MARCH 1985/$5

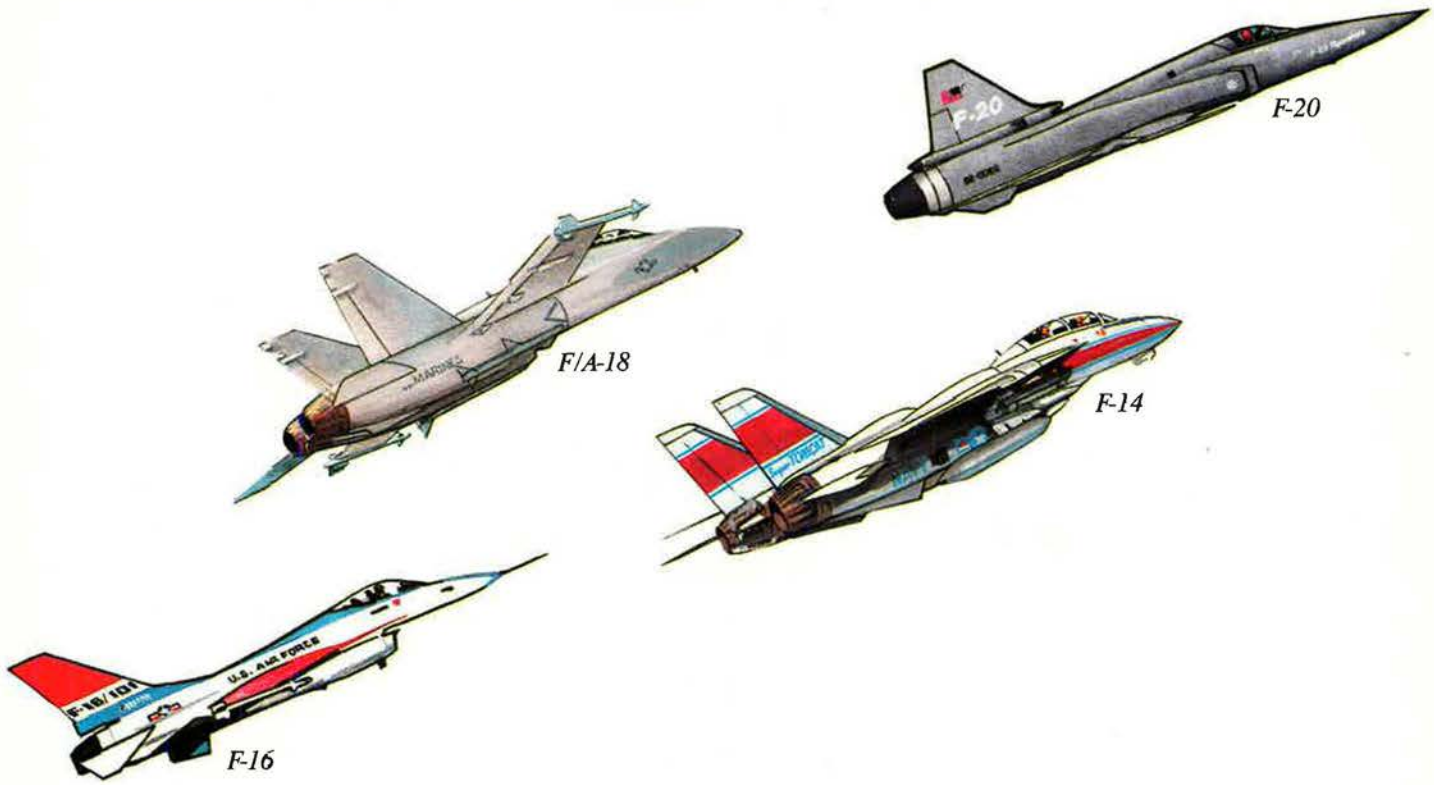
AIR FORCE MAGAZINE

PUBLISHED BY THE AIR FORCE ASSOCIATION

SOVIET AEROSPACE ALMANAC 1985

PREVIEWING THE MiG-2000

ADVANTAGE



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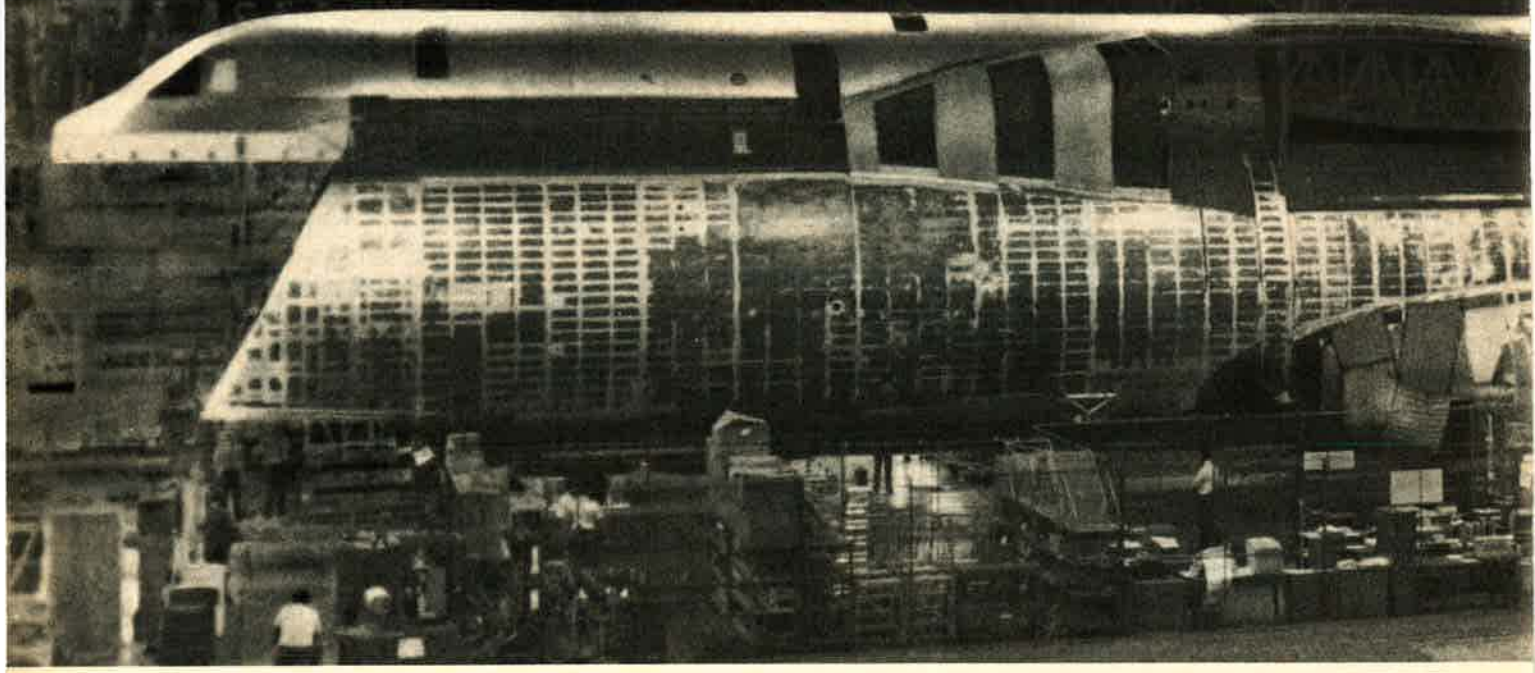
Innovation

A new generation of American airlifters moves closer to completion as the first C-5B undergoes pressure tests.



Lockheed-Georgia

Giving shape to imagination.

Main landing gear structures arrive from subcontractor, Menasco Inc., Fort Worth, Texas.

Marietta, Georgia—March 1985

The first new USAF C-5B is passing another major milestone on its way toward rollout this summer. Pressure testing has begun, and is proceeding on schedule.

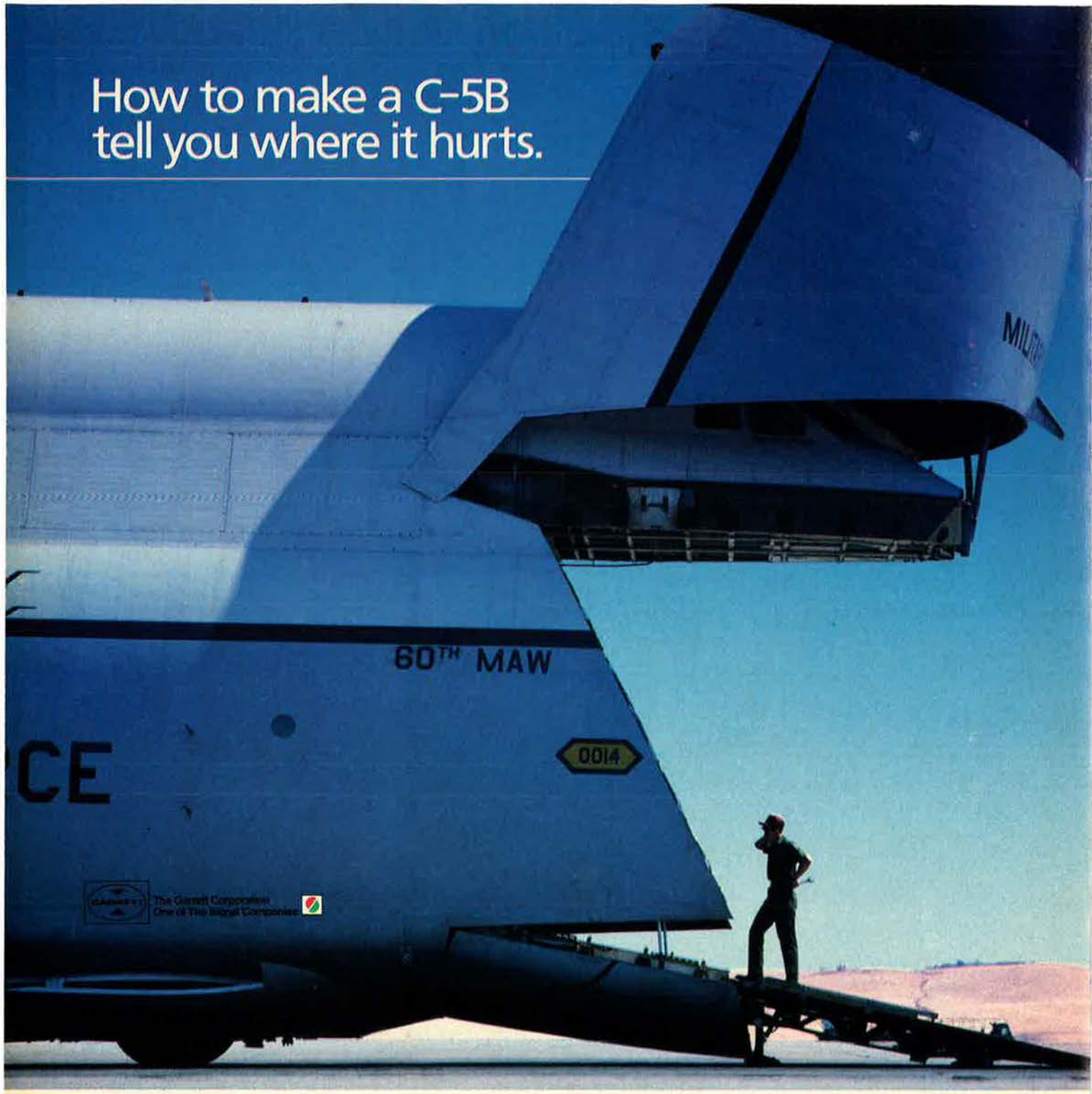
The aircraft will take to the air this fall. Soon afterwards, it will become the first of 50 new C-5Bs to join the 77 C-5As now serving the Military Airlift Command.

America's outsize cargo capacity will increase by 65% through this fixed-price program. Airlift—vital to deterrence—will be dramatically enhanced, increasing the nation's ability to move fully assembled helicopters, infantry fighting vehicles, M-1 tanks and other essential equipment anyplace on the globe. With the speed to deploy them effectively.

The C-5B incorporates numerous technological innovations in aircraft design, materials and manufacturing. Improved avionics and engines with increased reliability are used. The aircraft employs new alloys that are stronger and more corrosion-resistant. New carbon brakes will cost less, last longer, and cut weight by more than 400 pounds per aircraft. During assembly, advanced new presses and automated sheet metal manufacturing systems improve efficiency while ensuring high quality. Working with these systems, the airlifter specialists at Lockheed-Georgia, as well as workers at Lockheed's suppliers in 45 other states, deserve credit for the C-5B setting high standards of program quality.

As these workers move toward completion of the first C-5B, they are giving shape to America's airlift strength well into the 21st century.

How to make a C-5B tell you where it hurts.



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For information, contact: SCADC Sales Manager, AiResearch Manufacturing Company, 2525 West 190th Street, Torrance, CA 90509. (213) 512-1025.

GARRETT

MARCH 1985
VOLUME 68, NUMBER 3

AIR FORCE MAGAZINE

PUBLISHED BY THE AIR FORCE ASSOCIATION

Page 48

Page 114

About the cover: The configuration of the next-generation Soviet air-superiority fighter aircraft, called here MiG-2000, is depicted in computer-generated form. Our annual Soviet Aerospace Almanac begins on p. 48.

Special Section: Soviet Aerospace Almanac

Features

Departments

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WORDS PERFORMANCE" THING

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The EF-111A OFT belongs to that top group of ASD projects meeting schedule and performance constraints. Now successfully completing Customer Acceptance Testing, it is a prime illustration of AAI's capability as a prime contractor.

Systems requirements for the EF-111A OFT are sophisticated — radar landmass, terrain following, variable geometry, high density EW (up to 300 simultaneous electronic signals), flight systems integration and contractor support. It is one of the most complex, closely integrated OFT's ever developed.

Along the way, we also developed efficient operating techniques. For example, all Systems Engineering people — prime and sub — worked together under the "one roof" concept, utilizing streamlined management procedures. Bringing this technical resource into one meeting place has proven extremely effective. We also have simplified prime/sub relationships; our experience with Sperry as a proven team member on the EF-111A OFT is a good example of how well that works. And our use of modern, special facilities has given AAI an additional edge.

The test of a successful contractor is performance. The record shows that no one matches AAI's background in EW. That is why we have successfully integrated EW into a total OFT system.

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And, just for the record, we bring them in on time and on spec. We are ready for the future.

AAI

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THE SENSIBLE SOLUTION

AN EDITORIAL

Between Ace and Deuce

By John T. Correll, EDITOR IN CHIEF

Lt. Gen. James A. Abrahamson, Director of the Strategic Defense Initiative Organization, says that support for SDI is diminished by misunderstandings based on "bumper-sticker logic." A similar—and potentially more dangerous—strain of intellectual innocence can be seen in the ongoing reevaluation of basic defense strategy, which is an inescapable corollary to the SDI debate.

Too often, our strategy options are depicted as a choice of extremes: a perfect defensive shield that frees us from all fear of nuclear weapons, or else the all-or-nothing retaliatory doctrine known as Mutual Assured Destruction (MAD). These concepts represent only an ace and a deuce from the strategic deck. In between, a great many more realistic cards can be found.

Up to World War II, military strategy was concerned mainly with how to *win* wars. There were, to be sure, instances when disputes among nations were decided by possession of power rather than by direct use of it, but avoidance of war was a by-product of strategy, not a central objective.

The nuclear age, however, required a new kind of strategy, one designed to prevent war and at the same time protect the interests of nations. This was the concept of deterrence—maintenance of sufficient power to forestall any thought of aggression on the part of an adversary. A family of implementing strategies was and is possible under the general heading of deterrence.

Massive Retaliation, a strategy of the 1950s, was a comparatively crude approach to deterrence. It relied on all-out exercise of nuclear power to such an extent that the nation had few defensive moves short of general war. Every confrontation had to be met with the threat of massive retaliatory attack. Even at a time when the United States had clear nuclear supremacy, that was inadequate. This led, in the 1960s, to the search for "Flexible Response." The major outcome was greatly increased attention to conventional forces. A number of strategic deterrent concepts to succeed Massive Retaliation emerged, too. One of these was MAD, but it was pretty much the same old dog wearing a new collar.

MAD is a minimalist strategy. All it requires—and all it allows—is that after sustaining an attack ourselves, we be able to devastate Soviet cities in retaliation. Sample figures once forecast potential destruction of thirty percent of the Soviet population and seventy-five percent of Soviet industry. Since military assets, many of which would be hardened, need not be targeted, weapons and forces for MAD are relatively inexpensive. Not much is required in the way of strategic defense or command and control. It is a reflexive revenge strategy, with no selective or measured options.

In the spectrum of strategic postures, MAD can be seen either as a self-contained strategy, complete in itself, or as a foundation on which more flexible deterrent strategies can be built. The essential difference in these strategies is the choice of targets, the amount of strategic defense provided for, and the sort of forces required.

The addition of defensive features, for example, complicates the enemy's targeting problems and provides some protection in case deterrence fails and an attack occurs. Better cards in the strategic deck are the more complex postures referred to as Damage-Limiting strategies. They incorporate not only a measure of defense but also some targeting of military assets as well.

At the high end of the theoretical deterrent deck is full Counterforce, with adequate capability to target all of the hardest of military assets with confidence. This is a very costly approach, requiring great sophistication in capabilities, disposition, and support, and one the United States is not likely to pursue or achieve.

The classic approach is for strategies to prescribe forces, but in reality the kind of forces available also prescribes and limits strategy. Forces with less capability have fewer strategy options. Given weapons that lack the accuracy and lethality to be effective against hardened military targets, a force may be restricted to a "city-bashing" Countervalue targeting doctrine. Strong, secure forces are less likely to be tempted by high-risk tactics, such as Launch on Warning.

The United States has, in recent years, sought its cards from the middle of the strategic deck. But as Soviet superhardening techniques get better and as their ICBMs become more lethal, a vigorous US strategic modernization effort is imperative. Otherwise, the Soviet Union will eventually have a commanding Counterforce capability, while we are left with strategic options that amount to little more than MAD.

SDI is a research and development program, not a set of fully perceived capabilities that will be ready for operational employment anytime soon. Perhaps SDI will someday yield technologies that permit us to replace deterrent strategies with defensive ones. So far, this possibility is only a goal, and a distant one at that.

Knowledgeable sources say that defensive technology is moving ahead fast, and that is good. But strategic defense, like MAD, need not be an isolated strategy in itself. Its most promising features can be blended, as they come along, into broader strategies. Even a partial defense against ballistic missiles, for example, could greatly enhance our current posture of deterrence.

