. Beyond that, there is Syrian economic distress brought on, in part, by the depression in oil prices. While Syrian oil production is modest, the Gulf kingdoms in the past have contributed almost $2 billion a year to the Assad government. Lately, the handouts have stopped. A war with Israel would presumably bring in new contributions.

All this may be mere speculation, but the situation in the eastern Med is perilous. Israel will continue to be threatened by neighbors who are declared enemies as far into the future as anyone can see.

Reluctant Partners

At best, NATO's northern members are reluctant participants in Mediterranean security. The Alliance faces resolutely north, or perhaps northeast, from its Mediterranean moorings and thus avoids seeing the unpleasantness elsewhere in the Med. The Allies view Israel as an American fixation. They are tolerant of it, but their own interests, in their opinion, lie in not stirring up the oil sheiks.

The Camp David accords made Egypt, together with Israel, a principal US beneficiary. Military and economic aid to Egypt amounts to some $2 billion a year, second only to Israel's $3 billion in total US aid. Dating from 1956, when the US abruptly canceled financial support for the Aswan High Dam, Egypt has had a stormy three decades. Gamal Nasser came along to stir up feelings of nationalism and Arab identity—Egyptians, of course, are not Arabs in the true ethnic sense—and he also tied Egypt's military to Soviet logistics and training. After the disastrous war of 1967 and the 1973 cliffhanger, Egypt tired of its role in the recurring battles with Israel. Sadat turned toward the US, Camp David, and a cautious peace. The sweetener in the deal was massive US aid.

Sadat is now gone, and while the peace with Israel still holds, relations between the two countries have cooled considerably. Egypt has enormous problems, and its future looks bleak. The population currently stands, according to an educated guess, at 47,000,000 and growing. As it grows, the problems multiply. Even with the increased fertility of the Nile delta brought about by the Aswan High Dam, Egypt is still more than ninety-five percent desert. It is also poor—desperately poor—with widespread unemployment and underemployment. The riots of the security police last spring may have been an isolated instance, but the seeds of internal trouble are well scattered in Egypt.

Farther along the North African coast are the former Italian and French colonies. Of these, Libya, of course, is the most worrisome, at least at the present time. The US can look back on pre-Qaddafi days with some regret for its shortsighted behavior. King Idris I, an indolent hypochondriac, was our man in Tripoli, and we were

In any strategy designed to protect NATO interests in the Middle East, Egypt plays a vital role. A strong Egyptian ally is also an important player in US plans for ensuring Israeli security. As evidence of the continuing US interest in Egypt, this picture of a C-5 landing while an Egyptian F-4 waits on the ramp was taken during the Bright Star '82 exercise.

completely tied to him and his feckless regime. Young Qaddafi's bloodless coup left us with nowhere to go but out. NATO, even more myopic, let Malta slip out of the Western camp.

During the late 1960s, the conservative Maltese government anxiously sought funds for a runway extension at Valletta airport. The extension was for the purpose of enhancing tourism and would, it appeared, secure the reelection of Premier Borg Olivier, friendly to NATO and the West. The few million dollars for the runway were not forthcoming, and the radical Dominic Mintoff, a man with a tremendous grudge against the British and NATO, came into power.

Now, both Malta and Libya are potential Soviet air and naval bastions. Certainly, they will not be ours.

Farther west, the Kingdom of Morocco remains friendly to our side, at least so long as King Hassan is on the throne. Hassan, however, is as mortal as the next man, and there have already been a few attempts on his life by his own military men. Morocco is strategic territory in any Mediterranean military calculation, and it should be worth a great deal to keep it in our camp.

Spain watches Morocco closely. The small Spanish colonies on the North African coast, Ceuta and Melilla, are apparently coveted by Morocco but, at the moment, not with any hostile intent. Morocco in unfriendly hands, such as those of a Muammar Qaddafi, would be a different matter, not only for Spain but for NATO's Mediterranean interests.

Ad Hoc Strategies

A coherent Mediterranean strategy has been a difficult thing to come by since airpower complicated the life of sailors. Vast military enterprises were undertaken in the Med during World War II, but the strategy, more often than not, was *ad hoc*. And always, behind every move, lay the requirement for air superiority.

The times are scarcely different today. Europe is still almost wholly dependent on oil from the Gulf sheikdoms, along with Libya, Algeria, and Tunisia. Sixty percent of that oil travels through the Mediterranean, much of it by way of the Suez Canal. If this trade route, or the Gulf states themselves, were to become hostage to the Soviet Union and its clients, NATO would become an anomaly, an alliance relying on the goodwill of its assumed enemy. How to protect the oil source and the means of transporting it thus becomes a key factor in devising a strategy for the Mediterranean region. Because more than the sea is involved in such a strategy, there will have to be a heavy reliance on airpower.

During their long years of Mediterranean dominance, the British made Egypt a principal stronghold from which to deploy their strength. When Rommel was riding high, Egypt was the place where the British, backs to the wall, regrouped. It would seem still to be essential to any strategy calculated to protect NATO interests. An Egypt firmly committed to our side is worth a vast amount of effort and American dollars, not only for the security of our Israel protectorate but for the Mediterranean outlook as a whole. The problems facing Egypt down the road are great ones, but it is in the West's vital interests to share in their solution. If Egypt were to go the Iranian route, we could look back on the present difficulties with nostalgia.

Finally, the F-111 raid on Tripoli, for all the disagreement about bombing accuracy and the raid's effect on terrorism, made a spectacular point about the versatility of US airpower. The fact that these fighter-bombers, refueling at night over the water, flew 2,800 miles and came in at low level precisely on their target will not be lost on sophisticated observers. This tanker/fighter combination is one of the truly valuable legacies of Vietnam.

A difficulty in exploiting our land-based air lies in the political inhibitions of our allies. As we learned from the Libyan raid, there is little support in Europe for unilateral American sorties. The tactical air wings in Europe are, in a real sense, hostage to the countries in which they are based. And since there is no chance NATO will expand its horizons beyond the present boundaries, total commitment to NATO is at least worth questioning. If US air resources in Europe are unemployable except in that most unlikely of events, a war between NATO and the Warsaw Pact, then developing a strategy for the Med and adjoining areas becomes a truly perplexing problem. ■

Gen. T. R. Milton, USAF (Ret.), is a longtime Contributing Editor to this magazine. His forty-year military career included combat service with Eighth Air Force in World War II, participation in the Berlin Airlift, command of Thirteenth Air Force in the Philippines, service as Air Force Inspector General and USAF Comptroller, and duty as the US Representative to the NATO Military Committee. He retired from active duty in 1974 and makes his home in Colorado Springs, Colo.

Western Europe must have better defenses against aircraft and shorter-range enemy missiles.

NATO's Need for Air Defense

BY PETER PETERSEN

EVER since President Reagan's "Star Wars" speech in March 1983, the Strategic Defense Initiative (SDI) has been the dominant subject of strategic discussions in Europe.

These discussions are not always rational. How could they be? Nuclear weapons and the possibility of a defense against them are topics that stir the deepest emotions known to man—fear and the drive for survival.

SDI discussions are also difficult to comprehend. Building a defense against nuclear weapons would be so complicated that the real experts and the self-appointed experts discuss it in technical jargon that sounds like Greek to most people.

Moreover, SDI has from the beginning been the target of a fierce disinformation campaign out of Moscow, which is not helpful in our internal debate.

A year ago, despite all this, my government clearly stated its political support for SDI.

Whether and to what extent German firms will participate in SDI research is being worked out by experts in government and industry. Our side will not inhibit cooperation across the Atlantic.

Support for SDI

There are three basic reasons for my government's political backing of SDI.

First, the Soviets have for years been working on a ballistic missile defensive system of their own.

Second, SDI may open a new path to meaningful arms control. Such a path is badly needed. The ABM, SALT I, and SALT II treaties have not slowed the frightening buildup of offensive nuclear missiles. On the contrary, the number of such missiles has tripled since East and West sat down together in 1972 to begin trying to reduce it.

Third, SDI could decrease our fear of a nuclear exchange. In the present state of affairs, it is possible that we would have to resort to nuclear weapons all too quickly under an attack in Europe by superior conventional forces. This could well lead to a nuclear response by the attacking force.

Because of the terrible destructiveness such a response would bring to our own people and territory, we have been wondering for some time how convincing the nuclear part of our deterrence really is.

This question is becoming graver. The near-total concentration on SDI in the strategic debate has pushed into the background some potentially dangerous developments—new, short-range Soviet ballistic missiles being introduced into the European theater, plus cruise missiles and new standoff missiles also coming along for fighter-bombers.

What to do about these missiles is a dilemma that NATO must urgently address.

In the 1970s, we focused our attention on the buildup of the Soviet medium-range (5,000 km) SS-20 missiles. They were not covered in the SALT II process because they were no threat to the United States proper. It was and is obvious, however, that they could easily destroy all of Europe.

The lack of a NATO response to these SS-20 missiles threatened to decouple the defense of Europe

The author believes that the deployment of the SS-20 (not a violation of SALT II because it did not threaten the continental US), without an appropriate response from NATO, could have decoupled the US from the defense of Europe.

from the US strategic nuclear deterrent and, thus, to decouple the NATO alliance itself. The exclusion of the SS-20 missiles from consideration in the SALT II process compounded this problem.

The decoupling was prevented by US deployment of Pershing II medium-range ballistic missiles and ground-launched cruise missiles in Europe. This is why Moscow, which has been trying to divide us from America for the last forty years, campaigned so feverishly in Western Europe against the Pershing IIs and the GLCMs and regarded their deployment as a diplomatic fiasco on its part.

Arranging for the acceptance of the missiles in my country was not easy—except for the Kola peninsula in the Soviet Union, there is no area in the world with such a concentration of nuclear warheads as in the densely populated Federal Republic of Germany.

The Concern Subsides

Now that we in NATO have demonstrated our political determination and our strategic unity, the subject of ballistic missiles unfortunately seems to have receded from our strategic considerations, which are largely taken up with SDI.

Like a traveling preacher, Dr. Manfred Woerner, our Minister of Defense, goes from one NATO meeting to the next and from one of our capitals to another urging us not to overlook the ominous developments that too few of us—even among strategic experts—are heeding.

Having deployed 441 SS-20 medium-range ballistic missiles since 1976, the Soviet Union is now modernizing its force of shorter-range ballistic missiles, deploying and developing new cruise missiles, and preparing to introduce new standoff weapons for fighter-bombers.

Among these, the ballistic missiles pose the worst immediate problem. They make up what is called the short-range ballistic missile (SRBM) force that is deployed with Soviet combat units. They are especially dangerous because of their short time of flight to targets.

In this category, the Soviet Union has deployed 700 SS-21 Frog-7 missiles with a 150-kilometer range, some 550 SS-23 Scud missiles of 350- to 500-km range, and 100 SS-12/SS-22 Scaleboard missiles of about 100-km range.

The Soviet Union is also developing sea-launched and ground-launched varieties of the AS-15 cruise missiles, with which it is now equipping its bomber force.

Obviously, all this greatly increases the nuclear threat to Europe. The ground-launched and sea-launched cruise missiles have not yet been deployed, although it is expected that they will become operational over the next year or two. Dr. Woerner estimates that the Soviet Union will have deployed 2,000 modern cruise missiles by the end of the 1980s.

But the short-range ballistic missiles are abundantly operational. Their deployment began soon after the previous round of Geneva arms-control negotiations between the US and the USSR came to an end in 1983.

This is the reason we urged Washington to include them in the current round of the Geneva negotiations for an interim arms-control agreement—and we are very glad that they were included in the US proposal.

By considering only intercontinental-range ballistic missiles, the SALT II process created a "gray zone" for medium-range ballistic missiles that the Soviet Union exploited in deploying its SS-20s. Including the shorter-range missiles in the current round of Geneva negotiations serves notice on the Soviet Union that there will be no such "gray zone" of exploitation for them.

A complicating factor, however, is that the Soviet Union could finesse the Geneva negotiations on nuclear weapons by arming its shorter-range ballistic missiles with non-nuclear warheads even while retaining their first-strike capability.

I quote Dr. Woerner as follows:

"An arsenal of very accurate weapons which can be conventionally armed gives to the Soviet Union a new, far-reaching capability. If you combine . . . foreseeable improvements of reconnaissance and command and control with modern [conventional] warhead technology and intelligent submuni-

tions, you will [have] a new conventional option that could change the military balance in Europe decisively."

Conventional Strike Options

Today, the Soviet Union assigns key military targets—air bases, command centers, troop concentrations—in Western Europe to its nuclear offensive forces. These targets can be taken out only in a first-strike nuclear attack. That, of course, entails a tremendous risk for the attacker; he does not know, but has to fear, that such an attack would be the start of an all-out nuclear war.

The new developments emphasized by Dr. Woerner offer the Kremlin a substitute conventional option, that of attacking the key military targets in a first strike with nonnuclear weapons—a capability that they do not have today.

The Soviets consider that option very attractive—to be able to break NATO's defensive backbone in Europe without risking a nuclear war.

One of the most creative and interesting Soviet soldiers, Marshal N. V. Ogarkov, when Chief of the Soviet General Staff two years ago, put it like this:

"Rapid changes in the development of conventional means of destruction and the emergence in the developed countries of automated reconnaissance-strike systems, long-range, high-accuracy, terminally guided combat weapons, unmanned aircraft, and qualitatively new electronic control systems make many types of weapons global and make it possible to increase sharply (by at least an order of magnitude) the destructive potential of conventional weapons, bringing them closer . . . to weapons of mass destruction in terms of effectiveness.

"The sharply increased range of conventional weapons makes it possible to extend immediately active combat operations not just to the border regions but to the entire [enemy] territory, [something] not possible in past wars."

Improving Air Defense

In view of all this, what we hope to do—and obviously this has to be taken up by the whole Alliance—is to widen the range of NATO's air defense.

The versatile Patriot, a surface-to-air missile system being deployed along the front lines of the Central Region, faces numerically superior Warsaw Pact air forces. An improved Patriot could counter Pact missile forces as well.

We have taken an important step in this regard in deciding to deploy modern, effective Patriot and Roland A1 air defense systems on German Air Force bases and American air bases in our country that could be used against attacking enemy aircraft.

Experts tell us that an improved Patriot could be deployed against missiles as well.

In looking forward to systems to replace HAWK and Roland missiles, we are considering that such systems should have the ability to fight not only aircraft but also missiles.

So far, the US and we have spent about the equivalent of $200 million (in US dollars) on development of a "Rolling Airframe Missile" (RAM) to fight low-flying, Exocet-type missiles. The US and Germany evenly divide ninety-eight percent of the RAM program funding, with Denmark providing the remaining two percent.

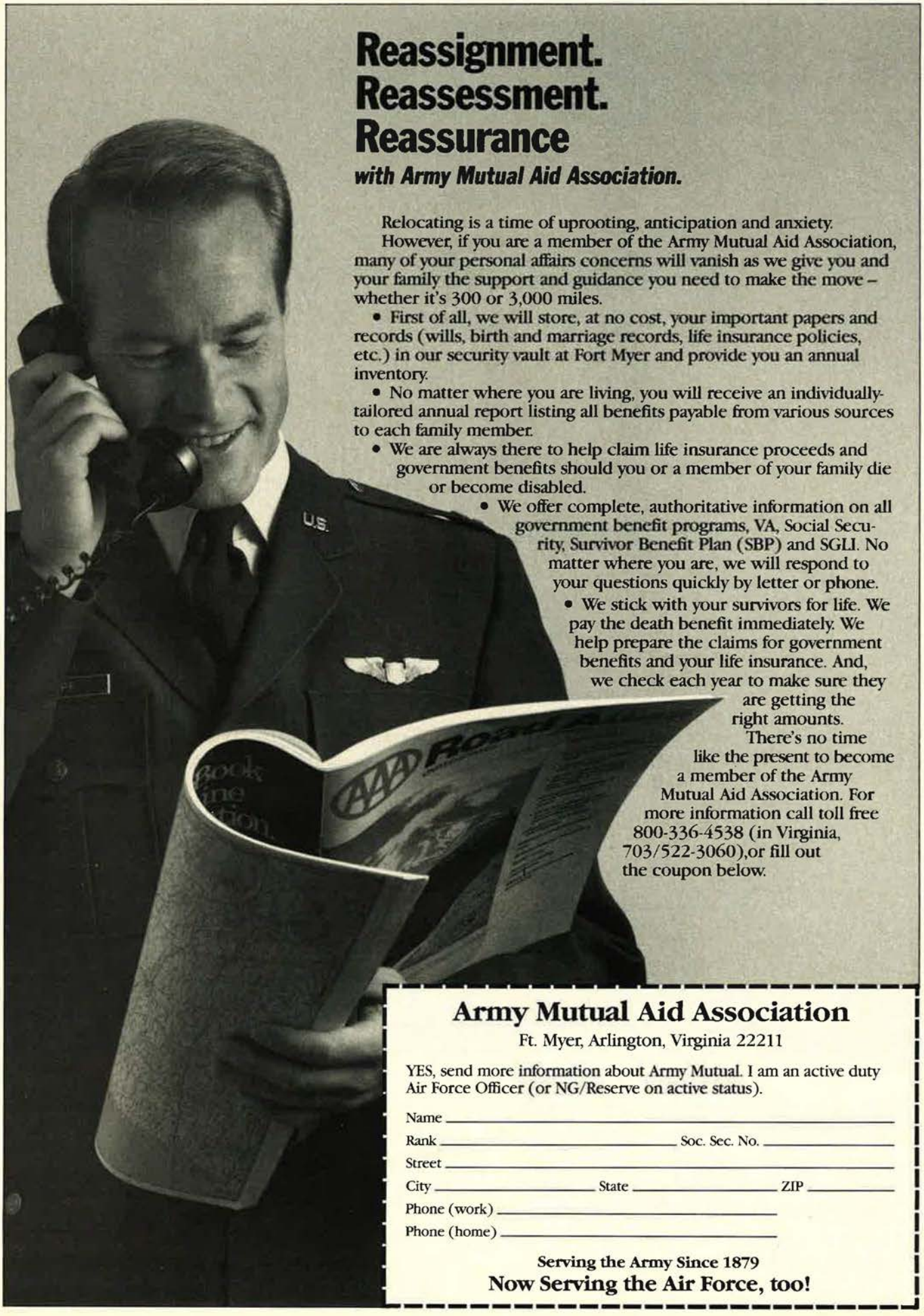
In spite of a lot of problems and unforeseen cost increases, we put much stock in the RAM system, which will have to be included in any concept for improving our air defenses against the growing threat of missiles.

And then, of course, the SDI program comes into the picture with the expected technological fallout from the phase of its research that is dealing with terminal defenses.

But we should not make the mistake of concentrating on SDI and counting on it for the future to the extent that we lose sight of the immediate threats and fail to cope with them now.

A dramatically improved air defense against both aircraft and shorter-range enemy missiles is one of the most important challenges that NATO is facing. ■

Peter Petersen is the ranking member of the West German Bundestag's Armed Services Committee. A native of Hamburg, he is a member of Germany's Christian Democratic Union and the German Society for Foreign Policy. His earlier articles for this magazine include "How the Burden Is Borne" in the December '84 issue and "Germany and Its Peace Protesters" in the May '85 issue.



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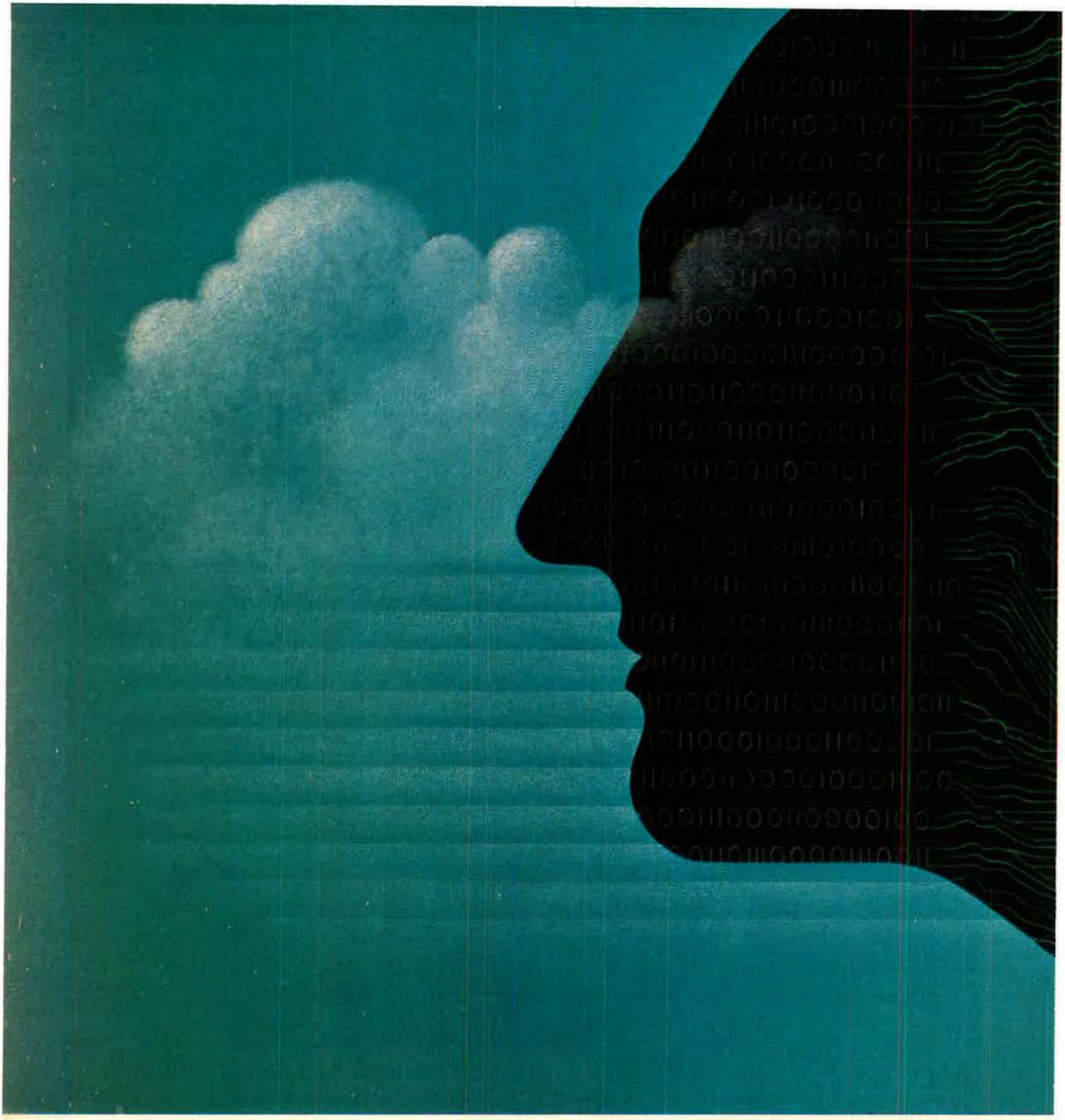

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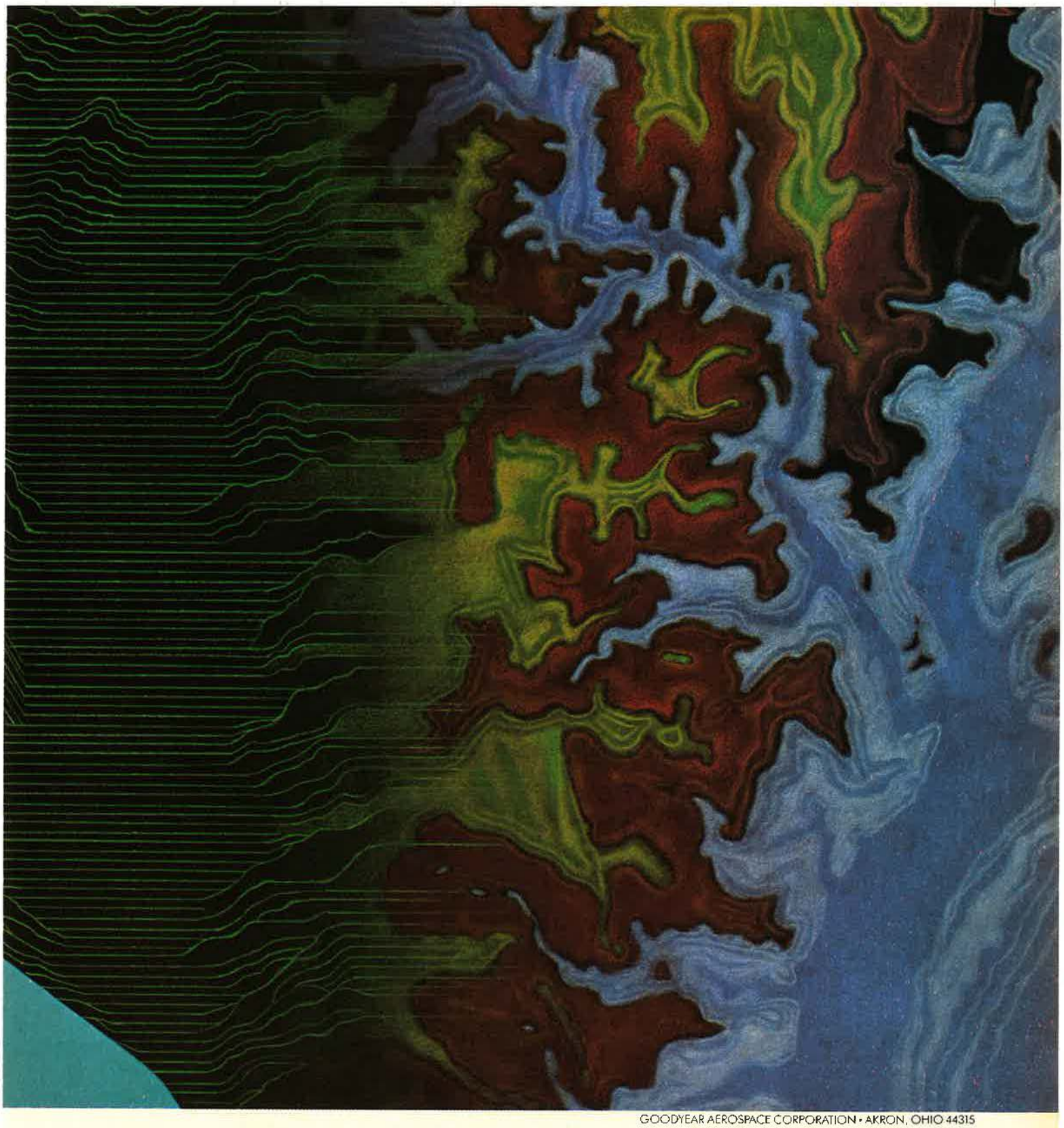

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AFLC is spending close to $850 million to cure its long-standing data problems and become more responsive to combat needs.

AUTOMATING LOGISTICS

BY MAJ. RANDAL E. MORGER, USAF
CONTRIBUTING EDITOR

THREE years ago, the defense logistics community suddenly became sharply visible to the public eye. Congress was holding hearings on spare-parts overpricing, and the media was having a field day with spares "horror stories." Secretary of Defense Caspar Weinberger established a ten-point program to make major changes in the way the Defense Department purchases spare parts.

Within the Air Force, the Corona Require study looked at the logistics process and revealed that there were "not enough spare parts available to support wartime commitments." An October 1983 Air Force Management Analysis Group report gave further insight into the problem of spare-parts acquisition, and a lot of midnight oil was burned as Air Force officials began planning what would eventually total more than 300 actions to revamp the supply and acquisition process. Air Force Logistics Command (AFLC) was charged to implement most of those initiatives.

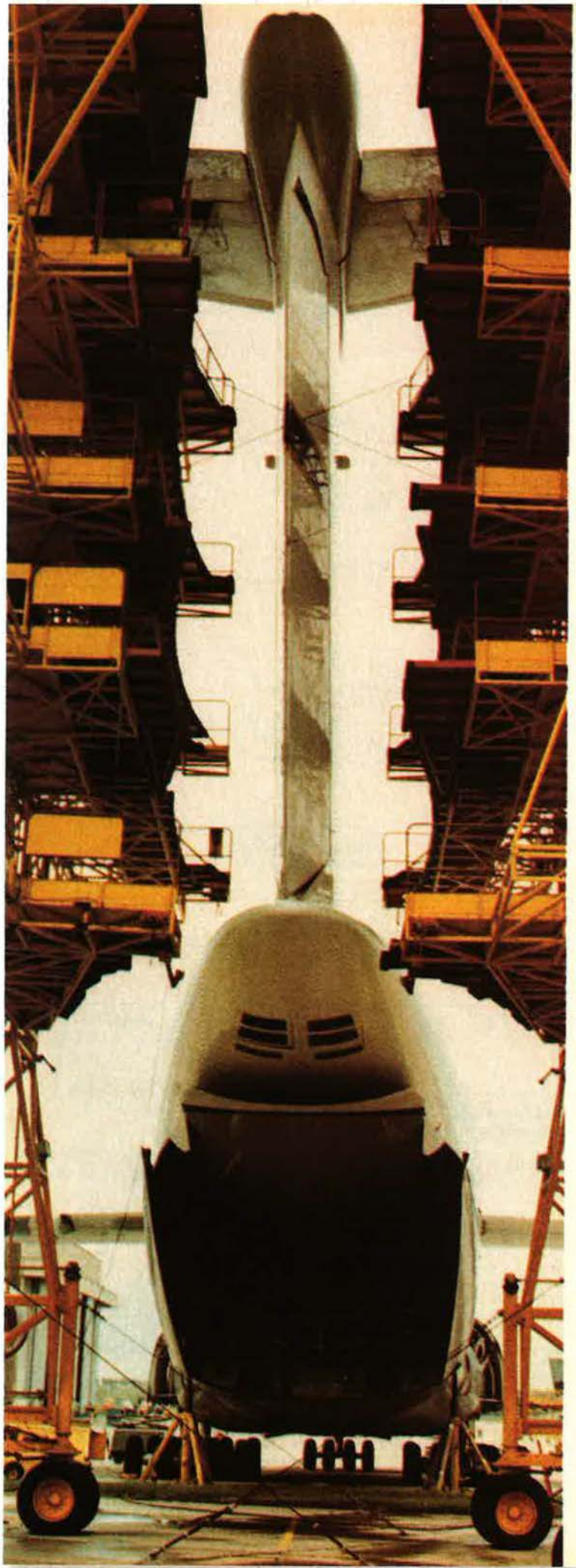
Although the reforms may have been painful at the time, AFLC today is far more capable of supporting the Air Force's operational commands.

However, a giant hurdle remains. One of the recurring themes in all the reports about logistics shortfalls was that the automated data processing (ADP) systems were insufficient and out of date. That conclusion "came as no surprise to AFLC," said Brig. Gen. Trevor A. Hammond, who heads AFLC's Information System Deputate. "We had been working toward [rectifying that] since the late 1970s. In fact, Logistics Command people helped prepare many of those reports."