Meanwhile, it would be a huge mistake to slacken efforts on modernization of the strategic triad of ICBMs, SLBMs, and manned bombers. In the era of nuclear parity, our doctrine no longer calls for strategic supremacy, or even for superiority. We do not have to hold the ace necessarily, but we must have some cards better than the deuce. Much depends on the hand our opponent is prepared to play. ■

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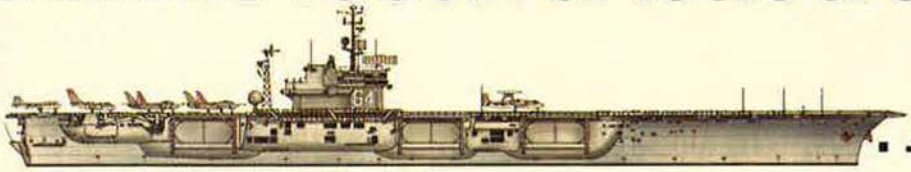
is the same receiver tested on board  . And

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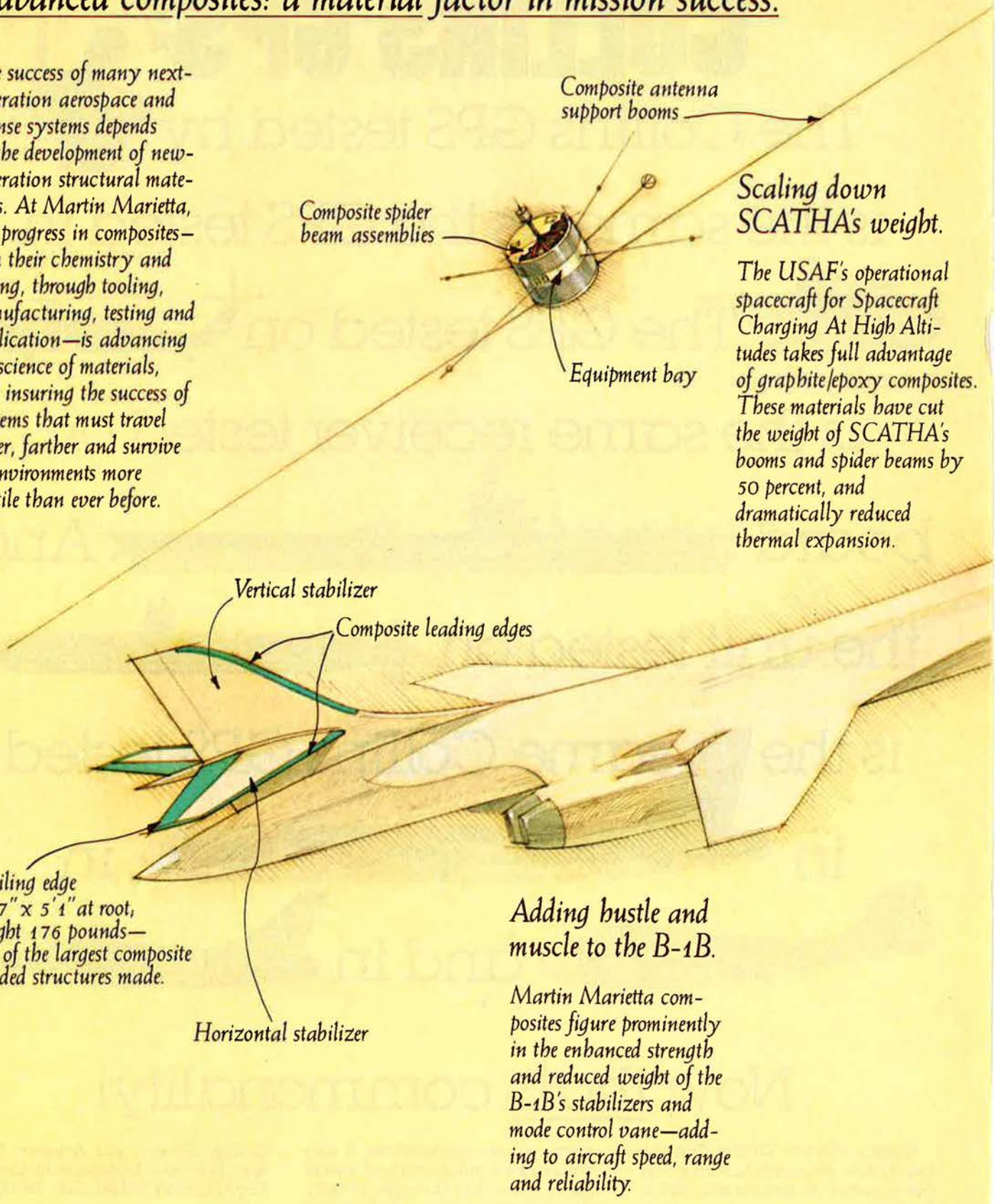

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The USAF's operational spacecraft for Spacecraft Charging At High Altitudes takes full advantage of graphite/epoxy composites. These materials have cut the weight of SCATHA's booms and spider beams by 50 percent, and dramatically reduced thermal expansion.

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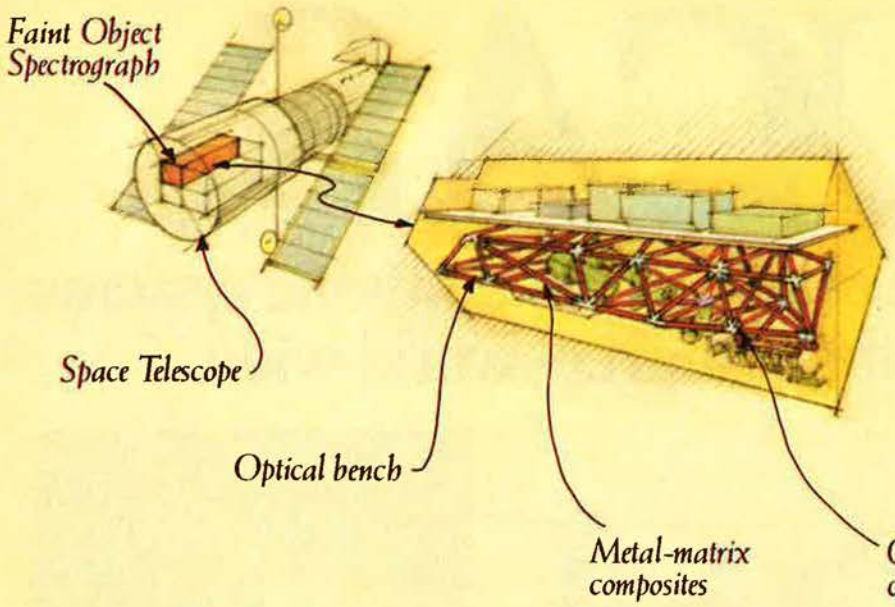
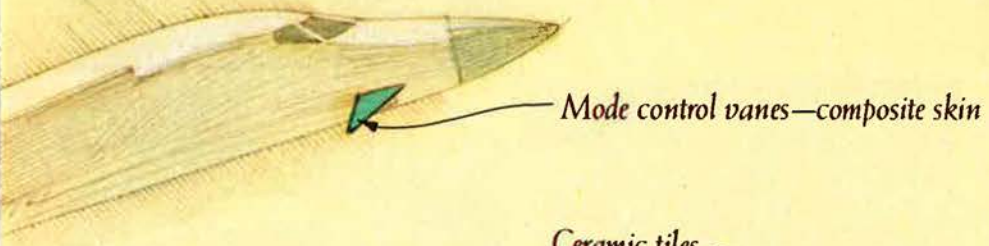
Martin Marietta composites figure prominently in the enhanced strength and reduced weight of the B-1B's stabilizers and mode control vane—adding to aircraft speed, range and reliability.

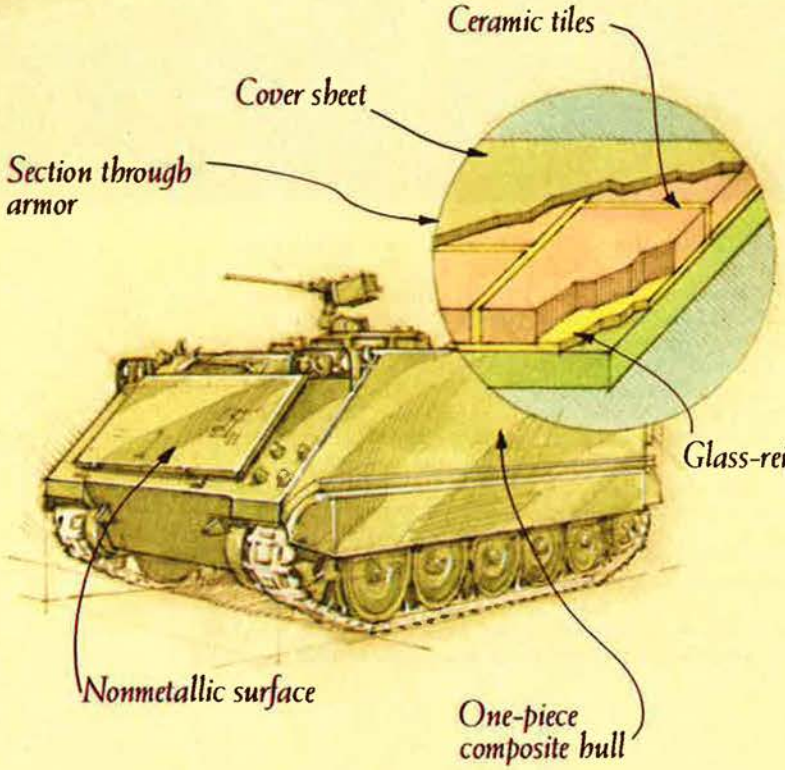
OUR COMMITMENT IS TOTAL. OUR CAPABILITIES



High-dimensional stability for the FOS.

The Faint Object Spectrograph relies on Martin Marietta metal-matrix composites to provide a dimensionally-stable optical bench, which will enable NASA's Space Telescope to accurately measure light from distant galaxies and stars.





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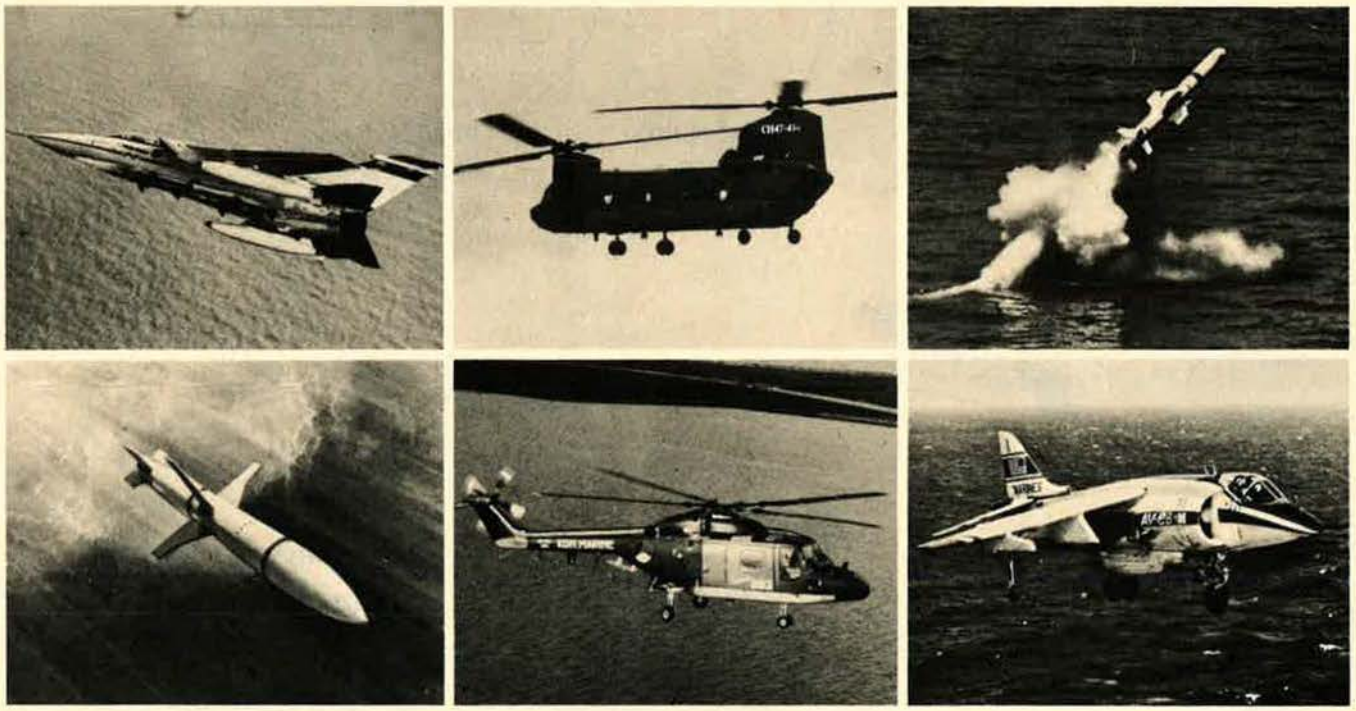

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AIRMAIL

Howard's Heroism

Your February 1985 AIR FORCE Magazine was another outstanding issue. I especially enjoyed Irene W. McPherson's excellent article, "Eagle Talk" *(p. 98).* James H. Howard's superhuman skill and courage in saving the 401st Bomb Group from decimation well earned her accolades.

Oh, that she had been correct in her statement that "not one B-17 was lost." I regret to report that we lost four aircraft.

Brig. Gen. Harold W. Bowman, USAF (Ret.)
Jupiter, Fla.

• *General Bowman, who was wartime commander of the 401st Bomb Group, is correct. The article should have read that not one B-17 was lost during General Howard's valiant effort to defend the bomber force.*—THE EDITORS

The Retirement Issue

I only hope that there are more people like your Editor in Chief, John Correll, and fewer like J. Peter Grace *(see "The Next Round on Retirement," January '85 issue, p. 6).* After having spent nearly eight years on active duty in the Air Force, I can assure you that retirement benefits made up one-third of the retention incentive for me (the other two-thirds being travel and experience).

Your editorial mentioned frequent moves, family separations, unpaid overtime, remote duty, up-or-out promotion, etc. For me, it came down to only a couple of those factors, and one big one was family separation. These, as we all know, involve TDYs and remote tours. I did not want to miss my family growing up. This is perhaps the hardest thing on any man or woman who chooses the military as a profession. Some families adjust very easily, and some families are torn apart. Seeing this, it became the "final nail in the coffin" for me.

I only hope that blue-suiters will speak out to their congressmen. After all, they are the ones most directly affected.

Thank you for thinking of a military member as an American with wishes, hopes, and dreams of a day when he or she can retire and enjoy life.

Eddie McCartney
Bryan, Tex.

Jewel in the Crown

The Aeropropulsion Systems Test Facility (ASTF) just coming on line at the Arnold Engineering Development Center (AEDC) is the jewel in the crown *(see "Big Wind at Tullahoma," January '85 issue, p. 78).*

Forty other test facilities at AEDC surrounding the new ASTF have contributed to every state-of-the-art aerodynamic propulsion system development during the past thirty-five years. The new ASTF will not antiquate the existing testing capabilities, but avails a cost-effective expansion for the present and the future.

A. A. Cimino
Arnold AFS, Tenn.

What's in a Name?

Re: Lt. A. A. Montalvo's "Airmail" letter on page 9 of the January '85 issue and the editors' note:

I am dual-rated; that is, I am rated both as a pilot and a navigator. While serving as a navigator in F-4s and B-52s, I considered myself just that—a navigator. The term is ancient, honorable, understandable, and meaningful.

To me, such phrases as weapon systems officer, defensive systems officer, and offensive systems officer are about as hollow as the euphemism "sanitary engineer." It was hard enough to explain at an open house that a B-52's radar navigator was what an earlier generation called a bombardier. Carrying the process of inventing new names for old tasks one step further, "flight systems officer" should replace pilot!

On one hand we play up Project Warrior to remind us of our role in the profession of arms, while on the other hand we try to mask the achievements of our forebears by throwing out the names they called themselves.

Maj. Arthur E. Fournier, USAF
Chesapeake Beach, Md.

I read the letter from Lt. A. A. Montalvo in your January '85 issue with great interest. He was concerned with the terms "Offensive Systems Operator" and "Defensive Systems Operator" proposed for crew members of the new B-1B.

It is unfortunate that so many young officers place so much importance on their duty title rather than on their performance. Having recently been named one of SAC's first B-1B flight instructors after a grueling five-month selection process, I can assure the Lieutenant that we do not care what we are called.

Those of us selected represent an experience base of 100,000 hours plus in both medium (FB-111) and heavy (B-52) bombardment aircraft. The reality of the situation is that when the SAMs start flying, I'll answer to "EW," "E-Dub," or "Dee-So." Old habits will be hard to break, so most of us expect to hear a lot of "hey radar" or "hey EW."

I, for one, am looking forward to a change.

Capt. Fred Strain, USAF
Dyess AFB, Tex.

No Way Midway!

Your January '85 issue article "Trials of the Tigershark" says in the caption to the picture on page 73 that "a Tigershark departs Midway."

I have never been to Midway, but was a civilian dispatcher with MAC operations on Wake Island in 1972. I would almost swear that your photo pictures Wake Island, *not* Midway!

John B. Leslie II
Seiling, Okla.

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

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AIRMAIL

Let me be one of many to point out that the Tigershark on page 73 of your January '85 issue is departing Wake Island, not Midway.

Ten million gooney birds are awaiting your correction.

1st Lt. Scott Dommin, USAF
Biloxi, Miss.

• *The gooney birds need wait no longer.*—THE EDITORS

The Navigation Spectrum

I found Lt. Col. Ralph R. Williams's article, "Navigation: From Dead Reckoning to Navstar GPS," to be an interesting account of aircraft navigation developments in the twentieth century. I have participated in both ends of the spectrum he covers and in many of the in-between activities.

In 1942, I became a Pan American Airways flight radio officer and was based at Dinner Key in Coconut Grove, Fla. I flew many missions on USAAF, US Navy, and RAF navigation training flights. The aircraft were Sikorsky and Consolidated Vultee flying boats fitted out with ten to twelve navigation work stations. As Colonel Williams noted, "The Air Corps had some students receiving navigational instruction with Pan American Airways."