Modernizing the logistics computer systems is easier said than done. Because of the magnitude and complexity of the systems involved, it will be a long-term venture. AFLC's improvement program has three elements: management of acquisition, parts inventory, and maintenance requirements by weapon system; support to those weapon systems as dictated by contingency plans; and a huge boost to real-time or near real-time responsiveness so that AFLC can depict future needs more accurately.

In each of those areas, AFLC's current information systems, primarily designed in the 1960s, are inadequate. Many of the 500 information systems in use were developed to keep track of specific functions. Only a few have either an "on-line" real-time capability or the ability to integrate—exchange information—with another system. "Processing data in a batch mode," as it is performed today, "is fine if all you want is record-keeping, but it really frustrates our ability to chart trends, anticipate problems, and use the data for upfront decision-making," General Hammond said.

In the early 1970s, AFLC tried to integrate its logistics functions with a computer and communication network called the Advanced Logistics System (ALS). The scope of that program was "just too big," say command officials. The technology of the era was inadequate to overcome integration problems. ALS



As suggested by this maintenance scaffolding framing a C-5 Galaxy at Kelly AFB, Tex., logistics is a large and complex business. New information systems now coming on-line will help "Loggies" get parts to combat forces quicker and more efficiently than ever before.

was canceled in late 1975, and the lessons learned have not been forgotten.

In the intervening years, the logistics community regrouped, rethought the problem, and took advantage of both information-processing advances and lessons learned in the commercial sector. The result is the AFLC Logistics Management Systems (LMS) Modernization Program, a long-term approach to automating and integrating logistics systems for the 1990s.

General Hammond explained that this LMS modernization effort is "functionally oriented." At present, it encompasses ten new information systems aimed primarily at solving data processing problems in four AFLC core functions—requirements development, acquisition, storage and distribution, and maintenance. Seven of the new systems will be tied together by two major communications systems, forming an interactive network called the "Big Nine," to place a wealth of diverse information in the hands of decision-makers. *(For more on the "Big Nine," see the chart, p. 82.)* AFLC estimates that sixty large new mainframe computers will either replace or interact with present processors.

How It's Different

General Hammond compared today's ADP orientation with tomorrow's information systems by noting that today's systems still focus on peacetime item management. That old "beans in the bins" orientation is a brake on the command's push toward combat support responsiveness. For example, it now takes several days for a supply manager to find out the status of a priority requisition.

Planned systems will shave that time to minutes. "The maldistribution of resources that is all too prevalent today will largely disappear," General Hammond said. "Resource visibility will be much better, and we'll be able to get the right part to the right place when we need it." Unnecessary weapon system downtime will be cut drastically, and operational managers will be able to make smarter decisions based on the comprehensive data at their fingertips.

General Hammond also empha-

sized that the program for the new LMS bears little resemblance to ALS. Development of the new information systems is being handled by private contractors and managed by AFLC Systems Program Offices. Beyond that, "We're taking a solid modular building-block approach, with tests proving that each module works before we go on to do the next one," General Hammond said. He added that implementation and integration of the different systems is also being done in increments, using a "risk-reducing approach."

The entire modernization effort is under intense scrutiny at both Air Force and DoD levels, with even the most modest program slips subject to thorough review. "We're under no illusions on the modernization program," the General said. "This is a very difficult, very complex undertaking. But we're confident it can be done."

Since DoD's Major Information Systems Review Council gave AFLC the go-ahead in late 1984, four of the systems have achieved Initial Operating Capability (IOC), and with present schedules and funding levels, the AFLC ADP modernization effort should be

The LMS "Big Nine"

Program	Primary Function	Major Contractors	Status	IOC/FOC[1]	Estimated Cost[2]
Requirements Data Bank (RDB)	Requirements forecasting	BDM Corp. (Development); Systems and Applied Sciences Corp. (Independent Validation)	Varies by LAG (Logical Application Group)	IOC: August 1985 (LAG 1); FOC: April 1986 (LAG 1), April 1989 (LAG 9)	$136.5
Weapon System Management Information System (WSMIS)	Requirements forecasting	Honeywell, Amdahl (hardware); Dynamics Research Corp., The Analytical Sciences Corp. (software)	Definition, development, acquisition (some elements operational)	IOC: March 1984; FOC: September 1987	$47.2
Contract Data Management System (CDMS)	Acquisition	Phase I contract award to take place in September	Acquisition (Phase I); Definition (Phase II)	IOC: April 1987 (Phase I); FOC: June 1990 (Phase II)	$49.8
Stock Control and Distribution System (SC&D)	Storage and distribution	Contract awarded in July 1986 to Martin Marietta Data Systems or Computer Sciences Corp.	Development	IOC: October 1986; FOC: January 1989	$205.2
Enhanced Transportation Automated Data System (ETADS)	Storage and distribution	Automated Sciences Group	Definition	IOC: June 1986; FOC: December 1986	$6.3
Depot Maintenance Management Information System (DMMIS)	Maintenance	Government-furnished hardware for Phase I; to be determined for Phases II and III	Operational (Phase I); Acquisition (Phase II)	IOC: June 1986 (Phase I); FOC: June 1990 (Phase III)	$89.9
Engineering Data Computer-Assisted Retrieval System (ED-CARS)	Maintenance	AT&T Technologies	Development	IOC: October 1986; FOC: May 1987	$32.9
Local Area Network (LAN)	Communication, integration	TRW Defense Systems Group; Information Systems & Networks	Acquisition and implementation	IOC: September 1986 (Hq. AFLC), January 1986 (ALC sites); FOC: October 1985 (Hq. AFLC), July 1990 (ALC sites)	$126.2
Intersite Gateway Processor (ISG)	Communication, integration	ARINC for prototype; production contractor to be determined	Implementation (link to AUTODIN); Acquisition (link to the Defense Data Network [DDN])	IOC: September 1986 (AUTODIN); FOC: May 1987 (DDN)	$21.9

[1]IOC is initial operational capability; FOC is full operational capability.
[2]Expressed in millions of then-year dollars. Research development, test, and evaluation (RDT&E) cost of $40.9 million and Depot Maintenance Industrial Fund (DMIF) cost of $81 million are not included.

Procurement of three other major information systems is also managed by the LMS Modernization Program. However, they are not linked to the interactive network and are funded separately from the "Big Nine." They include the Automated Technical Order System (ATOS), the Reliability and Maintainability Information System (REMIS), and the Central Procurement Accounting System (CPAS).

completed by 1990. Total cost of the new systems is projected to be about $850 million, with $314 million being obligated by the end of FY '86. "We've had tremendous support from the Air Staff, the Secretariat, DoD, and Congress," said General Hammond. "I think everyone recognizes what the return on the investment will be in terms of increased combat capability."

The payback should be substantial. For example, planners foresee that one new system, the Weapon Systems Management Information System (WSMIS), will increase aircraft availability rates by ten percent—which means several hundred additional fighter aircraft on call for combat sorties at any given time.

WSMIS, one of two new computer systems keyed primarily to readiness and sustainability, has two parts: a classified system tied to the World-Wide Military Command and Control System (WWMCCS) that provides sustainability information, and a separate unclassified system dealing with readiness. WSMIS has already achieved IOC and is now providing theater-wide assessments on combat readiness and sustainability, along with unit-level sustainability and "get-well" assessments.

WSMIS will eventually become a subsystem of the larger Requirements Data Bank (RDB). This system promises huge advances in the way the Air Force forecasts logistics needs. RDB will allow planners to compute individual weapon systems requirements across a wide spectrum of peacetime and wartime scenarios. This capability means that the Air Force will be able both to adjust rapidly to changing weapon system programs and to allow senior military and civilian officials to assess possible reprogramming actions. Moreover, the entire character of the inventory manager's domain will change to an almost clinical atmosphere of computer terminals instead of files and piles of paper.

Implementing in LAGs

But RDB will do much more, such as cutting from months to days the time it takes to produce a spare-parts budget forecast. Because of its complexity, AFLC is implementing RDB in what it calls Logical Application Groups (LAGs). LAG 1 provides "quick-upfront" capabilities for Program Objective Memorandum (POM) and budget preparation. LAG 1 is already fully operational, and the benefits of automation are being seen for the planning, programming, and budgeting system (PPBS). The tedious efforts of the past in assembling and sorting PPBS data have become almost pleasurable.

The next step, LAG 2, "is the heart and soul of RDB," said General Hammond. It will complete the integration of other on-line data bases and absorb several complete systems, including some financial analysis and file maintenance functions. LAG 2 is scheduled for Full Operational Capability (FOC) by November of this year. More than 1,500 people have been trained during LAG 1, and an estimated 5,600 will have been trained when LAG 2 achieves FOC. Follow-on LAGs, which deal with system integrations to track and forecast information about recoverable spares, war requirements, and equipment, will come along incrementally through 1989.

The second of the core logistics functions, acquisition, is also getting much needed help through LMS modernization developed at McClellan AFB, Calif., and Hill AFB, Utah, for export commandwide. The Contract Data Management System (CDMS) will automate many actions in the processing of AFLC's annual work load of a quarter million purchase requests and half a million contracting actions. General Hammond anticipates that benefits will include a ten percent reduction in administrative lead time and better safeguards against parts overpricing.

Phase I of the system, dealing mainly with enhanced automation capability, will be operational by late FY '87. Phase II, consolidating nine currently operating data systems and incorporating the capability from Phase I into a fully interactive system, is planned for completion in 1990.

In the core area of storage and distribution systems, the Stock Control and Distribution System (SC&D) and the Enhanced Transportation Automated Data System (ETADS) should help unit-level combat readiness by controlling supply inventory and distribution better. "The primary goal of these programs is to get parts to our customers faster," General Hammond said. SC&D will cut down depot processing time and provide for quick redistribution of parts to meet changing priorities. It also ties together other AFLC warehouse upgrades, such as the Logistics Marking and Automated Warehouse Systems, both of which are already operational.

At a projected cost of $205.2 million, SC&D consumes almost one quarter of the entire modernization program budget. Again, the benefits will eventually outweigh the price tag—by reducing AFLC's pipeline inventory and by improving parts delivery times, aircraft availability rates will increase.

ETADS is a $6.3 million system to manage Air Force transportation funds and the movement of cargo. The program will integrate and upgrade five current data systems when it achieves FOC in December of this year.

The major maintenance information system in LMS is the Depot Maintenance Management Information System (DMMIS). It will replace forty-one existing systems. Each year, AFLC depots overhaul about 2,000 aircraft and 9,000 engines and last year repaired almost 2,000,000 component parts. DMMIS will improve scheduling and maintenance work loads, provide better use of workers' skills, and ensure that the right parts are on hand at the right time for depot repair and maintenance.

Faster Data and Updates

Other LMS maintenance-oriented systems are also in the works.

The Engineering Data Computer-Assisted Retrieval System (EDCARS) will give depots easy computer terminal access to engineering data now stored on 38,000,000 microfilm slides. In addition, equipment and parts contractors who have engineering data stored in the system will be able to update their data directly from their factories. EDCARS will also reduce from one to three weeks to two to four minutes the time needed to obtain drawings.

A view of automated storage modules at the Ogden Air Logistics Center, Hill AFB, Utah. One LMS project, the Stock Control & Distribution System, will tie together such already completed warehouse upgrades and significantly cut down depot processing time. (USAF photo)

The Automated Technical Order System (ATOS) will handle technical order (TO) data in much the same way as EDCARS handles engineering data. Along with greatly reduced research time, ATOS will be able to get changes and updates to tech orders down to base level in about a week. Right now, the process can take more than five months. Additionally, ATOS will yield a fourfold increase in daily TO page production and has already increased TO change capability. The first portion of ATOS has been implemented at Ogden and Warner Robins ALCs.

One new information system under the LMS modernization has elements of both the requirements development and maintenance core logistics areas. REMIS, for Reliability and Maintainability Information System, will support AFLC's increased emphasis on reliability and maintainability. REMIS will rely heavily on base-level automated maintenance systems to extract data on each combat unit's daily logistics activities, such as aircraft break rates and parts problems. Information from these units will be available to major command planners and AFLC reliability engineers to establish trends and provide proactive fixes. Of equal significance is the combat units' ability to get "feedback" through the system.

Communications links are critical to the integration of these LMS systems. AFLC has installed Local Area Networks (LANs) at each of its five ALCs and at the command's headquarters. LANs provide data communication between information systems. Another communications system, dubbed the Intersite Gateway (ISG), will provide access to the military's Automated Defense Information Network (AUTODIN) and to its replacement, the Defense Data Network (DDN).

One huge advantage offered by LANs is the ability of any authorized user to sit down at a single computer terminal and call up data from any of the new information systems, using just one "protocol," or method. Up and running command-wide, LAN links are already demonstrating their value with quicker data collection and retrieval. ■

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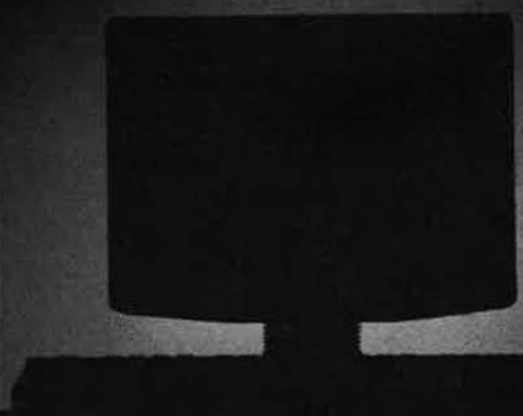

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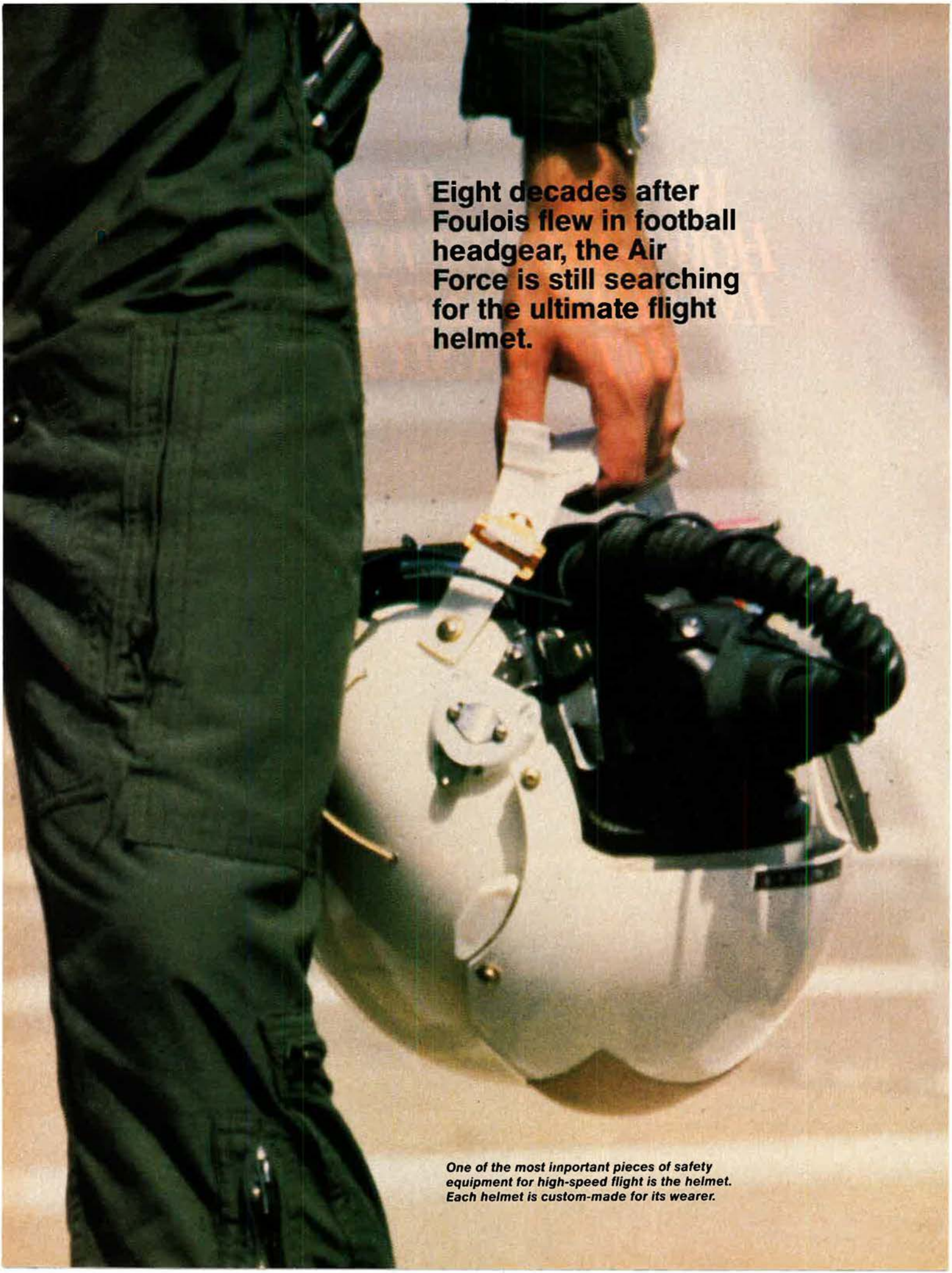

Eight decades after Foulois flew in football headgear, the Air Force is still searching for the ultimate flight helmet.

One of the most important pieces of safety equipment for high-speed flight is the helmet. Each helmet is custom-made for its wearer.

BRAIN BUCKETS

BY C. V. GLINES

WHENEVER we see a jet pilot or astronaut today, he's usually wearing or carrying a helmet of space-age plastic almost as hard as steel. It is carefully custom-fitted to that pilot's head and has concealed radio earphones, a pull-down visor, and an attached oxygen mask. The object of this equipment, of course, is to protect an airman's head, eyes, and face and enable him to breathe at the high altitudes being flown today.

Like most other pieces of military flying equipment, what is in use today was developed over a long period of time under trial-and-error conditions. Take the safety belt, for example. Maj. Gen. Benjamin D. Foulois, one of the first US military airmen and Air Corps Chief of Staff from 1931–35, is credited with being the first to strap himself into an aircraft.

Benny Foulois was sent to Fort Sam Houston in 1910 with Aeroplane No. 1 under orders from the Army's Chief Signal Officer to "teach yourself to fly." He recalled that on March 2, 1910, after only a few minutes of dual instruction several months before at College Park, Md., he made his "first solo, landing, takeoff, and crash."

When the aircraft was repaired ten days later, Foulois made five flights, but the landing after the last one almost did him in. The plane hit a sharp downdraft. He went up as the plane went down, and he hit his head on the top wing. When he came down, he hit the seat hard and almost fell out.

"The only reason I wasn't thrown out was that there were two truss wires in front of the pilot's seat," he wrote in his memoirs. "With throbbing head and aching seat, I jammed the nose of the plane downward and managed to regain control of my bucking bronco before it stalled. The landing was as near to a crash without being one as could be imagined." The next day, he had a strap made at the Fort Sam Houston saddlery shop and lashed himself in the seat on subsequent flights. This strap was the world's first safety belt.

Foulois didn't mention it in his autobiography, but he also wore a football helmet afterward. He may have been the first aviator to do so. Lt. Thomas Selfridge, fixed-wing aviation's first fatality, had died in 1908 from a skull fracture suffered during a crash. He was not wearing any type of head protection.

Football helmets thus became the first of a long line of "brain buckets" in the US Air Force—all designed to protect an airman's head. Students and instructors used them in training schools until shortly after World War I.

Meanwhile, British and French combat pilots during the war were using a French-designed protective helmet. Made of cork, rubber, and metal fibers and covered with a dark fabric, it offered excellent head protection. However, American pilots found they couldn't turn their heads far enough in combat and opted for soft leather helmets lined with fabric or fur, or cloth helmets, even though neither provided much crash protection.

As aircraft were designed with partially enclosed cockpits and as engines were placed in front of the pilot, engine noise became a problem, especially when radio headsets were installed in the helmets. When planes were able to go higher and became more sophisticated, so did the airman's personal flying equipment. Following World War I, many types of winter helmets were tested, including experimental electrically heated helmets, which were not satisfactory. (A twelve-volt electric cloth insert for wear under a regulation winter helmet was tried early in World War II, but it also proved ineffective.)

Headsets and Fur

Various lightweight helmets were also designed during the early 1920s, some of which were used throughout World War II. Retaining straps for goggles became standard. Some, made for primary flying schools, were equipped to accommodate the one-way Gosport tubes used by instructors to communicate with students in flight. As the students passed on to basic and advanced training schools, where they flew aircraft with enclosed cockpits, they were issued helmets with headsets—or just headsets, which were worn over a cap or with no cap at all. Few basic and advanced flying instructors wore helmets of any type once cockpits were enclosed. However, leather helmets and goggles became the status symbol for all pilots flying open-cockpit aircraft.

When oxygen masks were re-

quired for altitude flying, helmets were designed with snap fasteners on both sides. But not all helmets had sockets for earphones. Some were padded with cotton batting to reduce noise; a few airmen inserted women's powder puffs to reduce noise further, which was always a problem because of leakage around the front of most helmets of the time. These were used long after World War II by ground personnel, especially by Navy crewmen working on the decks of carriers.

Different types of inner linings were used in winter helmets through the years. Some had dog fur, nutria, chamois, pelts of South African or Brazilian hairsheep, doeskin, mouton, and silk-pile fabric. One type of winter helmet, the B-9, was designed during World War II for use by nonflying personnel, maintenance crews, and emergency ground use in cold weather. It was made of pile fabric and lined with mouton, extending far enough in the back to cover the neck against the cold, rain, and snow. It could also be worn over other headgear for added warmth. This basic style, with large earflaps that can be tied over the top of the head, is still popular today with hunters, police officers, and others who may work in cold climates.

Aerial gunners had a special helmet called the G-1 gunner's auxiliary helmet, which was worn over a regular flying helmet. It was made of a hard brown papier-mâché shell and had sponge rubber padding and cotton webbing inside to absorb the head-numbing shocks of a gun turret.

C. G. Sweeting, curator of flight materiel at the National Air and Space Museum, noted in his excellent reference book *Combat Flying Clothing* that extensive experiments on many types of handmade hard helmets were conducted at Wright Field's Personal Equipment Laboratory beginning in 1943. He writes: "William L. Moore, an engineer at the laboratory, personally tested most of the early designs by donning the sample helmet and hitting himself on the head with a mallet and banging his head on a post."

The laboratory had been established that year because of Gen. H. H. "Hap" Arnold's oft-stated complaint about existing flight clothing and related airmen's gear. In the early days of World War II, there had been a question about jurisdiction over the design of personal flying equipment and a lack of coordination between the Quartermaster Corps of the Army and the Army Air Forces. Flight crews had complained loud and long over the years about their equipment, and it was not until General Arnold established the laboratory that clothing and personal equipment were procured for flying personnel without oversight by an organization whose main interest was supplying the ground soldier.

A far cry from today's high-tech, high-impact plastic helmets, the leather helmet was standard attire for the early generations of airmen. As can be seen from the photo, this leather helmet features attachments for goggles and built-in headphones. The intrepid aviator is then-Maj. Gen. Henry H. "Hap" Arnold, circa 1940.

The laboratory took advantage of the availability of many experts in the various equipment industries involved. The Clothing Branch was staffed with textile engineers, anthropologists, clothing designers, pattern makers, and test engineers. Donald Husley, assigned to the laboratory during World War II, explained in a letter to Sweeting what it was like:

"Each member of the laboratory was made aware of the importance of his or her efforts to the successful completion of the mission of the AAF. We were told, quite forcefully, that the final responsibility was ours alone. We could request assistance from the various segments of the industry, but we were to personally prepare all specifications and related documents. This then was the end of total dependence on any part of the industry for the preparation of procurement data. We made some mistakes, but they were consistent mistakes and as such were easily correctable. Perhaps our greatest accomplishment was the standardization of patterns. For example, if the AAF procured size medium regular flight suits from twelve sources, all garments had the same finished dimensions.

"However, it is my firm belief that the most important contribution to the eventual development of all armed services personal equipment was the separation of the developmental agencies of the Army and the Army Air Forces. The resulting competition, although never acknowledged by either service, certainly expedited development and vastly improved the quality of all military clothing and personal equipment."

The Hard-Hat Era

Toward the end of World War II, experiments were conducted with fiberglass hard hats for fighter pi-

lots. Aluminum side plates were attached, which enclosed padded radio earphones. This was a forerunner to the development of the P-1 protective hard helmet adopted in 1948. The first helmets used by a number of the original P-80 pilots in the late 1940s were tank helmets furnished by the Army.

Meanwhile, the helmet experiments at Wright-Patterson AFB became more sophisticated. Instead of having a lab technician run his head against the wall, someone made a weighted pendulum device that zapped the helmets being tested with ever-increasing force until the subject inside called a halt. To the relief of lab personnel, this technique was later improved by testing on mannequins. The force applied to helmets under test was measured and equated with what was known about the human head's ability to withstand hard blows.

The advent of jet fighter and bomber aircraft was the basic reason for developing hard helmets. In turbulence at high speeds, jet pilots found their heads being knocked from side to side, hitting the canopy. There was genuine fear that a pilot could be rendered unconscious from the drubbing, especially at low altitudes.

In the years since the Korean War, the first jet air war, much more experimentation has been conducted on head gear to safeguard crew members against new weapons that might be used against them and against high-speed bailouts. The aerodynamic shape of the first jet helmets produced lift during high-speed ejections and could instantly leave a pilot's head as he left the aircraft. This realization brought changes in the shape and construction of helmets and visors in the post-Korean era.

One of the basic changes was to make helmets that would be custom-fitted to an individual's head to assure helmet retention, protection, and comfort during aircraft maneuvering and acceleration. This is accomplished by a helmet liner made of layers of plastic, usually bubbled Styrofoam similar to that used in packaging, that have been molded to create protrusions that, when the liner is heat-softened, partially collapse to conform to the contour of the head.

There are other concerns now. Experiments are being conducted on various types of helmets and visors to protect the wearers against chemical agents, nuclear flash blindness, and laser damage as well as the age-old problem of outside noise. Helmet manufacturers in recent years have been designing integrated systems with communication components, breathing systems, and visors as part of a total package, rather than as add-ons to a basic helmet shell. Human-factors engineers have been employed to consider practicality and comfort.

One of the innovations developed by Gentex Corp. of Carbondale, Pa., is a head cooling system for helicopter aircrew members. It circulates chilled water through a skull cap worn under the helmet's inner liner. Used only in warm weather, the cooling system is an addition to the normal head cooling system that circulates filtered air over the pilot's head and eyes. Other protections for chopper crews built into the new helmet will be an air-filtration system, an artificial facepiece, and a chemical-resistant shroud to protect the wearer in the event of nuclear, biological, or chemical threat.

Noise, the age-old hearing destroyer for aircrews, is a constant challenge to helmet makers. A study by the Surgeon General several years ago found that hearing loss was costing the government nearly $50 million annually in compensation. Many who were being compensated had been helicopter crewmen.

To help solve the problem, a helmet featuring rotating sound protective earcups was developed. The rotating earcups allow the helmet to be adjusted comfortably on the head while the earcups stay in the proper position to shield against outside noise. Later models were designed with an outside bulge over the ears to give even more noise protection, especially for sonar operators, who need to hear the pings of the sonar equipment.

Another relatively new Air Force helmet program is the advanced Integrated Chemical Defense System (ICDS). As with the helmet system for helicopter pilots, the ICDS consists of a helmet, visor, and breathing system that provides eye, head, and respiratory protection and that aids pilots in case of chemical or biological contamination. A shroud fastens around the bottom of the helmet and visor and over the

The hard hat for pilots of the future will look radically different from helmets of today. The Visually Coupled Airborne Systems Simulator (VCASS) is one avenue being explored for air combat in the next century. The VCASS presents flight information visually that the pilot can respond to by voice commands or visual cuing.

mask to form a liquid- and vapor-proof barrier for the head and shoulders. Filtered air circulates through the helmet to provide cooling for the head and eyes and to keep the visor clear of moisture. A portable ground unit provides the pilot with filtered air and communications during transit between the ground shelter and the plane.

Helmet of the Future

The Air Force recently announced that researchers were working on a "revolutionary" visual system within a pilot's helmet for use in flight simulators and future high-performance aircraft.

The helmet of the future has a miniaturized electronic system that projects onto its lens-like "eyes" a view of the world outside the cockpit, with certain flight data superimposed over the scene. With that display in front of his eyes, the pilot can activate various aircraft systems merely by eye and hand movements and voice commands rather than by reaching for knobs and switches.

The new helmet program, conducted by the Air Force Aerospace Medical Research Laboratory, is called the Visually Coupled Airborne Systems Simulator (VCASS). Although it may have other uses in the future, the VCASS was originally conceived as an inexpensive replacement for the costly visual systems used in current large flight simulators that consist of projection screens, terrain boards, computers, and complex electronics to provide a realistic simulation of the view outside the cockpit.

The inventor of VCASS is Dean Kocian, who made two technological breakthroughs in order to reduce the VCASS helmet into a small, self-contained visual system. He made a one-inch-diameter TV picture tube with a high-resolution, high-contrast, high-brightness image and mated that with an optic system that relays images from the tube to the pilot's eyes. Computer-generated graphics are projected onto the small TV screen. The image then passes through the optics system, where it becomes, to the pilot, a realistic, three-dimensional scene with a 120-degree panoramic view.

Dr. Thomas Furness, program manager for the helmet and chief of the Visual Display Systems Branch in the laboratory's Human Engineering Division, believes the system can be adapted to future cockpits. "The trend of future supersonic aircraft," he says, "is to have smaller cockpits and reclining seats to allow pilots to tolerate high G forces. Since a pilot in reclined positions cannot see his cockpit instruments, we need another scheme of presenting to him the information he needs to fly the aircraft. VCASS can do that."

According to Dr. Furness, the fidelity of the VCASS is so "pure" that when a pilot wearing the helmet moves his head, he sees only that particular section of the overall scene. This is because of an electromagnetic radiator located behind the cockpit seat that emits rays that are sensed within the helmet and that give the computer the location and position of the pilot's head. When the pilot looks up, down, or to either side, the computer will bring up the display as if the pilot's eyes were actually looking in that direction in the real world. Data on weapons being carried, targets, potential threats, and flight instruments is superimposed on the screen with appropriate symbology.

Voice Control

Since a pilot experiencing high G forces cannot normally use his hands to activate switches, the VCASS enables him to use his voice, point a finger, or switch his eye positions. For example, a pilot of a future supersonic fighter might look at a weapon system he wants to activate. He will simply say the word "Select" and then look away. When he sees the target on his helmet optics and is ready to fire, he will command the system verbally to "Lock on" and then "Fire!"

The future pilot may also have a sensing system sewn into his glove. By pointing his finger at certain switches, he can activate them automatically.

Another VCASS feature is the capability through the use of aircraft sensors to display the safest route away from a hostile environment. The computer system can also call up target locations and display predetermined navigation waypoints so that a pilot will know his position at all times. If he wants to know the distance to, say, a mountain ahead of the plane, he need only look at the mountain on his helmet display and give a voice command. Within a fraction of a second, the display will carry a digital reading of the mileage to the mountain.

The VCASS has potential uses beyond simulator training and advanced fighters. It may help develop future cockpits by presenting different flight situations, new weapon systems, or advanced mission requirements on the helmet displays. Thus, it is an inexpensive tool requiring only reprogramming of the software to conduct experiments. The system can "grow" as an aircraft takes on new missions and armaments. Already, the US Army has requested the laboratory to use VCASS to study some flight scenarios for its family of light helicopters. Experiments are also being conducted for NASA to enhance the ability of astronauts to work, navigate, and rendezvous in space as well as dock with satellites and receive information from earth.

Since the basic research and engineering work has been essentially completed on VCASS, a lightweight, low-bulk Air Force version is now being made and will soon be flight-tested. A three-pound system containing the pilot's helmet, visual display, microphone, and headset is being developed for the Army. A prototype model will be flight-tested next year.

Although the airplane has been in existence for more than eight decades, the perfect helmet that will satisfy all pilot comfort desires and mission requirements is not yet here. Fortunately, however, experimentation goes on continually to find the ultimate helmet that will not only protect but also help future Air Force combat pilots fly their aircraft more efficiently and safely. VCASS shows promise that it may be the "brain bucket" for tomorrow's flight crews. ■

C. V. Glines, a retired Air Force colonel, is a free-lance writer, a magazine editor, and the author of a number of books. A frequent contributor to this magazine, his by-line most recently appeared here in the May '86 issue with the article "A Bolt from the Blue."

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

Rep. Les Aspin, the outspoken Chairman of the House Armed Services Committee, wields considerable influence over the fortunes of the Defense Department.

At the Focal Point of Key Controversies

BY BRIAN GREEN
AFA DIRECTOR OF LEGISLATIVE RESEARCH

REP. Les Aspin (D-Wis.), the outspoken Chairman of the House Armed Services Committee, sees a very basic failure in the top management of the Defense Department: "The guys running the Pentagon are not very good." The problem is a "failure to set priorities, basic policy."

That kind of bluntly expressed—often controversial—opinion is typical of Representative Aspin. An independent thinker on defense issues, much of what he has to say makes the Pentagon squirm.

He expresses dismay, for example, over the Administration's strategic modernization policy. He is particularly concerned over the fate of the Midgetman, a small, mobile ICBM scheduled for initial deployment in 1992. Mr. Aspin says, "What I think the Pentagon ought to do, if they're smart, [is] go ahead with the 37,000-pound missile, get Congress to raise [the weight limit] . . . go ahead with full-scale development in December on that missile with a single warhead, and look at the possibility of MIRVing it within that weight limit. . . . Worry about MIRVing it later. Get the program started!" The missile is currently limited by Congress to a maximum of 33,000 pounds, but an intense debate over the missile's weight, and the number of warheads it will carry, continues.

While worried about the Small ICBM, Representative Aspin is much more positive about the Advanced Technology Bomber (ATB) and doesn't believe that more than 100 B-1Bs should be produced. He is a strong supporter of the two-bomber program. While the ATB will be expensive, he expressed satisfaction that the cost will be in line with that of the B-1.

Although he is harshly critical of the Pentagon's top brass, his comments suggest that DoD procurement problems are not so bad as they seem. "Procurement is always a problem," he says. "It's never as bad as the public thinks it is in the worst scandals, and it can always be improved." While the public may think procurement is a mess and nothing is being done to correct the problems, Mr. Aspin believes that the Defense Department is about as effectively run as the government's other departments—and maybe even a little better. He points out that really "revolutionary changes" have been imposed on the Pentagon procurement system over the past several years and that the system is still in turmoil as a result.

Mr. Aspin's Priorities

The HASC Chairman's own priorities are clear. In the context of overall defense spending, he thinks the balance for the Air Force is about right, but he would spend more on the Army and less on the Navy. He parts company with the Reagan Administration in his preference to stress conventional forces over the strategic modernization program. And he places the greatest importance on current accounts—manpower and readiness—over procurement and research and develop-

Chairman Aspin was a congressional aide to Sen. William Proxmire (D-Wis.) and a Department of Defense "whiz kid" under former Secretary of Defense Robert McNamara before rising to his present position in the congressional hierarchy. He was selected to be the HASC Chairman in 1985 over six other Democrats with greater seniority—an indication of his persuasiveness and influence on defense issues.

ment funding. In support of that emphasis, he cites figures that indicate dramatic gains in the quality of manpower with only modest increases in expenditure. Recruitment improved dramatically, the intelligence ratings of new recruits rose, and retention skyrocketed, all with only a twelve percent increase in manpower funding.

He is concerned, however, that the "current accounts" are the most vulnerable in the current budget crunch. As he is wont to point out, the defense cuts being considered would hit actual expenditures in the coming budget year—outlays—proportionately harder than budget authority—the legal authority to spend money in the future. Readiness and personnel funds are virtually all spent in the year in which they are authorized, while procurement and R&D funds are spent over a period of several years. Mr. Aspin is worried that the current accounts might be cut drastically to achieve the outlay savings required by the current-year defense budget now under consideration on Capitol Hill.

Strategic Modernization

Representative Aspin has a lot of problems with the Administration's strategic modernization program as it is currently structured—or, as he might suggest, unstructured.

"Their whole strategic program is in a mess. If you can tell me what it is they're up to, I would like to hear it," Mr. Aspin says. He cites questions about basing modes for the second fifty MX ICBMs, the debate over the proper configuration for the Midgetman, and varying rationales for the Strategic Defense Initiative (SDI) as evidence of pervasive confusion within the Administration.

He further accuses the Administration of doing nothing to address the much-discussed "window of vulnerability," the idea that US land-based missiles might be susceptible to destruction in a preemptive Soviet attack. He sees the Scowcroft Commission recommendations—the Midgetman and an arms-control agreement to limit the number of Soviet warheads—as the cornerstone of strategic stability by assuring the survival of a land-based retaliatory force.

"If they delay the Midgetman for two years . . . they will have left office in 1988 with still no answer in sight," Representative Aspin complains. "That's a really remarkable piece of work."

Critics of the single-warhead approach maintain that MIRVing the Small ICBM could save billions of dollars. The effect of additional weight on the missile's mobility, however, is unclear, and the Air Force is conducting studies to determine answers to these questions. But for Mr. Aspin, delay is the key factor. A decision to MIRV the small missile could delay its initial operating capability by a year or two, and he believes long consideration of numerous configurations will lead to confusion and

exasperation on the part of lawmakers. "If you start gunking around with this missile, you're going to end up doing to it what you did to the MX," he says.

Even if the Pentagon concludes that MIRVing is the right path, an extended fight would ensue, he believes. Military reformers would object to "adding bells and whistles" to a simple system, and arms controllers would continue to argue that a single-warhead missile is stabilizing because it is a low-value target and is ineffective as a first-strike weapon. Mr. Aspin accepts the arguments of the arms controllers, but believes that mobility is the real key to success. "I was never opposed to a MIRVed Small ICBM. I [just] wanted it to be small," he now says.

Even while expressing support for the Scowcroft Commission Report, which also recommended 100 MX missiles in Minuteman silos, and for R&D funding for alternative MX basing modes, he insists "the problem with MX isn't the basing mode, it isn't the cost, the system has just gotten fouled up." It is afflicted, he says, with the kind of confusion that he seeks to avoid in the Midgetman program. Indeed, he believes a new, more survivable basing mode might even exacerbate the MX's political problems by leading to doubt about the wisdom of putting the first fifty missiles in Minuteman silos. "[The MX debate] is beyond the argument stage," he says. "Rationality carries just so far in this business, and then if the rational people keep screwing up, it enters into the area of the absurd." He sees little chance that the political climate for the MX will change in the near future.

He differs in large degree with Administration policy on SDI as well. While President Reagan has made SDI his top defense priority, Representative Aspin looks at it as "a great bargaining chip. . . . I can say it's a bargaining chip, because I'm not bargaining. If I were the bargainer, I don't think I'd say it." He accuses the SDI supporters of two-faced support—publicly promoting a program to protect populations while privately conceding that the real goal is to protect US nuclear forces.

Mr. Aspin supports continued research and development funding, but sees only limited technical promise. He suggests that SDI might be able to protect missiles and provide limited defense against antitactical ballistic missile attack but that the system will never protect populations, an idea he describes as "loopy." While he sees limited technical possibilities, he does not necessarily support deployment. "The whole issue of trying to defend silos is not technologically crazy, but I think it does lead to a lot of problems on stability."

Mr. Aspin abides by the arms-control theory that argues that the Soviets would deploy additional offensive forces to overcome US silo defenses. That theory led to the Antiballistic Missile Treaty of 1972, but did not slow the massive expansion of the Soviet strategic offensive arsenal. In spite of that expansion in the absence of defenses, Mr. Aspin insists that mobility, embodied in the Small ICBM, is the far cheaper way to ensure the survivability of land-based missiles. He dismisses simpler, lower-cost ground-based defenses as "rubber bands and baling wire."

The Chairman continues his opposition to the F-15-launched ASAT miniature homing vehicle. He favors cancellation of the system, which he described as "the Model T of ASAT capability." He notes that other activity is ongoing that could perform the ASAT mission.

The Chairman and SALT

Representative Aspin expressed uncertainty as to how President Reagan's decision to abandon the limits imposed by the unratified SALT II Treaty would affect congressional consideration of the strategic modernization program. But he was harshly critical of the decision itself, which he describes as "absolute lunacy." He maintains the decision was politically motivated: "We're just stuck with ideology. People are not making that decision based on rational choices."

He concedes that the Soviets are violating the treaty. But, he says, "The small violations they have been conducting are annoying, and, indeed, we should not allow them to get away with it, but [the violations] are much less than [what] they could do if SALT were abandoned altogether." He approves of what he considers a more proportional response to Soviet violations—an acceleration of the Midgetman. Under SALT constraints, the Soviets have had to dismantle fourteen submarines and more than 500 ballistic missiles, according to Representative Aspin. At the same time, he maintains that the US faces no significant constraints while staying within the limits of SALT II. He believes the US is facing a window of perhaps three or four months during which the US would be in violation of SALT II limits on multiwarhead platforms because of the planned deployment of additional bombers equipped with air-launched cruise missiles. But Mr. Aspin maintains that the US would again fall within the multiwarhead limits when it dismantles another Poseidon submarine later this year.

Representative Aspin cheerfully concedes that the Soviets already "have enough stuff to blow us up fifteen times" and that there is an argument about what they would do in response to a US breach of SALT II numerical limits. But he is absolutely convinced the the Soviets would engage in a massive buildup of their offensive arsenal. Why? "What in their history has ever [suggested] that the Soviets are rational?" Mr. Aspin asks. "The Soviets will go on piling nuclear weapon on nuclear weapon. . . . The Soviet Union has no finite concept about overkill. They think more is better. Even if you don't get military benefit, you'll get political benefit from it, and I think they're probably right. . . . It would have some political fallout." How do you negotiate with an irrational opponent? "One thing you do is you don't do something stupid like violate SALT II when you've got them in an agreement like that," according to Mr. Aspin.

The HASC Chairman views the SALT II compliance issue as a national security issue, not an arms-control matter. "Is it in our national security interests for the Soviets to add warheads and launchers?" he asks, concluding that it is not. He says that he will support legislative efforts in the House to mandate continued US SALT II compliance and that he is unconcerned with the constitutional issues stemming from such a course of action. Treaties must be submitted to the Senate for advice and consent and are then ratified by the President. The Senate never gave its consent to SALT II, and the treaty was never ratified. The proposed and pending legislation would ignore these constitutional procedures

and enforce treaty provisions over the objections of the Chief Executive. Nevertheless, Mr. Aspin intends to attach a binding measure to the defense authorization bill that would dictate US compliance.

He will not, however, support a congressional measure that would enforce a comprehensive nuclear test ban on the US by cutting off funding for such tests so long as the Soviets refrain from nuclear testing. He argues that such a ban cannot be verified at low levels of testing. Representative Aspin voted for a nonbinding resolution last February calling for the negotiation of a comprehensive test-ban treaty and the submission of the 1974 Threshold Test Ban Treaty (limiting underground tests to 150 kilotons) to the Senate for its approval. He continues to support the ratification of the TTBT, arguing that although verification isn't perfect, the ratification of the treaty would lead to improved verification.

In spite of his emphasis on controlling the expansion of the Soviet arsenal, Representative Aspin says that arms control, for him, is not primarily an effort to reduce the number of warheads and launchers. It is, rather, an attempt to reduce the probability of nuclear war. Arms control, in conjunction with particular weapons deployments, can, in Mr. Aspin's judgment, reduce the probability of war by reducing the number of vulnerable systems, such as fixed land-based missiles and battlefield nuclear weapons that are too close to the front lines, and by lowering the vulnerability of satellites. "My view of arms control is that it has a limited, important—bordering on crucial—role to play in the overall scheme of things," he says.

More Bang for the Buck

Elaborating on his claim that the Administration lacks a coherent defense policy, Representative Aspin said that "part of the problem with this Administration is they're really not serious about defense. . . . They equate putting money in there with better defense. Absolutely, money is important, but money is a necessary but not sufficient ingredient for a strong military. Also important for a strong military is how you organize it, how you're spending the money, what you're doing to solve problems. . . . " And in these endeavors, Mr. Aspin feels that the current Pentagon leadership falls short.

The HASC Chairman sticks to his guns on the conclusions of his controversial "trillion dollar" report. He maintains that the Defense Department did not get good value for its money during the Reagan Administration's defense buildup, a contention that Air Force Secretary Edward C. Aldridge recently labeled as "garbage." Mr. Aspin contends, "Sure [the US military] is better off, but not a trillion dollars better off."

Citing readiness as an example, Mr. Aspin claims that DoD's own figures show that mission-capable rates and C-ratings (a military rating used to indicate how completely a unit can carry out its full range of missions) haven't improved very much, even with "tremendous" increases in funding. "I'd like to hear Secretary Aldridge come over here and defend [the Air Force] if he thinks [my contention] is garbage," Mr. Aspin argues. The Secretary has cited large increases in flying hours, aircraft mission-capable rates, and sorties per pilot to make his point that the Air Force has made tremendous strides over the past several years.

Representative Aspin endorses the Packard Commission recommendations, especially those pertaining to defense reorganization. Those recommendations—to create a Vice Chairman of the Joint Chiefs of Staff, to make the Chairman of the Joint Chiefs the principal advisor to national command authorities, and others—either have been or will soon be reflected in legislation. "I don't know if it's going to do any good, but I don't see anyone thinking of anything better to do," he says. While he refused to single out any of the Packard Commission procurement reforms as being of particular significance, he said that many of those recommendations would be embodied in legislation in the House as well. Mr. Aspin claims that it is still too early to tell how well the procurement reforms already implemented over the past several years are working out: "Part of the problem is that it takes two or three years to find out how good it is now. You're constantly looking back."

One of the biggest problems he foresees is the extremely high unit cost of modern weapon systems, citing, for example, the projected $35 million cost of the Advanced Tactical Fighter (ATF). He expressed concern that the ATF price tag could go even higher. Mr. Aspin believes that the Reagan Administration has exerted less downward pressure on unit costs than previous administrations. He attributes the decline in the growth of unit costs over six years, from thirteen percent a year to one percent annually, to a reduction in inflation rates for which he believes the current Administration can take little credit.

Congress's role in defense management does not escape Representative Aspin's critique either: "Too much micromanagement." But this, too, he sees as an almost intractable problem. "To [get Congress out of line-item management] at the time when the papers are full of horror stories is just well-nigh impossible."

He does see limited promise in what could be described as a partial two-year budget. Suggesting that Congress would not accept two-year funding for "hot button items," such as chemical weapons, SDI, or the MX, and that the Administration would never sit still for two years of small defense budgets, he recommends that Congress treat different parts of the defense budget differently. Every year, Congress could revisit controversial weapons programs and adjust the level of spending, depending on the international situation and budgetary pressures. That would leave, according to Mr. Aspin, many weapon systems that would fit into a two-year budget, with substantial potential savings to be realized from increased program stability.

Chairman Aspin sees the Soviet Union as an aggressive, expansionist power—"but not recklessly so"—that poses a very serious military threat to which the US must attend very carefully. While the measures he recommends are often at odds with those of the Pentagon and the Air Force, he at least shares a common view of the Soviet threat.

From his lofty position in the congressional hierarchy, he wields considerable influence over the fortunes of the Department of Defense and will continue to do so for the foreseeable future. At the very least, he will stay at the focal point of key controversies, and his colorful, sometimes outrageous expressions of opinion will demand attention. ■

The AFA Nominees for 1986-87

BY DAVID C. NOERR
AFA ASSISTANT EXECUTIVE DIRECTOR/FIELD ORGANIZATIONS

At a meeting on May 24 in Colorado Springs, Colo., the Air Force Association Nominating Committee selected a slate of candidates for the four national officer positions and the eighteen elective positions on the Board of Directors that will be presented to the delegates at the National Convention in Washington, D. C., on September 16. The Nominating Committee consists of the five most recent past National Presidents, the twelve National Vice Presidents, and one representative from each of the twelve regions.

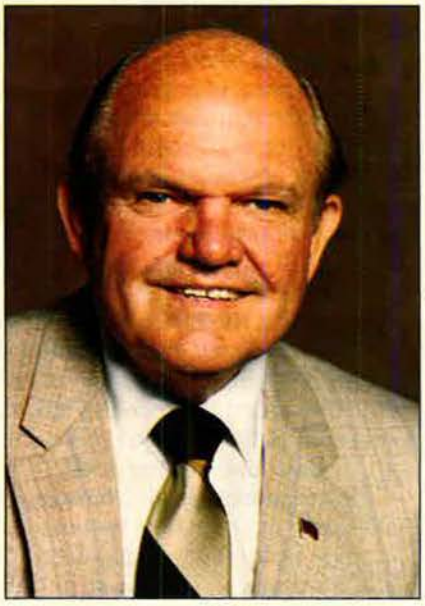
Nominated for his first term as National President of the Air Force Association was **Sam E. Keith, Jr.,** of Fort Worth, Tex. He is a retired General Dynamics executive and former executive vice president of Geoscience and Services, Inc., an energy firm specializing in remote-sensing satellite technology. He currently serves as senior consultant to Arrowhead Associates, an aviation-related firm, and he is also an independent oil and gas developer and investor. He is a combat veteran of World War II and later served with the occupational forces in Korea. Mr. Keith attended Texas Christian University and Texas A&M and has taken part in numerous national defense forums.

Mr. Keith is an active leader in charitable and civic endeavors, including Goodwill Industries (past president), the Fort Worth Boys Club (past president), the Fort Worth Women's Club, the Fort Worth Symphony League, the TCU Fine Arts Guild, the Fort Worth Opera Guild, and others. Mr. Keith serves as cochairman of the Fort Worth Military Ball and is vice president of the Greater Fort Worth Civic Leaders Association.

Mr. Keith served previously on the Executive, Finance, and Organizational Advisory Committees of AFA. He has also served as National Vice President (Southwest Region), elected at-large AFA National Director (eight times), Texas State President, Fort Worth Chapter President, and Chairman of the Fort Worth Air Power Council, an official AFA organization. Currently, he serves as a permanent member of the Board of Directors and as a member of the National Audit Committee and is a Doolittle Fellow. He has received AFA's Presidential Citation, Exceptional Service Plaque (twice), and Medal of Merit. He received AFA's Man of the Year Award in 1968 and is a Life Member of AFA.

Martin H. Harris of Winter Park, Fla., was nominated for the office of Chairman of the Board. Currently an aerospace industry executive, he received his bachelor's degree in aeronautical engineering from New York University in 1953. Mr. Harris later earned his master of science degree in systems management from the University of Southern California. He is a veteran of both the Air Force and the Air Force Reserve.

Mr. Harris is active in community affairs and holds memberships in the American Management Society, the American Helicopter Society, the Army Aviation Association of America, and the Retired Officers Association. He has



Sam E. Keith, Jr.

served as National Vice President of the American Defense Preparedness Association.

Mr. Harris was Chairman of the first AFA/SAC Strategic Requirements Symposium in 1971 and was AFA's National Secretary and Chairman of AFA's Resolution Committee for four years. He has also served AFA as State President, Chapter President, National Vice President (Southeast Region), and Organizational Advisory Council member. Currently, he serves as National President, a permanent member of the Board of Directors, Chairman of the Executive and Resolutions Committees, and a trustee of the Aerospace Education Foundation. He received AFA's Man of the Year Award in 1972 and is a Life Member of AFA.

Nominated for his second term as National Secretary, **A. A. "Bud" West** of Hayes, Va., a retired aerospace executive, received his bachelor of science degree from MIT in 1947 and did graduate study at MIT's Sloans School of Industrial Management. Having served on active duty as a combat pilot during World War II and as a research and development staff officer during the Korean War, he retired from the Air Force Reserve in 1974 with the rank of colonel.

Mr. West has been active in numerous civic and professional organizations, having served as President of the Virginia Peninsula Chamber of Commerce and National President of the 57th Bomb Wing Association. He holds memberships in the Retired Officers Association, the American Helicopter Society, and the Daedalian Society

In addition to his current service as permanent National Director of the Association, Mr. West is a member of the Executive and Resolutions Committees and a trustee of the Aerospace Education Foundation. He has also held the elective offices of National Vice President (Central East Region), State President, and Chapter President and has served as a member of the Constitution Committee and Scientific Advisory Committee. Mr. West is an AFA Life Member.

Nominated for his sixth term as National Treasurer was **George H. Chabbott** of Dover, Del. He is a management consultant and real estate counselor. He served in the Air Force for twenty-three years, retiring as a colonel in 1973. He participated in fifty combat missions in B-26s during the Korean War and flew 100 combat missions as a forward air controller during the Vietnam War. A graduate of Utah State University, he attended senior-level finance courses at the Columbia School of Bank Administration and Management. He has been awarded the designation of Certified Commercial Investment Member (CCIM) by the National Real Estate Marketing Institute.

In addition to his current service as National Treasurer, Mr. Chabbott is Chairman of the Finance Committee and a member of the Executive and Resolutions Committees. He also has held the elective offices of National Director, National Vice President (Central East Region), and State President. Mr. Chabbott is an AFA Life Member.

The following are permanent members of the AFA Board of Directors under the provisions of Article IX of AFA's National Constitution: John R. Alison, Joseph E. Assaf, William R. Berkeley, David L. Blankenship, John G. Brosky, Daniel F. Callahan, Earl D. Clark, Jr., Edward P. Curtis, R. L. Devoucoux, James H. Doolittle, Russell E. Dougherty, George M. Douglas, Joe Foss, James P. Grazioso, Jack B. Gross, George D. Hardy, Alexander E. Harris, Martin H. Harris, Gerald V. Hasler, John P. Henebry, Robert S. Johnson, Sam E. Keith, Jr., Arthur F. Kelly, Victor R. Kregel, Thomas G. Lanphier, Jr., Jess Larson, Curtis E. LeMay, Carl J. Long, Nathan H. Mazer, J. P. McConnell, J. B. Montgomery, Edward T. Nedder, J. Gilbert Nettleton, Jr., Jack C. Price, William C. Rapp, Julian B. Rosenthal, Peter J. Schenk, Joe L. Shosid, C. R. Smith, William W. Spruance, Thos. F. Stack, Edward A. Stearn, James H. Straubel, Harold C. Stuart, James M. Trail, A. A. West, Herbert M. West, and Sherman W. Wilkins.

The twenty people whose photographs appear on the following page are nominees for the eighteen elected Directorships for the coming year. Asterisks indicate incumbent National Directors.

Martin H. Harris

A. A. "Bud" West

George H. Chabbott

***Richard H. Becker,** Oak Brook, Ill. Retired senior account executive. Former State and Chapter President, Advisory Council member for the Aerospace Education Foundation, and national committee member. Current National Director, national committee member, and Advisory Council member for the Aerospace Education Foundation. Life Member.

Charles H. Church, Jr., Kansas City, Mo. Bank executive. Former Chapter President and national committee chairman. Current National Vice President (Midwest Region) and national committee chairman. Life Member.

***Jon R. Donnelly,** Richmond, Va. Editor. Former Under-40 National Director, National Vice President (Central East Region), national committee member, AEF trustee, Advisory Council member for the Aerospace Education Foundation, and State and Chapter President. Current National Director, national committee chairman, AEF trustee, and Advisory Council member for the Aerospace Education Foundation. Life Member.

E. F. "Sandy" Faust, San Antonio, Tex. Bank executive. Former National Vice President (Southwest Region), State President, national committee member, and national trustee of the Arnold Air Society. Current national committee member. Life Member.

***Thomas J. Hanlon,** Buffalo, N. Y. Industry executive. Former National Vice President (Northeast Region), national committee member, and State President. Current National Director and national committee member. Life Member.

***H. B. Henderson,** Seaford, Va. Aerospace industry executive. Former National Vice President (Central East Region), national committee member, and State and Chapter President. Current National Director and national committee member. Life Member.

Francis L. Jones, Wichita Falls, Tex. Property manager. Former National Director, National Vice President (Southwest Region), national committee member, and Chapter President. Life Member.

John P. E. Kruse, Cherry Hill, N. J. Marketing manager. Former national committee member and State and Chapter President. Current National Vice President (Northeast Region) and national committee member. Life Member.

***Jan M. Laitos,** Rapid City, S. D. Corporate business consultant. Former National Vice President (North Central Region) and national committee member. Current National Director, national committee member, and chapter officer. Life Member.

***Lee C. Lingelbach,** Warner Robins, Ga. Personnel director. Former National Vice President (Southeast Region), State President, and national committee member. Current National Director and national committee member. Life Member.

***Frank M. Lugo,** Mobile, Ala. Educator. Former National Vice President (South Central Region), national committee member, AEF trustee, and State and Chapter President. Current National Director, national committee member, and member of the Aerospace Education Foundation Advisory Council. Life Member.

***William V. McBride,** San Antonio, Tex. Chamber of Commerce executive. Former USAF Vice Chief of Staff, National Director, national committee member, and AEF trustee. Current National Director, national committee member, Advisory Council member for the Aerospace Educat on Foundation, and AEF trustee. Life Member.

***James M. McCoy,** Bellevue, Neb. Insurance executive. Former Chief Master Sergeant of the Air Force. Former national committee chairman and national committee member. Current National Director, national committee chairman, and national committee member. Life Member.

Arley McQueen, Jr., We Is, Me. Aerospace executive. Former State President and former chapter officer. Current National Vice President (New England Region) and national committee member.

***Edward J. Monaghan,** Anchorage, Alaska. Flight school instructor/president. Former National Vice President (Northwest Region), national committee chairman, and State and Chapter President. Current National Director and national committee chairman.

Ellis T. Nottingham, Atlanta, Ga. Marketing executive. Former state officer, Chapter President, Under-40 Director, National Director, and national committee member.

***Walter E. Scott,** Dixon, Calif. Former national committee member, AEF trustee, and Advisory Council member for the Aerospace Education Foundation. Current National Director, national committee member, AEF trustee, and Advisory Council member for the Aerospace Education Foundation. Life Member.

***Mary Ann Seibel,** St. Louis, Mo. Administrative officer. Former Under-40 Director, national committee member, and Chapter President. Current National Director, national committee member, and state officer. Life Member.

***Howard C. Strand,** Marshall, Mich. Retired Air National Guard Commander. Former National Vice President (Great Lakes Region), national committee member, State and Chapter President, and Advisory Council member for the Aerospace Education Foundation. Current National Director and national committee member. Life Member.

Edward I. Wexler, Savannah, Ga. Aircraft maintenance officer. Former State President and Chapter President. Current Under-40 Director and national committee member. ■

NOMINEES FOR AFA'S BOARD OF DIRECTORS

VIEWPOINT

Forecasting for Security

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

The short history of aerial warfare confirms that victory follows the most technically advanced adversary rather than the most heavily armed one.

Back in what must seem, to today's military leaders, the prehistoric era of the 1930s, the United States Military Academy conducted a course in aerodynamics. All things considered, including the widely held opinion among soldiers at that time that the airplane business was essentially frivolous and that aviators, in any case, did not require much in the way of an education, this was a remarkable concession.

One sleepy afternoon, a West Point instructor was holding forth on the mysteries of lift and drag to his class of less-than-fascinated cadets. When question time came along, one of my fellow scholars had a real stumper: "I understand what you've just told us," he said, "but what makes it *fly?*"

My classmate went on to become a fighter pilot and presumably never again bothered his head about the mysteries of flight. It was enough for him, as indeed it was enough for most of us, simply to believe the machines would do what they were supposed to do.

Luckily for the good of our Air Force and of our nation, there have always been some types around who not only understand the scientific end of things but who project that knowledge down the road. Thus, seemingly immutable facts, like the impenetrability of the sound barrier, become a challenge for the visionaries.

The entire short history of air warfare confirms that victory follows the most technically advanced adversary rather than the most heavily armed. With something like this in mind, then, Project Forecast was chartered in 1964. The Chief of Staff, Gen. Curtis LeMay, gave the order to Gen. B. A. Schriever, Commander of Systems Command, to take a long look into the future. More than two decades later, with Project Forecast II the new catalyst, it is instructive to take a look back and see where that first Project Forecast took us.

Global air mobility was high on the list of that group of seers. Twenty-two years before the Libyan raid, they were concerned about the availability of foreign bases and overflight permission. Accordingly, they put great emphasis on the development of a long-range transport and in-flight refueling. The transport would have a gross weight of 2,000,000 pounds and would be augmented by theater vertical takeoff and landing (VTOL) transports. As an interesting sidelight, in view of current discussions, the group felt that the landing of a large logistic transport in forward fields would be neither necessary nor desirable.

The original Forecasters were certainly on the mark when they questioned the availability of foreign bases and overflight authority. Our considerable airpower assets in Europe are, for all practical purposes, hostage to a single scenario, and global air mobility remains an objective not yet fully attained.

Project Forecast I saw clearly ahead to the Space Shuttle and, with somewhat longer vision, to the Strategic Defense Initiative. All in all, the original Project Forecast was an impressive effort, one that provided goals, if not actual guidelines, for much of the technological progress of the next two decades.

Project Forecast II conjures up some fascinating ideas for the next twenty years. The nuclear powerplant is one instance—safe, reliable, and no larger than an oil barrel, yet producing 50,000 pounds of thrust. With that sort of engine, spaceflight could become routine. Just roll down the runway and point the nose toward the moon.

The 1964 group foresaw the development of the new materials that have had a major effect on aircraft and engine design. This year's prophets see similar—and even more spectacular—developments to go along with the oil-barrel-size engine.

Project Forecast II looks ahead to an exciting future for this year's nursery school crop—and, apparently, it is no farther away than that, always providing, of course, that enthusiasm is matched by budgetary authority.

As we all discover sooner or later, the years have a way of passing by quickly. The end of this century is not really very far off, and between now and then, some big bills for things like MX, Stealth, the C-17, and the Advanced Technology Fighter will be coming due. The other services have also run up large bills on the joint bank account. Meanwhile, in Congress, there is diminished enthusiasm for new expenditures.