During all of 1943 and part of 1944, I flew on either afternoon (dead reckoning) or night (celestial) flights. Professional Pan Am navigators provided classroom instruction in Coral Gables and took groups of students on afternoon or evening flights to provide them with actual experience. As the article noted, many navigation students were "washouts" from pilot training.

I participated at the close end of the spectrum in the early 1980s at Vandenberg AFB, Calif. We flew two GPS receiver flights piggyback on Minuteman III missiles. The data acquired was used to judge the Minuteman III inertial guidance system.

Thank you for an interesting and informative article.

P. I. Waite
Vandenberg AFB, Calif.

People and Force Structure

The "Airmail" department in your December '84 issue included a letter from Capt. Chris Krisinger on the subject of "Manning the New Aircraft" *(p. 13)*. While the letter was well intended, it didn't adequately credit the full measure of our efforts to meet future manpower requirements.

In 1983, our long-range planners took a close look at this issue and at how it related to our future airlift force structure. The result was a comprehensive, well-structured set of documents entitled "The USAF Airlift Master Plan" and "The USAF Airlift Total Force Plan."

The Airlift Master Plan (AMP) outlines the well-balanced, modernized, and effective airlift force structure that is needed to meet future airlift requirements. Going a step further, the Airlift Total Force Plan (ATFP) takes the AMP's recommended force structure and builds a corresponding force mix composed of active-duty and Air Reserve Forces (ARF) personnel.

The critical element in this force structure and force mix issue is the C-17. It represents the most cost-effective, manpower-efficient solution to meet future airlift challenges. As the C-17 comes into the inventory in the early 1990s, we anticipate "growing pains" that are somewhat typical any time we acquire a new major weapon system, transfer aircraft to the reserve forces, or retire less reliable and maintainable aircraft. The AMP and ATFP provide a roadmap around this turbulence as we modernize our fleet and expand the ARF's role in the airlift mission area.

Captain Krisinger also questioned the December '84 issue's front cover, which depicted a C-17 delivering a single battle tank to a hostile forward operating location. He doubted that a combat commander would risk a C-17 to deliver a single battle tank.

It's important to note that every situation is, of course, scenario-dependent, and delivery requirements would vary accordingly. However, I want to assure you of our resolve to use the C-17 to its fullest capability, including use in a hostile environment, if necessary. This position is the essence of a January 1984 letter from MAC Commander in Chief Gen. Thomas M. Ryan, Jr., to USAF Chief of Staff Gen. Charles A. Gabriel concerning the C-17 concept of operations.

General Ryan stated: "Whenever possible, we need to publicly reinforce our position that the C-17 is to be a combat aircraft that will deliver combat forces wherever and whenever needed." General Ryan's statement leaves no doubt as to how we intend to employ the C-17.

Thanks for the opportunity to clarify these issues. We do recognize that

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force structure decisions must consider all elements of the airlift system—especially our people.

Brig. Gen. Frank J. Kelly, Jr., USAF
Ass't DCS/Plans
Hq. MAC
Scott AFB, Ill.

A Mercenary Attitude?

Articles like "Gains for the Troops" in the December '84 issue bother me. I serve my country for the honor of good and faithful service. Yes, I need remuneration, and it must be sufficient to keep the topic from becoming an irritant. However, the cause and effect must stay in the right order: I don't serve for pay; I am paid for good and faithful service.

I'm not faulting the reporting of remuneration activity in our magazine; rather, I'm suggesting that it might be done at a lower key and with a different attitude. After all, I'm not a mercenary, and anything that makes me look like one reduces the honor of my good and faithful service!

Col. Robert E. Kellock, USAF
Lincoln, Mass.

Benjamin S. Catlin's article in the December 1984 issue, "Gains for the Troops," informed us in a clear and concise manner of the actions of the Ninety-eighth Congress on military benefits.

That the results were much better than could be expected when the year began can be attributed—no doubt to a great degree—to the hard work of AFA and Ben Catlin.

Col. Desco E. McKay, USAFR (Ret.)
Indianapolis, Ind.

I would like to express my appreciation to AIR FORCE Magazine for the information contained in the article by Benjamin S. Catlin, "Gains for the Troops."

Many Air Force people and veterans are not aware of the benefits to which they are justly entitled.

Lt. Col. Paul H. Campbell, USAFR
West Lafayette, Ind.

A Few Mistakes

In a couple of recent issues, I noticed a few mistakes.

In the November '84 issue article "The Magnificent B-1B," it was reported that the positions of the defensive and offensive systems officers were "five yards" behind those of the aircraft commander and crew pilot. How about five feet? Five yards would put them into the bomb bays.

On page 88 of the December '84 issue, an SR-71B is misidentified as an SR-71A. The B model is used for training SR-71 pilots and has a rather distinctive hump behind the front cockpit.

On page 123 of the same issue, there is a gaggle of mistakes in identifying the Egyptian and US planes. The planes pictured are (from left): A US F-16, an Egyptian Mirage, a US F-14, an Egyptian F-6, a US A-7, and a US A-6.

It's odd that whoever wrote the cutline for this photo identified the Chinese-made F-6 as a MiG-19, because no MiG-19s are listed in the Egyptian Air Force's inventory on the page opposite the photo. However, the F-6s (virtually identical copies of the MiG-19 made by China) are there!

Mike Whye
Rock Rapids, Iowa

• *Mr. Whye is correct in his suspicion that five yards is too great a distance. The stations for the offensive and defensive systems operators are approximately eight to ten feet behind the positions of the front two crew members. Mr. Whye is correct also about the SR-71. It is a B version, as should have been clear to us from the second cockpit.*

The photograph of US and Egyptian aircraft is somewhat more complicated—the caption *is right; the* photo *was cropped incorrectly. As cropped in the December issue, the photo shows an* Egyptian *F-16, an Egyptian Mirage, a US F-14,* an Egyptian MiG-21, *an Egyptian MiG-19, a US A-7, and a US A-6. Mr. Whye is correct that the F-6 designation is more precise in this case; the more familiar MiG-19 designation is often used interchangeably.*

We'll keep trying!—THE EDITORS

What Price Freedom?

While politicians of both parties are loudly decrying the burden that preparedness and taxes are placing on the shoulders of our citizens, how often we are reminded that when our lives—or our freedom—are on the line, then "cost" or "price" is no object! We tend to forget that our freedom is on the line twenty-four hours a day, 365 days a year, and that the lives of others (military members) are on the line daily, protecting our freedom.

Early in October 1984, the 92d Bomb Wing at Fairchild AFB, Wash., was engaged in a series of B-52 training exercises over the rugged desert areas of Utah. During one of these night exercises involving low-level flying, one of the B-52Gs experienced a mechanical failure that necessitated evacuation of the aircraft by the crew.

Col. William Ivy, 92d Wing director of operations, and Sgt. David Felix, B-52 gunner, did not survive the ensuing crash. Fortunately, the other crew members did survive.

It is only a routine headline to many people when a military aircraft crashes; however, it is not routine for the families of the victims—the sons, daughters, husbands, wives, parents, brothers, sisters, etc. Those who perish in such crashes are only doing their jobs, but they pay the extreme price so that we can sleep in complete safety. Courageous people like Col. Bill Ivy and Sgt. David Felix risk their lives daily, maintaining peak proficiency of their flying skills.

Yes, Colonel Ivy and Sergeant Felix paid the price—yet they fully understood the risks they were taking, particularly in flying aircraft that are more than a quarter of a century old. Men and women at Fairchild and at military bases all over the world take the same kind of risks daily.

I sincerely hope that each of us will stop a moment and reflect on the loss of these fine young men—perhaps even say a prayer for them and their families. We should realize how truly small the "dollar cost of freedom" is to each of us, compared to the price they paid willingly so that we can remain free.

Andy Kelly
Spokane, Wash.

Helicopters and USAF

Having read several comments in various publications recently concerning Air Force helicopters, I see a common concern developing among USAF helicopter pilots like myself. After six years and 2,000 flying hours, I find myself asking, "Is there a future in the Air Force for helicopter pilots?"

We are a small but highly dedicated group of some 500 active pilots flying 244 aircraft worldwide. These airframes, on the average, are sixteen years old. In wartime, our primary mission is combat search and rescue (SAR)—the saving of the most valuable resource, human life. In peacetime, we perform many less notable but nevertheless essential missions, supporting such diverse operations as SAC missile complexes, R&D research, and space programs. We also continue to provide medevac/MAST support as well as disaster relief

throughout CONUS. In 1982, we recorded our 20,000th "save." Helicopters contribute significantly to the overall accomplishment of the Air Force mission.

In spite of flying many demanding missions in often-deteriorating weather and using airframes in desperate need of replacement, our career field is always overmanned. We believe in what we do. Does anyone else?

Several recent developments seem to be cause for alarm. The first is the drastic reduction in the planned procurement of the HH-60D Night Hawk helicopter from 243 to ninety-nine. The second is the proposed transfer of certain Air Force helicopters and missions to the Army. These proposals, though not actualized, seem to indicate that the Air Force is contemplating a marked reduction or total elimination of the helicopter fleet.

I enjoy flying helicopters and wouldn't want to fly anything else. For my peace of mind, I would like someone to state honestly what the future holds for helicopters in the Air Force.

Capt. David C. Delisio, USAF
Andrews AFB, Md.

Where Would *You* Start?

As a lifetime member of the Air Force Association and an officer of the greatest air force in the world, I eagerly read every edition of AIR FORCE Magazine, more often than not while sitting seven days on strategic ground alert as a KC-135 crew member. As an officer and American citizen, I am truly interested in and have a lot invested in the defense of the free world and encourage any and all efforts to ensure its continued security. However, there are other important though not new aspects of American security that must be addressed.

The Air Force Association and AIR FORCE Magazine leave no doubts as to their support of the defense buildup, and I, in general, agree. But the security of the country cannot be measured in airframes, missiles, and naval vessels alone. The traditional and longstanding fame of the United States has been its degree of prosperity and high standard of living as compared to the rest of the world. If in the future we cannot sustain that, then what are we defending?

The current emphasis on huge government deficits is well earned. On a small scale, I experience the same dilemma with my family when we face the hard facts: Up to a certain point, we cannot spend more than we earn. Taking on too much credit only hurts us in the long run. No matter what anyone thinks, the same holds true for the federal government, and apparently most economic specialists feel the same way. . . .

So, we must cut the deficit. The question President Reagan and Congress must wrestle with is how. Social programs and the like can be cut, but only so much. To me, it is obvious that the Defense Department must do its part. I cannot and will not pretend to begin to know how this should be done, for that is not my area of expertise. Others get paid a lot more than I do to deal with such questions.

What I would like to know is: How does the Air Force Association feel about this? I read every month about "buy this weapon system, retain that program, expand this capability," but the budget cuts must start somewhere. If we don't offer some intelligent plan that does more than just skim the top, then you can be sure that the hackers in Congress will come up with something unacceptable to us all. AFA, where would *you* start?

I would gladly give up a pay increase next year if I knew that everyone in both the government and the private sector was giving up something, too. By the way, a good way for Congress to send a signal to the American people would be to cut back on their own huge, unpublicized, yearly pay increases.

Capt. Glenn A. Walsh, USAF
Kokomo, Ind.

Useless Weapons?

I concur with Col. Peter Boyes *(see "Airmail," January '85 issue, p. 10)* and others of like mind, but they don't go far enough.

The undersigned was the original project engineer on the F-100, the first supersonic fighter. It could carry, in one sortie, more nuclear "bang" than was carried by all the conventional high-explosive bombers in all the bomb raids in history. This leads me to question the cost-effectiveness of the B-1B.

Two Legions of Merit for contributions to antiaircraft weaponry likewise lead me to the opinion that the "Star Wars" defenses will inevitably be so porous as to be more or less useless. While fluidics may be of some help in the airborne elements of the systems, the intense electromagnetic pulse coincidental with nuclear detonations will disable much if not all of our communications and control systems.

In my view, the chances of a nuclear exchange with the USSR approach zero. We both have a capability for "overkill" many times over, regardless of a possible "first strike." Why then the MX, when conventional weaponry has been the *modus operandi* in all the engagements since 1945?

And the MX won't counter an unsophisticated "dirty" atomic bomb sailed into San Francisco harbor in a rusty freighter. Such a gambit, sponsored by terrorist Iran or Libya, could hold the nation hostage.

On August, 28, 1944, the Germans launched 101 V-1 "buzz bombs" at London. Of these, ninety-seven were shot down by fighters, which usually had to dive to get enough speed to catch them. Now we call a similar subsonic weapon a "cruise missile" and blindly commit billions in spite of the facts that they also have an essentially linear flight path and will be opposed by fighters twice as fast, by sophisticated seeker missiles, and by such gun systems as the Soviet ZSU-23-4 tank-mounted antiaircraft system of four radar-directed and computer-controlled 23-mm guns.

Unless our aircraft and cruise missiles attack on a significantly evasive flight path, such as the fully automated and computer-controlled "helical" flight path I have repeatedly proposed, our losses may well approximate the V-1 statistics cited above.

Some ten years ago, it was postulated that this "helical" flight path would virtually negate the effectiveness of both antiaircraft and fighter guns. Nevertheless, it continues to get the DoD "idiot treatment" because it is "unconventional."

If cruise missiles are to be an effective weapon, they *must* attack on an evasive flight path.

Col. G. C. MacDonald,
USAF (Ret.)
Shalimar, Fla.

Defense Attaché Duty

The Directorate of Attaché Affairs, Air Force Intelligence Service, is soliciting volunteers for defense attaché duty.

Positions are open for the following grades and AFSCs: staff sergeant and master sergeant/70270, senior master sergeant/70290, chief master sergeant/70200, and staff sergeant and master sergeant/A43174 (turboprop experience preferred for duty with C-12 aircraft). These positions are available at US embassies worldwide.

Also, we are looking for language-qualified personnel to serve in SDI 99606 in Yugoslavia and the USSR only.

This duty is challenging, interesting, and rewarding and offers eligible personnel an opportunity to observe and work with the United States diplomatic corps. Only personnel assigned in CONUS are eligible to apply

for defense attaché duty. All assignments have automatic concurrent travel for married personnel and a civilian clothing allowance. Those selected for language-qualified positions will receive language training (if not already qualified), along with approximately three months of training at the Defense Intelligence College (DIC) in Washington, D. C., in a PCS status prior to reporting to station. All other selectees will receive DIC training on TDY status.

Interested personnel should contact the address below. Eligible NCOs will be mailed an information letter on the selection process, housing, availability of schooling, and a brief description of duties. Applications remain active for a one-year period.

MSgt. Robert Becker, USAF
Sgt. Robert Withrow, USAF
Hq. AFIS/INH
Fort Belvoir, Va. 22060-5788
Phone: (703) 664-6036
AUTOVON: 354-6036

AFRES Medical Corps

At the 1984 annual meeting of the Association of Military Surgeons of the United States (AMSUS) held in San Diego, Calif., on November 4–9, 1984, the Society of Air Force Reserve Medical Service Corps Officers was officially established.

The purpose of the Society is to promote excellence in health-care administration in the Air Force Reserve by uniting and coordinating the efforts of AFRES MSC officers. The Society's goals are to improve communication among AFRES MSCs and to provide increased opportunities for professional development.

Every AFRES MSC is invited and encouraged to join the Society, regardless of training category. The Society is attempting to enlist every AFRES MSC as a member.

A newsletter was to be sent to every AFRES MSC in February 1985 with specific information on the Society and plans for the coming year. The next general membership meeting will be held at the 1985 AMSUS annual meeting this fall.

For more information on the Society, write the address below.

Society of AFRES Medical Service Corps Officers
P. O. Box 97
Del Valle, Tex. 78617
Phone: (216) 746-1892

9th WRS

I am researching the thirty-one-year USAAF/USAF flying career of my late father, Lt. Col. John J. Burgmeier, in order to assemble a complete model collection of every type of aircraft he flew during his military service. I am attempting to detail each model with the exact squadron codes, colors, serial numbers, and other markings of the actual aircraft he flew.

I would like to hear from any former pilots or ground crew of the 9th Weather Reconnaissance Squadron (Provisional) of the Ninth Air Force, 1944–45, or from anyone who might have photos of the squadron's P-51s carrying the ID code "80." I would be *especially* interested in photos of a P-51D christened *Kansas Aggie* or *St. Cloud.*

I also need photographs of F-86Es and T-33As of the 40th Fighter Interceptor Squadron, Johnson AB, Japan, circa 1954.

All letters will be promptly answered, and any materials loaned will be copied and returned immediately via certified mail.

John J. Burgmeier III
411 43d Ave.
Yuma, Ariz. 85364

AIRMAIL

Walnut Ridge AAF

In preparing an article on the Army Air Forces' aircraft storage program, I found that one of the fields used most for this purpose—Walnut Ridge AAF, Ark.—is missing from the historical files that are available at Hq. AFLC and elsewhere.

Walnut Ridge was used from about 1945–48 for storage of more than 5,000 surplus war planes from World War II. I have letters from more than a dozen former AAF pilots who say that they ferried some dozen different types of planes there for storage and disposition in 1946–47.

Is there anyone who was stationed at Walnut Ridge during World War II who can tell me something about this field? Is there anyone who might have been a part of the station complement when these planes were arriving for storage?

Please contact me at the address below.

Col. Robert F. Schirmer, USAF (Ret.)
8978 E. Anna Pl.
Tucson, Ariz. 85710

POW Chaplain

As a recently commissioned chaplain in the Air Force Reserve, I have become interested in a subject that I have never heard anything about: the role of the chaplain in a POW setting.

I would appreciate very much hearing from anyone with firsthand knowledge of or experience with an imprisoned chaplain during any conflict. In addition, I would like to hear from any former POWs who might share with me their own spiritual concerns while imprisoned. Much has been recorded about the physical and psychological ramifications of being captured, but little has been noted about the spiritual considerations.

Please contact the address below if you can help me out with any information or observations.

1st Lt. Robert Stroud, USAFR
6321 Beta Court
Citrus Heights, Calif. 95621

Interned in Switzerland

I am writing a book about the American planes that landed or crashed in neutral Switzerland during World War II.

I would be most interested to get in touch with former internees as well as to obtain pictures of interned planes and aircrews here in Switzerland. Personal reports about the missions and the time spent interned would prove most valuable to my research.

I am looking forward to hearing from airmen who were interned in my country during the war. Please write to me at the address below.