Current readiness—the mundane business of providing for spare parts, adequate pay, training, and war materiel—must continue. It would be convenient if another sort of Project Forecast could precisely determine when the next crisis will come so that, in the interim, readiness money could be saved for more exotic matters, but short of enlisting celestial membership in that group, the only safe approach is to keep ready. How to balance the money for great technology leaps against requirements for everyday security is something that is going to take wise and careful counsel. ■

The Outstanding Squadron at the Air Force Academy made a winning combination of academics, military leadership, and athletic achievement.

THE REDEYES RANK

BY JAMES A. McDONNELL, JR., MILITARY RELATIONS EDITOR

IN THE twenty-seven years that the Air Force Association has honored the outstanding cadet squadron at the Air Force Academy, Cadet Squadron 25—the "Redeye" Squadron—has never earned that coveted recognition. But this year's squadron, undeterred by history and determined to distinguish itself as the Academy's best, compiled a record of achievement that ensured its selection as the Outstanding Squadron of the US Air Force Academy for 1986.

The 25th worked hard for recognition as the Outstanding Squadron. But according to fall-term Cadet Squadron Commander Michael I. Rarick, "We had more fun in winning the Outstanding Squadron honor than any other group in the history of the Academy!"

The squadron was feted last May at a black-tie dinner sponsored by AFA and its Colorado Springs-Lance Sijan Chapter. The dinner honored the squadron for its accomplishments in all phases of cadet life. Winning squadrons are selected on the basis of demonstrated excellence in academics, military leadership, and athletics.

The Redeyes racked up an impressive academic record in their drive to be the Academy's best. With its First Class pacing the Academy with a 3.2 grade point average, the squadron topped the Cadet Wing academically for two semesters in a row.

Consistent military performance characterized the Redeyes as well. While they never won top honors as Squadron of the Month, their unequalled string of second-place finishes allowed them to finish ahead of all other contenders.

In athletics, the 25th had a surfeit of talent. But the Redeyes boasted so many varsity athletes that the squadron had a bit of a problem in rounding up enough cadets to field

FIRST

Cadet Squadron 25, the "Redeyes," was named the Outstanding Cadet Squadron at the Air Force Academy for 1986. The 25th topped the Cadet Wing in the classroom, and it also won four trophies in the intramural competition to claim the award.

competitive teams for intramural sports. Undaunted, the 25th managed to marshal seven intramural teams for the wing championship competition and walked away with four intramural trophies.

This sort of grit is what makes an outstanding squadron. As AFA President Marty Harris told the Redeyes, "You set a goal . . . and worked that goal. . . . Long after the memory of tonight's festivities dims in your mind, the qualities of determination you showed in getting here will still be helping to make you better Air Force officers. I think that's really the bottom line for this program, and that's why AFA's proud to be a part of it."

The dinner audience of 600 guests also heard remarks by Academy Superintendent Lt. Gen. Winfield W. Scott, Jr., and USAF Vice Chief of Staff Gen. John L. Piotrowski. General Piotrowski told the cadets that determined but flexible leadership is what the Air Force requires as it moves into the next century.

Given their outstanding record, the Redeyes of the 25th Squadron will be ready to meet the challenge of leadership in the twenty-first century. ■

AFA National President Marty Harris (far right) presented the Outstanding Squadron trophy to the 25th at a May dinner. Also attending the ceremony were (from left): Col. Thomas D. Pilsch, master of ceremonies; Cadet Lt. Col. Bradley D. Harmon, spring semester commander; Maj. Wayne E. Hopfer, 25th Squadron Air Officer Commanding; and Cadet Lt. Col. Michael I. Rarick, fall semester commander. (USAFA photo by SSgt. René Tyron)

AIRMAN'S BOOKSHELF

Kaleidoscope of Airpower

A Short History of Air Power, by James L. Stokesbury. William Morrow and Co., New York, N. Y., 1986. 313 pages with bibliography and index. $18.95.

In 1900, the "aeroplane" was little more than the seemingly whimsical dream of fledgling designers and incurable romantics; seventeen years later, it had become an awesome and deadly instrument of war. From its earliest appearance, the military airplane has grown to be the strategic and tactical weapon of effectiveness, devastation, choice—and decisiveness.

In an age of high-tech aircraft equipped with the latest avionics and laden with "smart" weapons, it somehow seems quaint to recall that the first cross-Channel flyers carried automobile inner tubes to use as floats if they had to ditch. However primitive the early World War I aircraft were, a tradition of skilled pilot hunters—aces—and the classic dogfight quickly evolved. Airpower in 1914 was represented mainly by an amateurish collection of daredevils and fragile, kite-like contraptions; by 1918, superlative aerial machines were roaring across the skies of Europe and into the pages of a revolutionary chapter of military history.

Like the sports heroes and entertainment stars of a later era, the legendary "aces" lived life with a devil-may-care, wild abandon. Small wonder—until the end of the war, Allied tradition held that flyers would not wear parachutes lest they willfully abandon government property "prematurely" and thus let it be destroyed. Given this odd bureaucratic notion in the face of skilled German pilots who were equipped with superb aircraft, Western airmen quite understandably considered themselves virtually expendable, little more than "Fokker fodder."

But just as the technical quality of their planes improved dramatically in four short years, so did the commanders' doctrine and theory of air warfare. Under the leadership of Hugh Trenchard, the Royal Air Force adapted the traditional naval doctrine of the "close blockade." The Royal Navy had always attempted to engage and defeat the enemy at its shoreline. Analogously, the RAF strove to attack German air bases and thus destroy the source of their adversary's strength. While this was a quite costly strategy, it was bound to be successful if pursued long enough—and ultimately it was.

Even though the traditionalists in the interwar period refought the old battles of their beloved Spads and Sopwith Camels, a new breed of engineers, pilots, and theoreticians was developing both the machines and aerial doctrine that would establish the airplane as a primary weapon system of World War II.

That war became the war of the big bomber—the German Heinkel He-177, the British Lancaster, the American B-17, and then the B-29. But Germany's strategic air war, despite the early victories, ultimately failed, and for the next few years of the war, the Anglo-American campaigns seemed to be fated irrevocably for the same result.

But the attrition philosophy of Sir Arthur Harris began paying off for the Allies—at a tragic cost to both sides. As Stokesbury notes, the driving strategy of Harris was to "build enough bombers, drop enough bombs on the Germans, and, by God, soon they would crack." The most efficient method of making them "crack" was to "drop enough explosives to create debris, incendiaries to set it afire, more high explosives to deter the fire fighters, more incendiaries to spread the blaze, some phosphorous to add more horror, and [finally] some delayed-action bombs to disrupt rescue-and-recovery efforts."

This hellish recipe was practiced with brilliance by "Bomber" Harris and his Bomber Command and Gen. Carl "Tooey" Spaatz and the Eighth Air Force. Their philosophical cohort in the Pacific theater, Gen. Curtis LeMay, proved equally adept and successful in his Armageddon-like bombing of the Japanese.

In the forty years since the end of World War II, the airplane has figured prominently in every war—declared or otherwise, big or small. The early strategists of the pre-World War I era rather quixotically but earnestly believed that the airplane would necessarily preclude not only the savage attrition aspect of modern warfare but even perhaps war itself. But aerial technology and doctrine have synergistically combined to forge a nightmarish force beyond their wildest pre-1914 dreams.

As Stokesbury points out, the airplane has "not rendered war obsolete, it has not even rendered wars of attrition obsolete. . . . Indeed, it has become an instrument of attrition itself." For good, evil, or otherwise, the air age is here to stay.

Stokesbury's "short history" of Western airpower is just that. As might be expected from the title, this book is often lacking in the substantive detail that many topics demand. This is particularly true with regard to those strategies, tactics, and conflicts not related directly to the world wars. Also, the author fails to include appropriate maps, charts, or photographs. The book does, however, contain an excellent bibliography.

But given the nature, scope, and intent of this work, this book is, in all fairness, a fine, kaleidoscopic narrative of the men, planes, theories, and battles that have contributed so heavily to the evolution of modern warfare. Though not a book for the serious expert, Stokesbury does contribute to the vast, complex study of airpower and its central importance to the twentieth century.

—Reviewed by William Teague. Dr. Teague teaches US Government and American Studies at the University of Texas at Dallas and is a regular reviewer for this column.

Understanding Soviet Tactics

Soviet Airland Battle Tactics, by Lt. Col. William P. Baxter, USA

(Ret.). Presidio Press, Novato, Calif., 1986. 304 pages with illustrations, notes, and index. $18.95.

Soviet military advisors are found today in Cuba, Nicaragua, Angola, Vietnam, Algeria, and in other nations where Moscow has a foothold. They instruct local troops in basic tactics. In some cases, they may go to the level of operational art. Marxist-Leninist indoctrination is fundamental to all of their instruction. In addition, many officers and military specialists from these Third-World nations go to the Soviet Union for further training.

Charts and graphs published by US government agencies show the amount of Soviet military equipment sent abroad. These publications do not show the extent to which Soviet military training affects the armed forces of the nations receiving Soviet military support.

If our military and foreign policies are to be effective, our national leaders and strategic planners must have an appreciation of the Soviet Armed Forces that goes beyond numbers and types of weapon systems. There must be an understanding of the training and indoctrination of the Soviet soldier and the fact that this same training and indoctrination is given by Soviet advisors to the armed forces of many other nations.

Scores of articles and several books each year appear in our press, purporting to explain the Soviet Armed Forces from their weapon systems to their command and control structure. While some of these publications are worthwhile, most consist of an author using only secondary sources, without any actual knowledge of the subject. Too often these writers make the Soviet Armed Forces mirror-images of those of NATO nations.

It is rare to find a book about the Soviet Armed Forces written by a former combat infantry officer who has also had firsthand experience in observing Soviet military units. It is equally unusual to find an author with this background who does his own translations from original Soviet military publications.

Lt. Col. William P. Baxter has the necessary qualifications to write in this area. A West Pointer, he started his career in the infantry. During combat duty in Southeast Asia, he was awarded the Distinguished Service Cross. He later specialized in Soviet studies, which included learning the Russian language.

After a second Southeast Asia tour, he served with the United States Military Mission in Potsdam, Germany, accredited to the Soviet Group of Forces. With this background, it is understandable that his book stresses what a combat soldier, airman, or sailor needs to know about the Soviet Armed Forces as a whole and about their battle tactics in particular.

For these reasons, *Soviet Airland Battle Tactics* is not the standard fare that one finds on bookshelves or in journal articles about the Soviet Armed Forces. The author is not trying to convince a reader of a certain viewpoint. Rather, he is seeking to explain Soviet battlefield tactics and the Soviet rationale for their development. He presents the tactics and related military concepts followed and taught in the Soviet Armed Forces.

Bill Baxter's outstanding book deals with Soviet military fundamentals. He explains the difference between Soviet military doctrine and Soviet military science. Military doctrine, in the Soviet sense, is the prerogative of the leadership of the Communist Party. Doctrine specifies who the enemy will be, what means will be used to fight, when and where the military forces will be used, and why the military will fight.

Military science is the purview of the military. Its most important component is military art, which includes military strategy, operational art, and tactics. There are no "doctrinal debates" as such in the Soviet Armed Forces. On the other hand, different points of view are permitted, and at times encouraged, on Soviet military science.

There has been a great deal of misinformation in the United States about the possibility of the Soviet leadership employing nuclear weapons. As the author points out, Soviet tactics do not make a sharp distinction between nuclear and conventional warfare. If possible, the Soviets would probably like to keep combat at the conventional level—provided they can win. But "if faced with defeat in a conventional war, the Soviet Army would be likely to resort to nuclear weapons regardless of any nonfirst-use doctrine. In this situation, the Soviet Army would not wish to indicate a decision by a change of tactics." It would be well for senior US planners in the Pentagon and elsewhere to ponder the significance of this statement.

How could "a tenth-rate economic power encumbered with an obsolete political doctrine" become a superpower? Colonel Baxter gives credit for this to Soviet military theory, which "is not the exclusive property of a bunch of mossbacked professors buried in musty, anonymous offices scattered about the outback of the USSR." Rather, Soviet military scholars "tend to be an elite group of intellectuals in uniform who complement their academic expertise with practical military experience." When they develop a hypothesis, it must withstand criticism, debate, and comment from within the professional military establishment. Afterwards, the theory must be tested in field exercises. Only after it has passed these tests is it accepted in the official military textbooks.

Soviet Airland Battle Tactics is a basic, carefully written text by an authority on the Soviet Armed Forces. It should be read by four-star generals, second lieutenants, sergeants, and petty officers who at some time in the future might engage in combat with forces trained by Soviet military advisors or with Soviet troops. It should also be read by those civilians who are concerned with national security affairs.

—Reviewed by Col. William F. Scott, USAF (Ret.). Colonel Scott is a former Air and Defense Attaché to Moscow and coauthor, with his wife Harriet, of the widely respected The Armed Forces of the USSR.

New Book in Brief

Aerospace Balloons: From Montgolfiere to Space, by Edwin J. Kirschner. From the first baroquely decorated hot-air balloon floated at Versailles by the Montgolfier brothers to the grand Zeppelins of the early part of this century to the space-age Mylar models circling the globe today, man has been fascinated by the practical and poetic possibilities of lighter-than-air flight. In this overview, author Kirschner limns the historical development of ballooning, examining such events as Auguste Piccard's ascents into the stratosphere in the 1930s and retired Air Force Col. Joseph Kittinger's 1984 solo crossing of the Atlantic in the *Rosie O'Grady.* In addition to the many photographs and illustrations, a set of appendices on terms and tables, regulations and safety, and ballooning records rounds out the text. Enthusiasts will find this book a tour de force of the sport and science of ballooning. With index. Aero Publishers, Fallbrook, Calif. (available from Tab Books, Inc., Blue Ridge Summit, Pa.), 1985. 120 pages. $9.95.

—Reviewed by Hugh Winkler, Assistant Managing Editor.

Atlas Launches Satellite from Vandenberg AFB, Calif.

Atlas/Centaur Launches Communications Satellite from Cape Canaveral, Fla.

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GENERAL DYNAMICS

JANE'S

ALL THE WORLD'S AIRCRAFT SUPPLEMENT

AUGUST 1986

South Africa's new Atlas Alpha XH-1 light attack helicopter

ATLAS

ATLAS AIRCRAFT CORPORATION OF SOUTH AFRICA (PTY) LIMITED, PO Box 11, Atlas Road, Kempton Park 1620, Transvaal, South Africa

ATLAS ALPHA XH-1

Revealing the existence of the Alpha XH-1 at a press conference in Johannesburg on 9 March 1986, the head of the South African Air Force, Lt Gen Dennis Earp, described this light attack helicopter prototype as "entirely locally designed to SAAF specifications, using what the South African industry can provide". In fact, this was a slight overstatement, since the XH-1 is based on the rotor and transmission systems, and almost certainly the power plant, of the French Aérospatiale SA 316B Alouette III, albeit with many engine, gearbox, and rotor system components manufactured in South Africa.

The Alpha XH-1 was developed under a SAAF contract awarded to Atlas in March 1981, and had made its first flight on 3 February 1985, more than a year before its public disclosure. Although exhibiting some outward signs of its Alouette ancestry, it

The good all-round field of view for the two-man crew is evident in this photograph of the Atlas Alpha XH-1

clearly does embody a considerable degree of new design. This is chiefly apparent in the almost all-new fuselage, which probably has no more than the tailboom and horizontal stabiliser in common with the Alouette III. In place of the latter's three-abreast cabin, the XH-1 has two single cockpits in tandem, resulting in a much narrower fuselage. The central portion has a mainframe of welded steel tube with metal skin; the front portion is a semi-monocoque structure using components of both metal and composite materials. The hemispherical nosecone, probably containing only flight test instrumentation at this stage of the aircraft's development, could be of different shape on the production version. Compared with the Alouette III the max T-O weight is unchanged, and overall fuselage length probably differs very little, but the empty weight is increased by a little over 20 per cent.

A sweptback fin has been added to the port side of the tailboom opposite the three-blade tail rotor, and new endplate fins attached to the stabiliser are angular, sweptback structures with most of their area below the horizontal surface. To give clearance for the undernose gun which is the Alpha XH-1's main feature, the non-retractable tricycle landing gear of the Alouette has had to be replaced by a 'tailsitter' type. In this, the mainwheel units have been moved much farther forward, to a position level with the rear cockpit instrument panel, while the tailwheel is carried on long V struts beneath the tailplane with a telescopic shock strut to the rear.

Initial flight testing of the Alpha XH-1 has been completed, and some modifications were planned before the start of the next stage of flight trials, which are aimed not only at further XH-1 development but also at conducting requirement studies and expanding the degree of local technology involved. According to General Earp, "We will be testing a wide range of airframe/engine/systems in the future, and technology derived from this programme will be tested on other helicopters in the SAAF inventory". These plans are expected to include provision of outriggers or stub-wings for the carriage of anti-tank guided weapons and unguided rockets.

TYPE: Experimental light attack helicopter.

POWER PLANT (SA 316B): One 649 kW (870 shp) Turboméca Artouste IIIB turboshaft engine, derated to 425 kW (570 shp).

ACCOMMODATION (XH-1): Two seats in tandem, with step down from rear (pilot's) cockpit to front cockpit occupied by weapons operator. Each cockpit has a forward opening door each side with very deep transparencies, giving an excellent field of view sideways and downward.

ARMAMENT (XH-1): Single-barrel GA1 20 mm cannon, with up to 1,000 rds of ammunition and max firing rate of 600 rds/min, in a servo controlled undernose turret. Gun is aimed by gunner's helmet mounted sight, and flexible mounting permits it to be traversed 120° to left and right and +10°/−60° in elevation. Installation can accept alternative weapons, including a grouping of four 7.62 mm machine-guns.

DIMENSIONS, EXTERNAL (SA 316B):

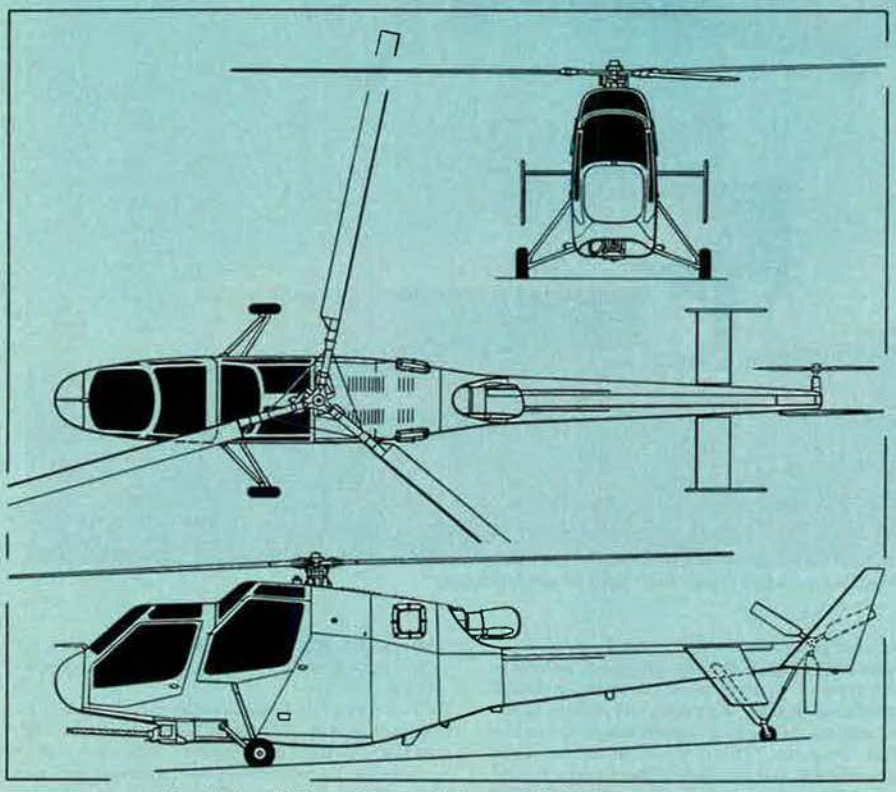
Main rotor diameter	11.02 m (36 ft 1¼ in)
Length overall, rotors turning	12.84 m (42 ft 1½ in)
Height to top of rotor head	3.00 m (9 ft 10 in)

WEIGHTS (XH-1):

Weight empty	1,400 kg (3,086 lb)
Max T-O weight	2,200 kg (4,850 lb)

PERFORMANCE (XH-1 at S/L, estimated):

Max level speed	113 knots (210 km/h; 130 mph)
Max cruising speed	100 knots (185 km/h; 115 mph)
Max rate of climb	244 m (800 ft)/min
Combat radius	148 nm (275 km; 171 miles)



Atlas Alpha XH-1 experimental light attack helicopter *(Pilot Press)*

SACAB

SCANDINAVIAN AIRCRAFT CONSTRUCTION AB, PO Box 43, S-23032 Malmö-Sturup, Sweden

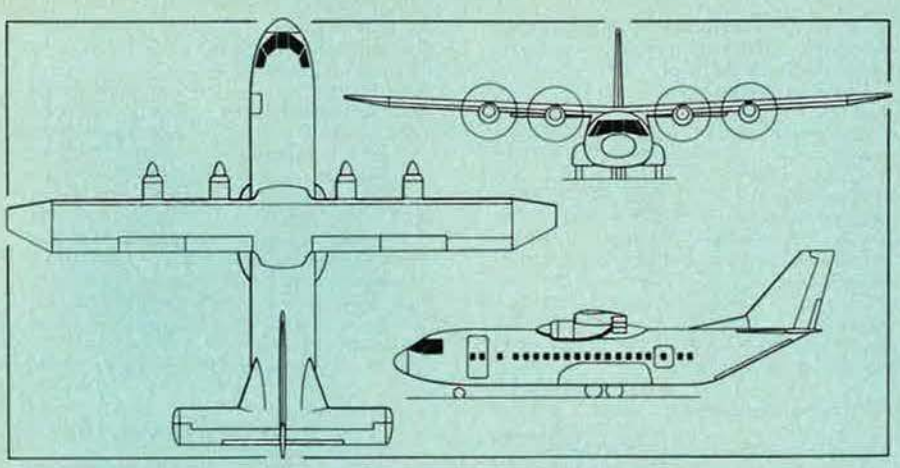
SACAB, which is owned by a consortium of Scandinavian companies, was formed in 1984 by Mr Peter Ahrens. His Puerto Rico based Ahrens Aircraft Corporation built four prototypes of a square-fuselage turboprop transport known as the AR-404 before ceasing operations in 1982; this aircraft has been described in past editions of *Jane's*, and was featured in the June 1977 "Jane's Supplement".

SACAB's first venture is the four-turboprop KM-180, much of which was designed by Mr Ahrens' son Kim.

SACAB KM-180

A full scale fuselage mockup of the KM-180 was completed in 1985, and construction is now under way of a flying prototype and static test airframe. First flight is anticipated in December 1986, with certification under FAR Pt 25 expected about a year later. Two versions are projected initially, the following description applying to the standard KM-180. A higher gross weight version, designated **KM C-180**, is aimed at government customers, both civil and military.

Features of the KM-180 include unrestricted fuselage cross-section, with provision for future pressurisation if required, and a rear-loading tailgate.



SACAB KM-180 four-turboprop utility transport *(Pilot Press)*

Intended as a feederliner and short-haul utility transport, it has a useful load (payload plus fuel) in the cargo configuration of some 5,942 kg (13,100 lb).

TYPE: Turboprop powered utility transport.

WINGS: Cantilever high-wing monoplane. Wing section NACA 64_3-418. Dihedral 2° 30'. Constant chord wings, of high aspect ratio and with tapered tips, built as single unit. Three-spar fail-safe main structure of 2024-T3 aluminium alloy, with 4130 chromoly steel for engine mounts and 303 stainless steel for engine cowlings, firewalls, and other fire risk areas. Conventional trailing-edge flaps and ailerons. Goodrich pneumatic de-icing boots on leading-edges.

FUSELAGE: Unpressurised semi-monocoque structure, mainly of 2024-T3 aluminium alloy. Circular cross-section throughout most of length, and standard jet airliner type windows and doors, to facilitate subsequent development of pressurised version. Upswept rear fuselage, with rear-loading ramp/door in underside.

TAIL UNIT: Conventional cantilever fail-safe structure. Angular sweptback fin and rudder, with small dorsal fin; constant chord non-swept tailplane and elevators (former with leading-edge root extensions), mounted on top of fuselage. Trim tabs in rudder and each elevator.

LANDING GEAR: Retractable tricycle type, with hydraulic actuation. Main units are of trailing-arm type, with oleo-pneumatic shock absorption. Each consists of two independent 670 × 210 × 12 wheels in tandem, retracting upward into large fairing on fuselage side. Steerable twin-wheel nose unit (wheel size 650 × 10) retracts forward. Mechanical or free-fall emergency extension in event of hydraulic failure. Goodrich wheels, tyres, and brakes.

POWER PLANT: Four 559 kW (750 shp) Avco Lycoming LTP 101-750 turboprop engines, derated to 447 kW (600 shp), each driving a Hartzell four-blade variable- and reversible-pitch propeller with spinner. Fuel in four equal-volume integral wing tanks, combined capacity 3,028 litres (666 Imp gallons; 800 US gallons). Provision for external auxiliary fuel tanks.

ACCOMMODATION: Pilot and co-pilot side by side on flight deck, with provision for third crew member if required. Cabin can be configured for up to 50 passengers, in mainly four-abreast seating with central aisle, with a typical layout for 40 passengers plus a cabin attendant. In all-cargo role, up to five standard LD3 containers can be accommodated. Passenger/crew door at front of cabin on port side. Two-door tailgate in underside of rear fuselage, lower portion serving as loading/unloading ramp for cargo, upper portion opening upward and inward. Additional payload can be carried on tailgate. Emergency exit on each side at rear of cabin. Entire accommodation heated (mixture of engine bleed air and combustion heater) and air-conditioned.

SYSTEMS: Freon type air-conditioning system. Hydraulic system, pressure 103.5 bars (1,500 lb/sq in), for landing gear extension/retraction, nosewheel steering, brakes, and tailgate actuation. Pneumatic system, using engine bleed air, for de-icing system and standby instruments. Electrical system (28V DC) powered by four 200A engine driven starter/generators, with voltage regulators, and lead-acid batteries. Converter for AC power available optionally. Aircooled diesel APU for on-demand power to drive one starter/generator, hydraulic pump, and air-conditioning system.

DIMENSIONS, EXTERNAL:

Wing span	21.34 m (70 ft 0 in)
Wing chord, constant portion	2.16 m (7 ft 1 in)
Wing aspect ratio	9.61
Length overall	18.44 m (60 ft 6 in)
Fuselage: Max diameter	2.74 m (9 ft 0 in)
Height overall	6.25 m (20 ft 6 in)
Tailplane span	8.00 m (26 ft 3 in)
Wheel track	3.23 m (10 ft 7 in)
Wheelbase	5.49 m (18 ft 0 in)
Propeller diameter	2.34 m (7 ft 8 in)
Propeller/fuselage clearance	0.305 m (1 ft 0 in)
Propeller ground clearance	1.52 m (5 ft 0 in)
Passenger/crew door:	
Height	1.83 m (6 ft 0 in)
Width	0.81 m (2 ft 8 in)
Emergency exits (each):	
Height	0.91 m (3 ft 0 in)
Width	0.51 m (1 ft 8 in)
Lower tailgate: Length	1.93 m (6 ft 4 in)
Width	1.93 m (6 ft 4 in)
Upper tailgate: Length	3.05 m (10 ft 0 in)
Width	1.93 m (6 ft 4 in)

DIMENSIONS, INTERNAL:

Cabin: Length	10.06 m (33 ft 0 in)
Max width	2.59 m (8 ft 6 in)
Max flat floor width	1.93 m (6 ft 4 in)
Tailgate opening width	1.93 m (6 ft 4 in)
Volume	41.06 m³ (1,450 cu ft)

AREAS:

Wings, gross	47.38 m² (510 sq ft)
Ailerons (total)	2.42 m² (26 sq ft)
Trailing-edge flaps (total)	6.78 m² (73 sq ft)
Fin, incl dorsal fin	13.47 m² (145 sq ft)
Rudder	2.69 m² (29 sq ft)
Tailplane	11.15 m² (120 sq ft)
Elevator	5.30 m² (57 sq ft)

WEIGHTS AND LOADING:

Weight empty, equipped:	
38-passenger configuration	5,443 kg (12,000 lb)
cargo configuration	4,944 kg (10,900 lb)
Max tailgate load:	
on ground	1,542 kg (3,400 lb)
in flight	635 kg (1,400 lb)
*Max T-O weight	10,886 kg (24,000 lb)
Max landing weight	9,072 kg (20,000 lb)
Max cabin floor loading	976 kg/m² (200 lb/sq ft)

PERFORMANCE (estimated at max T-O weight, S/L, ISA):

Max level speed for normal operation	200 knots (370 km/h; 230 mph)
Econ cruising speed	180 knots (333 km/h; 207 mph)
Cruising speed, one engine out	175 knots (324 km/h; 201 mph)
Stalling speed, flaps and landing gear down	75 knots (139 km/h; 87 mph)
Max rate of climb (4 engines)	548 m (1,800 ft)/min
Rate of climb, one engine out	274 m (900 ft)/min
Service ceiling	7,925 m (26,000 ft)
T-O run	488 m (1,600 ft)
T-O to 15 m (50 ft)	915 m (3,000 ft)
Landing run: normal	732 m (2,400 ft)
with brakes and propeller reversal	183 m (600 ft)
Balanced field length for T-O and landing	915 m (3,000 ft)

*12,700 kg (28,000 lb) for KM C-180

BEECHCRAFT

BEECH AIRCRAFT CORPORATION (subsidiary of Raytheon Company): 9709 East Central, Wichita, Kansas 67201-0085, USA

BEECHCRAFT 1900C and KING AIR EXEC-LINER

US Army designation: C-12J

Beech began design of the Model 1900 commuter airliner during 1979, and the construction of three flying prototypes, a static test airframe, and a fuselage pressure cycle test airframe in 1981. The first flight of the performance prototype was made on 3 September 1982, followed by the systems prototype on 30 November 1982. The third prototype was used for function and reliability testing, equipment certification and demonstration, and is now in operational service. FAA certification under SFAR Pt 41C was obtained on 22 November 1983, and included single pilot approval under FAR Pt 135 Appendix A.

The Beech 1900 is offered in two variants: **Model 1900C** with cargo door, the first of which was delivered in February 1984; and **King Air Exec-Liner,** deliveries of which began in July 1985 with an aircraft (N34GT) for General Telephone Co of Illinois. Recent orders for the 1900C include three for Pennsylvania Airlines of Middletown, Pennsylvania; one for Mesa Airlines of Farmington, New Mexico; four for Business Express of Bridgeport, Connecticut; and six aircraft configured for electronic surveillance missions for delivery to the Egyptian Air Force in 1988. These aircraft will be equipped with a new 'wet' wing which will increase fuel capacity by nearly 60 per cent and extend range by some 85 per cent.

In March 1986 the US Army Aviation Systems Command awarded Beech Aircraft Corporation a $20.8 million contract for the supply of six Model 1900Cs, which will be designated **C-12J** in Army service. These aircraft, which will also have 'wet' wings, will be assigned to the Air National Guard as mission support aircraft, replacing Convair C-131s currently in service. Deliveries of the C-12Js will commence in September 1987. Beech delivered a total of 21 Model 1900s during 1985.

The description which follows applies to the commercial Model 1900C and King Air Exec-Liner:

TYPE: Twin-turboprop commuter/cargo airliner and executive transport.

WINGS: Cantilever low-wing monoplane. Wing section NACA 23000. Thickness/chord ratio 18% at root, 12% at tip. Dihedral 6°. Incidence 3° 29' at root, −1° 4' at tip. No sweepback at quarter-chord. Semi-monocoque fail-safe structure of aluminium alloy, riveted and bonded, with a continuous main spar. Single-slotted trailing-edge flaps, in two sections on each wing, of aluminium alloy construction; symmetrical ailerons of similar construction. Trim tab at inboard end of port aileron. Pneumatic de-icing boots on wing leading-edges.

FUSELAGE: Semi-monocoque fail-safe pressurised structure of aluminium alloy, mainly of bonded construction but including some riveting. Small horizontal vortex generator on each side of fuse-

lage immediately forward of wing leading-edge.

TAIL UNIT: Aluminium alloy structure comprising a cantilever T tail with sweptback vertical and horizontal surfaces. Small fin (taillet) beneath each side of tailplane, near tip; and auxiliary fixed horizontal tail surface (stabilon) on each side of rear fuselage. Trim tabs in elevators and rudder. Pneumatic de-icing boots on leading-edges of tailplane and stabilons.

LANDING GEAR: Hydraulically retractable tricycle type. Main units retract forward and nose unit rearward. Beech oleo-pneumatic shock absorber in each unit. Twin Goodyear wheels on each main unit, size 6.50 × 10, with Goodyear tyres size 22 × 6.75-10, pressure 6.07 bars (88 lb/sq in); Goodrich steerable nosewheel size 6.5 × 8, with Goodrich tyre size 19.5 × 6.75-8, pressure 6.07 bars (88 lb/sq in). Multiple-disc hydraulic brakes. Beech/Hydro-Aire anti-skid units and power steering optional.

POWER PLANT: Two Pratt & Whitney Canada PT6A-65B turboprop engines, each flat rated at 820 kW (1,100 shp) and driving a Hartzell four-blade constant-speed fully-feathering reversible-pitch composite propeller with spinner. Five bladder tanks and one integral fuel cell in each wing, all interconnected, with a total capacity in both wings of 1,627 litres (430 US gallons), of which 1,608 litres (425 US gallons) are usable. Refuelling point in each wing leading-edge, adjacent to tip. Oil capacity (total) 27.2 litres (7.2 US gallons).

ACCOMMODATION: Crew of one (FAR Pt 91) or two (FAR Pt 135) on flight deck, with standard accommodation in cabin of commuter version for 19 passengers, in single seats on each side of centre aisle. Forward and rear carry-on baggage lockers, underseat baggage stowage, rear baggage compartment, and nose baggage compartment. Forward and rear doors, incorporating airstairs, on port side. Upward hinged cargo door on port side standard on Model 1900C. Two emergency exits, over wing on starboard side. Accommodation is air-conditioned, heated, ventilated, and pressurised. King Air Exec-Liner has 12/18-passenger cabin with forward and rear compartments, combination lavatory/passenger seat, and two beverage bars at cabin compartment division. Club seating optional. Customised interiors to customer choice.

SYSTEMS: Bleed air cabin heating and pressurisation, max differential 0.33 bars (4.8 lb/sq in). Air cycle and vapour cycle air-conditioning. Hydraulic system, pressure 207 bars (3,000 lb/sq in) for landing gear actuation. Electrical system includes two 300A engine starter/generators and one 22Ah nickel-cadmium battery. Constant-flow oxygen system of 4.33 m³ (153 cu ft) capacity standard.

AVIONICS: Duplicated King com/nav, glideslope receiver, transponder, audio, ADF, DME, marker beacon receiver, and Bendix RDR-160 weather radar. Sperry EFIS, and Collins autopilot and Pro Line II equipment, optional.

DIMENSIONS, EXTERNAL:

Wing span	16.61 m (54 ft 5¼ in)
Wing chord: at root	2.18 m (7 ft 1¼ in)
at tip	0.91 m (2 ft 11¼ in)
Wing aspect ratio	9.8
Length overall	17.63 m (57 ft 10 in)
Length of fuselage	16.19 m (53 ft 1½ in)
Fuselage: Max diameter	1.79 m (5 ft 10½ in)
Height overall	4.54 m (14 ft 10¾ in)
Tailplane span	5.63 m (18 ft 5¾ in)
Wheel track	5.23 m (17 ft 2 in)
Wheelbase	7.25 m (23 ft 9½ in)
Propeller diameter	2.78 m (9 ft 1½ in)
Propeller ground clearance	0.35 m (1 ft 1¾ in)
Distance between propeller centres	5.23 m (17 ft 2 in)
Passenger doors (fwd and rear, port, each):	
Height	1.32 m (4 ft 4 in)
Width	0.69 m (2 ft 3 in)
Height to sill: fwd	1.28 m (4 ft 2½ in)
rear	1.15 m (3 ft 9¼ in)
Cargo door (rear, port):	
Height	1.32 m (4 ft 4 in)
Width	1.32 m (4 ft 4 in)
Height to sill	1.15 m (3 ft 9¼ in)
Baggage door (nose, port):	
Max height	0.56 m (1 ft 10 in)
Width	0.66 m (2 ft 2 in)
Height to sill	1.45 m (4 ft 9 in)
Emergency exits (two stbd; plus one port on 1900C only, all overwing):	
Height	0.70 m (2 ft 3½ in)
Width	0.51 m (1 ft 8 in)

DIMENSIONS, INTERNAL:

Cabin, incl flight deck and rear baggage compartment:	
Length	12.02 m (39 ft 5½ in)
Max width	1.37 m (4 ft 6 in)
Max height	1.45 m (4 ft 9 in)
Floor area	15.28 m² (164.5 sq ft)
Volume (excl baggage space)	16.79 m³ (593 cu ft)
Baggage space:	
Cabin:	
forward, standard	0.42 m³ (15.0 cu ft)
forward, optional	1.19 m³ (41.9 cu ft)
rear, Exec-Liner	2.18 m³ (77.0 cu ft)
rear, 1900C	4.36 m³ (154.0 cu ft)
Nose compartment	0.38 m³ (13.5 cu ft)

AREAS:

Wings, gross	28.15 m² (303.0 sq ft)
Ailerons (total)	1.67 m² (18.0 sq ft)
Trailing-edge flaps (total)	4.17 m² (44.9 sq ft)
Fin	3.42 m² (36.85 sq ft)
Rudder (incl tab)	1.106 m² (11.9 sq ft)
Taillets (total)	0.305 m² (3.28 sq ft)
Tailplane	4.52 m² (48.7 sq ft)
Elevator (incl tab)	1.79 m² (19.3 sq ft)
Stabilons (total, exposed)	1.44 m² (15.46 sq ft)

WEIGHTS AND LOADINGS:

Weight empty	3,947 kg (8,700 lb)
Max fuel weight (usable)	1,292 kg (2,848 lb)
Max payload	2,404 kg (5,300 lb)
Payload with max fuel	2,341 kg (5,162 lb)
Max baggage	880 kg (1,940 lb)
Max T-O weight	7,530 kg (16,600 lb)
Max ramp weight	7,580 kg (16,710 lb)
Max landing weight	7,302 kg (16,100 lb)
Max zero-fuel weight	6,350 kg (14,000 lb)
Max wing loading	267.5 kg/m² (54.8 lb/sq ft)
Max power loading	4.59 kg/kW (7.55 lb/shp)

PERFORMANCE (at max T-O weight except where indicated):

Max cruising speed at AUW of 6,350 kg (14,000 lb):
at 2,440 m (8,000 ft)
256 knots (474 km/h; 295 mph)
at 4,875 m (16,000 ft)
253 knots (468 km/h; 291 mph)
at 7,620 m (25,000 ft)
235 knots (435 km/h; 271 mph)

T-O speed, 20° flap
105 knots (194 km/h; 121 mph) CAS

Approach speed at max landing weight
113 knots (209 km/h; 130 mph) CAS

Artist's impression of the Beechcraft C-12J mission support aircraft

Stalling speed at max T-O weight:
wheels and flaps up
101 knots (187 km/h; 116 mph) CAS
wheels down and 20° flap
95 knots (176 km/h; 109 mph) CAS

Stalling speed at max landing weight, wheels and flaps down
87 knots (161 km/h; 100 mph) CAS

Max rate of climb at S/L 710 m (2,330 ft)/min

Rate of climb at S/L, one engine out
149 m (490 ft)/min

Service ceiling exceeds certificated ceiling of 7,620 m (25,000 ft)

Service ceiling, one engine out
3,960 m (13,000 ft)

T-O run, 20° flap 671 m (2,200 ft)

T-O to 15 m (50 ft), 20° flap 994 m (3,260 ft)

Landing from 15 m (50 ft) at max landing weight
774 m (2,540 ft)

Landing run at max landing weight
466 m (1,530 ft)

Accelerate/stop distance, 20° flap
1,158 m (3,800 ft)

Range with max fuel, with allowances for starting, taxi, T-O, climb, descent, and 45 min reserves at max range speed:
max cruise power:
at 2,440 m (8,000 ft)
531 nm (984 km; 611 miles)
at 4,875 m (16,000 ft)
663 nm (1,228 km; 763 miles)
at 7,620 m (25,000 ft)
793 nm (1,469 km; 913 miles)

max range power:
at 2,440 m (8,000 ft)
596 nm (1,104 km; 686 miles)
at 4,875 m (16,000 ft)
712 nm (1,319 km; 820 miles)
at 7,620 m (25,000 ft)
794 nm (1,471 km; 914 miles)

XIAN

XIAN STATE AIRCRAFT FACTORY, Shaanxi Province, People's Republic of China

XIAN (ANTONOV) Y-7

Chinese name: Yunshuji-7 (Transport aircraft 7) or Yun-7

NATO reporting name: Coke

Soviet production of the Antonov An-24 twin-turboprop transport aircraft ended in 1978 after about 1,100 had been delivered, including 40 to China. These have been in service with CAAC and the PLA Air Force since about 1970. A 'considerably improved' Chinese version of this 48/52-passenger aircraft, known as the **Y-7**, is now in production at Xian, following the completion of nine pre-series examples for a 1,600 hour flight test programme and other testing. The aircraft's engines (derived from the Ivchenko AI-24A) are manufactured at Shanghai.

Public debut by a pre-production Y-7 took place on 17 April 1982 at Nanyuan Airport, Beijing, and production is believed to have started during that year, initially to replace Soviet built Il-14s and Il-18s in service with CAAC. First flight of a production Y-7, in the Shanghai area, was announced by the New China news agency (Xinhua) on 1 February 1984, and the initial delivery to CAAC was made shortly afterwards. Ten Y-7s had been completed by the end of 1984, when subsequent output was planned to continue at the rate of six per year.

Under the first of two similar contracts (the other being for the Harbin Y-12), the Hong Kong Aircraft Engineering Company (HAECO) undertook 'prototype' refurbishment of a 48-passenger production Y-7 in 1985. This programme called for a new three-person flight deck layout, all-new cabin interior with 52 reclining seats, windscreen de-icing, new HF/VHF communications, new navigation equipment, and installation of oxygen, air data, and environmental control systems. The aircraft was also fitted with winglets which, by reducing induced drag by 4 per cent, are claimed to offer a 5 per cent reduction in fuel consumption. In this new form the aircraft meets BCAR standards, and is known as the **Y7-100**.

North American, British, French, and German firms supplying equipment include Becker, Collins, Hamilton Standard, IDC, Lermer, Litton, Nordam, PTC, Puritan-Bennett, Sfena, Smiths, Sperry, and Sundstrand. The Y-7 (registration B-3499) was delivered to HAECO on 27 December 1984 and was returned to China in Y7-100 configuration on 16 August 1985. Information on the programme as it progressed was fed back to China, where two other Y-7s were being similarly upgraded at Xian using kits supplied by HAECO.

This initial phase was expected to be followed by a seven-aircraft second phase, and possibly by a third involving the surviving examples of China's 40 Soviet built An-24s. The contract with Nordam, which was responsible for the cabin interior redesign, included an option for 50 shipsets of floors, seats, lights, and toilets. In the longer term, China is reportedly interested in a re-engining programme, possibly using Rolls-Royce Dart or Pratt & Whitney Canada turboprops.

The following description is based on that of the An-24RV, modified where possible to refer to the Y-7 and Y7-100:

TYPE: Twin-turboprop short/medium-range transport.

WINGS: Cantilever high-wing monoplane, with 2° 12′ 2″ anhedral on outer panels. Incidence 3°. Sweepback at quarter-chord on outer panels 6° 50′. All-metal two-spar structure, built in five sections: constant chord centre-section, two tapered inner wings, and two tapered outer panels. Mass balanced servo-compensated ailerons, with large glassfibre trim tabs. Hydraulically operated flaps along entire wing trailing-edges inboard of unpowered ailerons; single-slotted flaps on centre-section, double-slotted outboard of nacelles. Servo tab and trim tab in each aileron. Winglet at each tip on Y7-100.

FUSELAGE: All-metal semi-monocoque structure in front, centre, and rear portions, of bonded/welded construction.

TAIL UNIT: Cantilever all-metal structure, with single ventral fin. Tailplane dihedral 9°. All controls operated manually. Balance tab in each elevator, trim tab and spring tab in rudder.

LANDING GEAR (An-24RV): Retractable tricycle type with twin wheels on all units. Hydraulic actuation, with emergency gravity extension. All units retract forward. Mainwheels are size 900 × 300-370, tyre pressure 3.45–4.90 bars (50–71 lb/sq in); nosewheels size 700 × 250, tyre pressure 2.45–3.45 bars (35.5–50 lb/sq in). (Tyre pressures variable to cater for different types of runway.) Disc brakes on mainwheels; steerable and castoring nosewheel unit.

POWER PLANT: Two Shanghai WJ-5A-1 turboprop engines, each rated at 2,080 kW (2,790 shp) for T-O and 1,976 kW (2,650 shp) at ISA + 23°C; four-blade constant-speed fully-feathering propellers with elongated spinners. Fuel in integral wing tanks immediately outboard of nacelles, and four bag-type tanks in centre-section, total capacity 5,550 litres (1,220 Imp gallons; 1,466 US gallons). Provision for four additional tanks in centre-section. Pressure refuelling point in starboard engine nacelle; gravity fuelling point above each tank. One 8.83 kN (1,985 lb st) Type RU 19-300 auxiliary turbojet (or Chinese equivalent?) in starboard engine nacelle for engine starting, to improve take-off and in-flight performance, and to reduce stability and handling problems if one turboprop engine fails in flight.

ACCOMMODATION: Crew of three (Y7-100) or five (Y-7) on flight deck, plus cabin attendant. Standard layout has four-abreast seating, with centre aisle, for 48 (Y-7) or 52 (Y7-100) passengers in air-conditioned, soundproofed (by Tracor), and pressurised cabin. Galley (by Lermer) and toilet at rear on starboard side. Baggage compartments forward and aft of passenger cabin, plus overhead stowage bins in cabin. Passenger door on port side, at rear of cabin, is of airstair type. Doors to forward and rear baggage compartments on starboard side. All doors open inward. Electric windscreen de-icing in Y7-100.

SYSTEMS: Hamilton Standard environmental control system in Y7-100 (cabin pressure differential in An-24RV is 0.29 bars; 4.27 lb/sq in). Main and emergency hydraulic systems, pressure 152 bars (2,200 lb/sq in), for landing gear actuation, nosewheel steering, flaps, brakes, windscreen wipers, and propeller feathering. Electrical system in An-24RV includes two 27V DC starter/generators, two alternators to provide 115V 400Hz AC supply, and two inverters for 36V 400Hz three-phase AC. Puritan-Bennett passenger oxygen system optional in Y7-100.

AVIONICS AND EQUIPMENT (Y7-100): Standard communications equipment comprises Collins 618M-3 dual VHF, Collins 628T-3 single HF, Becker audio selection and intercom, and Sundstrand AV-557C cockpit voice recorder. Standard navigation equipment comprises dual ADI-84A, dual EHSI-74 electronic HSI, dual RMI-36, FGS-65 flight guidance system, dual 51RV-4B VOR/ILS, dual DME-42, dual DF-206 ADF, 860F-4 radio altimeter, 621A-6A ATC transponder, 51Z-4 marker beacon receiver, and CWC-80 instrument warning system, all by Collins; Litton LTN-211 VLF/Omega navigation system; Sperry MHRS dual compass system, dual attitude reference, and Primus 90 colour weather radar; IDC air data system; Sundstrand UFDR flight data recorder; and KJ-6A autopilot. Gables control units. Other instrumentation by Gould, IDC, Sfena, and Smiths.

DIMENSIONS, EXTERNAL:

Wing span: Y-7	29.20 m (95 ft 9½ in)
Y7-100	29.637 m (97 ft 2¾ in)
Wing chord: at root	3.50 m (11 ft 5¾ in)
at tip	1.095 m (3 ft 7 in)
Wing aspect ratio	11.7
Length overall	23.708 m (77 ft 9½ in)
Height overall	8.553 m (28 ft 0¾ in)
Fuselage: Max width	2.90 m (9 ft 6¼ in)
Max depth	2.50 m (8 ft 2½ in)
Tailplane span	9.08 m (29 ft 9½ in)
Wheel track (c/l of shock struts)	7.90 m (25 ft 11 in)
Wheelbase	7.90 m (25 ft 11 in)
Passenger door (port, rear):	
Height	1.40 m (4 ft 7 in)
Width	0.75 m (2 ft 5½ in)
Height to sill	1.40 m (4 ft 7 in)
Baggage compartment door (starboard, fwd):	
Height	1.10 m (3 ft 7¼ in)
Width	1.20 m (3 ft 11¼ in)
Height to sill	1.30 m (4 ft 3 in)

The prototype Xian Y7-100 before the addition of winglets

Y-7 assembly line at the Xian State Aircraft Factory *(Xinhua)*

Baggage compartment door (starboard, rear):
Height 1.41 m (4 ft 7½ in)
Width 0.75 m (2 ft 5½ in)

DIMENSIONS, INTERNAL:

Cabin:
Length, incl flight deck:
Y-7 9.90 m (32 ft 5¾ in)
Y7-100 10.50 m (34 ft 5½ in)
Max width 2.80 m (9 ft 2¼ in)
Max height 1.90 m (6 ft 2¼ in)
Volume: Y7-100 56.0 m³ (1,978 cu ft)
Baggage compartment volume (Y7-100):
fwd 4.50 m³ (159 cu ft)
rear 6.70 m³ (237 cu ft)

AREAS:

Wings, gross 74.98 m² (807.1 sq ft)
Vertical tail surfaces (total) 13.38 m² (144.0 sq ft)
Horizontal tail surfaces (total) 17.23 m² (185.5 sq ft)

WEIGHTS AND LOADINGS:

Operating weight empty:
Y-7 14,235 kg (31,383 lb)
Y7-100 14,900 kg (32,849 lb)
Max fuel (both) 4,790 kg (10,560 lb)
Max payload:
Y-7 4,700 kg (10,362 lb)
Y7-100 5,500 kg (12,125 lb)
Max T-O and landing weight (both) 21,800 kg (48,060 lb)
Max wing loading (both) 290.7 kg/m² (59.6 lb/sq ft)
Max power loading (both) 5.24 kg/kW (8.61 lb/shp)

PERFORMANCE (Y7-100 except where indicated):

Max level speed 279 knots (518 km/h; 322 mph)
Max cruising speed at 4,000 m (13,125 ft):
Y-7 258 knots (478 km/h; 297 mph)
Y7-100 261 knots (484 km/h; 301 mph)
Econ cruising speed at 6,000 m (19,685 ft) 228 knots (423 km/h; 263 mph)
Max rate of climb at S/L 458 m (1,504 ft)/min
Service ceiling 8,750 m (28,700 ft)
Service ceiling, one engine out 3,900 m (12,800 ft)
T-O run at S/L, FAR Pt 25:
ISA 1,248 m (4,095 ft)
ISA + 20°C 1,398 m (4,590 ft)
Landing run 620 m (2,035 ft)
Range:
max (52-passenger) payload 491 nm (910 km; 565 miles)
max standard fuel 1,025 nm (1,900 km; 1,180 miles)
standard and auxiliary fuel 1,306 nm (2,420 km; 1,504 miles)

ILYUSHIN

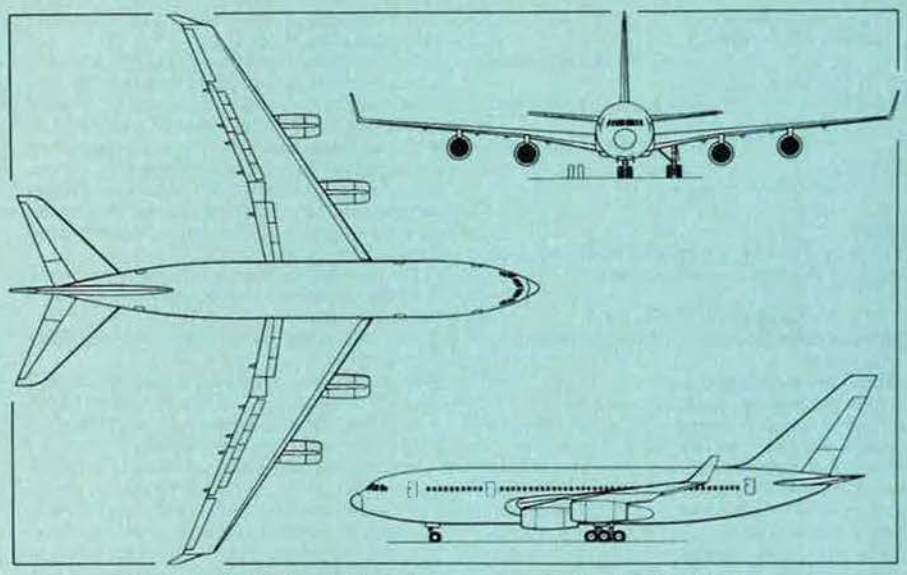
ILYUSHIN DESIGN BUREAU: Moscow Central Airport, Khodinka, Moscow, USSR

Under the five-year plan (1986–90) approved by the 27th Congress of the Communist Party of the Soviet Union, Aeroflot is set the task of carrying a total of 580 million passengers. To make this possible, its fleet will be modernised and expanded with a number of new aircraft, including the twin-turboprop short-haul Ilyushin Il-114, twin-turbofan medium-range Tupolev Tu-204, and four-turbofan long-range Il-96-300.

ILYUSHIN Il-96-300

The Il-96-300 is the longer-range derivative of the Il-86 to which reference was first made in the 1982–83 *Jane's*. It bears a superficial resemblance to the Il-86 but is, in fact, a new design, making use of the latest design concepts and most advanced equipment available to the Soviet aerospace industry. New structural materials and state of the art technology are intended to make practicable a service life of 60,000 flying hours and 12,000 landings. The power plant will comprise four high bypass ratio turbofans, each rated at about 157 kN (35,300 lb st) and with a 27 per cent better fuel efficiency than the engines of the Il-86.

The wings of the Il-96-300 will have a supercritical section, winglets, an increased span compared with those of the Il-86, and reduced sweepback of 30° at quarter-chord. The control surfaces will be enlarged to improve stability after an engine failure. The fuselage will be basically unchanged in form, with lighter and more comfortable seating for a normal complement of 235 to 300 passengers, eight or nine abreast, and a flight crew of three (two pilots and a flight engineer).



Ilyushin Il-96-300 four-turbofan long-range transport, developed from the in-service Il-86 *(Pilot Press)*

Conventional standby instruments will be retained, but primary flight information will be presented on dual twin-screen colour CRTs, fed by triplex INS, a satellite navigation system, and other sensors. Triplex flight control and flight management systems, together with a head-up display, will permit fully automatic en-route control and operations in ICAO Category III minima. Duplex engine and systems monitoring and failure warning systems will feed in-flight information to both the flight engineer's station and monitors on the ground. Another electronic system will provide real-time automatic weight and CG situation data.

The Il-96-300 is designed to conform with ICAO Chapter 3 Supplement 16 noise requirements. The brief specification that follows includes comparative data for the Il-86:

DIMENSIONS, EXTERNAL (A, Il-86; B, Il-96-300):
Wing span: A 48.06 m (157 ft 8¼ in)
B 57.66 m (189 ft 2 in)
Wing aspect ratio: A 7.5
B 9.5
Length overall: A 59.54 m (195 ft 4 in)
B 55.35 m (181 ft 7¼ in)
Length of fuselage: A 56.10 m (184 ft 0¾ in)
B 51.15 m (167 ft 9¾ in)
Diameter of fuselage: A, B 6.08 m (19 ft 11½ in)
Height overall: A 15.81 m (51 ft 10½ in)
B 17.57 m (57 ft 7¾ in)

AREA:

Wings, gross: A 320 m² (3,444 sq ft)
B 350 m² (3,767 sq ft)

WEIGHTS:

Max payload: A, B 42,000 kg (92,600 lb)
Max T-O weight: A 206,000 kg (454,150 lb)
B 230,000 kg (507,060 lb)
Max landing weight: A, B 175,000 kg (385,810 lb)

PERFORMANCE (estimated):

Normal cruising speed:
A 486–512 knots (900–950 km/h; 559–590 mph)
B 459–486 knots (850–900 km/h; 528–559 mph)
Normal cruising height:
A 9,000–11,000 m (30,000–36,000 ft)
B 9,000–12,000 m (30,000–39,370 ft)
Landing speed:
A 130–141 knots (240–260 km/h; 149–162 mph)
B 135–146 knots (250–270 km/h; 155–168 mph)
Range: with 40,000 kg (88,185 lb) payload:
*A 1,944 nm (3,600 km; 2,235 miles)
B 4,050 nm (7,500 km; 4,660 miles)
with 30,000 kg (66,140 lb) payload:
B 4,860 nm (9,000 km; 5,590 miles)
with 15,000 kg (33,070 lb) payload:
B 5,940 nm (11,000 km; 6,835 miles)

*Reports suggest that the design ranges for the Il-86 have not been achieved. The East German airline Interflug quotes a max range of 1,350 nm (2,500 km; 1,550 miles) in its sales literature.

AÉROSPATIALE

AÉROSPATIALE SNI: 37 boulevard de Montmorency, 75781 Paris Cédex 16, France

AÉROSPATIALE SA 365M PANTHER

This multi-role military development of the Dauphin 2 was first flown in prototype form (F-WZJV) on 29 February 1984. It has since undergone considerable refinement, and was first shown in production form, as the Panther, on 30 April 1986. It will be available for delivery in 1988.

The airframe of the Panther is basically similar to that of the SA 365N, but with greater emphasis on survivability in combat areas. Composite materials are used exclusively for the dynamic components and for an increased (15 per cent) proportion of the fuselage structure. The crew seats are armoured, and similar protection will be extended to the flying control servos and engine controls of production Panthers. Other features include self sealing fuel tanks and redundant hydraulic circuits. Further development is expected to permit continued operation of the main transmission after total loss of lubricating oil.

Similar attention has been paid to crashworthiness. The crew seats will tolerate 15*g*. The entire basic airframe is designed to withstand an impact at a vertical speed of 7 m (23 ft)/s at max T-O weight; the fuel system is capable of withstanding a 14 m (46 ft)/s crash.

The Panther is powered by two Turboméca TM 333-1M turboshaft engines, each rated at 680 kW (912 shp), and utilises the larger 'fenestron' shrouded tail rotor of the SA 365F. To reduce infrared signature, the engine efflux is first mixed with cool ambient air and then ejected upward. Noise level is low, and radar signature is minimised by the aircraft's composite structure and the use of special paints.

As a high speed assault transport, the Panther will carry a crew of two and eight to ten troops over a range of 215 nm (400 km; 248 miles). For close support missions of three-hour duration, the fuselage-side outriggers can each carry a Brandt pack of twenty-two 68 mm rockets or a 20 mm GIAT gun pod with 180 rounds per gun. Three-hour day or night anti-tank missions are possible, carrying two

four-round packs of Euromissile Hot anti-tank missiles with an associated Viviane roof mounted stabilised sight. Operations against fixed-wing aircraft or other helicopters are envisaged, using either 20 mm guns or two four-round packs of Matra Mistral infra-red homing air-to-air missiles. Secondary roles could include reconnaissance, aerial command post, search and rescue, air ambulance (four litters), and transport of up to 1,600 kg (3,525 lb) of slung external freight.

The structural description of the SA 365N in the 1985–86 *Jane's* applies generally to the SA 365M Panther, except as noted above. Currently available specification details are as follows:

DIMENSIONS, EXTERNAL:

Main rotor diameter	11.93 m (39 ft 1¾ in)
Diameter of 'fenestron'	1.10 m (3 ft 7⅛ in)
Main rotor blade chord:	
basic	0.385 m (1 ft 3¼ in)
outboard of tab	0.405 m (1 ft 4 in)
Length overall, rotors turning	13.74 m (45 ft 1 in)
Length of fuselage	12.07 m (39 ft 7¼ in)
Height to top of tail fin	4.07 m (13 ft 4¼ in)
Wheel track	1.90 m (6 ft 2¼ in)
Wheelbase	3.61 m (11 ft 10¼ in)
Main cabin door (fwd, each side):	
Height	1.16 m (3 ft 9½ in)
Width	1.14 m (3 ft 9 in)
Main cabin door (rear, each side):	
Height	1.16 m (3 ft 9½ in)
Width	0.87 m (2 ft 10¼ in)

DIMENSIONS, INTERNAL:

Cabin: Length	2.30 m (7 ft 6½ in)
Max width	2.03 m (6 ft 8 in)
Max height	1.40 m (4 ft 7 in)
Floor area	4.20 m² (45.20 sq ft)
Volume	5.00 m³ (176 cu ft)

AREA:

Main rotor disc	111.8 m² (1,203.2 sq ft)

WEIGHTS:

Basic operating weight, incl two crew	2,690 kg (5,930 lb)
Max sling load	1,600 kg (3,527 lb)
Max T-O weight, internal or external load	4,100 kg (9,039 lb)

PERFORMANCE (at max T-O weight):

Never-exceed speed	160 knots (296 km/h; 184 mph)
Max cruising speed at S/L	150 knots (278 km/h; 172 mph)
Max rate of climb at S/L	480 m (1,575 ft)/min
Hovering ceiling: IGE	3,200 m (10,500 ft)
OGE	2,500 m (8,200 ft)
Range with max standard fuel at S/L	400 nm (740 km; 460 miles)

Aerospatiale Panther multi-role military helicopter carrying 20 mm gun pods

MICROJET

MICROJET SA: Aérodrome de Marmande-Virazeil, 47200 Marmande, France

MICROJET 200 B

Aim of the Microjet programme is to offer economies in military pilot training by use of very small high-performance jet aircraft with comparatively low initial and operating costs. Staggered side by side seating makes a single instrument display adequate for both crew members, but gives the pupil an important impression of being in sole command of the aircraft. The flying controls at each station comprise conventional rudder pedals and a small side stick with armrest.