Hans-Heiri Stapfer
Bergstrasse 35
CH-8810 Horgen/ZH
Switzerland

71st Bomb Squadron

I am attempting to compile a unit history and a day-to-day picture of operations of this unit during and after World War II until the squadron's deactivation in the 1960s. Can any veterans out there help me?

The squadron has been reactivated as the 71st Tactical Missile Squadron with a new mission in a remote assignment. I need original materials to help in compiling our history. Daily operations reports, for instance, would be a big help.

Please contact the address below.

2d Lt. Larry S. Tabor, USAF
71st TMS
APO New York 09188-5000

F-100 Super Sabre

The neglected "Hun" and its flight and ground crews are the subjects of my next book for Osprey's "Air Combat Series." I'd appreciate hearing from anyone with time in or experience with the North American F-100 aircraft in USAF active, Reserve, or ANG units or in any foreign service. The book, my ninth hard cover, will be

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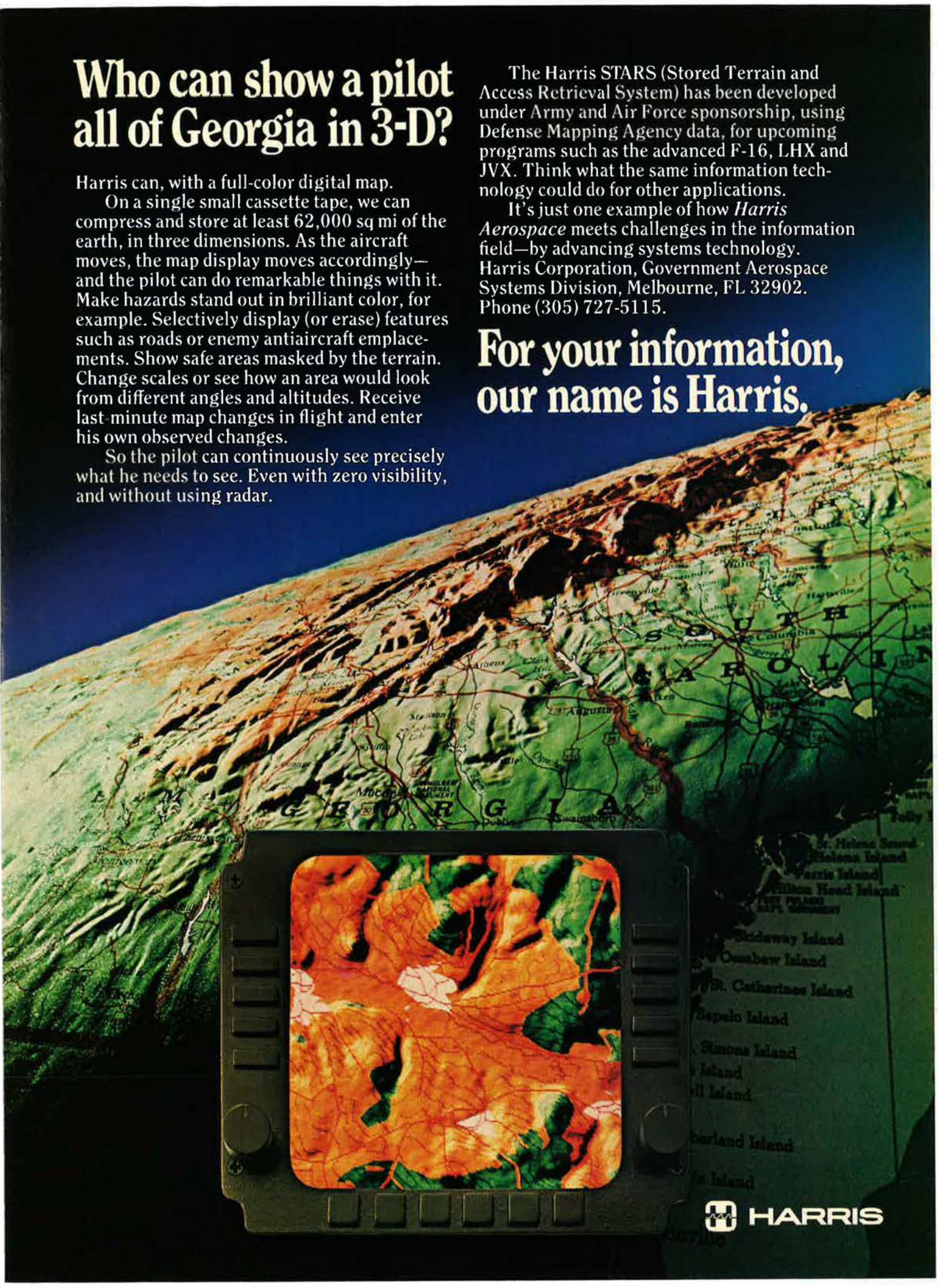

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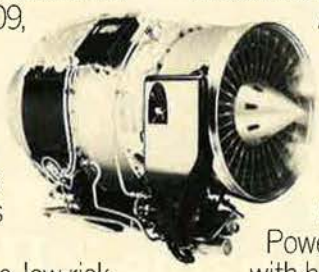

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similar to my earlier *Republic F-105 Thunderchief* and will include extensive photographic coverage.

Contributors will receive an autographed copy of the book upon publication as well as an acknowledgment in the text. Please contact the address below.

David A. Anderton
30 South Murray Ave.
Ridgewood, N. J. 07450
Phone: (201) 652-0632

Air Force Ghosts

I am collecting stories about ghosts that haunt Air Force bases and planes. I hope to publish a log of these stories eventually for future generations to read and enjoy.

Readers are requested to please let me know of any strange or unexplained incidents that you may have experienced or heard about on Air Force bases here or abroad.

Please contact me at the address below.

Leon Thompson
1211 Chicago St.
Kent, Wash. 98031

"Tidal Wave"

"Tidal Wave" is fast slipping into history, and young people today know little or nothing about what "Tidal Wave" participants were doing on August 1, 1943. I am working on a project to bring the "Tidal Wave" story front and center.

If you can contribute in any way to my endeavor, I would like to hear from you. Please send your name and address, phone number, MOS, and bomb group.

Leroy W. Newby
810 North Terrace Dr.
Webster City, Iowa 50595

F-104 Starfighter

I am writing a study of the various models of the Lockheed F-104 Starfighter from a technical and a pilot's point of view. I would appreciate receiving any information, manuals, etc., that could help me in my research.

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

David J. Porter
939 Park Blvd.
Baton Rouge, La. 70806

Survival Procedures

I am currently doing research on tropical survival, wilderness first aid, search and rescue, and emergency procedures for downed pilots.

Any information shared in the form of letters, brochures, pamphlets, manuals, books, or any other material would be greatly appreciated. Please contact me at the address below.

Scott Tatum
1500 Fairway Terrace
Clovis, N. M. 88101

AIRMAIL

B-25 Mitchell

Hurlburt Field in Florida has a noteworthy memorial air park. Unfortunately, we lack a very important aircraft in our air park, one that is significant because of the days when the 1st Special Operations Wing here at Hurlburt Field was the 1st Air Commando Group in the China-Burma-India theater during World War II.

This aircraft is the B-25 Mitchell. If anyone knows of a B-25 in the southeast part of the United States, we would be interested in learning the name of the owner so that we can contact him regarding possible donation of the aircraft to our memorial air park. The aircraft would not have to be in flyable condition, as the 1st SOW would undertake restoration.

Please contact the address below.

MSgt. Allen P. Holtman, USAF
Hq. 1st SOW
Hurlburt Field, Fla. 32544-5260

Korean War

I have been commissioned by Simon & Schuster in New York to write a new study of the Korean War. Like my earlier books, *Overlord* and *Battle for the Falklands,* this one will be based overwhelmingly on the testimony of those who took part.

I would like to hear from any veteran of the fighting in Korea, initially just giving rank and brief details of service, with a view to arranging for personal interviews in the US later this year.

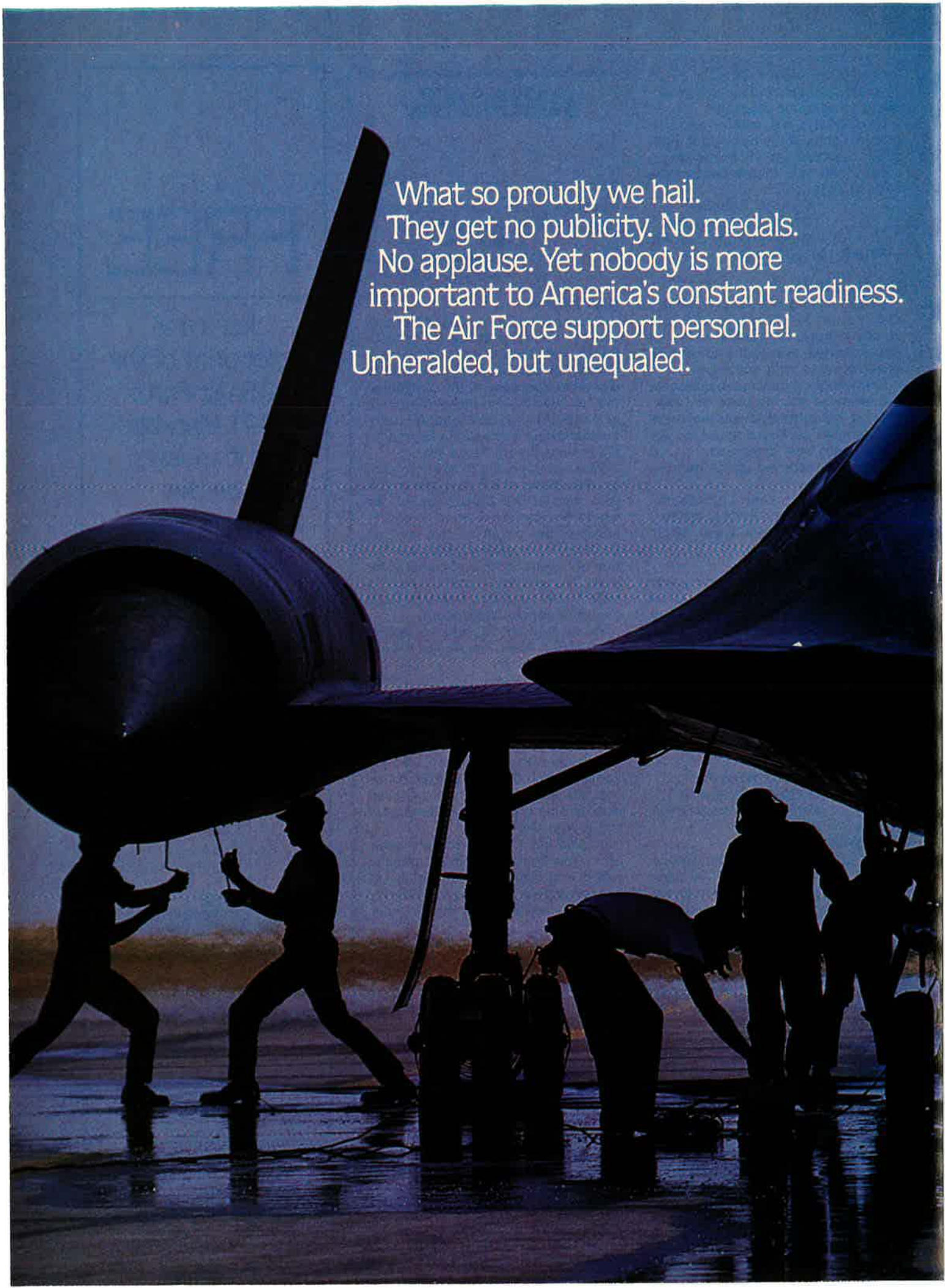
Please contact me at the address below.

Max Hastings
Guilsborough Lodge
Guilsborough
Northamptonshire
United Kingdom

441st Troop Carrier Group

My company recently purchased C-47 42-101012. We have returned the aircraft to the US after forty years of service in Europe, primarily with the Norwegian and Danish air forces. We plan to use it in its World War II colors to haul freight.

We wish to contact anyone who was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They get no publicity. No medals.
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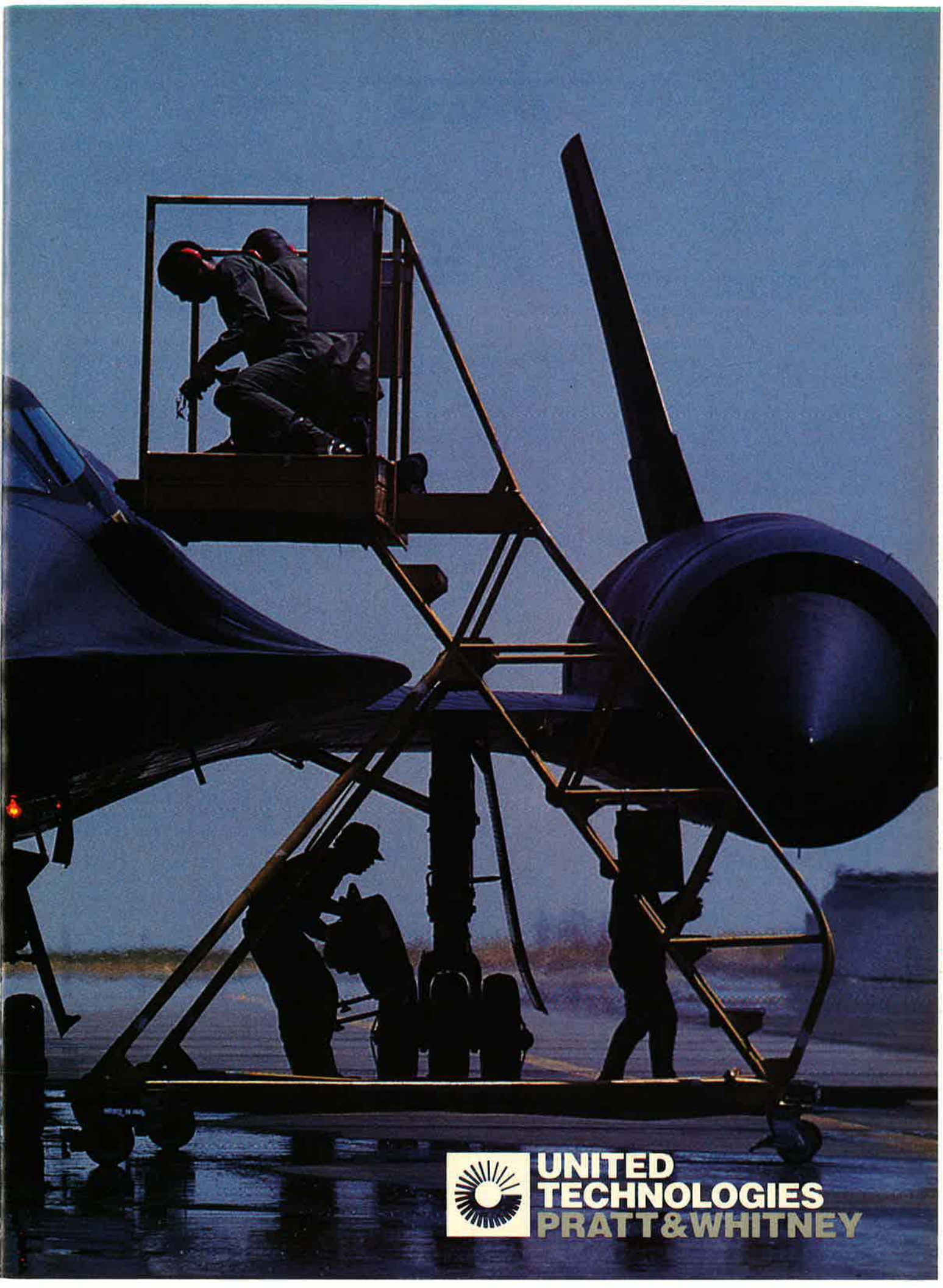
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assigned to the 99th or 301st Troop Carrier Squadrons, 441st Troop Carrier Group, in 1944–45, and who may know more about the history of this aircraft.

Robert E. Houghton
Northern Airways, Inc.
Box 2326
Burlington IAP
S. Burlington, Vt. 05401

Looking for . . .

I am trying to trace the widow of the late Capt. Lawrence Lolley, who was killed in action during World War II.

Apparently, he took off from St. Eval in Cornwall in January 1943 and was never seen again. He was recorded as missing in action for a while and then reported killed in action. He served with the 1st Antisubmarine Squadron, 479th Antisubmarine Group. He was a crew member of a B-24 that was lost over the Atlantic Ocean.

Captain Lolley was born on April 2, 1918, and he entered the service on March 15, 1941. His home was in Monroe, La.

I would like to hear from his widow or from any other relatives. Please contact me at the address below.

Norma Lolley
31 Wasdale Rd.
Northfield
Birmingham B31 1QH
United Kingdom

I am currently researching the history of the 392d Bomb Squadron, Eighth Air Force, based at Wendling, England, in 1944. On July 5, 1944, a B-24H (42-95092) from this unit collided in midair with another B-24. Four members of the crew survived the accident and the war. I would like to establish contact with these men or with anyone who can tell me more about the 392d.

They are 2d Lt. Alden S. Fletcher, Sgt. S. G. McCormick, Sgt. E. J. Plycht, and Sgt. P. D. Zollinger.

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

Grace M. Kimble
13 Ram Gorse
Harlow
Essex CM20 1PX
United Kingdom

I would like to hear from anyone who can give me information concerning my uncle, SSgt. Tink J. Hughes. He was killed on a mission to Kiel, Germany, on June 5, 1942. I believe he was aboard a B-17 bomber.

My uncle's fellow crew members included O. M. Ekin, E. E. Fulghum, E. R. Ellis, Frank Profitt, W. S. Thys, Bill Garsuch, and M. J. Sarenson.

AIRMAIL

Please contact me at the address below.

Bill Hughes
3216 Cragg Dr.
Oklahoma City, Okla. 73150

I am attempting to locate three members of my old B-24 crew from World War II. We flew together with the 450th Bomb Group, 721st Bomb Squadron, at Manduria, Italy.

I would like to get in touch with Joseph T. Kent, Oliver G. White, and Raymond M. Hook.

Please contact the address below.

Doid K. Raab
5695 Ireland Rd., N. E.
Lancaster, Ohio 43130
Phone: (614) 536-7635

I would like to contact former aircrew members of the 429th and 430th Tactical Fighter Squadrons of the 474th TFW. These squadrons were based at Takhli Royal Thai Air Base from October 1972 through February 1973. They were equipped with F-111As and operated over North Vietnam as part of an operation called "Constant Guard Five."