In addition to the Microjet's primary training role, it offers an inexpensive means by which experienced pilots can maintain their flying proficiency.

First flight of a pre-production Microjet (F-WDMT) took place on 19 May 1983. Together with the earlier, wooden, prototype, it then underwent technical evaluation by pilots of the Centre d'Essais en Vol (CEV) official flight test centre. The second pre-production Microjet (F-WDMX), manufactured entirely by Marmande Aéronautique, flew for the first time on 5 January 1985 and has special significance in that it is the first Microjet with underwing hardpoints for expanded military applications. A third pre-production aircraft has since flown. The fourth airframe will be used for static tests at the Centre d'Essais Aéronautique de Toulouse (CEAT).

The following description applies to the planned initial production version of the Microjet 200 B. Take-off rating of each engine will be increased progressively to 1.80 kN (405 lb st), to improve performance and payload, with particular emphasis on the aircraft's potential in an anti-helicopter combat role.

TYPE: Two-seat lightweight training aircraft.

WINGS: Cantilever low-wing monoplane of tapered planform. Wing section RA 16.303. Thickness/chord ratio 16%. Dihedral 5° 2′ constant from roots. Incidence 3°. Sweepback 0° at 30% chord. Wings, Frise ailerons, and electrically operated single-slotted trailing-edge flaps all of glassfibre/epoxy, with carbonfibre wing spars. Small airbrake forward of outer end of flap on upper surface of each wing. Ailerons embody adjustable artificial feel. Ground adjustable tab on starboard aileron.

FUSELAGE: Conventional light alloy semi-monocoque structure. NACA flush engine air intake on each side of fuselage aft of cockpit; exhaust through lateral jetpipes forward of tail unit.

TAIL UNIT: Cantilever V type, comprising interchangeable fixed surfaces and elevators of glassfibre/epoxy, with carbonfibre spars. Sweepback 26° at 50% chord. Included angle 110°. Controllable tab at root end of each elevator. Shallow ventral fin.

LANDING GEAR: Retractable tricycle type, with single wheel on each unit. Electric retraction, nosewheel rearward, main units inward into fuselage. Manual emergency extension. All wheels fully enclosed by doors when retracted. Microjet oleo-pneumatic shock absorber in all three units. Nosewheel offset 149 mm (6 in) to starboard. Goodyear wheels, tyres, and two-disc hydraulic brakes. Mainwheel tyres size 386 × 172-150, pressure 4.2 bars (61 lb/sq in); nosewheel tyre size 361 × 120-125, pressure 1.8 bars (26 lb/sq in). Parking brake.

POWER PLANT: Two Microturbo TRS 18-1 turbojet engines, each rated at 1.30 kN (293 lb st) for normal operation, uprated automatically to the T-O rating of 1.45 kN (326 lb st) on surviving engine after failure of the other during take-off. Ratings will be increased to 1.60 kN (360 lb st) and 1.80 kN (405 lb st) respectively for series production aircraft. Fuel in two structural tanks behind cockpit and one in each wing, with total capacity of 440 litres (97 Imp gallons; 116 US gallons). Two refuelling points, aft of cockpit on each side. Total oil capacity 1.6 litres (0.35 Imp gallon; 0.42 US gallon).

ACCOMMODATION: Pilot and instructor on side by side adjustable seats, under one-piece rearward hinged jettisonable tinted transparent canopy. Starboard (instructor's) seat staggered 55 cm (1 ft 9¾ in) aft of port seat. Adjustable rudder pedals. Cockpit heated and ventilated by ram air and exhaust heat exchanger, but not pressurised.

SYSTEMS: Electrical system comprises two 1.6kW engine driven generators and a 15Ah nickel-cadmium battery which actuate the landing gear and flaps through non-reversible mechanical jacks. Gaseous oxygen supply for two crew for four hours, from one 1,400 litre (50 cu ft) bottle.

AVIONICS AND EQUIPMENT: Blind-flying instrumentation and avionics for IFR flight standard, including ADI, HSI, and RMI. Typical installation would include VHF, VOR, ILS, DME, marker beacon receiver, transponder, ADF, and intercom. Military version would have UHF, Tacan, and IFF.

DIMENSIONS, EXTERNAL:

Wing span	7.56 m (24 ft 9¾ in)
Wing chord at root	0.85 m (2 ft 9½ in)
Wing aspect ratio	9.3
Length overall	6.665 m (21 ft 10½ in)
Length of fuselage	6.56 m (21 ft 6¼ in)
Width of fuselage	1.10 m (3 ft 7¼ in)
Height overall	2.27 m (7 ft 5½ in)
Tailplane span	3.07 m (10 ft 1 in)
Wheel track	1.92 m (6 ft 3½ in)
Wheelbase	2.64 m (8 ft 8 in)

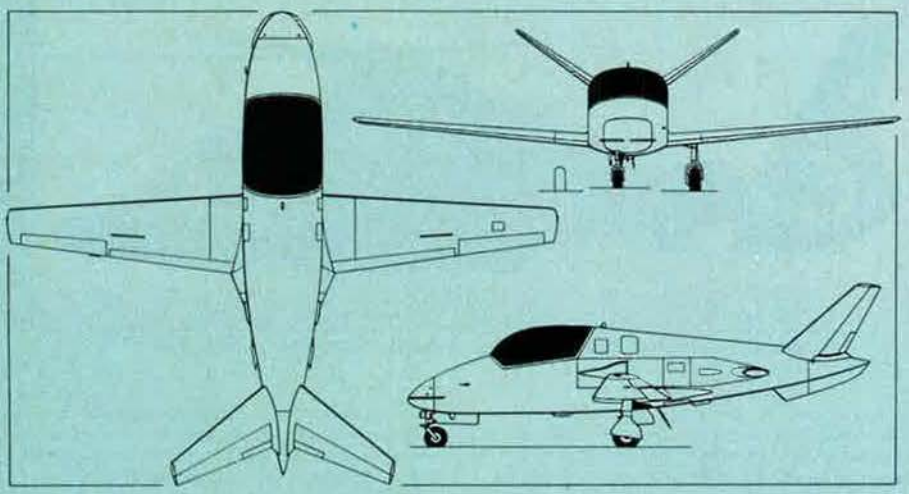
AREAS:

Wings, gross	6.12 m² (65.87 sq ft)
Ailerons (total)	0.446 m² (4.80 sq ft)
Trailing-edge flaps (total)	0.69 m² (7.43 sq ft)
Tail surfaces (total)	2.50 m² (26.91 sq ft)

WEIGHTS AND LOADINGS:

Weight empty	770 kg (1,698 lb)

First pre-production example of the Microjet 200 B



Microjet 200 B two-seat lightweight training aircraft *(Pilot Press)*

Max fuel	340 kg (750 lb)
Max T-O weight: Aerobatic	1,140 kg (2,513 lb)
Utility	1,300 kg (2,866 lb)
Max ramp weight	1,300 kg (2,866 lb)
Max zero-fuel weight	960 kg (2,116 lb)
Max landing weight	1,280 kg (2,822 lb)
Max wing loading	212.4 kg/m² (43.5 lb/sq ft)
Max power loading	448 kg/kN (4.40 lb/lb st)

PERFORMANCE (at max T-O weight with 1,45 kN engines):

Never-exceed speed	300 knots (555 km/h; 345 mph)
Max level speed and max cruising speed at 5,500 m (18,000 ft)	250 knots (463 km/h; 287 mph)
Econ cruising speed	210 knots (389 km/h; 241 mph)
Stalling speed, flaps down, engines idling	72 knots (134 km/h; 83 mph)
Max rate of climb at S/L	520 m (1,705 ft)/min
Rate of climb at S/L, one engine out	120 m (390 ft)/min
Service ceiling	9,150 m (30,000 ft)
Service ceiling, one engine out	3,050 m (10,000 ft)
T-O run	850 m (2,800 ft)
T-O to 15 m (50 ft)	1,180 m (3,870 ft)
Landing from 15 m (50 ft)	510 m (1,674 ft)
Landing run	390 m (1,280 ft)
Range with max internal fuel, 20 min hold	470 nm (870 km; 541 miles)
Max endurance	2 h
g limits	+7/−3.5 Aerobatic
	+4/−1.8 Utility

section of the 1977–78 *Jane's*), is shown in the accompanying illustration.

TYPE: Subsonic jet powered recoverable target drone.

AIRFRAME: Cantilever mid-wing monoplane. Constant chord wings, with unsymmetrical section, 2° anhedral and 0° 45′ incidence. Fuselage built in three sections, those at front (housing radio control, telemetry, and electrical equipment) and rear (autopilot and flares) being of aluminium alloy. Central portion, made from steel sheet, forms integral fuel tank. Rectangular conventional tail surfaces, with tailplane mounted near base of fin. No landing gear.

POWER PLANT: One 25.5 kN (5,732 lb st) turbojet engine (Shenyang Wopen-6 modified by removal of afterburner section), mounted in nacelle underslung beneath centre of fuselage. Main fuel in steel integral tank forming central portion of fuselage; auxiliary fuel in underwing pods. (See under 'Weights' for capacities.)

LAUNCH AND RECOVERY: Launched from re-usable trolley, upon which drone is mounted on three short guiderails and attached by a single connecting pin at base of engine nacelle. Complete ensemble accelerates along runway under engine power, connecting pin being withdrawn automatically by pneumatic release system when speed reaches 151–154 knots (280–285 km/h; 174–177 mph). Drone then lifts off trolley and enters climbout phase, trolley decelerating and being brought to halt under radio command by brake-chute and wheel brakes. Drone can enter firing area two or three times during mission. If not shot down, it can be directed to a pre-selected landing site, where engine is shut down at a pre-determined speed and altitude and drone completes an unpowered landing. Engine nacelle is reinforced to absorb landing impact, resulting in only minor damage which can be repaired easily before re-use.

GUIDANCE AND CONTROL: Four-channel autopilot (pitch, roll, yaw, and altitude) in rear of fuselage stabilises aircraft and controls its flight in response to radio commands from ground station; it incorporates gyroscope, directional gyro, three-axis rate gyro, programmer, electrical actuator, amplifier, and converter. After drone's separation from trolley, first 85 s of flight are programme controlled; mission then comes under pre-planned radio command from ground controller. Aerodynamic control by ailerons, elevators, and rudder.

AVIONICS AND EQUIPMENT: Onboard radar transponder for identification and tracking from ground. Airborne radio equipment comprises receiver/decoder which enables up to 24 command signals to be conveyed to autopilot and other components and equipment. A 52-channel telemetry system provides ground controller with continuous indication of altitude, speed, angle of bank, engine rpm and temperature, and other functions. Mission equipment includes miss distance indicator (antenna at rear of fin-tip); infrared augmentation pod at each wingtip; five corner reflectors for radar signature augmentation; and flares (on undersurface of each wing and on rear edge of engine nacelle fairing) to provide visual augmentation to aid tracking by ground based optical aids. Main electrical power for avionics and equipment provided by engine driven generator, with alternator for AC power; emergency battery supplies DC power for continued safe flight in the event of main system or engine failure.

DIMENSIONS, EXTERNAL:

Wing span	7.50 m (24 ft 7¼ in)
Wing aspect ratio	6.58
Length overall	8.435 m (27 ft 8 in)
Body diameter (max)	0.55 m (1 ft 9¼ in)
Height overall	2.955 m (9 ft 8⅓ in)

AREA:

Wings, gross	8.55 m² (92.03 sq ft)

WEIGHTS:

Fuel: fuselage tank	600 kg (1,323 lb)
underwing tanks (total)	240 kg (529 lb)
Max launching weight	2,450 kg (5,401 lb)

PERFORMANCE:

Operating speed range	458–491 knots (850–910 km/h; 528–565 mph)
Operating height range	500–16,500 m (1,640–54,135 ft)
Range	324–485 nm (600–900 km; 373–559 miles)
Endurance at low and medium altitude	45 min

NAI
NANJING AERONAUTICAL INSTITUTE

Department of RPV Research, Nanjing, Jiangsu Province, People's Republic of China

NAI CHANGKONG 1C

The Nanjing Aeronautical Institute began its research work for this series of unmanned aircraft at the end of the 1960s, and finalised the design of a CK1 prototype in late 1976. In the following year it developed a version with underwing equipment pods, known as the CK1A, and in 1982 replaced these pods with non-jettisonable auxiliary fuel tanks, the designation then becoming CK1B.

The definitive version, tested successfully in the Autumn of 1984, is the Changkong 1C or CK1C. This is described as the first high-manoeuvrability pilotless aircraft researched and developed by the People's Republic of China, and subsequent test flights have demonstrated its ability to meet requirements for use as an aerial target for various types of missile, including a capability for high-manoeuvre flights at bank angles of 70–77°.

The following description applies to the CK1C. Its overall configuration, which outwardly resembles that of the Lavochkin La-17 (see USSR RPV

NAI Changkong 1C (CK1C) highly manoeuvrable and recoverable target drone *(Wang Lue)*

VALOR

The Practice of Professionalism

Capt. Merlyn Dethlefsen said he was "just doing his job" at Thai Nguyen. It was an extraordinary job by any standard.

BY JOHN L. FRISBEE
CONTRIBUTING EDITOR

In mid-1964, Air Force and Navy airmen began fighting for approval of a large-scale air campaign against strategic targets in North Vietnam in order to end the war quickly. But timorous military amateurs who were setting policy in Washington both feared unlikely Chinese intervention and believed that close support of ground forces in South Vietnam was the way to victory. It was not until eight years, thousands of lives, and billions of dollars later that a major air campaign in the North—Linebacker II—was approved, leading to a cease-fire in eleven days.

During those eight years, while this country was being torn apart by antiwar sentiment, high-priority targets in the vicinity of Hanoi were released sporadically and in driblets by the civilian theorists, "sending signals" from Washington. In response, the North Vietnamese, with Soviet and Chinese help, rapidly built up an extremely dense air defense system in their industrialized areas.

One of the targets approved early in 1967 was the iron and steel plant at Thai Nguyen, located in a valley some forty miles north of Hanoi. It and its surrounding industrial complex were considered an important symbol of industrial growth by the North Vietnamese. By 1967, the Thai Nguyen area was heavily defended by AAA guns, surface-to-air (SAM) missiles, and about 100 MiG fighters on fields that were off limits to strikes by our airmen.

The first attack on the steel plant was launched from Takhli Air Base in Thailand on March 10, 1967, a day of rare good weather. Preceding the strike force was a flight of four F-105G Wild Weasel aircraft, call sign "Lincoln," whose job it was to knock out ground-based defenses around the target. The Weasels had a high-risk task for which only the best pilots were selected. Flying No. 3 aircraft was Capt. Merlyn Dethlefsen, on his seventy-eighth combat mission.

Strike aircraft ordinarily made one run at a target, dropped their bombs, and headed for home. Those who tried a second pass often didn't survive. The Weasel crews, on the other hand, were usually in the target area for ten minutes or more.

Coming in on the steel plant, "Lincoln" leader immediately picked up an active SAM site, fired a missile that missed, and was shot down by flak. His wingman was also hit and had to pull out, leaving Captain Dethlefsen in command of the remaining two Weasels.

As Dethlefsen lined up for a run at the SAM, two MiG-21s came in fast from the rear. Quickly, he fired a missile at the site and broke away from the MiGs. Standard practice when attacked by fighters was to jettison ordnance, hit the deck, and outrun the MiGs to safety. Dethlefsen kept his bombs and dove through the flak, guessing correctly that the enemy pilots wouldn't follow him. Climbing back to altitude, he evaded two more MiGs, but was hit by flak, as was his wingman.

Maj. Merlyn Dethlefsen (right) and Jeffrey and Julie look on as President Johnson presents Medal of Honor citation to Jorga Dethlefsen.

By this time, the strike force had dropped its bombs and departed with no damage to any of its aircraft. Captain Dethlefsen and his backseater, Capt. Kevin Gilroy, checked their aircraft and found it extensively damaged but still controllable. Dethlefsen knew that another strike on the steel plant would be scheduled for the next day. He decided to get the SAM, which was now hidden by smoke. While maneuvering around the flak pattern, he spotted another SAM site and silenced it with a missile.

Once more Dethlefsen went down to the deck through murderous flak, looking for the first SAM. His wingman, Maj. Kenneth Bell, stuck with him, despite the damage to his own plane. Pulling up, Dethlefsen rolled into his run and destroyed the site with a direct bomb hit. To make sure the SAM wouldn't come up the next day, he hosed the site with his 20-mm cannon, headed for a tanker, and nursed his damaged F-105 back to Takhli, 500 miles away.

Captain Dethlefsen could have pulled out of that maelstrom of enemy fire with honor when the MiGs attacked his loaded Thud, or when he and his wingman were hit by flak, or when the strike force completed its attack, or when the smoke of battle made it difficult to locate the remaining SAM site. Instead, he chose to make repeated runs on enemy defenses, the chance of survival decreasing with each pass. Why did he do it? "It was a case of doing my job to the best of my ability," Dethlefsen said. "I think that's what we mean when we call ourselves professional airmen in the Air Force."

For his courageous decision to finish the job at any cost, Merlyn Dethlefsen, an extraordinarily professional airman, was awarded the Medal of Honor by President Johnson at a White House ceremony on February 1, 1968. He was the third of twelve airmen to be awarded the nation's highest decoration for valor during the Vietnam War. ■

THE RIGHT BALANCE

The U.S. Air Force has initiated a program to procure a new Automatic Depot Inertial Navigation Test System called ADINTS. This generic, long-term test capability will replace older test systems in accordance with the Air Force's MATE guidelines.

ADINTS requires:

- Unique knowledge of the Prime Equipment and its test procedures.
- Familiarity with the end-user environment.
- Extensive Avionics Automatic Test Equipment experience.
- Demonstrated MATE expertise.

To meet these challenging requirements, Singer's Kearfott Division and Harris Corporation's Government Support Systems Division, have formed a partnership to provide the right balance of capabilities to ensure ADINTS success.

Singer's Kearfott Division has pioneered the development of inertial navigation systems and components. Over the last 25 years, more than 36,000 systems have been delivered including all of the current units to be tested on ADINTS.

Harris' Government Support Systems Division has over three decades of test system experience and is the military's leading supplier of avionics test equipment.

At Harris MATE is already underway as an internally funded program that successfully demonstrated a fully compliant MATE system from the ground up.

The Singer/Harris commitment to ADINTS has all the elements necessary to fulfill current and future Air Force needs for an organically supportable MATE compliant inertial depot.

Directly applicable experience, technology, and reliability in design provide the right balance.

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HARRIS

AFA INTERCOM

By Robin L. Whittle, AFA DIRECTOR OF COMMUNICATIONS

Accent on Youth

AFA's Alexandria Chapter in Louisiana and Massachusetts AFA have one thing in common. Both are making young people in their communities aware of AFA. Alexandria Chapter President Paul Johnston reports that the Chapter participated in the Central Louisiana Science Fair at Louisiana College this spring. The Chapter honored the winner in the "Earth and Space Science Category, Junior Division," with a $50 savings bond, a one-year complimentary AFA membership, and an AFA citation. Sixth-grader Anthony Campo of South Alexandria Elementary School won for his project on Halley's Comet.

"Anthony and his parents were thrilled with this recognition from us. We plan to continue this project in the future. It was a definite plus for us," Mr. Johnston said. In a letter to the Alexandria Chapter President, Anthony expressed his pride in receiving the honors and said he hoped "that you and your organization will continue to support the fair and its participants through these awards in years to come."

Massachusetts AFA President John White and several chapter presidents have initiated a "back-to-school" program. They discuss geography once a week for four weeks in local schools in the Boston area. Mr. White volunteered to develop a pilot program on the geographical history of the United States that, if successful, could be used in the schools by other Boston-area AFA chapter presidents.

As a participant in the School Volunteers for Boston program, Mr. White selected geography for his lessons for good reason. "A survey conducted by the Boston *Globe* revealed that respondents could not, for the most part, locate the United States on a world map or identify neighboring states near their home state," Mr. White said. When representatives from the school volunteer program briefed a meeting of the East Boston Community Relations Committee, in which Mr. White is actively involved, he recalled that survey and decided to volunteer for the program.

Enjoying a light moment during a recent San Diego Chapter luncheon are (from left) San Diego Chapter member Gen. James P. Mullins, USAF (Ret.); Dr. Kerry Dance, President of GA Technologies, Inc., and President of the National Security Industrial Association; luncheon speaker and former astronaut Lt. Gen. Thomas P. Stafford; and Jack L. Heckel, Chairman of the Board of the Aerojet General Corp.

"Every Thursday at 1:00 p.m., I had the pleasure of being a fourth-grade teacher for the students of Mrs. Ellen Einsen, and I was impressed with their knowledge of this country and our geography," he said. Mr. White reviewed the nation's expansion from the colonial era to the present for the young students at the Hugh Roe O'Donnell Elementary School.

"The youngsters were a cross section of every ethnic mix imaginable. When I asked what America meant to them, they were unanimous in their response. 'America is the land of the free,' they told me."

Each day, Mr. White reviewed the subject matter and homework assignment with the class. "Each student completed his written assignment. Some were more imaginative than others, but all revealed real effort and thought. Their word association and sense of recall was electrifying," he said. "The attitude and discipline of these students was a thing of joy."

Mr. White had some friends review the students' work. Two students were selected for special awards. Rebecca Rossano and Nelson Ramos were honored with AFA citations.

The success of the program guarantees that it will be continued. This fall, Paul Revere Chapter President Bill Lewis, Robert V. Pace Chapter President John Campbell, and Minuteman Chapter President Peter Coerico are scheduled to assist students at Boston-area schools. Beginning in the fall term, Mr. White will review American geography with junior high school students.

Since 1966, the School Volunteers for Boston program has placed community, business, and civic leaders at all levels in the Boston school system to tutor, counsel, and teach subjects across the spectrum of human endeavor and interest.

Mobile Chapter's Brookley Air Show

News reports estimated the crowd at 85,000 for the Mobile, Ala., AFA Chapter's annual Brookley Air Show. The show was held April 5–6 in glorious weather and with the glowing support of the city of Mobile and the local Chamber of Commerce.

The show, to the delight of the crowd, combined static displays with back-arching stunts by aerobatic

INTERCOM

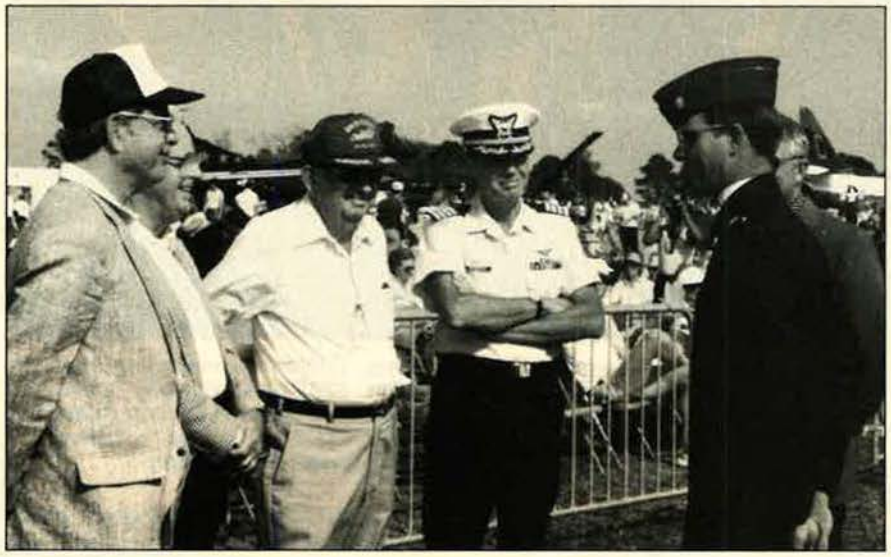
teams and flybys of World War II aircraft. The Lower Alabama Radio Control Club conducted flights of authentic scale aircraft, and the US Precision Helicopter Team, whose pilots represent every branch of the armed services, followed with a demonstration of its capabilities. The team's intricate maneuvers were in preparation for a summer competition in England against a Soviet team, officials said. Another highlight was the "sky-dancing" routine performed by "French Connection," a husband-and-wife aerobatic team whose graceful maneuvers were set to classical music.

Other events included a tribute to the lost *Challenger* Shuttle astronauts and a demonstration of the Marine Corps AV-8B Harrier fighter. The fighter screamed over the field at near the speed of sound and then came to a complete midair halt at 2,000 feet, press accounts reported. There were also demonstrations of the Coast Guard's HU-25A Falcon jet, HH-65A Dolphin, Sikorsky HH-3F Pelican, and the Sikorsky HH-52A Seaguard and a fast-paced flight demonstration of the Northrop F-5E fighter by former Lt. Randy Cunningham, a US Navy fighter ace in Vietnam, who zoomed by the crowd only feet above the ground. The crowd also enjoyed the impressive loops, rolls, climbs, and dives of the Air Force Thunderbirds.

Retired Brig. Gen. John R. Dyas, an active AFA member who flew combat missions in World War II and who now chairs the Military Affairs Committee of the local Chamber of Commerce, told the Mobile *Register* that he was amazed to see how well the pilots stand the strains and pull of gravity as they do their rolls and dives. He had just been watching veteran aerobatic pilot Robbie Grice of Irvington, Ala., put a Super Acro Sport through a particularly demanding routine. Flight demonstrations of the A-10 Thunderbolt II and the Marine Corps's AV-8B Harrier also elicited appreciation from the viewers.

Another crowd-pleaser was the Air Force Academy's "Wings of Blue" Free-Fall Parachute Demonstration Team. Cadet 1st Class Michael Houston of Foley, Ala., jumped from a C-130 transport, trailing spirals of smoke from canisters and an American flag that was secured to his upper leg. He made a soft landing between two orange markers right in front of the reviewing stands.

Organizers were pleased with this year's event. Mobile Chapter President Herb Lockett enthused, "Things went perfectly." Chapter Air Show Coordinator Terry Durham and AFA National Director Dr. Frank Lugo concurred. "This show has been a total success—100 percent. We've had a good crowd turnout, thanks to the help from the media, and no accidents either in the air or on the ground," Mr. Durham said. "We sponsored this event as a special aerospace education program with the tremendous support of the city of Mobile and the Mobile Area Chamber of Commerce, and everyone is delighted with the result," Dr. Lugo explained.



Air Force Thunderbirds leader Lt. Col. Roger Briggs (right foreground) was welcomed to the Brookley Air Show by (from left) Sen. Jeremiah Denton (R-Ala.), Mobile Mayor Arthur Outlaw, Mobile Airport Authority Chairman M. C. Farmer, USCG Capt. Robert Ashworth, and Maj. Gen. William Fleming, USMC (Ret.).

Last May, Lubbock Chapter President Eldon Turner, right, presented a joint Army and Air Force ROTC National Award to AFROTC Cadet Nicholas Coleman. Cadet Coleman majors in mechanical engineering at Texas Tech University in Lubbock.

On the Scene

Sen. Warren Rudman (R-N. H.) discussed deficit reduction at a meeting of AFA's Pease Chapter, reports Chapter President **Lee Blythe Lilljedahl.** More than 200 members and guests turned out for the reception and dinner, including **Col. and Mrs. Robert McCracken,** 509th Bombardment Wing Commander; **Col. Bernie Kane,** Pease AFB Commander; **Arley McQueen, Jr.,** AFA National Vice President for the New England Region; AFA National Director and Mrs. **R. L. "Dev" Devoucoux;** New Hampshire AFA President and Mrs. **Robert**

Former POW Bobby Bagley recently presented an AFA medal on behalf of the Swamp Fox Chapter to AFJROTC Cadet Katrina Spencer at a dining-out at the Shaw AFB Officers' Club. Cadet Spencer, who attends Sumter High School in Sumter, S. C., will serve as her unit's cadet captain and chief of personnel.

McChesney; and Mr. and Mrs. **Rod Brock.** Mr. Brock is Chairman of the Seacoast Military Affairs Council. Senator Rudman, elected to the Senate in 1980 and cosponsor of the Gramm-Rudman-Hollings deficit-reduction act, serves on the Senate Appropriations Committee, the Senate Small Business Committee, and the Governmental Affairs Committee.

In other Pease Chapter news, Chapter President Lilljedahl and Vice President **John Hanson** are working with the Pease AFB Air Park Preservation Committtee to help establish a park near the base front gate. The park will include a display of the B-52, B-29, B-47, and KC-97—aircraft that have been used by the 509th Bombardment Wing at Pease. The Chapter is helping with fund-raising.

AFA National Director **Carl J. Long** has two new reasons to be proud. First, his son, **Carl Long, Jr.,** a doolie at the Air Force Academy, was recently honored as a member of the Academy's Outstanding Squadron for 1986—the 25th Squadron *(see also p. 100).* Second, Carl Sr.'s photo, pictured at the right, won the Northeast Region's photo contest because of its unique content. He was awarded a Kodak Tele-Disc pocket camera. The contest was conducted during the Northeast/New England AFA regional meeting earlier this spring.

Pilot Class 43-D, consisting of veterans of one of the largest pilot classes of World War II, counts three Medal of Honor recipients among its members, reports "Delta Eagle" Secretary **Don Connor.** They are Washington state AFA leader **Joseph M. Jackson, William R. Lawley, Jr.,** and **Edward S. Michael.** In April, all three attended a reunion during AFA's Gathering of Eagles in Las Vegas, Nev.

San Diego Chapter President **Roger R. Tierney** reports that the "standing-room-only" crowd at the Marine Corps Recruit Depot Officers' Club thoroughly enjoyed the Chapter's awards luncheon honoring astronaut **Lt. Gen. Thomas P. Stafford.** General Stafford's slide presentation on "Manned Space Exploration" included futuristic concepts that intrigued the crowd, Mr. Tierney said.

May 26 marked the General Robert F. Travis Chapter's eleventh annual Memorial Day Golf Tourney, reports Chapter President **Betty Hazeleaf.** The event has evolved from a small gathering of AFA members to a classic sport competition that involves the community and that benefits the Chapter's AFROTC Scholarship Program.

In other Travis Chapter news, these individuals and organizations were honored at the Chapter's Tenth Annual Awards Banquet: Field Training Detachment 525, Community Service Award; Maj. Douglas W. Johnson, SSgt. Vicki A. Blanchette, and A1C Debra Jane Anderson, Meritorious Service Award; 86th Military Airlift Squadron, Distinguished Aircrew Award; Maj. Gary Stanberry, CMSgt. Raymond Stiltner, and Ronald Holdsworth, Military Management Award; 60th Field Maintenance Squadron, Resources Effectiveness Award; SMSgt. Gary L. Koch, Senior NCO of the Year; MSgt. Juan M. Martinez, NCO of the Year; SrA. Renee M. Loomis, Airman of the Year; 60th Security Police Squadron, Exceptional Service Award; A1C Nathan K. Umetsu, Humanitarian Service Award; the Medical Center Development Team (consisting of the Air Force Regional Civil Engineers Western Region, the Project Health Facility Office, and the David Grant Medical Center Directorate of Development), Joint Management Award; Travis AFB Honor Guard, President's Citation for Sustained Excellence; and the 75th Military Airlift Squadron, President's Citation for Aircrew Excellence.

"Those living in relatively small communities have a limited exposure to learning institutions for higher ed-

AFA National Director Carl J. Long's photograph of AFA leader Amos Chalif clowning with a photograph of himself (to the great amusement of Marie and Adolph Krober) won first prize in the Northeast/New England regional photo contest conducted during a joint conference in March. Mr. Long won a Kodak pocket camera.

AFA's Foreign Chapters—A Budding, New 'Region'

One of AFA's unique features is its expanding network of chapters throughout the world. Now at a record thirty-two foreign chapters, this group has been one of AFA's fastest growing, both in numbers and enthusiasm. Last year, I had the pleasure of chartering thirteen new chapters in Europe. In my long affiliation with AFA, I have never seen such an enthusiastic outpouring of support for the goals and ideals on which we stand as an organization.

Foreign chapters are structured differently from those in the United States. Active-duty members can vote and hold elective office. These privileges, granted by delegates to our 1981 National Convention, recognize the outstanding contributions made to AFA by active-duty members residing overseas, where traditional civilian support is lacking.

Many active-duty members had found themselves stationed in locations overseas with no active AFA chapters—chapters organized according to our proud tradition of civilian leadership. To foster a greater, more rewarding AFA involvement for our people overseas, active-duty members were granted these exceptions, which pertain to overseas locations only.

Since 1981, the growth and expansion of AFA's foreign chapters have proved beneficial for our members overseas and for AFA overall. These unique organizations have enabled our members overseas to pursue AFA goals and objectives while stationed on foreign soil, where they were previously unable to participate actively in AFA.

These units report directly to the AFA National President rather than to a National Vice President, and they are unique in this regard. It has been my pleasure to work with our overseas units these past two years. I look forward to witnessing even greater accomplishments from them in the future.

—Martin H. Harris, National President.

Last year, AFA National President Marty Harris, right, presented the charter to the then-President of the newly formed chapter at Incirlik AB, TSgt. James Sack. (USAF photo by TSgt. Fred Spriggs)

EUROPE

AFA has twenty-four chapters in Europe. Another chapter is soon to be officially chartered at Sembach AB, West Germany. Recently, AFA National Director Mary Ann Seibel addressed a luncheon meeting of Sembach organizers on how to increase membership and the role of AFA in the United States and overseas.

Belgium

There are two AFA chapters in Belgium. The Florennes Chapter at Florennes AB is led by Capt. Donna F. Bullard, and the General Lauris Norstad Chapter at Supreme Headquarters Allied Powers Europe (SHAPE) is led by Col. Earl D. Riley.

Norstad Chapter officials held a meeting at the SHAPE Officers' Club, and new officers presented briefings on their responsibilities. Gen. John T. Chain, Jr., Chief of Staff, SHAPE, attended the meeting. General Chain addressed a September meeting held to commemorate the Air Force's thirty-eighth anniversary. Several social events were held with the local Air Force Sergeants Association for the Christmas and Easter holidays.

Germany

Seven chapters are clustered around key Air Force installations throughout West Germany.

AFA's Eifel Chapter, chartered on March 31, 1985, is located at Bitburg AB and is led by Peter D. Robinson.

In Berlin, AFA's Gateway to Freedom Chapter sponsors regular programs. Led by President Lt. Col. Fred N. Brown, Chapter officials sponsored their first military ball in February for 130 guests. The event took place at the Silverwings NCO Club and was catered by the Enlisted Open Mess. Gen. Richard Lawson, Deputy Commander in Chief, US European Command, delivered a stirring address highlighting the stark differences between Western and Communist-bloc societies. Armed Forces Network (AFN)-Berlin videotaped General Lawson's address and broadcast key portions of it after the event. Excellent coverage resulted in the base newspaper.

Lt. Col. Wayne E. Dereu is President of AFA's Hahn Chapter at Hahn AB. The Chapter was chartered on February 13, 1985. A key event was the Chapter's patriotic banquet held March 20, 1986, with Gen. Charles Donnelly, Jr., CINCUSAFE, as speaker. General Donnelly highlighted changes in the military and in the conduct of war since the early days of his career.

Located in Heidelberg, AFA's Maj. Gen. Robert M. White Chapter is led by Lt. Col. Thomas L. Burke, Jr. In February, Chapter leaders sponsored a meeting with the Chapter namesake as the speaker. General White discussed the X-15 rocket plane that he flew at record speeds and altitudes in the early 1960s and showed film clips. General White was the first pilot to be awarded astronaut wings. Another meeting was scheduled for June with Gen. Richard Lawson, Deputy CINCEUR, as the speaker.

AFA's Rheinpfalz Chapter at Ramstein AB sponsors quarterly programs and is led by President Lt. Col. Herbert F. Meyer, Jr. A chili cook-off in September raised $1,500 for the Chapter's scholarship fund.

Located at Lindsey AS, AFA's Wiesbaden Chapter is led by Joseph A. Avallone. The Chapter conducts quarterly events that have featured local Air Force leaders as speakers.

Robert P. Spivey leads AFA's Zweibrücken Warrior Chapter at Zweibrücken AB. The Chapter holds regular functions for members.

Greece

AFA has one chapter in Greece, the Athens Chapter, which is led by Lt. Col. Richard J. Erickson and is located at Hellenikon AB. It was chartered last April and has held several meetings.

Italy

There are two chapters in Italy. One was chartered in January at San Vito AS. It is

the Appia Chapter, led by SMSgt. Alexis Herrera. Capt. David M. Rauch leads AFA's Dolomiti Chapter at Aviano AB. Regular meetings are held for members.

The Netherlands

AFA's Eagle Chapter, chartered in March 1985, is located in Soesterberg. Maj. Tom Symonds leads the unit, which reports several executive council meetings and one general membership meeting since the charter date.

Spain

Torrejon AB is the site for AFA's Red Raider Chapter, which was chartered on March 31, 1985. Led by David J. Vogel, the unit held its first function on March 5, 1986. Col. Tom Kirk, USAF (Ret.), a former Vietnam POW who flew the F-105, discussed "Aim low—boring; aim high—soaring." Chapter officials were planning another meeting with former Vietnam POW Col. George "Bud" Day as a joint program with the local Daedalians.

Frederic J. Rowland is President of AFA's Zaragoza Chapter, which was recently chartered.

Turkey

Turkey has three AFA chapters.

AFA's Ankara Chapter at Ankara AS was chartered by National President Marty Harris in April 1985 during a gala dinner at the Ankara Officers' Club. The unit is led by Don W. Box.

Barbara D. Martin leads AFA's Gregory E. Miller Chapter, located at Incirlik AB.

Izmir AS is the site for AFA's Izmir Chapter, chartered in March 1985. The Chapter is led by President Maj. Temple Black.

United Kingdom

There are six AFA chapters throughout the United Kingdom.

David Hill leads AFA's Fens Chapter at RAF Alconbury.

AFA's RAF Bentwaters Chapter, chartered last year and led by Lt. Kevin H. Brennan, sponsored an Air Force Anniversary Ball in cooperation with the Air Force Sergeants Association, the Chiefs' Group, and the NCO Academy Graduates Association. The guest speaker was Col. Lester P. Brown, 81st Tactical Fighter Wing Commander. Some 800 people attended the ball, which was sponsored for the entire base and held at both the Officers' and NCO Clubs.

Formerly called the RAF Fairford Chapter, the name was changed this year to the Cotswold Chapter. Activities have included the sponsorship of a "Special People Day" during the International Air Tattoo, the world's largest military air show. The Chapter sponsored the attendance of seventy-five disabled children and adults at the event. Christopher E. Spade is President.

Maj. Gregory J. Niemiec leads AFA's RAF Greenham Common/Welford Chapter. The Chapter holds regular Executive Council meetings and quarterly membership meetings. One event featured John Silva, base director of retired activities, who discussed retirement benefits. Chapter members sold Christmas wreaths on base to raise funds and have established an "Esprit de Corps" award, which is presented to one deserving member in each graduating NCO Preparatory Class at the 501st Tactical Missile Wing.

Chartered in 1982, AFA's RAF Mildenhall Chapter has had peaks and valleys of activity depending on the leadership team and the effects of PCS moves.

RAF Upper Heyford Chapter is led by CMSgt. Neal Crossland. A new-officer installation ceremony was addressed by Gen. Charles Donnelly, Jr., CINCUSAFE.

PACIFIC

AFA has eight chapters in the Pacific basin.

Australia

SSgt. Michael Millstone leads AFA's Woomera Chapter in the land down under. Meetings have been held, and chapter officials have been in contact with AFA headquarters for advice and counsel on overseas chapter operations.

Japan

Japan has three AFA chapters. They include the Keystone Chapter at Kadena AB, AFA's Misawa Chapter at Misawa AB, and the Tokyo Chapter.

Korea

There are two chapters in Korea.

Lt. Col. Bob Gaskin is President of AFA's Capt. Joseph McConnell, Jr., Chapter, which is located at Osan AB.

AFA's Wolf Pack Chapter is located at Kunsan AB.

Philippines

Paul J. Graf leads AFA's Manila Chapter, which was chartered in February 1985. Activities have included luncheon meetings at the Manila Polo Club with Col. John Yaryan, Jr., Chief of the Air Force Division, JUSMAG, on USAF assistance to the Philippine Air Force and with Thomas Price, Jr., Regional Director of the VA, on VA benefits of interest to AFA members. Mailings have gone out to 250 prospective members as part of the membership effort, and discussions have centered on community relations projects for the future. Regular meetings have been held since the Chapter chartering.

AFA's Bataan Memorial Chapter (formerly named Clark AB Chapter) is located at Clark AB. The Chapter is led by John F. H. Schenk. Chartered a year ago this month, the Chapter has held several meetings, sponsored an AFA booth at the Clark AB Open House, and held an active on-base membership drive. "Several hundred new members were signed up due to the imaginative and resourceful leadership of Capt. Doug Hall," Chapter President Schenk reports.

CMSgt. John C. Van Blarcom addressed a luncheon meeting on the role of the NCO relative to the officer corps. At another luncheon meeting, Col. (Brig. Gen. selectee) Charles F. Luigs, 3d Tactical Fighter Wing Commander, discussed the results of a recent ORI of the 3d Tactical Fighter Wing. Mr. Herb Hoffman, the Political-Military Affairs Officer at the US Embassy in Manila, met with 160 AFA members at a Chapter luncheon as part of a newly created "greater issue lecture series" to discuss the internal, economic, political, and military situation. Dealing with battle-damage repair of runways and support structures in "the Air Force's ground war" was the subject for Col. Robert F. Boyer, Director of Engineering and Services Lab, AFESC, Tyndall AFB, Fla., at another meeting. In February, the Chapter, in concert with the Federal Women's Employees Group, sponsored a lecture and luncheon on the Tuskegee Airmen in support of the Air Force's "Black History Month."

At a recent meeting of the Zaragoza Chapter, 406th Tactical Fighter Training Wing Commander Col. John Granskog, second from right, presented an AFA plaque to visiting RAF Gp. Capt. Bobby Oxspring. Looking on are 406th Combat Support Group Commander Col. James W. Boyce, Jr., left, and Zaragoza Chapter President Lt. Col. Frederic J. Rowland.

INDUSTRIAL ASSOCIATES OF THE AIR FORCE ASSOCIATION

Listed below are the Industrial Associates of the Air Force Association. Through this affiliation, these companies support the objectives of AFA as they relate to the responsible use of aerospace technology for the betterment of society and the maintenance of adequate aerospace power as a requisite of national security and international amity.

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UTC, Research Center
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V. Garber Int'l Associates, Inc.
Vitro Corp.
Walter Kidde Aerospace Operations
Western Gear Corp.
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Westinghouse Electric Corp., Baltimore Div.
Westland Technologies, Ltd.
Wild & Leitz Technologies Corp.
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ucation in the dynamically oriented professions, such as the high-technology aerospace industries," said former test pilot and McDonnell Douglas Corp. senior executive **Cliff Stout** in a guest column that recently appeared in the Medford, Ore., *Mail-Tribune.* "Obviously, the aerospace applicant must have a degree in at least one of the engineering or science disciplines. However, we are not seeing a sufficient number of students entering universities offering these types of degrees. More importantly, many of those who have the initiative can't qualify," he added.

US Space Command CINC Gen. Robert T. Herres was the featured speaker at the Alabama State AFA convention in May. With General Herres are Alabama State AFA President Robie Hackworth, left, and AFA National Director Dr. Frank M. Lugo.

Florida Highlands Chapter President **Roy Whitton** recently presented an honorary chapter membership to **Elsie Laird,** widow of pioneer aircraft designer and builder **Matty Laird.** Mr. Whitton also presented a Community Partnership to **George Houghton,** President of Aeromark Corp.

In early May, **Lt. Gen. David L. Nichols,** Commander of Alaskan Air Command, addressed the Anchorage Chapter's awards banquet, Chapter President **Frank Weaver** reports. Honored during the evening were the 21st Equipment Maintenance Squadron, Robert C. Reeve Award for the outstanding contribution to aerospace progress by an Air Force unit; Capt. Carl R. Binford, 71st Aerospace Rescue and Recovery Squadron, Lt. Gen. Glen R. Birchard Memorial Award for a conspicuous act of valor during flight; Lt. Col. William T. Caroon, 21st Tactical Fighter Wing, CMSgt. John F. Tobey, Hq. AAC, and TSgt. Larry M. Williams, 71st Aerospace Rescue and Recovery Squadron, the Maj. Norman C. Miller Memorial Award for an act of heroism connected with saving or attempting to save a life; and SSgt. Claude W. Allbee and family, MSgt. Richard H. Foster, TSgt. Kenneth R. Stewart, and SrA. Scott E. Carl, selected as AAC outstanding airmen. (Sergeant Foster has been selected as one of the Air Force's twelve outstanding airmen of the year.)

Also honored during the evening were the recipients of the Chapter's Robert C. Reeve Scholarships. They were Donald R. Ryan of Bartlett High School and John L. Shepherd of Chugiak High School.

Dr. Jon L. Boyes, International President of the Armed Forces Communications and Electronics Association (AFCEA), recently addressed a joint dinner meeting of AFA's Chicagoland-O'Hare Chapter and the local AFCEA chapter. He discussed the Air Force-Navy team in space, reports Chapter leader and CAP **Lt. Col. Ben Minardi.** During the evening, Colonel Minardi was honored with an AFA National Medal of Merit. Also honored were Chicagoland-O'Hare Chapter Vice President **Len Lesjak** with AFA's Distinguished Service Award and **Catherine Lesjak** with AFA's Medal of Merit.

Tennessee AFA President **Jack Westbrook** has been named Tennessee's "Man of the Year in Life Insurance" by the 4,000-member Tennessee Association of Life Underwriters. Mr. Westbrook was cited for "significant contributions to the life insurance industry throughout Tennessee."

AFA Life Member **Cmdr. Jim Tritten** has been selected by the Navy League as the 1986 recipient of the Alfred Thayer Mahan Award for Literary Achievement. He has written a number of substantive pieces published in "Airmail" in AIR FORCE Magazine. He is currently assigned to the Office of the Secretary of Defense as the Assistant Director for Net Assessment. This summer, he will be trans-

Chicagoland-O'Hare Chapter leaders Len and Catherine Lesjak and CAP Lt. Col. Ben Minardi were honored with national AFA awards during a recent joint meeting of the Chicagoland-O'Hare Chapter and the local unit of the Armed Forces Communications and Electronics Association.

ferred to the Naval Postgraduate School, where he will be assigned as the Chairman of the National Security Affairs Department, which has some forty-five Air Force officers currently enrolled.

Lone Star Brewery Gardens was the site for the Alamo Chapter's annual mixer. "Our annual mixer is always a relaxing, enjoyable event on the beautiful grounds of the Lone Star Brewery," said **Claire Garrecht,** Alamo Chapter President. With 8,000 members, Alamo is AFA's largest chapter.

Newly elected Alabama AFA President **Robie Hackworth** reports that the state held an outstanding convention last May 9–11. **Gen. Robert T. Herres,** Commander in Chief, Air Force Space Command, was the featured speaker. Other activities included a tour of the Alabama Space Museum. The convention, hosted by the Tennessee Valley Chapter, was held at the Marriott Hotel in Huntsville.

AFA's Tacoma Chapter in Washington has established a philanthropic foundation "to further the well-being of the armed forces through the support of education of future members of the Air Force and deserving members of the active Air Force," Washington State Communications Director **Jack Gamble** reports. "This step means that our Chapter has achieved a degree of maturity and stability we can be proud of," Mr. Gamble added. The Tacoma Foundation Board of Trustees includes **Wanda R. Scott, Jack H. Sandstrom, Mario Iafrate, Kenneth R. Powell, Mary Davis, Ronald T. Powell, Eugene J. Ness, Jack Gamble, Edward V. Hudson,** and **A. R. "Dick" Lewis.**

Rose Sweesy, President of AFA's Scott Berkeley Chapter in North Carolina, presented AFA's Bronze Medal to Air Force Junior ROTC Cadet **Lt. Col. Peter J. Dienhart.** Cadet Dienhart was commander of the Cadet Corps and graduated in June. The ceremony was held at South Johnston High School on April 30.

Maj. John H. Smalley, former Chief of Public Affairs at Bergstrom AFB, Tex., was made an honorary citizen of Texas and was presented with an AFA citation at a recent Austin Chapter meeting, reports Texas AFA President **Ollie Crawford.**

When it comes to AFA programs in California, President **Gerry Chapman** cited two impressive events that took place earlier this year. One was the annual General Robert F. Travis Chapter's "Defense Roundtable." This community forum offers the opportunity to discuss issues of concern to AFA with a congressman. The other event is the Airpower Chapter's "Executive Forum," in which selected industry executives are invited to an open forum to address issues of concern to them. Their comments and recommendations are delivered to the Commander of Space Division. Both events were cited in the California AFA newsletter, which is edited by Communications Director **Bob Griffin.** ■

INTERCOM

UNIT REUNIONS

Air Rescue Association
Air Rescue members will hold a reunion on September 17–20, 1986, at the Fort Magruder Inn in Williamsburg, Va. **Contact:** Al Scott, P. O. Box 98568, Tacoma, Wash. 98498.

Air Resupply & Communications Association
Members of the 580th, 581st, and the 582d Air Resupply and Communications Wings will hold a reunion on September 19–21, 1986, at the Marriott Hotel on International Dr. in Orlando, Fla. **Contact:** Sam Ziff, 4401 Real Ct., Orlando, Fla. 32808.

Green Park Officers' Club
The Green Park Officers' Club will hold a reunion on October 16–20, 1986, in Las Vegas, Nev. **Contact:** Andrew W. Waters, 525 E. Semoran Blvd., Apt. 1005, Fern Park, Fla. 32730. Phone: (305) 331-9215.

Nagoya AB
Veterans who served at Nagoya AB (including Komaki), Japan, during 1947–56 will hold a reunion on August 29–31, 1986, in Nashville, Tenn. **Contact:** Art Haley, P. O. Box 181, St. Bethlehem, Tenn. 37155. Phone: (615) 647-3262.

Retired Judge Advocates
Retired Air Force Judge Advocates will hold their reunion on September 11–15, 1986, at the Antlers Hotel in Colorado Springs, Colo. **Contact:** Col. Tom Krauska, USAF (Ret.), 401 Candleglo Dr., San Antonio, Tex. 78239. Phone: (512) 655-3112.

Southern Airways School Alumni
Alumni of the Bainbridge AFB, Ga., Southern Airways School during the 1950s will hold a reunion during the 1986 Labor Day weekend. **Contact:** Col. Vernon O. Darley, USAF (Ret.), 6671 Peacock Blvd., Morrow, Ga. 30260. Phone: (404) 961-5135.

WASPs
The Women's Airforce Service Pilots (WASPs) will hold their forty-fourth-year reunion on September 25–28, 1986, at their former training headquarters (Avenger Field) in Sweetwater, Tex. **Contact:** Chamber of Commerce, P. O. Box 1148, Sweetwater, Tex. 79556. Phone: (915) 235-5488.

Weather Forecasters
Weather forecasters who supported the Berlin Airlift from Rhein-Main AB, Germany, will hold an "Operations Vittles" reunion on October 10–11, 1986, in Washington, D. C. We are seeking a pilot who flew during the Airlift to speak at dinner on the evening of October 11. **Contact:** Col. James B. Jones, USAF (Ret.), P. O. Box 23, Clinton, Md. 20735. Phone: (301) 423-4228.

1st Fighter Group Association
The 1st Fighter Group will hold its reunion on September 14–17, 1986, in Reno, Nev. **Contact:** Charles E. Schreffler, 4142 Oakwood Rd., Lompoc, Calif. 93436.

7th Fighter Command
Members of the 7th Fighter Command will hold a reunion on December 4–7, 1986. **Contact:** Clyde Mortensen, P. O. Box 82, Hartland, Wis. 53029. Phone: (414) 367-5628.

8th Air Force Historical Society
The 8th Air Force Historical Society "Salute to the B-24 Liberator" reunion will be held on October 15–19, 1986, in Hollywood, Fla. Several units of the Eighth Air Force will rendezvous with the 8th AFHS. They include 7th Photo Group, 8th Fighter Command, 34th Bomb Group, 92d Bomb Group, 96th Bomb Group, 303d Bomb Group, 325th Reconnaissance Wing, 351st Bomb Group, 381st Bomb Group, 392d Bomb Group, 447th Bomb Group, 466th Bomb Group, 486th Bomb Group, and 493d Bomb Group. **Contact:** The 8th Air Force Historical Society, P. O. Box 3556, Hollywood, Fla. 33083. Phone: (305) 961-1410.

Coming Events

August 9–10, **Arkansas State Convention,** Fort Smith . . . August 9–10, **North Carolina State Convention,** Seymour Johnson AFB . . . August 15–16, **New York State Convention,** Rome . . . August 15–16, **Wisconsin State Convention,** Milwaukee . . . August 16, **Illinois State Convention,** Scott AFB . . . August 21–23, **California State Convention,** Riverside . . . September 5–6, **Arizona State Convention,** Davis-Monthan AFB . . . September 15–18, **AFA National Convention and Aerospace Development Briefings & Displays,** Washington, D. C. . . . September 19–20, **Washington State Convention,** Tacoma.

The Arnold Centennial

AFA's 1986 National Convention

and

Aerospace Development Briefings and Displays

September 15–18, 1986

This year marks the 100th anniversary of the birth of the late Gen. H.H. "Hap" Arnold. Our 1986 Convention theme commemorates this significant aerospace event.

Plan now to attend AFA's National Convention and Aerospace Development Briefings and Displays at the Sheraton Washington Hotel. Some additional rooms at lower rates are available at the Normandy Inn (five blocks from the Sheraton), Howard Johnson's in Crystal City, Va., and Connecticut Avenue Days Inn (both on the Metro), or through "Washington, D.C., Accommodations."

Convention activities include Opening Ceremonies, Business Sessions, luncheons honoring the Secretary of the Air Force and the Air Force Chief of Staff, the Aerospace Education Foundation Awards Luncheon, the Annual Reception, and a black-tie Reception and Dinner Dance salute to the Air Force's thirty-ninth anniversary.

A special AFA National Symposium, "The Mounting Challenge of Low-Intensity Conflict and Special Operations," featuring key Washington-based speakers, will be included at no additional charge for every Convention registrant.

Send hotel reservation requests (in writing) for the Sheraton Washington to: Sheraton Washington Hotel, 2660 Woodley Road, N.W., Washington, D.C. 20008. Phone: (202) 328-2000. For accommodations at the Normandy Inn, send information to: Normandy Inn, 2118 Wyoming Ave., N.W., Washington, D.C. 20008. Phone: (202) 483-1350. Howard Johnson's, 2650 Jefferson Davis Highway, Arlington, Va. 22202. Phone: (703) 684-7200. Connecticut Avenue Days Inn, 4400 Connecticut Ave., N.W., Washington, D.C. 20008. Phone: (202) 244-5600. "Washington, D.C., Accommodations" offers a free service that promises to match you with the best available price, hotel, and location. They'll send a confirmation and detailed map after making the reservation. To use this service, call toll-free (800) 554-2220.

Make your reservations as soon as possible. All hotels have a cutoff date. To ensure the AFA rate, please refer to the AFA National Convention. All reservation requests must be accompanied by one night's deposit or an approved credit card number. Deposits will be refunded only if cancellation notification is given at least forty-eight hours prior to arrival.

Airline Reservations: Once again, arrangements have been made for Convention attendees to enjoy discount fares on United and Eastern Airlines. United's toll-free number is (800) 521-4041, AFA Account No. 6050D. Eastern's is (800) 468-7022, or, in Florida, (800) 282-0244, AFA Account No. EZ9AP69. When calling, please mention the AFA Account Number.

ADVANCE REGISTRATION FORM*

AIR FORCE ASSOCIATION NATIONAL CONVENTION & AEROSPACE BRIEFINGS & DISPLAYS

September 15–18, 1986 SHERATON WASHINGTON HOTEL WASHINGTON, D.C.

Type or print

NAME _____
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CITY, STATE, ZIP _____

NOTE: Advance registration and/or ticket purchases must be accompanied by check made payable to AFA. Mail to AFA, 1501 Lee Highway, Arlington, Va. 22209-1198.

Registration Fee (after September 3) $120.

*Official AFA Delegates: Do not use this form. You have received separate information and forms.

Please reserve the following for me:

☐ Current Registration Packets @ $110 each . . . . . $ _____
Includes credentials and tickets to the following Convention functions:
Air Force Secretary's Luncheon
Air Force Chief of Staff Luncheon
Annual Reception
National Symposium

Tickets also may be purchased separately for the following:

☐ Aerospace Ed. Foundation Luncheon @ $42 each . . . . . $ _____
☐ AF Secretary's Luncheon @ $42 each . . . . . $ _____
☐ AF Chief of Staff Luncheon @ $42 each . . . . $ _____
☐ Annual Reception @ $42 each . . . . . $ _____
☐ AFA National Symposium @ $50 each . . . . . $ _____
☐ AF Anniversary Reception & Dinner Dance @ $95 each . . . . . $ _____
Total for separate tickets . . . . . $ _____ $ _____
Total amount enclosed . . . . . $ _____

AFA State Contacts

Following each state name, in parentheses, are the names of the communities 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 appropriate contact.

ALABAMA (Auburn, Birmingham, Huntsville, Mobile, Montgomery, Selma): **Robie Hackworth,** 206 Dublin Circle, Madison, Ala. 35758 (phone 205-532-4920, ext. 29).

ALASKA (Anchorage, Fairbanks): **Michael T. Cook,** P. O. Box 25, Fairbanks, Alaska 99707 (phone 907-456-7762).

ARIZONA (Green Valley, Phoenix, Sedona, Sun City, Tucson): **Robert A. Munn,** 7042 Calle Bellatrix, Tucson, Ariz. 85710 (phone 602-747-9649).

ARKANSAS (Blytheville, Fayetteville, Fort Smith, Little Rock): **Thomas P. Williams,** 4404 Dawson Drive, N. Little Rock, Ark. 72116 (phone 501-758-6885).

CALIFORNIA (Apple Valley, Edwards, Fairfield, Fresno, Los Angeles, Merced, Monterey, Novato, Orange County, Pasadena, Riverside, Sacramento, San Bernardino, San Diego, San Francisco, Sunnyvale, Vandenberg AFB, Yuba City): **Gerald S. Chapman,** 13822 Via Alto Court, Saratoga, Calif. 95070 (phone 408- 379-6558).

COLORADO (Boulder, Colorado Springs, Denver, Fort Collins, Grand Junction, Greeley, Littleton, Pueblo): **Thomas W. Ratterree,** 5007 Alta Loma Rd., Colorado Springs, Colo. 80918 (phone 303-599-0143).

CONNECTICUT (Brookfield, East Hartford, Middletown, Storrs, Stratford, Torrington, Waterbury, Westport, Windsor Locks): **Joseph Zaranka,** 9 S. Barn Hill Rd., Bloomfield, Conn. 06002 (phone 203-242-2092).

DELAWARE (Dover, Wilmington): **Horace W. Cook,** 112 Foxhall Drive, Dover, Del. 19901 (phone 302-674-1051).

DISTRICT OF COLUMBIA (Washington, D. C.): **Howard W. Cannon,** 1501 Lee Highway, Arlington, Va. 22209-1198 (phone 703-247-5820).

FLORIDA (Avon Park, Brandon, Broward County, Cape Coral, Daytona Beach, Fort Walton Beach, Gainesville, Homestead, Jacksonville, Leesburg, Miami, Naples, Neptune Beach, New Port Richey, Orlando, Panama City, Patrick AFB, Redington Beach, Sarasota, Tallahassee, Tampa, West Palm Beach, Winter Haven): **Donald T. Beck,** 1150 Covina St., Cocoa, Fla. 32927 (phone 305-636- 7648).

GEORGIA (Athens, Atlanta, Columbus, Rome, Savannah, St. Simons Island, Valdosta, Warner Robins): **Wilbur H. Keck,** 116 Stillwood Drive, Warner Robins, Ga. 31088 (phone 912-922-0655).

GUAM (Agana): **George W. Baldwin, Jr.,** P. O. Box 8710, Tamuning, Guam 96911 (phone 671-646-4445).

HAWAII (Honolulu): **Don J. Daley,** P. O. Box 3200, Honolulu, Hawaii 96847 (phone 808-525-6296).

IDAHO (Boise, Mountain Home, Twin Falls): **Stanley I. Anderson,** Box 45, Gowen Field, Boise, Idaho 83707 (phone 208-362-9360).

ILLINOIS (Belleville, Champaign, Chicago, Elmhurst, Peoria, Springfield-Decatur): **Walter G. Vartan,** 230 W. Superior Court, Chicago, Ill. 60610 (phone 312-477-7503).

INDIANA (Bloomfield, Fort Wayne, Grissom AFB, Indianapolis, Lafayette, Marion, Mentone, South Bend, Terre Haute): **Bill Cummings,** 12031 Mahogany Drive, Fort Wayne, Ind. 46804 (phone 219-672-2728).

IOWA (Des Moines, Sioux City): **Carl B. Zimmerman,** 608 Waterloo Bldg., Waterloo, Iowa 50701 (phone 319-232-2650).

KANSAS (Garden City, Topeka, Wichita): **Cletus J. Pottebaum,** 6503 E. Murdock, Wichita, Kan. 67206 (phone 316-683-3963).

KENTUCKY (Lexington, Louisville): **Jo Brendel,** 726 Fairhill Drive, Louisville, Ky. 40207 (phone 502-897-7647).

LOUISIANA (Alexandria, Baton Rouge, Bossier City, Monroe, New Orleans, Shreveport): **James P. LeBlanc,** 3645 Monroe St., Mandeville, La. 70448 (phone 504-626-4516).

MAINE (Bangor, Loring AFB, N. Berwick): **Alban E. Cyr, Sr.,** P. O. Box 160, Caribou, Me. 04736 (phone 207-496-3331).

MARYLAND (Andrews AFB area, Baltimore, Rockville): **Francis R. O'Clair,** 6604 Groveton Drive, Clinton, Md. 20735 (phone 301-372-6186).