I am particularly interested in any information regarding Maj. Richard McElvain, who was reported MIA by the Los Angeles *Times* on December 18, 1972.

Any information would be appreciated.

Howard Gething
P. O. Box 1189
Glendale, Calif. 91209

I would like to obtain the mailing address for a former Sikorsky test pilot.

This pilot's name is Charles "Les" Morris. He terminated his employment with Sikorsky in 1944.

Please contact me at the address below.

Samuel S. Kloda
5817 Eldridge Ave.
Cote St. Luc, Quebec
Canada H4W 2E3

I am trying to locate two radio operators from Class 38-B at the Army Air Forces Technical School at Sioux Falls, S. D.

They are Niel H. Hodges, San Diego, Calif., and Beryle Miller, Kansas or Missouri.

Any information regarding their present whereabouts would be greatly appreciated.

Isaac B. Colo
55 Crane Ave.
Pittsfield, Mass. 01201

I am looking for Jack B. Low. He was a lieutenant and later a captain with the 92d Troop Carrier Squadron during World War II. He served later as a general's aide during Korea.

Lt. Col. Thomas F. Corrigan, USAF (Ret.)
3815 Somerset Dr.
Colorado Springs, Colo. 80907

I would like to contact any former members of the 3711th Basic Military Training Squadron, Flight 62. The dates for this basic training class were from January 17, 1968, through March 1, 1968.

I am not planning a reunion. I am only interested in corresponding with anyone from Flight 62.

TSgt. Brian J. Rueger, USAF
OLFO Hq. ESE
APO New York 09108

I am trying to locate any aircraft propeller specialists who were assigned to the 305th, 306th, and 307th Propeller Shops at MacDill AFB, Fla., during 1948 to 1954.

CMSgt. William B. Camp, USAF (Ret.)
113 Devonshire Rd.
Warner Robins, Ga. 31093
Phone: (912) 922-0256

Collectors' Corner

I would like to learn of a store where I can purchase Air Force uniforms and equipment, as the "US Cavalry" store in Radcliff, Ky., sells Army paraphernalia. There must be some place in America selling directly to the general public and offering Air Force equipment, just as the "US Cavalry" store offers Army equipment.

I am especially interested in obtaining a set of wings that I had during Korea. I can't find them anywhere. All equipment places offer only World War II wings and not much Air Force equipment.

Kenneth Williams
Box 423
Quogue, N. Y. 11959

Anyone interested in obtaining an original copy of *Aviation* magazine dated May 30, 1927, should contact the address below. The publication contains such items as reassignment notices for Lt. Hoyt S. Vandenberg, Lt. Benjamin W. Chidlaw, and others.

Steve Straight
Adel, Iowa 50003
Phone: (515) 993-4287

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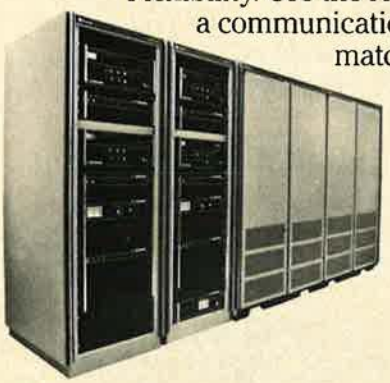

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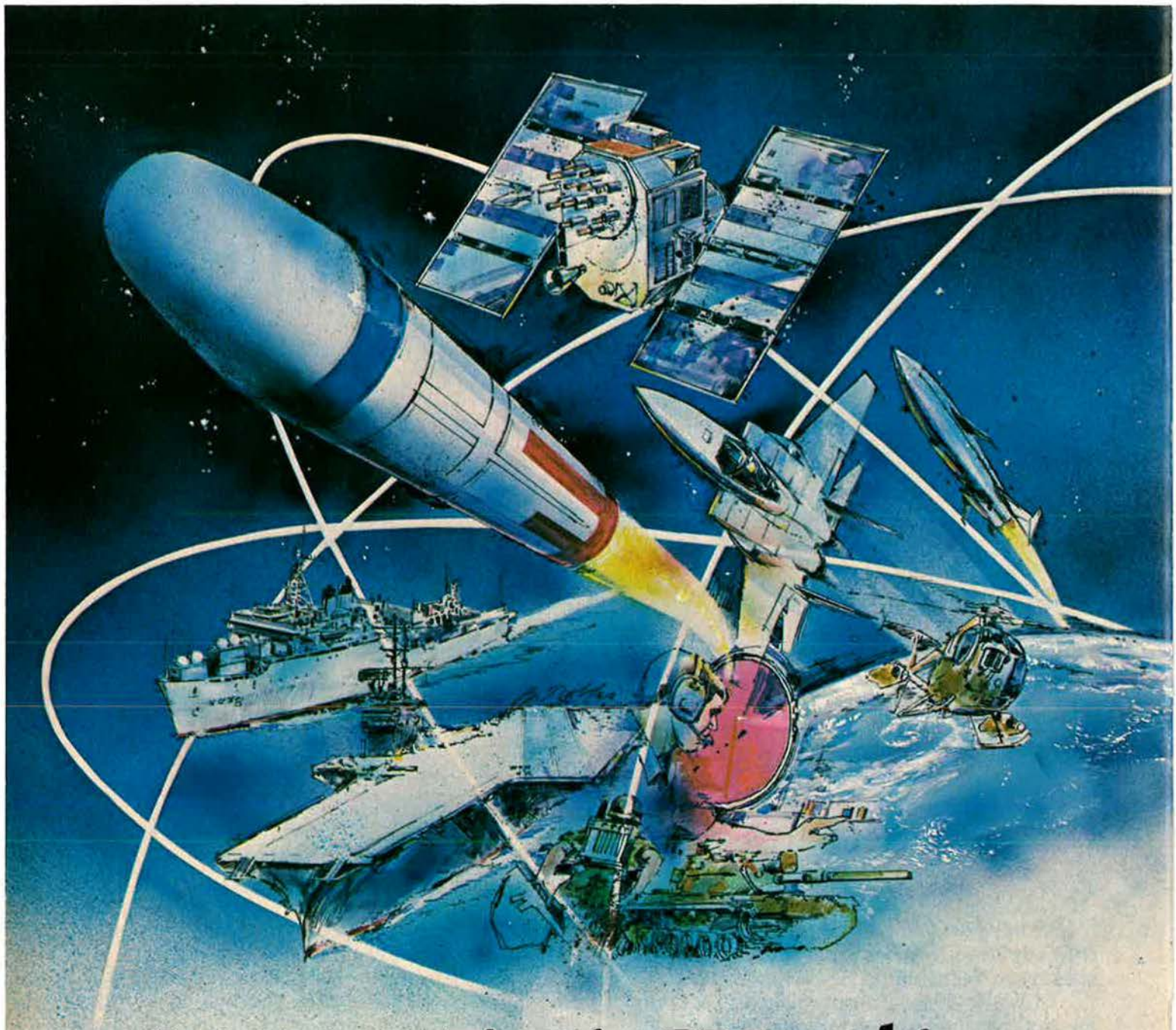

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IN FOCUS...

When Gs Get Deadly

By Edgar Ulsamer, SENIOR EDITOR (POLICY & TECHNOLOGY)

The tactical air forces are concerned about sudden blackouts and grayouts of pilots in newer fighters that generate and sustain more G forces than humans can tolerate.

Washington, D. C., Feb. 4

Pilot blackout and grayout problems have taken on a new, more ominous dimension with the advent of aircraft that can generate and sustain "G" forces far in excess of what humans can tolerate. Compounding the problem is the fact that new electronic flight controls allow high Gs to build up so rapidly that even highly experienced pilots lapse into unconsciousness before they have a chance to heed the physiological warning signals—such as tunnel vision and indications of impending grayout—that in the past made it possible to ease up on the stick in time.

While the phenomenon of G-induced loss of consciousness (GLC) has claimed the lives of pilots in the past, it remained a little-understood event that occurred relatively rarely. But now, the heads of TAC, USAFE, and PACAF told this writer, GLC has been catapulted to a top-priority concern of the tactical air forces (TAF). Intensive efforts are under way to shield pilots by a variety of means from the grim consequences of GLC. But, so far, there haven't been any easy answers.

According to Gen. Jerome F. O'Malley, Commander of Tactical Air Command, the effects on pilots of high Gs are taking on a new, markedly more dangerous twist that surfaced first with the F-16 and its electronic flight control system and that "can totally incapacitate the pilot." The insidious aspect of GLC is "that you can apply [intolerable levels of] G forces instantaneously in an F-16," General O'Malley told an AFA symposium on tactical air warfare recently.

Pointing out that GLC is not the gradual onset of blackout that has confronted every fighter pilot at one time or another—"where all you need to do is to let off the stick a little bit and you come to"—he stressed that "this is not what we are talking about in GLC at all." Rather, the issue involves "total loss of consciousness for twenty to twenty-five seconds. When the pilot wakes up from having this done to him in the centrifuge, he denies that it ever happened to him, and he is kind of spastic as he comes out of GLC." Obviously, the consequences of such instantaneous, prolonged loss of consciousness to "pilots flying single-seat F-16s at 200 feet [are] disastrous," he said, adding, however, that "as we started to look over the facts from past accidents, [it became apparent] that this has been going on for a long time."

High G forces do essentially two things to the pilot, according to Air Force experts: They tend to drain some of the blood—and hence oxygen—from the brain and restrict or even shut off the flow of blood from the heart to the brain. Hence the various degrees of amnesia that follow GLC. A set of relatively straightforward physical and medical factors influences the GLC phenomenon.

Obviously, in purely physical terms, the distance from the heart to the brain—as determined by the size and body shape of the pilot—is an important factor. This is hardly a new discovery, of course; the Israeli Air Force, for instance, picks its combat pilots according to physical attributes that promise high resistance to blackout induced by high Gs. Also, a low heart rate—whether the result of hereditary factors or physical conditioning—may increase susceptibility to GLC. As a result, the TAF's long-distance runners are fast becoming an endangered species. In the case of TAC, for instance, pilots are cautioned against running more than three miles three times a week and are encouraged to engage in a complementary weight training program to build up upper body strength, according to General O'Malley.

The fact that aerobic exercises lower heart rates and increase susceptibility to GLC does not militate against the need for well-rounded physical conditioning on the part of fighter pilots, TAC experts are quick to point out. The idea is simply to avoid a one-sided regimen. Proper diet, weight control, and a healthy lifestyle are other factors that have so far been identified as increasing resistance to GLC. The characteristics of G-suits also affect the GLC phenomenon. As the TAC Commander pointed out, "We are trying to get air through the G-suit faster by coming up with better valves for all of our fighters."

Although GLC is most acute in the case of air-to-air maneuvers, it does not spare pilots engaged in air-to-ground training missions. Nor is it awed by experience levels. As General O'Malley pointed out, "It's happening almost without fail to experienced pilots, not young lieutenants with 100 hours." He added that most of the recent fatalities attributed to GLC involved veteran pilots—in the main, those with the rank of major. A lieutenant colonel flying an OV-10, for instance, recently encountered a clear-cut case of GLC, but survived because of the intervention of his backseater. As one of the rare survivors of GLC, he is expected to shed some light on the onset of GLC, according to the TAC Commander.

Among the initial remedial steps being taken, the Air Force is redesigning the G valve of the F-16, F-15, and A-10. The new valve opens sooner and boosts the flow rate to the pilot's G-suit, cutting the inflation time from about six seconds to less than two. The new valve is undergoing flight test and might be available for retrofit within a year.

At the same time, the Air Force, "for the first time in many years, is looking for ways to redesign our G-suit," according to General O'Malley. In addition, centrifuge design and training are being revamped with an eye to the GLC phenomenon. Centrifuge train-

ing has been resurrected at Brooks AFB, Tex., for instance, and the device itself has been modified extensively to generate high G forces more rapidly. Lead-in fighter training at Holloman AFB, N. M., has been broadened to include centrifuge training.

Construction will start at Holloman AFB next year on an advanced centrifuge that can reach high G levels—on the order of nine Gs or more—almost instantly. Any pilot undergoing training on this new centrifuge "will find out for himself how long it takes him to go out," the TAC Commander said.

While research by the Air Force on how to combat GLC is far from complete, one fact is already abundantly clear, according to General O'Malley: "The most important thing we can do after we [have come up with new equipment] is to teach the pilot a straining maneuver," meaning essentially a controlled breathing rhythm—one breath about every three seconds—that, when properly applied, can add up to three Gs to a pilot's normal G tolerance.

By way of a benchmark, a G-suit—even when fed through the new high-flow valve—can boost tolerance levels by no more than one G. The G-suit may do very little to boost G tolerance by itself, but it can increase the effectiveness of the straining maneuver significantly by giving the pilot something to "push against" as he prepares himself physiologically for the onset of high G forces. The key here is timing. Obviously, if the pilot waits until the onset of high Gs, it may be too late.

While the Air Force's GLC experts admit the perplexing nature of this phenomenon that is the suspected cause of a number of recent aircraft accidents, there is high confidence that ways will be found to ease the problem. Future cockpit designs may well be influenced by the findings of GLC studies in progress.

In the final analysis, no one is willing to surrender the role of the fighter pilot to remotely piloted vehicles (RPVs) that can pull twelve Gs without breathing hard but that lack what it takes to win in aerial combat—human ingenuity, judgment, and guts.

New Soviet Treaty Violations

As required by Congress, the White House recently released an updated, unclassified report on Soviet violations of various arms-control accords. In transmitting the report to Congress, President Reagan disclosed that the US "is concerned about Soviet preparations for a prohibited territorial ABM [antiballistic missile] defense." The 1972 ABM Treaty prohibits the deployment of an ABM system for the defense of the national territories of the signatories and enjoins them from providing a base for such a defense. Three specific activities on the part of the Soviets are cited in the unclassified version of the report and underlie the Administration's concern about Soviet ABM capabilities. (It is probable that the two classified reports to Congress on Soviet treaty violations contain additional information that can't be divulged publicly without endangering US intelligence sources and methods.)

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As reported previously in this space, the construction of a large phased-array radar near Krasnoyarsk in central Siberia constitutes a breach of the ABM Treaty. The accord limits the deployment of ballistic missile early warning radars to locations along the periphery of the national territory of the US and the USSR and requires that such radars be oriented outward. The new White House report discloses that evidence accumulated during the past year on activities associated with the Krasnoyarsk installation, especially "continuing construction, and the absence of credible alternative explanations have reinforced our assessment of [the radar's illegal] purpose. Despite US requests, no corrective action has been taken" by Moscow.

Mobile land-based ABM systems and components of such systems make up the second element of the suspected Soviet territorial ABM defense capability. Here the White House charged that the Soviet Union's "development of components of a new ABM system, which apparently are designed to be deployable at sites requiring relatively little or no preparation, represent a potential violation of [the USSR's] legal obligation under the ABM Treaty."

Lastly, the President's report states that "evidence of Soviet actions with respect to concurrent operations [of ABM and SAM components, an activity outlawed by the 1972 treaty to prevent the covert assembly of an ABM system,] is insufficient to assess fully compliance with Soviet obligations . . . although the Soviet Union has conducted tests that have involved air defense radars in ABM-related activities. The number of incidents of concurrent operation [of such components] indicates the USSR probably has violated the prohibition on testing SAM components in an ABM mode. . . . This and other such Soviet activities suggest that the USSR may be preparing an ABM defense of its national territory."

Elsewhere, the new White House report elaborated on previously disclosed proven or suspected violations of binding arms-control accords by the Soviets—ranging from interfering with the US national technical means for verifying Soviet compliance to illegal development of a second new ICBM, the SS-X-25.

In his cover letter to Congress, the President asserted that the US demarches concerning the violations cited by the US in January 1984 have so far failed to cause the Soviet Union either to provide a satisfactory explanation or take corrective actions "sufficient to alleviate our concerns."

He added that "strong congressional consensus on the importance of compliance to achieving effective arms control will strengthen our efforts both in the new negotiations and in seeking corrective actions from the Soviet Union."

$2 Trillion Defense Program Proposed for FY '86–90

The President's FY '86–90 Defense Program just submitted to Congress totals about $2 trillion and provides a "balanced mix of defense resources to implement our strategy" for coping with the military threats faced by this country, according to Secretary of Defense Caspar Weinberger. The FY '86 budget request of the Department of Defense is $313.7 billion in budget authority and $277.5 billion in outlays. Allowing for anticipated inflation these figures reflect a real growth of about 5.9 percent over the FY '85 defense budget. The new budget, if approved in full by Congress—which is unlikely—would amount to about 6.6 percent of the nation's Gross National Product and to about 28.5 percent of all proposed federal outlays.

The Air Force budget request for FY '86 is $110 billion, or about 5.8 percent above FY '85. USAF's active-duty force strength would be upped by 10,000 slots to 612,000; the Air Force's civilian end strength would be boosted from 257,000 to 267,000. Major Air Force procurement requests include forty-eight B-1Bs, forty-eight MX ICBMs, forty-eight F-15s, and 180 F-16s.

Over the next five years, the new

Retrofitting the C-130 with the Self-Contained Navigation System (SCNS) demands an integration contractor with a combination of practical experience and technical expertise. Over a long and successful association with the United States Air Force, Delco Systems has acquired these credentials.

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Defense Plan calls for the acquisition of 1,284 Air Force fighter and attack aircraft, suggesting that the goal of forty USAF tactical fighter wings is being delayed until FY '91. A new version of the F-16, the "F" model, possibly using technology from the F-16XL and the Advanced Fighter Technology Integration (AFTI) program, is scheduled to enter the USAF inventory by FY '89.

DoD Reacts to Revamping Plans

A high-powered group of defense experts, known as the Georgetown CSIS (Center for Strategic and International Studies) Working Group, came up with tentative plans recently for reorganizing the Defense Department. The plans are drawing mixed reviews from the Pentagon's current leadership.

The gist of the CSIS Working Group's recommendations hinges on boosting the influence of the Chairman of the Joint Chiefs of Staff, the Joint Staff, and the Unified and Specified Commanders while curtailing the clout of the Secretary of Defense, the service Secretaries, the service Chiefs, and the service staffs. The rationale underlying this proposed shift in power is the assumption that such a restructuring would reduce parochialism, improve efficiency, and get better advice faster to the NCA (National Command Authorities).