MASSACHUSETTS (Bedford, Boston, Falmouth, Florence, Hanscom AFB, Lexington, Taunton, West Springfield, Worcester): **John F. White,** 49 West Eagle St., East Boston, Mass. 02128 (phone 617-567-1592).

MICHIGAN (Alpena, Battle Creek, Detroit, Kalamazoo, Marquette, Mount Clemens, Oscoda, Petoskey, Southfield): **Robert J. Schaetzl,** 42247 Trotwood Court, Canton, Mich. 48187 (phone 313-552-3280).

MINNESOTA (Duluth, Minneapolis-St. Paul): **Earl M. Rogers, Jr.,** 325 Lake Ave., S., Duluth, Minn. 55802 (phone 218-727-2191).

MISSISSIPPI (Biloxi, Columbus, Jackson): **R. E. Smith,** Route 3, Box 282, Columbus, Miss. 39701 (phone 601-327-4071).

MISSOURI (Kansas City, Richards-Gebaur AFB, Springfield, St. Louis, Whiteman AFB): **Orville R. Blair,** 1504 Golden Drive, St. Louis, Mo. 63137 (phone 314-867-0285).

MONTANA (Bozeman, Great Falls): **Ed White,** 2333 6th Ave., S. Great Falls, Mont. 59405 (phone 406-453-2054).

NEBRASKA (Lincoln, Omaha): **Donald D. Adams,** FirsTier Inc., 17th & Farnam, Omaha, Neb. 68102 (phone: 402-348-7905).

NEVADA (Las Vegas, Reno): **David Broxterman,** 1455 E. Tropicana, Las Vegas, Nev. 89119 (phone 702-361-7027).

NEW HAMPSHIRE (Manchester, Pease AFB): **Robert N. McChesney,** Scruton Pond Rd., Barrington, N. H. 03825 (phone 603-664-5090).

NEW JERSEY (Andover, Atlantic City, Belleville, Camden, Chatham, Cherry Hill, E. Rutherford, Forked River, Fort Monmouth, Jersey City, McGuire AFB, Middlesex County, Newark, Old Bridge, Trenton, Wallington, West Orange, Whitehouse Station): **Jim Young,** 513 Old Mill Rd., Spring Lake Heights, N. J. 07762 (phone 201-449-8637).

NEW MEXICO (Alamogordo, Albuquerque, Clovis): **Louie T. Evers,** P. O. Box 1946, Clovis, N. M. 88101 (phone 505-762-1798).

NEW YORK (Albany, Bethpage, Brooklyn, Buffalo, Chautauqua, Griffiss AFB, Hudson Valley, Nassau County, New York City, Niagara Falls, Patchogue, Plattsburgh, Queens, Rochester, Rome/Utica, Suffolk County, Syosset, Syracuse, Westchester, Westhampton Beach, White Plains): **Robert H. Root,** 57 Wynnwood Ave., Tonawanda, N. Y. 14150 (phone 716-692-2100).

NORTH CAROLINA (Asheville, Charlotte, Fayetteville, Goldsboro, Greensboro, Kitty Hawk, Raleigh): **Bobby G. Suggs,** P. O. Box 1630, Fayetteville, N. C. 28302 (phone 919-323-5281).

NORTH DAKOTA (Concrete, Fargo, Grand Forks, Minot): **Michael Langlie,** 2901 Columbine Court, Grand Forks, N. D. 58201 (phone 701-772-7211).

OHIO (Akron, Cincinnati, Cleveland, Columbus, Dayton, Mansfield, Newark, Youngstown): **John Boeman,** 10608 Lake Shore Blvd., Bratenal, Ohio 44108 (phone 216-249-8970).

OKLAHOMA (Altus, Enid, Oklahoma City, Tulsa): **G. G. Atkinson,** P. O. Box 25858, Oklahoma City, Okla. 73125 (phone 405-231-6213).

OREGON (Eugene, Portland): **Zane R. Harper,** 5360 SW Dover Lane, Portland, Ore. 97225 (phone 503-244-4561).

PENNSYLVANIA (Allentown, Altoona, Beaver Falls, Coraopolis, Drexel Hill, Erie, Harrisburg, Homestead, Johnstown, Lewistown, Mon-Valley, Philadelphia, Pittsburgh, Scranton, State College, Willow Grove, York): **Jack B. Flaig,** P. O. Box 375, Lemont, Pa. 16851 (phone 814-238-4212).

PUERTO RICO (San Juan): **Fred Brown,** 1991 Jose F. Diaz, Rio Piedras, P. R. 00928 (phone 809-790-5288).

RHODE ISLAND (Warwick): **King Odell,** 413 Atlantic Ave., Warwick, R. I. 02888 (phone 401-941-5472).

SOUTH CAROLINA (Charleston, Clemson, Columbia, Myrtle Beach, Sumter): **Harry E. Lavin,** 28 Little Creek Rd., The Forest, Myrtle Beach, S. C. 29577 (phone 803-272-8440).

SOUTH DAKOTA (Rapid City, Sioux Falls): **John E. Kittelson,** 141 N. Main, Suite 308, Sioux Falls, S. D. 57102 (phone 605-336-2498).

TENNESSEE (Chattanooga, Knoxville, Memphis, Nashville, Tri-Cities Area, Tullahoma): **Jack K. Westbrook,** P. O. Box 1801, Knoxville, Tenn. 37901 (phone 615-523-6000).

TEXAS (Abilene, Amarillo, Austin, Big Spring, College Station, Commerce, Corpus Christi, Dallas, Del Rio, Denton, El Paso, Fort Worth, Harlingen, Houston, Kerrville, Laredo, Lubbock, San Angelo, San Antonio, Waco, Wichita Falls): **Ollie R. Crawford,** P. O. Box 202470, Austin, Tex. 78720 (phone 512-331-5367).

UTAH (Brigham City, Clearfield, Ogden, Provo, Salt Lake City): **Harry Cleveland,** 224 N. Jackson Ave., Ogden, Utah 84404 (phone 801-621-2365).

VIRGINIA (Arlington, Danville, Harrisonburg, Langley AFB, Lynchburg, Norfolk, Petersburg, Richmond, Roanoke): **Charles G. Durazo,** 1725 Jefferson Davis Highway, Suite 510, Arlington, Va. 22202 (phone 703-360-9098).

WASHINGTON (Bellingham, Seattle, Spokane, Tacoma, Yakima): **Edward V. Hudson,** 2902 S. 12th St., Tacoma, Wash. 98405 (phone 206-627-1177).

WEST VIRGINIA (Huntington): **David Bush,** 2317 S. Walnut Drive, St. Albans, W. Va. 25177 (phone 304-722-3583).

WISCONSIN (Madison, Milwaukee): **Gilbert Kwiatkowski,** 8260 W. Sheridan Ave., Milwaukee, Wis. 53218 (phone 414-463-1849).

WYOMING (Cheyenne): **Irene G. Johnigan,** 503 Notre Dame Court, Cheyenne, Wyo. 82009 (phone 307-775-3641).

9th Photo Recon Squadron
The 9th Photo Reconnaissance Squadron, 8th Photo Group, will hold a reunion on October 16–19, 1986, in San Antonio, Tex. **Contact:** Fred H. "Doc" Daugherty, 5249 Webb St., Aliquippa, Pa. 15001. Phone: (412) 375-2439.

26th Fighter Squadron
The 26th Fighter Squadron, 51st Fighter Group "China Blitzers," will hold a reunion on September 11–13, 1986, at the Satellite Hotel in Colorado Springs, Colo. **Contact:** Kenneth R. Nelson, 36501 County Rd. T, Eckley, Colo. 80727. Phone: (303) 359-2466. Dewey Nulph, P. O. Box 43, Limon, Colo. 80828. Phone: (303) 775-9571.

27th Bomb Group
Members of the 27th Bomb Group (L) will hold a reunion on October 17–19, 1986, in Fort Walton Beach, Fla. **Contact:** Charles Cook, 3822 Cumberland Way, Lithonia, Ga. 30058. Phone: (404) 981-3945.

48th Fighter Squadron
The 48th Fighter Squadron will hold a reunion on October 2–5, 1986, at the Holiday Inn in Williamsburg, Va. **Contact:** George Olson, Elks National Home, Bedford, Va. 24523. Phone: (703) 586-3409.

68th Fighter Squadron
Veterans of the 68th Fighter Squadron will hold a reunion on August 15–17, 1986, at the Marriott Hotel at O'Hare IAP in Chicago, Ill. **Contact:** Bruce "J. B." Mitchell, 436 S. Villa Ave., Villa Park, Ill. 60181. Phone: (312) 530-1231.

74th Tactical Recon Group
The 74th Tactical Reconnaissance Group will hold a reunion on October 23–25, 1986, at the Embassy Suites in San Antonio, Tex. **Contact:** Col. Ed W. "Pappy" Hughes, USAF (Ret.), 3844 E. Weldon Ave., Phoenix, Ariz. 85018. Phone: (602) 956-2228.

75th Air Service Group
The 75th Air Service Group will hold a reunion on October 10–13, 1986, in Orlando, Fla. **Contact:** John H. Gentry, 825 Appalachee Ave., Winter Park, Fla. 32792. Phone: (305) 678-1902.

75th Bomb Squadron
Veterans of the 75th Bomb Squadron will hold a reunion on September 18–20, 1986, in Las Vegas, Nev. **Contact:** Paul T. Smith, 5409 Del Rey Ave., Las Vegas, Nev. 89102. W. A. "Bill" Thomas, 1588 W. 25th Ave., Eugene, Ore. 97405. Phone: (503) 484-9900.

96th Bomb Group
Members of the 96th Bomb Group will hold a reunion in conjunction with the 8th Air Force Historical Society on October 15–19, 1986, in Hollywood, Fla. **Contact:** Thomas L. Thomas, 1607 E. Willow Ave., Wheaton, Ill. 60187.

123d/124th Tactical Control Flights
Members of the 123d/124th Tactical Control Flights, OhioANG, will hold a reunion on September 7, 1986, at the Blue Ash ANG Station, Cincinnati, Ohio. **Contact:** TSgt. Karen E. Brady, OhioANG, Blue Ash ANG Station, 10649 McKinley Rd., Cincinnati, Ohio. 45242. Phone: (513) 891-7316.

INTERCOM

152d Fighter Squadron
Officers and aircrew members of the 152d Fighter Squadron, RIANG, will hold a reunion on October 5, 1986, in Quonset Point, R. I. **Contact:** Donald W. Guilfoyle, 233 Grandview Rd., East Greenwich, R. I. 02818. Phone: (401) 884-2481. Frank Howard, 221 London Ave., Pawtucket, R. I. 02861. Phone: (401) 725-0142.

345th Bomb Group
Members of the 345th Bomb Group will hold a reunion on November 12–16, 1986, at the La Mansion Del Norte Hotel in San Antonio, Tex. **Contact:** Ken McClure, 2770 E. Main, Columbus, Ohio 43209. Phone: (614) 237-4251.

355th Fighter Group
The 355th Fighter Group will hold a reunion on September 11–14, 1986, in Colorado Springs, Colo. **Contact:** Robert E. Kuhnert, 4230 Shroyer Rd., Dayton, Ohio. Phone: (513) 294-2986.

380th Bomb Group
Members of the 380th Bomb Group "Flying Circus" will hold a reunion on September 24–28, 1986, in Plattsburgh, N. Y. **Contact:** Lt. Col. Forrest "Tommy" Thompson, USAF (Ret.), 2401 Lakeview Dr., Heber Springs, Ark. 72543. Phone: (501) 362-2891.

385th Bomb Group
The 385th Bomb Group will hold a memorial dedication and minireunion on September 20, 1986, in Washington, D. C. **Contact:** Sam Lyke, 4992 S. E. Princeton Dr., Bartlesville, Okla. 74006. Phone: (918) 333-4939.

438th Troop Carrier Group
Veterans of the 438th Troop Carrier Group, including the 87th, 88th, 89th, and 90th Troop Carrier Squadrons, will hold their reunion on September 26–28, 1986, at the Ramada Inn Resort in Fort Walton Beach, Fla. **Contact:** Col. Bob Gates, USAF (Ret.), 254 Yacht Club Dr., Fort Walton Beach, Fla. 32548. Phone: (904) 243-7465.

556th Recon Squadron
A reunion is in the planning stages for members of the 556th Reconnaissance Squadron who served at Yokota AB, Japan, during the 1968–72 era.

Please contact the address below for additional information.

Keith C. McDonald
Box 205
Swansboro, N. C. 28584
Phone: (919) 237-7004 (office)
(919) 291-4520 (home)

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For military retirees and their dependents . . . and dependents of active-duty personnel . . . more and more medical care is being provided through the government CHAMPUS program.

And, of course CHAMPUS pays 75% of allowable charges.

But today's soaring hospital costs—nearly $550 a day in some major metropolitan medical centers—can run up a $20,000 bill for even a moderately serious accident or illness.

Your 25% of $20,000 is no joke!

AFA CHAMPLUS® protects you against that kind of financial catastrophe *and* covers most of your share of routine medical expenses as well.

HOW AFA CHAMPLUS® WORKS FOR YOU!

WHO IS ELIGIBLE?

1) All AFA members under 65 years of age who are currently receiving military retired pay and are eligible for benefits under Public Law 89-614 (CHAMPUS), their spouses under age 65 and their unmarried dependent children under age 21, or age 23 if in college. (There are some exceptions for older age children. See "Exceptions and Limitations".)
2) All eligible dependents of AFA members on active duty. Eligible dependents are spouses under age 65 and unmarried dependent children under age 21, or age 23 if in college. (There are some exceptions for older age children. See "Exceptions and Limitations".)

EXCEPTIONAL BENEFIT PLAN

(See chart at right)

FOUR YEAR BASIC BENEFIT. Benefits for most injuries or illnesses may be paid for up to a four-year period.

PLUS THESE SPECIAL BENEFITS . . .

1) Up to 45 consecutive days of in-hospital care for mental, nervous, or emotional disorders. Outpatient care may include up to 20 visits of a physician or $500 per insured person each year.
2) Up to 30 days care per insured per year in a Skilled Nursing Facility.
3) Up to 30 days care per insured per year and up to 60 days lifetime in a CHAMPUS-approved Residential Treatment Center.
4) Up to 30 days care per insured per year and up to 60 days lifetime in a CHAMPUS-approved Special Treatment Facility.
5) Up to 5 visits per insured per year to Marriage and Family Counselors under conditions defined by CHAMPUS.

YOUR INSURANCE IS NON-CANCELLABLE

As long as you are a member of the Air Force Association, pay your premiums on time, and the master contract remains in force, your insurance cannot be cancelled.

ADMINISTERED BY YOUR ASSOCIATION . . . UNDERWRITTEN BY MUTUAL OF OMAHA

AFA CHAMPLUS® insurance is administered by trained insurance professionals on your Association staff. You get prompt, reliable, courteous service from people who know your needs and know every detail of your coverage. Your insurance is underwritten by Mutual of Omaha, the largest individual and family health insurance company in the world.

AFA OFFERS YOU HOSPITAL BENEFITS AFTER AGE 65

Once you reach Age 65 and are covered under Medicare, AFA offers you protection against hospital expenses not covered by Medicare through the *Senior Age Benefit Plan* of AFA Hospital Indemnity Insurance. Members enrolled in AFA CHAMPLUS® will automatically receive full information about AFA's Medicare supplement program upon attainment of Age 65 so there will be no lapse in coverage. However, no Medicare supplement benefits can be issued to residents of the state of Georgia.

AFA CHAMPLUS® BENEFIT SCHEDULE

Care	*CHAMPUS Pays*	*AFA CHAMPLUS® Pays*
	For Military Retirees Under Age 65 and Their Dependents	
Inpatient civilian hospital care	CHAMPUS pays 75% of allowable charges.	CHAMPLUS® pays the 25% of allowable charges not covered by CHAMPUS.
Inpatient military hospital care	The only charge normally made is a $7.30 per day subsistence fee, not covered by CHAMPUS.	CHAMPLUS® pays the $7.30 per day subsistence fee.
Outpatient care	CHAMPUS COVERS 75% of outpatient care fees after an annual deductible of $50 per person ($100 maximum per family) is satisfied.	CHAMPLUS® pays the 25% of allowable charges not covered by CHAMPUS after the deductible has been satisfied.
	For Dependents of Active-Duty Military Personnel	
Inpatient civilian hospital care	CHAMPUS pays all covered services and supplies furnished by a hospital, less $25 or $7.30 per day, whichever is greater.	CHAMPLUS® pays the greater of $7.30 per day or $25 of the reasonable hospital charges not covered by CHAMPUS.
Inpatient military hospital care	The only charge normally made is a $7.30 per day subsistence fee, not covered by CHAMPUS.	CHAMPLUS® pays the $7.30 per day subsistence fee.
Outpatient care	CHAMPUS covers 80% of outpatient care fees after an annual deductible of $50 per person ($100 maximum per family) is satisfied.	CHAMPLUS® pays the 20% of allowable charges not covered by CHAMPUS after the deductible has been satisfied.

NOTE: Outpatient benefits cover emergency room treatment, doctor bills, pharmaceuticals, and other professional services.

There are some reasonable limitations and exclusions for both inpatient and outpatient coverage. Please note these elsewhere in the plan description.

Against Costs CHAMPUS Doesn't Cover

APPLY TODAY!
JUST FOLLOW THESE STEPS

Choose either AFA CHAMPLUS® Inpatient coverage or combined Inpatient and Outpatient coverage for yourself. Determine the coverage you want for dependent members of your family. Complete the enclosed application form in full. Total the premium for the coverage you select from the premium tables on this page. Mail the application with your check or money order for your initial premium payment, payable to AFA.

AFA's CHAMPLUS®

EXCEPTIONS & LIMITATIONS

Coverage will not be provided for conditions for which treatment has been received during the 12-month period prior to the effective date of insurance until the expiration of 12 consecutive months of insurance coverage without further treatment. *After coverage has been in force for 24 consecutive months, pre-existing* conditions will be covered regardless of prior treatment. Children over age 21 (age 23 if in college) will continue to be eligible if they have been declared incapacitated and if they were insured under CHAMPLUS® on the date so declared. Coverage for these older age children will be provided at slightly higher rates upon notification to AFA.

EXCLUSIONS

This plan does not cover and no payment shall be made for:

a) routine physical examinations or immunizations

b) domiciliary or custodial care

c) dental care (except as required as a necessary adjunct to medical or surgical treatment)

d) routine care of the newborn or well-baby care

e) injuries or sickness resulting from declared or undeclared war or any act thereof

f) injuries or sickness due to acts of intentional self-destruction or attempted suicide, while sane or insane

g) treatment for prevention or cure of alcoholism or drug addiction

h) eye refraction examinations

i) Prosthetic devices (other than artificial limbs and artificial eyes), hearing aids, orthopedic footwear, eyeglasses and contact lenses

j) expenses for which benefits are or may be payable under Public Law 89-614 (CHAMPUS)

PREMIUM SCHEDULE

Plan 1—For military retirees and dependents (Quarterly Premiums)

Inpatient Benefits

Member's Attained Age	Member	Spouse	Each Child
Under 50	$21.88	$27.35	$14.85
50–54	$32.70	$40.88	$14.85
55–59	$39.78	$49.73	$14.85
60–64	$45.80	$57.25	$14.85

Inpatient and Outpatient Benefits

Under 50	$30.82	$36.98	$37.13
50–54	$42.35	$50.82	$37.13
55–59	$56.01	$67.21	$37.13
60–64	$64.48	$77.38	$37.13

Plan 2—For dependents of active-duty personnel (Annual Premiums)

Inpatient Only	None	$ 9.68	$ 5.94
Inpatient and Outpatient	None	$38.72	$29.70

APPLICATION FOR AFA CHAMPLUS®

Group Policy GMG-FC70
Mutual of Omaha Insurance Company
Home Office: Omaha, Nebraska

Full name of Member _____
Rank Last First Middle

Address _____
Number and Street City State ZIP Code

Date of Birth _____ Current Age ____ Height ____ Weight ____ Soc. Sec. No. _____
Month/Day/Year

This insurance coverage may only be issued to AFA members. Please check the appropriate box below:

☐ I am currently an AFA Member.

☐ I enclose $18 for annual AFA membership dues (includes subscription ($14) to AIR FORCE Magazine).

PLAN & TYPE OF COVERAGE REQUESTED

Plan Requested (Check One)
☐ AFA CHAMPLUS® PLAN I (for military retirees & dependents)
☐ AFA CHAMPLUS® PLAN II (for dependents of active-duty personnel)

Coverage Requested (Check One)
☐ Inpatient Benefits Only
☐ Inpatient and Outpatient Benefits

Person(s) to be insured (Check One)
☐ Member Only
☐ Spouse Only
☐ Member & Spouse
☐ Member & Children
☐ Spouse & Children
☐ Member, Spouse & Children

PREMIUM CALCULATION

All premiums are based on the attained age of the AFA member applying for this coverage. Plan I premium payments are normally paid on a quarterly basis but, if desired, they may be made on either a semi-annual (multiply by 2), or annual (multiply by 4) basis.

Quarterly (annual) premium for member (age ____) $_____

Quarterly (annual) premium for spouse (based on member's age) $_____

Quarterly (annual) premium for ____ children @ $ $_____

Total premium enclosed $_____

If this application requests coverage for your spouse and/or eligible children, please complete the following information for each person for whom you are requesting coverage.

Names of Dependents to be Insured	Relationship to Member	Date of Birth (Month/Day/Year)

(To list additional dependents, please use a separate sheet.)

In applying for this coverage, I understand and agree that (a) coverage shall become effective on the last day of the calendar month during which my application together with the proper amount is mailed to AFA, (b) only hospital confinements (both inpatient and outpatient) or other CHAMPUS-approved services commencing after the effective date of insurance are covered and (c) any conditions for which I or my eligible dependents received medical treatment or advice or have taken prescribed drugs or medicine within 12 months prior to the effective date of this insurance coverage will not be covered until the expiration of 12 consecutive months of insurance coverage without medical treatment or advice or having taken prescribed drugs or medicine for such conditions. I also understand and agree that all such pre-existing conditions will be covered after this insurance has been in effect for 24 consecutive months.

Date _____, 19 ____ _____
Member's Signature

Form 6173GH App.

Application must be accompanied by a check or money order. Send remittance to: Air Force Association, Insurance Division, 1501 Lee Highway, Arlington, VA 22209-1198

8-86

Bob Stevens'

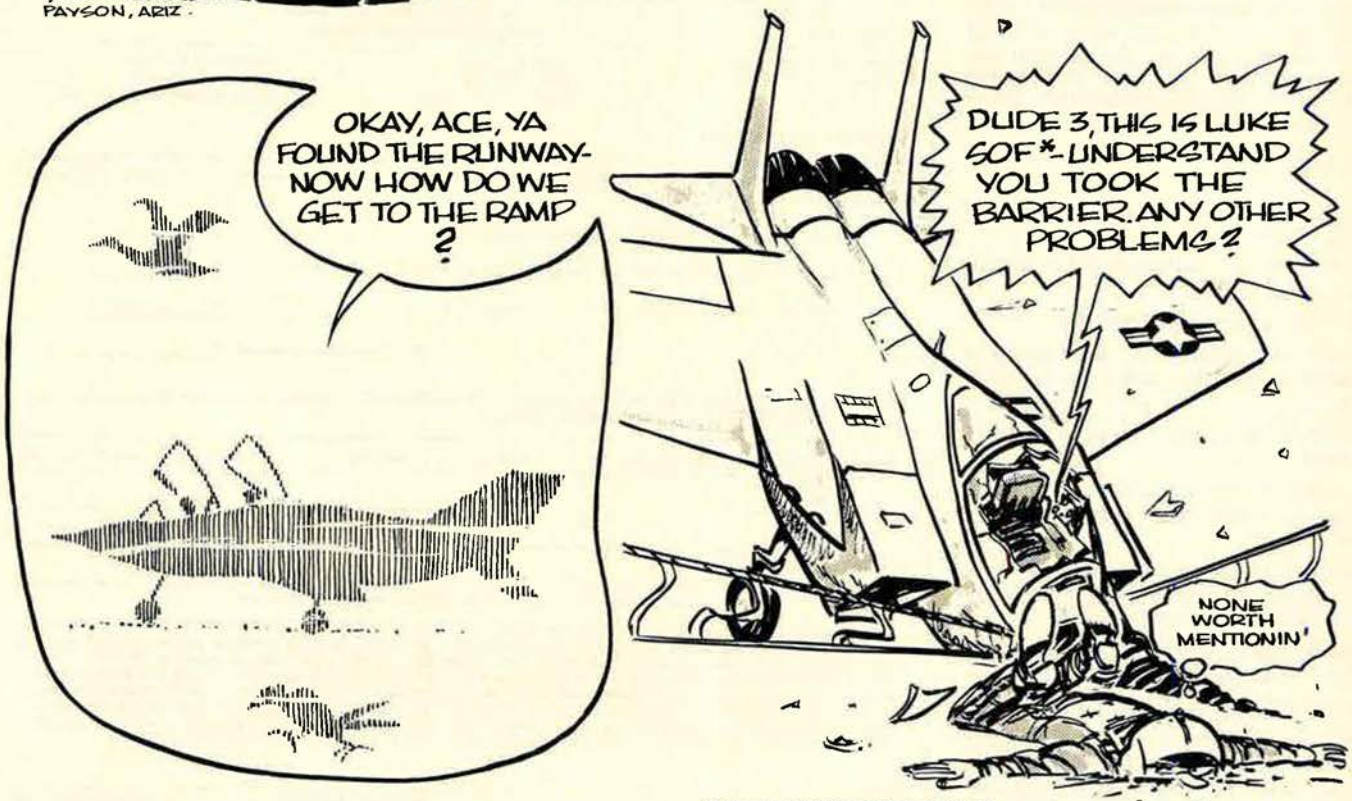
"There I was..."

THE BON MOTS USED BELOW ARE TAKEN FROM REAL-LIFE EXPERIENCES, EXAGGERATED A BIT MAYBE, BUT ***REAL***. PROVING, ONCE AGAIN, THAT COMMUNICATION IS THE BASIS OF MOST HUMOR. YOU'LL NOTE THE MAJORITY OF INCIDENTS INVOLVES NIGHT OR WEATHER...CONDITIONS THAT BREED THE GARBLED WORD.

KOREA-1952. A USAF NIGHT INTRUDER IS CAUGHT IN SEARCHLIGHTS & FLAK. THE CREW REACTS WITH ITS USUAL APLOMB–

LT/ERNIE BENNETT
PAYSON, ARIZ.

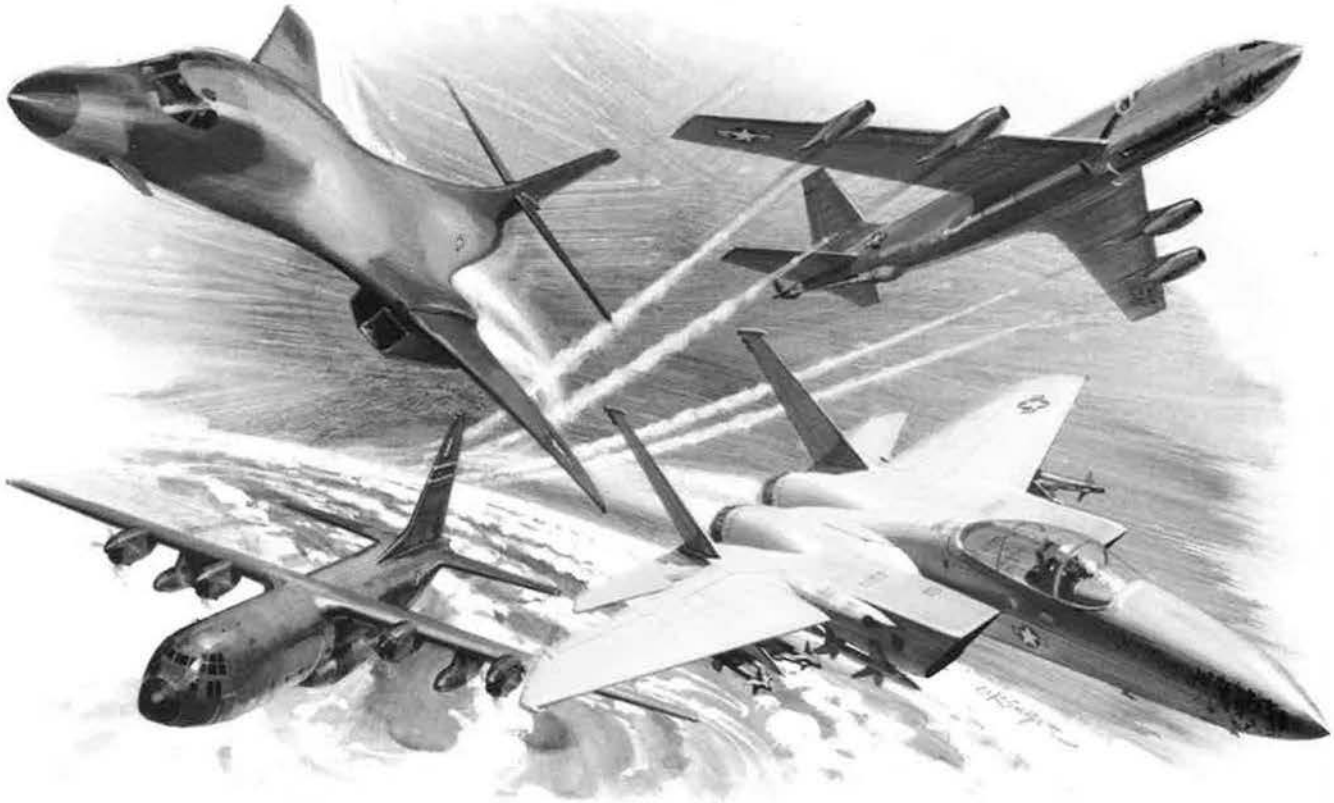
THERE'S ***ALWAYS*** SOMEONE WHO DOESN'T GET THE WORD–



*SUPERVISOR OF FLYING

Bob Stevens

USAF has selected the Collins ARC-190.



So should you.

The United States Air Force has selected the ARC-190 as the HF radio for the aircraft they fly, including the C-130, KC-135, F-15 and B-1B. Today, the mil-spec ARC-190 is fully qualified and operational on a global basis.

The ARC-190 operates with our exclusive SELSCAN™ adaptive communications system, which combines receiver scanning and selective calling with microprocessor control to monitor preset channels. Together with an internal link quality analysis, the SELSCAN™ processor provides automatic selection of optimum channels between stations without operator intervention.

Optional equipment includes a digitally tuned preselector and a variety of digitally tuned antenna couplers. The ARC-190 is designed to retrofit most Collins 618T, ARC-58 and ARC-105 systems using existing wiring. Retrofit kits are available for other applications.

The ARC-190 is in full production and available immediately. So choose the HF radio selected by the USAF, and put more than 50 years of Collins experience to work for you. Start by contacting your nearest Collins representative, or Collins Defense Communications Division, Defense Electronics Operations, Rockwell International, Cedar Rapids, Iowa 52498. USA phone 319/395-2690. TELEX 464-435.

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