The Working Group's preliminary report on its defense reorganization project stresses four fundamental objectives. The key one is a sharper focus by the Secretary of Defense on formulating policy and overseeing its broad execution. Secondly, the CSIS proposal underscores the importance of having the military departments concentrate their efforts on "force maintaining functions" and program management. Conversely, there is a recommendation to extricate OSD from program management minutiae.

Thirdly, the Working Group details changes that would strengthen the ability of existing joint military structures to channel realistic, relevant advice to the NCA. Lastly, the high-powered Working Group—which includes former Defense Secretary Melvin Laird, four members of Congress, and a host of former high-ranking civilian and military Pentagon leaders—advocated greater stability in the force development, weapon acquisition, and program/budgeting process.

Concomitant goals include creation of three Assistant Secretary of Defense slots—for strategic deterrence, NATO, and regional defense—below the Under Secretary of Defense for Policy as a means for boosting the latter's role in the resource allocation process. Also, the JCS Chairman, supported by an independent Joint Staff, would provide cross-service, integrated military planning and programming advice within the matrix of the Defense Secretary's policy and fiscal guidance. The JCS Chairman is to be elevated to the role of principal military advisor to the President, the Secretary of Defense, and the National Security Council, thus displacing the Joint Chiefs in this function.

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The Chairman, further, would oversee the CINCs of the Unified and Specified Commands and represent their interests in the planning and resource allocation process. He would, however, be required to consult with the Joint Chiefs in formulating his advice for the NCA and in deciding joint issues and to report dissenting views on crucial national issues, such as arms-control treaties. Additionally, the Chairman would have full authority over the Joint Staff, which he would direct through a four-star deputy who also acts as his alter ego.

The current Pentagon hierarchy is known to have grave reservations about this proposed expansion in the Chairman's power. Pentagon thinking is, instead, in line with the Hudson Institute assessment that a good Chairman doesn't need these additional powers and that no bad Chairman should have them. Reportedly, the predominant view in the Pentagon is that the JCS—as a sort of military Supreme Court for discussing military options and advice—is essential for providing undiluted, pertinent views to the NCA and Congress. There is apprehension that an all-powerful Chairman supported by a subordinated Joint Staff would sunder the service Chiefs and service staffs from their crucial policy-making function.

The service Chiefs, under the Working Group's proposed arrangement, would be confined to internal management matters and would not take any direct role in military operations. The Joint Staff would be organized as an independent military staff, not subject to single-service vetoes. Joint Staff officers would be selected by the Chairman, but cleared with the service involved. The Chairman would have a "significant role" in promotions of personnel on the Joint Staff.

The operational chain of command would be revamped by making the Chairman—rather than the Joint Chiefs—the instrument for transmitting civilian directions to the CINCs and by assigning the CINCs greater operational authority over component commands.

Among the host of other recommendations drawn up by the CSIS Working Group are provisions for a Pentagon-wide long-range (fifteen years out) investment plan that would be prepared by the Chairman of the Joint Chiefs of Staff and OSD and management recommendations designed to streamline the development and acquisition process and to "disengage Congress from the micromanagement of weapons programs."

Counterproposals drawn up by the Defense Department are at odds with the CSIS plan in some key areas, notably in their stress on the need to "strengthen the service Secretaries' role in providing advice to the President." DoD also rejects inserting the Chairman in the chain of command between the Secretary of Defense and the CINCs of the Unified and Specified Commands.

Major Defense Department Reorganization

Apparently unswayed by the CSIS recommendations, Defense Secretary Caspar Weinberger has just announced a major reorganization of OSD by creating the new post of Assistant Secretary of Defense for Acquisition and Logistics and by expanding the responsibilities of the existing Assistant Secretary for C^{3}I (Command Control Communications and Intelligence). Both positions will report directly to the Secretary of Defense.

Impelling the creation of a DoD acquisition executive post, Secretary Weinberger announced, is the need for a senior OSD official "who can devote full time to overseeing the acquisition process, production, contracting, procurement, maintenance, supply, installations management, and related matters, with a corresponding range of responsibility for all of them within my office."

He added that spinning off these functions from the Under Secretary of Defense for Research and Engineering and the Assistant Secretary of Defense for Manpower will enable these two officials to "devote full time to the important programs over which they will retain cognizance." The new Assistant Secretary for Acquisition and Logistics will chair DSARC III meetings (during which the Defense Systems Acquisition Review Council de-

cides whether or not major weapon systems should be cleared for production) and be in charge of the Defense Logistics Agency.

Also spun off from the Under Secretary of Defense for Research and Engineering is the Assistant Secretary of Defense for C³I, who now reports directly to the Secretary of Defense and who is in charge of the Defense Mapping Agency, the Defense Communications Agency, and the Joint Tactical C³ Agency. Additionally, the ASD/C³I has been given "primary staff supervision" over the Defense Intelligence Agency, the National Security Agency, and the Central Security Service. Secretary Weinberger stressed that the ASD/C³I is responsible for both policy and hardware aspects of command and control as well as intelligence.

Washington Observations

★ Current efforts by the Administration toward arms-reduction accords with the Soviet Union will apparently not entail US compliance with SALT II beyond the unratified accord's expiration at the end of this year. The reason is that the SALT II ceilings would restrain the programmed deployment of such critically important weapon systems as Trident SSBNs and air-launched cruise missiles, unless corresponding reductions of weapons already in the inventory were made. Continued adherence to the SALT II terms would curtail modernization of USAF's force structure significantly.

★ Two of the Air Force's major tactical programs recently encountered critical setbacks. Even though the Air Force was able to bring the severely troubled Advanced Medium-Range Air-to-Air Missile (AMRAAM) program back on track, Secretary Weinberger put AMRAAM on hold and ordered a stem-to-stern review of both the design and the program structure, with special emphasis on cost/performance tradeoffs. He directed the establishment of a multiservice/OSD committee to review the feasibility of alternatives to the current program.

Ironically, the same Air Force office that would seem to bear the blame for the cost and schedule problems of the program—that of the Assistant Secretary of the Air Force for Research, Development and Logistics—was put in charge of the Pentagon's efforts to reduce AMRAAM production costs. Deputy Secretary of Defense William H. Taft IV nixed production of this weapon—which is badly needed by the Air Force, the Navy, and allied air forces—on an indefinite basis but okayed continuation of full-scale development efforts.

The Air Force's Advanced Tactical Fighter (ATF) program also was put on ice, at least until mid-summer. Reason for this delay, in part driven by internal service concerns, is the notion of some senior Pentagon officials that a new close air support system should be given precedence over ATF in this period of budget constraints and that the potential for greater commonality with Navy requirements warrants further study.

★ Another horror story in the area of technology transfer—the clandestine and illicit acquisition of US defense technology by the Soviets and others—has surfaced recently. Highly placed Administration officials have disclosed that about $70 million worth of advanced composite material of the carbon/carbon type used for high-performance ballistic missile reentry vehicles (RVs) has found its way from the US to the Soviet Union. On first blush, the resultant damage to US national security appears to be enormous. ■

CAPITOL HILL

By Kathleen G. McAuliffe, AFA DIRECTOR OF LEGISLATIVE RESEARCH

Washington, D. C., Jan. 25

Defense Spending

The only thing certain about defense spending for FY '86 is that the Administration's proposed outlay cut of $8.7 billion will not satisfy congressional budget-cutters. The proposed growth rate of 5.6 percent will be scaled back; the only question is by how much.

GOP senators continue to draft an alternative budget. Options being considered include a freeze, negative growth, and three percent growth. The alternative budget is not expected to be offered until after the President submits his proposal to Congress in early February.

A freeze on defense, with allowance for inflation, would require outlay cuts of $8 billion beyond the President's reductions, according to an OMB spokesman. A nominal freeze at the FY '85 level would mean additional cuts of about $11.5 billion.

But the tide may have changed, and defense may not have to bear the brunt of deficit reduction. Sen. Robert Dole (R-Kan.), who is leading the deficit-cutting effort in the Senate, is reportedly shying away from significant defense cuts that would mean negative growth for defense. Sen. Barry Goldwater (R-Ariz.), new chairman of the Senate Armed Services Committee who said earlier that he found the idea of a budget freeze attractive, now is fighting a freeze.

Senator Goldwater warned his GOP colleagues of potential serious damage to national security, saying that freezing procurement and R&D programs would create the very instability and waste that Congress has tried to eliminate.

The Senator implied that the budget must contain at least three percent or higher growth in order to keep faith with the NATO allies. Congress has chastised the Europeans for failing to meet their commitment to raise defense expenditures by three percent each year. A three percent rate is also being espoused by Sen. Ted Stevens (R-Alaska), chairman of the defense appropriations subcommittee.

Aspin and MX

Rep. Les Aspin (D-Wis.), new chairman of the House Armed Services Committee, said recently that Congress will not rubber-stamp all of the President's defense programs just because arms negotiations with the Soviets have been renewed. At the same time, however, Representative Aspin suggested that if Congress zeroes such important defense programs as MX and SDI, there would be no reason for the Soviets to negotiate.

Representative Aspin, a master at forging compromises, is viewed as the key to MX survival in the House because of the votes he will sway. He did not tip his hand on how he will vote on MX, but he said the President's Strategic Defense Initiative (SDI) may have replaced MX as the key to negotiations with the Soviets.

Some members of Congress told Air Force officials that the new chairman would vote against MX as a tradeoff for liberal support received in his race for the committee chairmanship. The Air Force believes, however, that Representative Aspin will vote in the early spring to authorize and appropriate $1.5 billion in FY '85 funds for twenty-one MX missiles. Further, USAF officials expect him to vote for MX in FY '86, albeit for a funding level lower than that to be requested.

Soviet Defense Efforts

The Soviets are working hard on strategic defense, and they lead the US in the broad area of defensive technology, according to previously classified congressional testimony.

Dr. Richard DeLauer, then the Under Secretary of Defense for Research and Engineering, told a Senate panel in closed session that even if Congress funded the Administration's SDI program as requested—$26 billion over five years—it would still take almost a decade for the US to catch up with the Soviets in overall defensive technologies.

Dr. Robert Cooper, Director of the Defense Advanced Research Projects Agency, concurred with this assessment, saying, "We will have to increase our spending maybe fourteen to twenty-five percent over the next few years to be able to close the gap in certain areas." He conceded, however, that the US is more advanced than the Soviets in many of the technologies the US views as critical to an effective strategic defense.

The Soviets are outspending the US in advanced ballistic missile defense, especially in the area of directed-energy weapons, he said. Soviet emphasis on laser weapon development could yield them "prototypes of ground- and space-based laser weapons for use against satellites and ballistic missiles" by the end of the decade, according to an intelligence assessment submitted to the Senate. The Soviets could have space-based lasers operational for ASAT purposes by the 1990s.

House GOP Defense Policy

House Republicans outlined an agenda for national security in 1985 that wholeheartedly endorsed Administration goals in strategic force modernization, arms control, and strategic defense.

Chief among the recommendations is development of the SDI program to include limited procurement money if the President determines that the Soviets "will not make reasonable agreements." Other aspects of strategic defense that were endorsed include an ABM system around a Minuteman field to add to the survivability of the land-based ICBM force. The lawmakers suggested also that the "shift in relative strength of Soviet and US strategic forces" may be a reason for refusing to comply with the ABM Treaty.

Meanwhile, some members of the California Democratic congressional delegation are seeking to develop a "House position" on SDI. Rep. George E. Brown, Jr. (D-Calif.), speaking for the group, alleged that SDI would be "tantamount to inviting an open-ended buildup of nuclear weapons" and that any eventual deployment could force abrogation of the ABM Treaty. He suggested that this would have a "chilling effect" on the new arms negotiations. ■

The C-20A Gulfstream III: It's doing everything they asked it to do.

And more.

When the U.S. Air Force set out to select replacement aircraft for the C-140s, it established some very demanding criteria. And rightfully so. The transports operated by the 89th Military Airlift Wing play a vital role in the conduct of our nation's affairs at home and abroad.

The Air Force program standards called for specific levels of performance, mission readiness, supply and maintenance efficiency —not to mention tight schedules for outfitting, crew training and delivery of the first three aircraft to Andrews Air Force Base. What's more, two mission requirements—one long range, the other medium range—suggested that two aircraft types were needed to do all the work that has to be done.

In the end, the Air Force decided it could get everything it needed in *one* airplane: the Gulfstream III.

The first C-20A Gulfstream III went into service in September 1983, only three months after contract signing, on schedule, within budget. Now that three C-20A Gulfstream IIIs are on duty, they're living up to the long heritage of superior performance, dispatch reliability, systems dependability, low maintenance requirements and cost-effectiveness of Gulfstream executive jets in transporting key executive teams anywhere in the world.

For example, the Air Force said the new aircraft had to be fully mission capable 85% of the time. The C-20A Gulfstream IIIs are currently working upwards from 95%.

The rate of non-mission capable supply—a measure of the inability to dispatch the aircraft because of a parts shortage—could be no more than 1.0%. With the C-20A Gulfstream IIIs, the rate is only 0.50%.

The Gulfstream III's performance not only meets the mission requirements of the C-140 program, it also fills many overseas travel demands for the Special Airlift Mission Fleet. This capability increases the flexibility and efficiency of the Air Force to meet high priority travel requests, yet the C-20As require only 7.5 maintenance man-hours per flight hour compared to 27 for the C-140s they replaced.

Finally, an example of the mission versatility and cost-effectiveness of the C-20A Gulfstream III in meeting the needs of the Special Airlift Mission Fleet:

One C-20A Gulfstream III departed Andrews AFB on a 13 day trip, logging 43 flight hours and traveling to locations in the Pacific. Upon its return to Andrews AFB, it was cleaned, refueled and put to work the next day flying missions in the United States. It required no maintenance for the entire period.

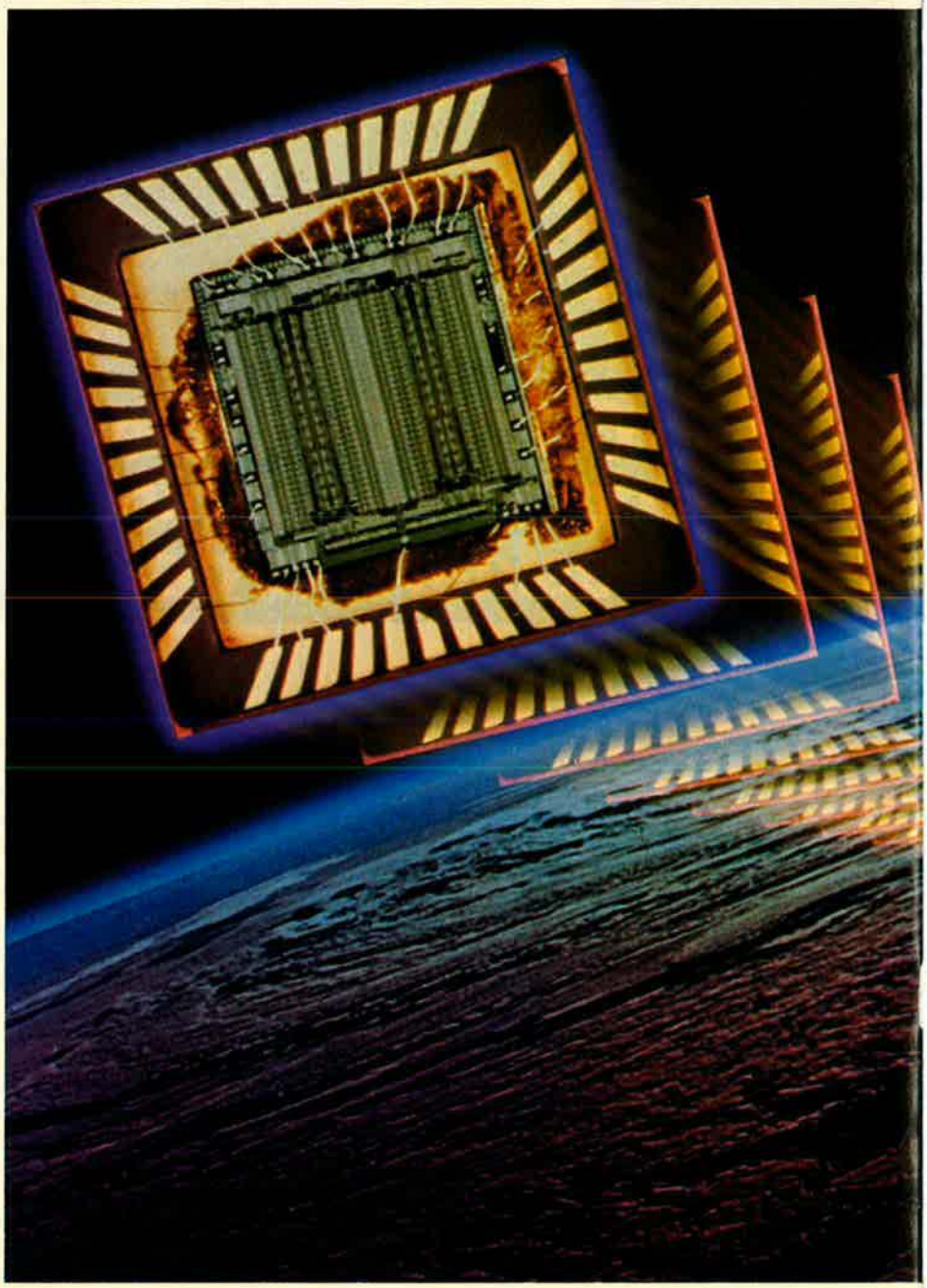
The U.S. Air Force demanded a lot in its new jet transports. By any measure, the C-20A Gulfstream IIIs are delivering everything it asked for.

And more.

Gulfstream Aerospace

For more information about the C-20A Gulfstream III or other mission capabilities of the Gulfstream III, contact Larry O. Oliver, Manager, Military Requirements, Gulfstream Aerospace Corporation, P.O. Box 2206, Savannah, Georgia 31402. Telephone: (912) 964-3246.

MISSION: ELECTRONICS ADVANCED SYSTEMS BY

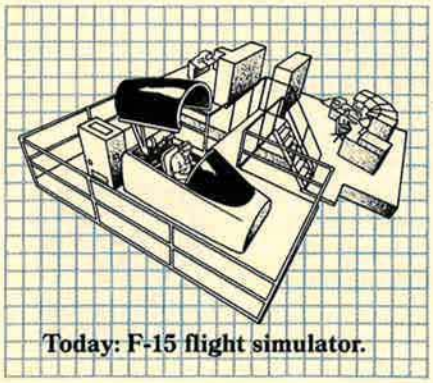


Goodyear Aerospace Corporation is a leader in the field of state-of-the-art electronics. Goodyear has established a tradition for linking technical innovation with total system capability in large-scale program management. Here are some examples.

Simulation Technology Applied to Missile Advanced Guidance

ADVANCED CORRELATION GUIDANCE SYSTEMS FOR MISSILES:

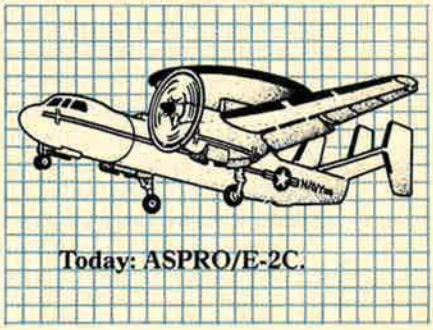
- Digital Scene-Matching Area Correlator
- Range Only Correlation System



Today: F-15 flight simulator.

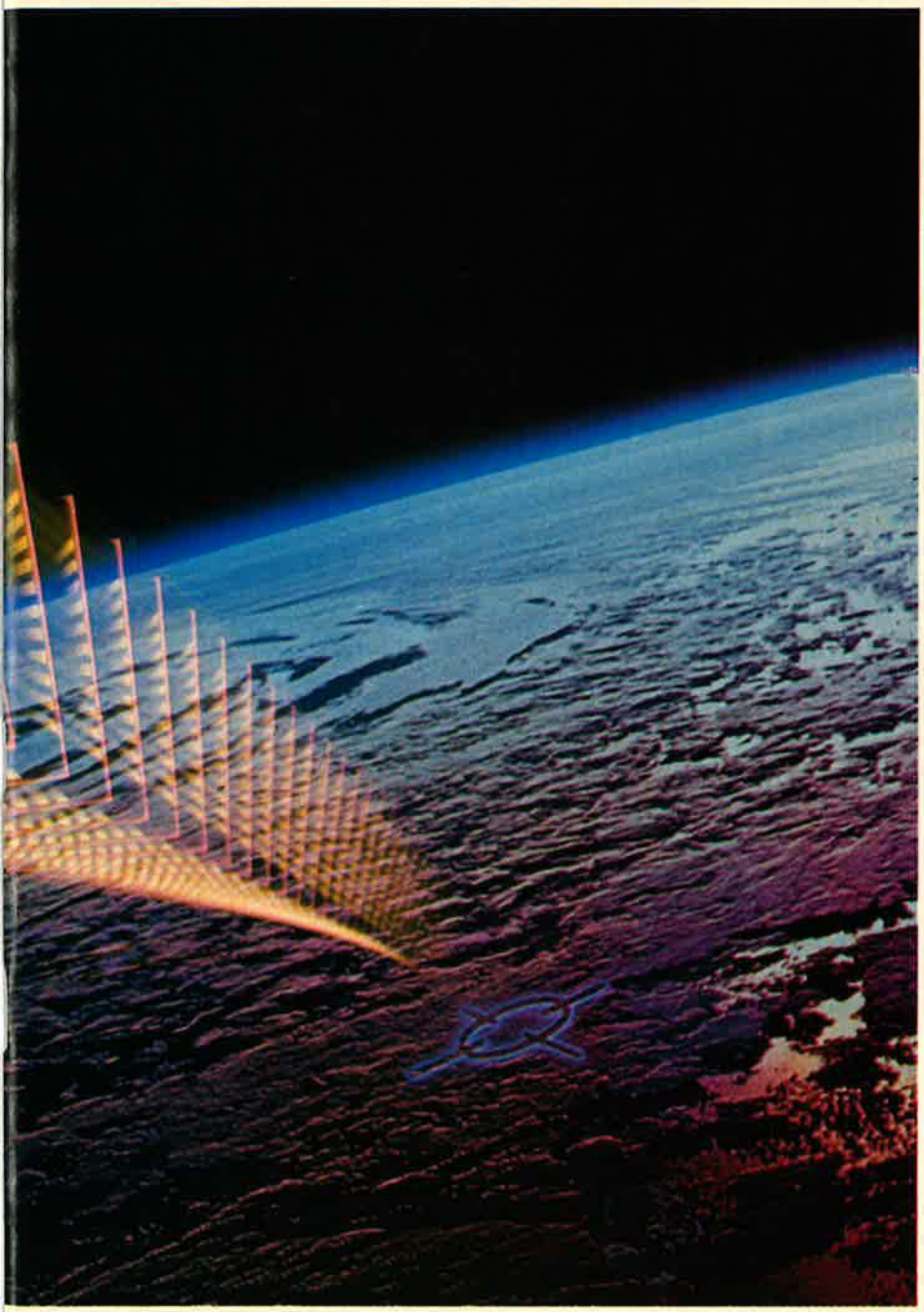
ADVANCED AIRCRAFT FLIGHT SIMULATOR SYSTEMS:

- F-15 Eagle flight simulator trainer
- High-resolution, programmable sensor simulator
- High acuity visual simulation

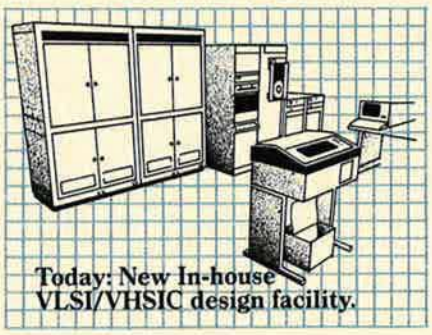


Today: ASPRO/E-2C.

SUPERIORITY... GOODYEAR



Goodyear Aerospace has a corporate commitment of capital investment to assure success in the years ahead.



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GOODYEAR AEROSPACE

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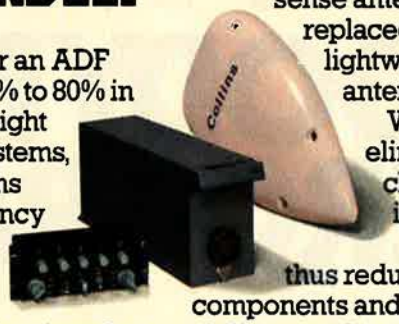
If you're looking for an ADF that can save from 25% to 80% in space, power and weight over older military systems, look at the new Collins DF-206A Low Frequency Automatic Direction Finder.



The DF-206A can not only upgrade older aircraft at minimal cost, but it also meets the stringent requirements for new military applications.

It's designed to adapt to existing ADF mounts and to use existing aircraft wiring. There's no need to buy special factory wiring bundles with critical impedance matching. Separate loop and sense antennas have been replaced by a single lightweight, low-drag antenna.

We have also eliminated synchros and switching devices in the DF-206A's design, thus reducing installation components and improving reliability over the older electromechanical units. All components exceed MIL-E-5400 Class 1 environmental requirements, and the DF-206A is available with MIL-STD-1553B digital interfacing.

The DF-206A provides coverage in the 100-2200 kHz range plus 500 kHz and 2182 kHz preset emergency frequencies.

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AEROSPACE WORLD
News, Views & Comments

By James P. Coyne, SENIOR EDITOR

Washington, D. C., Feb. 4

★ One of the largest and most spectacular aerospace events to be held in the United States, AFA's "Gathering of Eagles, 1986," has been scheduled by the Air Force Association for April 27–May 1, 1986, in Las Vegas, Nev. It will commemorate the fortieth anniversary of the formation of AFA and of the establishment of Strategic Air Command, Tactical Air Command, and Aerospace Defense Command.

The event is intended to be international in scope, which is why it was announced at AIR FORCE Magazine's annual Foreign Air Attaché Reception in January. "We expect participation by leaders and supporters of friendly and allied forces from all over the world," said Russell E. Dougherty, AFA Executive Director, during the announcement.

The gathering will include displays and exhibits by foreign and domestic aerospace manufacturers as well as international symposia and meetings. One symposium is entitled "USAF—Its People, Equipment, and Plans for the Future."

Many aerial displays are planned, including a live Air Force firepower demonstration. The Confederate Air Force, flying World War II aircraft, will appear, and other demonstrations are expected.

In addition to meetings, symposia, displays, and demonstrations during the day, three receptions—plus a dinner and a major entertainment event featuring nationally recognized personalities—will be held.

AFA has reserved 465,000 square feet of floor space in the huge Las Vegas Convention Center, of which more than 260,000 square feet will be available for displays and exhibits. Some 2,500 hotel rooms will be available in the MGM Grand Hotel, and another 10,000 rooms will be available in nearby luxury hotels.

Scheduled events will provide the opportunity for three generations of Air Force members and supporters to remember the significant accomplishments of the last forty years, to honor today's Air Force, and to recognize the role played by allied and friendly air forces in the continuing defense of the free world.

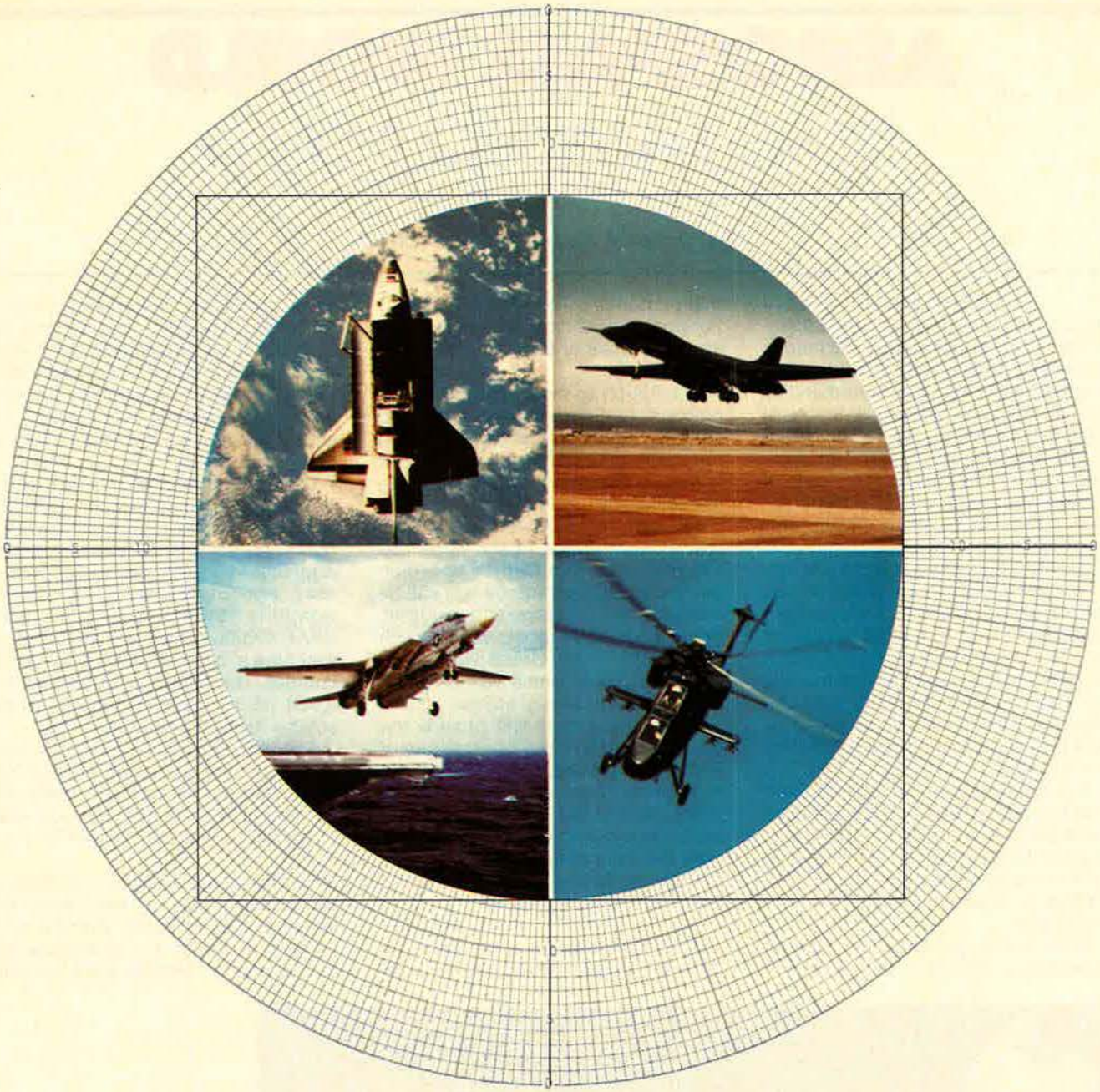
★ The 26th Aggressor Squadron at Clark AB, Republic of the Philippines, set a significant flying safety record for fighter aircraft by chalking up its 20,000th hour of accident-free flying during the month of December 1984, the 3d Tactical Fighter Wing has announced. In setting the record, the squadron flew 22,750 sorties over a seven-year period.

Using Soviet tactics and formations, Aggressor squadrons fly mock combat missions against other USAF fighter squadrons. All weapons on an Aggressor simulate the range, accuracy, and performance of Soviet weapons. Such training teaches USAF aircrews what to expect if they ever have to confront Soviet aircraft in combat. The 26th trained more than 3,000 US and allied aircrews while setting its safety record.

The 26th flies about 3,600 sorties a year, including approximately 1,000 in Cope Thunder, which is the Pacific Air Forces version of the famous Red Flag exercises held at Nellis AFB, Nev.

★ Two aerospace companies, Martin Marietta and Boeing, have been selected to design, build, and test prototypes of the hard mobile launcher for the small intercontinental ballistic

AFA National President Martin Harris, right, met with Air Vice Marshal Ron Dick, left, British Defense Attaché and head of the British Defense Staff, and Maj. Gen. Hans Neij, Swedish Defense and Air Attaché, at AIR FORCE Magazine's annual reception for foreign Air Attachés, held in Washington in January. During the reception, plans were unveiled for AFA's "Gathering of Eagles, 1986." See item.



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missile. The two pre-full-scale development projects will take twenty-one months to complete. One of the two competing prototypes will probably be selected for further development.

The hard mobile launcher will transport, protect, and launch the small intercontinental ballistic missile. Initial deployment of the small missile system, which is part of the strategic modernization program recommended by the President's Commission on Strategic Forces and approved by Congress in 1983, is currently projected for the early 1990s.

★ Eleven infrared-guided (IR) AGM-65D Maverick missiles out of eleven launched have scored direct hits during a Follow-on Test and Evaluation (FOT&E) program at Eglin AFB, Fla. The results were announced in January.

FOT&E is a USAF test program that establishes whether or not hardware provided off the production line is ready for operational employment by the Air Force. The tests are managed by the Air Force Operational Test and Evaluation Center (AFOTEC), a USAF Separate Operating Agency headquartered at Kirtland AFB, N. M.

Manufactured by the Missile Systems Group of Hughes Aircraft Co., the missiles were launched from F-111 and F-16 aircraft operating in typical combat mission environments over the Eglin ranges. One missile was a telemetry round and was not counted as part of the FOT&E series.

The Mavericks scored hits against moving and stationary targets, such as tanks and armored personnel carriers. Three missiles launched at night scored hits as well.

★ Lt. Gen. George M. Seignious II, USA (Ret.), has been named president of the Atlantic Council of the United States, a spokesman for the council announced. The twenty-five-year-old Atlantic Council is a national, bipartisan center for the formulation of policy recommendations for the democracies of Western Europe, North America, Japan, Australia, and New Zealand.

★ USAF has selected 7,647 individuals for promotion to staff sergeant during the period February 1 to July 1, 1985. There were 70,425 candidates eligible for selection. Selectees will be promoted in monthly increments.

During all cycles in 1984, the Air Force selected 22,418 of 145,317 eligible for staff sergeant. The average selectee for the first 1985 cycle had nearly 2.5 years in grade and 5.26

Britain's new Westland Lynx-3 is designed especially for anti-tank work, but also meets Royal Navy specifications. Powered by two Rolls-Royce Gem 60 turboshaft engines, it is about twenty-five percent heavier than earlier versions, with more armor and firepower. With a day-or-night, adverse-weather capability, it can employ the Euromissile Hot, Hughes TOW, and Rockwell Hellfire air-to-ground missiles as well as the General Dynamics Stinger for air-to-air defense.

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years in service and was twenty-five years old.

★ Seventy-five captains out of a total of 776 candidates were selected by a Manpower and Personnel Center board for the 1986 Air Staff Training (ASTRA) program. Thirty alternates were also selected. Selectees are assigned to Hq. USAF for one-year tours to expose them to USAF management and decision-making at the highest level and to allow them to participate in such activities.

The first USAF F-15 equipped with an improved central computer and armament control system—part of a multistage improvement program—makes its first flight. The program will eventually include a greatly improved radar (although current radar is excellent) plus provision for employment of the advanced medium-range air-to-air missile (AMRAAM), an antisatellite system, and the joint tactical information distribution system (JTIDS). First delivery is expected in June.

★ The last B-52H Stratofortress assigned to the 96th Bomb Wing at Dyess AFB, Tex., departed January 18 for K. I. Sawyer AFB, Mich. Dyess will begin receiving the new B-1B in June.

The 96th, which switched from the B-52D to the B-52H in 1982, is credited with one of two MiG kills by B-52s during the Vietnam War. The wing also has one of the longest-running safety records in Strategic Air Command, flying twenty-two years without a major accident.

★ Fairchild Republic's new T-46A trainer, which was rolled out in February, will begin flight tests at Edwards AFB, Calif., in April. When it does, the company claims, it will be the most proven trainer ever to make a first flight.

Overall, Fairchild Republic has logged 1,300 hours of wind-tunnel time, hundreds of hours in flight simulators, many more in radio-controlled model flights, and twenty-three hours of actual flight time in a sixty-two-percent-scale manned demonstrator. Extensive ground testing has been completed on the T-46A's major systems, including hydromechanical, propulsion, electrical, landing gear, and flight control.

Deliveries of the T-46A to the Air Force are scheduled to start in 1986. A total of 650 USAF trainers is expected to be built through 1992, representing a sales potential of more than $1.5 billion for Fairchild Republic.

★ After eighteen years, the Smithsonian Institution's National Air and Space Museum, *Science 85* magazine, and Seattle's Museum of Flight—in cooperation with AG Industries, Inc.—have announced the Second Great International Paper Airplane Contest.

The First Great International Paper Airplane Contest received 11,581 entries from 5,144 people in twenty-eight countries. The sponsors decided to hold a second contest because of the dramatic changes in aviation and aerodynamics over the last eighteen years. For instance, many of today's aircraft incorporate components made of layered or fibrous composite materials instead of metal.

Entries will be judged in three categories—professional, nonprofessional, and children under fourteen years of age.

Entries will compete in one of four major events—time aloft, flight distance, aerobatics, or aesthetic design. Judges include former astronaut Maj. Gen. Michael Collins, USAFR (Ret.), and Sheila Widnall, MIT aerodynamics engineer.

Anyone who can make a paper airplane is eligible to enter. A contestant's entry form is his airplane, which must have the name, address, phone number, category of entry, type of event, and throwing instructions written clearly on it. Entry deadline is May 1, 1985. Entries should be sent to International Paper Airplane Contest, Museum of Flight, 1904 Marginal Way South, Seattle, Wash. 98108. Entries will be judged in a Boeing aircraft hangar in Seattle.

★ The first USAF F-15 to be equipped with an improved central computer and armament control system—all part of a multistage improvement program—is successfully meeting all test parameters, McDonnell Douglas Corp. has announced.

The improvement program will, in stages, result in a greatly improved radar and add capability to employ the advanced medium-range air-to-air missile (AMRAAM), an antisatellite system, and the joint tactical information distribution system (JTIDS). The first production F-15 with these improvements is scheduled to be delivered in June.

The new IBM central computer stores four times more information than the old one and processes data three times faster and with twenty percent more reliability. A new programmable armament control system that

utilizes a new cockpit display for weapons selection and arming is also being installed.

Improvements to the Hughes APG-70 radar will include better target definition, electronic countermeasures, increased data-processing capability, larger memory, and a twenty-five percent increase in reliability.

★ The Air Force has purchased three C-20A Gulfstream III business jets that it had been leasing for fourteen months, Aeronautical Systems Division, Wright-Patterson AFB, Ohio, has announced. Purchase price for the three aircraft was $43.7 million. The Air Force plans to purchase eight additional C-20As through 1988 at a cost of $176 million.

The Gulfstream III was selected in June 1983 to replace the aging fleet of C-140Bs, which had been used to airlift government officials in the United States and Europe. The Gulfstream III cruises at speeds exceeding 500 mph and at altitudes up to 45,000 feet.

Military Airlift Command's 89th Military Airlift Wing at Andrews AFB, Md., will be home base for eight of the aircraft. Three more will be based with the 58th Military Airlift Squadron at Ramstein AB, Germany.

★ The first Space Shuttle launch from Vandenberg AFB, Calif., originally scheduled for October 15, 1985, has been slipped to January 29, 1986, or later. Recent tile problems on the Orbiter *Challenger* and concern about the readiness of the Defense Department payload convinced the Air Force and National Aeronautics and Space Administration to agree to the delay.

The Orbiter *Discovery* will be kept in an operational status at the Kennedy Space Center in Florida for two additional flights later in 1985 to help ease the schedule impact of *Challenger's* tile problem.

Discovery will be delivered to Vandenberg in early September, instead of May as originally scheduled. Shuttle flight hardware, such as solid rocket booster cases and external tanks, has been delivered to Vandenberg ahead of schedule. Ground system tests using the nonoperational *Enter-*

A new Gulfstream III C-20A is shown in its Air Force colors. Eleven will be purchased to replace the aging C-140B for the transportation of government officials in the United States and Europe. USAF had been leasing three of the executive jets for fourteen months to evaluate performance and mission suitability. They will be based at Andrews AFB, Md., and Ramstein AB, Germany.

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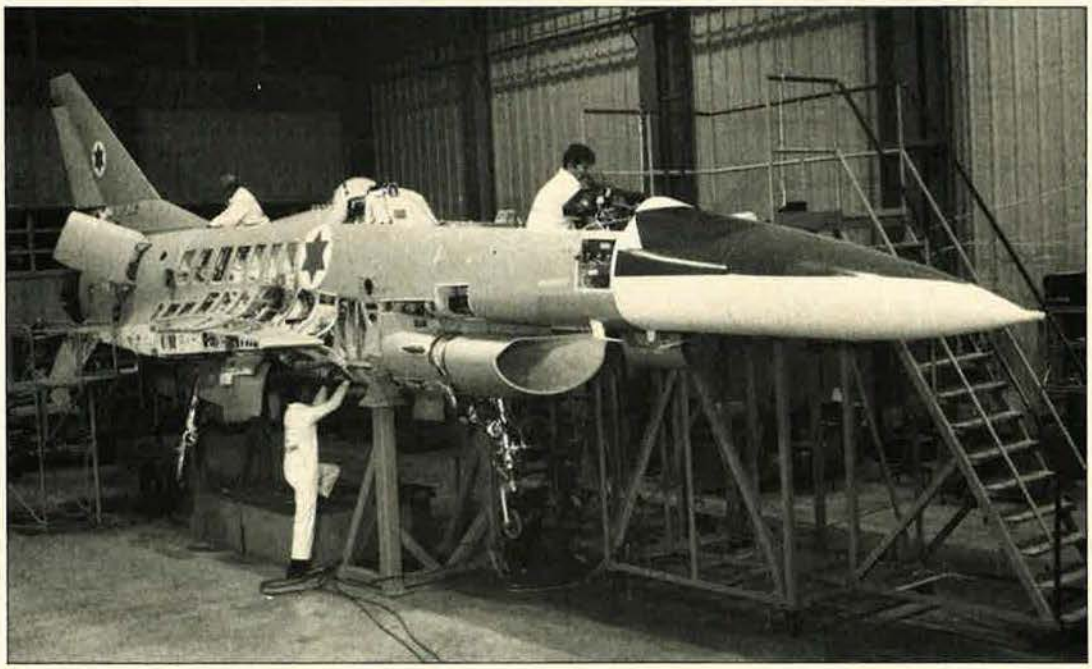
prise are currently under way in preparation for initial checkout of *Discovery* in January 1986.

The decision to delay the Vandenberg launch, a joint USAF and NASA statement said, "was based primarily on the importance of maintaining the current Shuttle manifest and of ensuring [an] adequate margin in the development of the DoD payload for the Vandenberg launch."

★ The 58th Tactical Training Wing at Luke AFB, Ariz., is the first unit to receive the newest versions of the F-16—the C and D models (the D is a two-seat version of the C). The new fighters have improvements that include a wide-angle head-up display, enhanced fire-control computer and radar, improved cockpit layout, and increased aircrew and avionics cooling capability.

The first operational F-16C wing will be the 363d Tactical Fighter Wing at Shaw AFB, S. C.



First released mockup photo of the Israeli Lavi (Lion) fighter shows it will be a small, multipurpose aircraft. Designed to meet requirements in the 1990s and beyond, it will be produced by Israel Aircraft Industries, Ltd., at Tel Aviv.

★ The first photo of a mockup of the new Israeli fighter, the Lavi, has been made public by Israel Aircraft Industries. It was unveiled at the company's Ben-Gurion International Airport plant.

The Lavi is intended to provide a "home-grown" answer to the needs of the Israeli Air Force, a company statement said, that were established as a direct result "of the most intensive air combat experience."

The mockup shows that the Lavi will be smaller than most of its potential opponents. Although the exterior design is original, many avionics are from US suppliers. Components related to the Lavi's Pratt & Whitney 1120 engine are now being utilized in the engine of the F-15 and F-16.

The first Lavi prototype is expected to fly in 1986. Deliveries will begin in 1990.

★ After a series of initial test flights, Grumman Aerospace Corp. has turned over the X-29 forward-swept-wing aircraft to NASA. The craft made its first flight on December 14, 1984, with Grumman test pilot Charles A.

Sewell at the controls. The flight originated from NASA's Dryden flight research facility at Edwards AFB, Calif.

"A very nice airplane," said Mr. Sewell in noting that it is easy to fly. NASA test pilots will now put the plane through its paces.

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★ The scorched area where an HH-53 helicopter of the 6594th Test Group, Hickam AFB, Hawaii, crashed onto the merchant vessel *Asian Beauty*, killing seven Air Force crew members, is evident in the accompanying photo.

A mission of mercy ended in tragedy for seven crew members of an Air Force HH-53 helicopter that attempted to land on this commercial vessel, which had radioed for emergency assistance for a seaman suffering from internal bleeding.

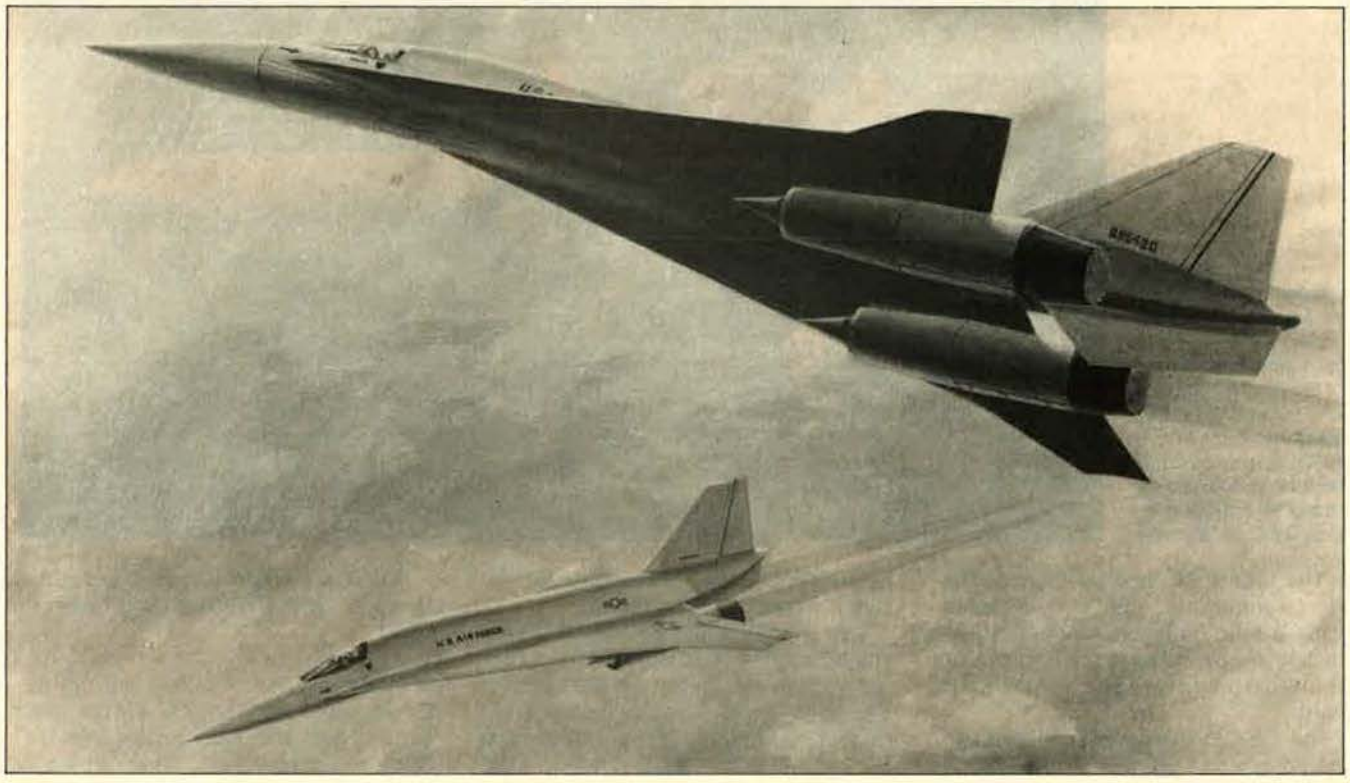
The crew was attempting to rescue a British seaman suffering from internal bleeding aboard the Panamanian-registered vessel, which was 540 miles north of Oahu at the time of the crash on January 15.

★ The Air Force has awarded a twenty-six-month, $572,000 contract to the Boeing Military Airplane Co. to optimize a supersonic interceptor aircraft configuration identified by Boeing under a previous contract. The original contract called for identification of technologies and promising configurations for a supersonic cruise interceptor.

Recent changes in long-range strategic concepts as well as advancements in Soviet interceptor capabilities have increased the need for aircraft to defend the United States against airborne attack.

Under the new contract, Boeing will optimize the configuration for continental defense, develop the design in more depth, and perform wind-tunnel tests of the final design.

Technologies to be evaluated include variable geometry and advanced airfoil and wing designs, advanced engines, advanced materials and fabrication processes, advanced stores and weapons-carriage con-



Boeing, which had designed a supersonic cruise interceptor capable of sustained supersonic speeds, has been awarded an Air Force contract to optimize the configuration for defense of the continental United States.

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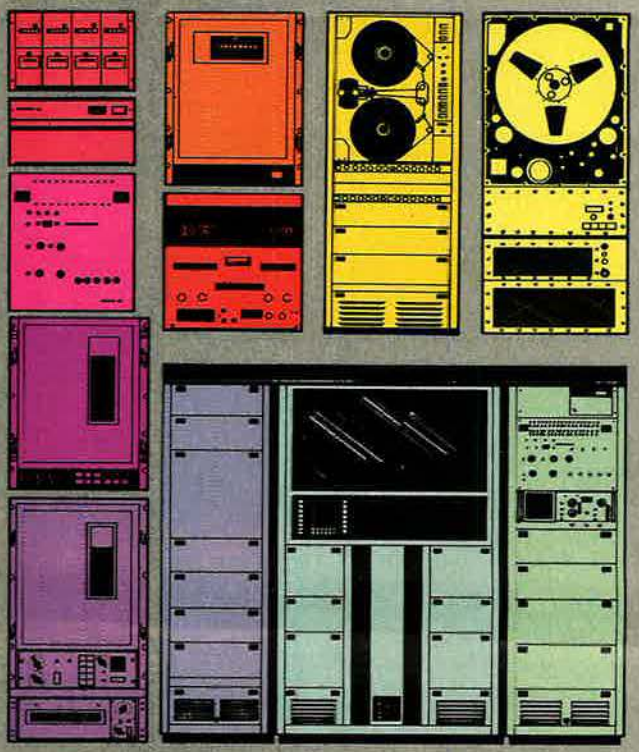

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cepts, a low-profile cockpit, a "closed-loop" environmental control system, advanced inlets and nozzles, infrared suppression techniques, advanced avionics, and low observability.

★ While establishing "DoD Productivity Week—1985" in January, Secretary of Defense Caspar W. Weinberger noted that DoD's productivity programs have made it a leader among federal agencies. Equipment purchased through the productivity investment fund returns $20 for each dollar invested. The programs promise to save more than $2.5 billion by 1990.

DoD employees and military personnel have been encouraged to use suggestion programs to propose productivity improvements. More than 1,800 "Quality Circles" have been established to allow employees to participate in identifying and solving issues and problems in their work. Productivity gainsharing, in which employees who exceed established standards of performance share in the improved productivity through cash or other awards, is being introduced on an experimental basis.

Emphasis on productivity programs has resulted in an average annual productivity increase of 2.3 percent in each year since 1977.

AEROSPACE WORLD

★ A three-month investigation into last year's crash of a Northrop F-20 Tigershark in Suwon, Republic of Korea, has found that the aircraft and all its systems were functioning properly and that a pilot-induced inverted stall led to the accident.

The crash, in which Northrop chief test pilot Darrell Cornell lost his life, occurred on October 10, 1984.

At the end of a demonstration flight (the last demonstration flight of the F-20 around-the-world tour), the pilot began a climbing roll and stopped the roll while inverted and at low speed, with landing gear and flaps extended. The aircraft stalled at an estimated altitude of between 1,200 and 1,800 feet, but did not recover from the inverted stall.

The Air Force, which is F-20 program executive agent for the Department of Defense, participated in an advisory capacity in the investigation effort. The investigation was thorough and arrived at logically derived conclusions, according to the Air Force.

★ The Air Force has given Lockheed-Georgia Co. a $1.3 billion contract for eight C-5B Galaxy transports, in addition to the original five ordered since 1982. The order reflects USAF's Fiscal Year '85 share of an overall procurement of fifty C-5Bs.

The FY '85 funding reflects a fifty-aircraft cost reduction of $439.6 million that resulted from a US inflation rate lower than that expected when the original contract was signed. The contract includes a price adjustment provision.

Galaxy production is on schedule. Fuselage mate of the first of the new transports was accomplished in December. Rollout of the first C-5B is expected in July 1985, with delivery in December. The fiftieth aircraft is scheduled for delivery during the first quarter of 1989.

★ USAF has awarded a $48 million contract to the Matra Co. of France to purchase the Durandal runway-attack bomb. This contract brings to $80 million the total awarded so far for the French-manufactured bomb.

Durandal is designed for low-altitude/high-speed delivery against enemy airfields. It is considered an interim solution to munitions deficiencies in the Air Force inventory, according to AFSC's Armament Division at Eglin AFB, Fla.

Durandal has been certified for carriage on the F-111 and F-4 and will be certified for the F-15, F-16, and A-7. The bomb will equip aircraft at NATO and US bases in Europe. ■

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The West does not understand how strongly Soviet strategy is based on these principles, called the laws of war and armed conflict.

SOVIET CONCEPTS OF WAR

BY WILLIAM F. SCOTT

IN THE summer of 1972, a few weeks after President Nixon returned from signing the SALT I treaty in Moscow, General Colonel Mikhail N. Mishuk, doctor of technical sciences, professor, and Soviet Air Forces deputy commander in chief for research and development, visited the United States. He was given a red-carpet tour of United States aircraft and electronics plants. In the new climate of détente, no one thought to inform the US Air Force that the fifth-ranking officer of the Soviet Air Forces was in the country. A similar visit by another senior Soviet Air Forces officer, also engaged in research and development, took place the following year, again without the knowledge of USAF.

From the Soviet viewpoint, there was a good reason for these experts in research and development to visit US high-tech industries. The Soviet Party-military leadership teaches that there are certain "laws" that determine victory or defeat in war. According to one of those laws, the course and outcome of war depend on the scientific capabilities of the opposing sides. In the 1970s, as now, the scientific capability of the West was of pressing concern to the Kremlin.

Moving Ahead in Military Technology

Soviet scientists had been first to construct a hydrogen bomb that could be dropped from an aircraft, first to test-fire an ICBM successfully, first to put an artificial satellite in orbit around the earth, first to put a man into space, and first to deploy an ABM system. But during the late 1960s, the West moved ahead in military technology. The United States developed MIRVed warheads that would make the then-current Soviet ABM system obsolete, had almost casually placed men on the moon, and was ready to deploy an ABM system of its own. By

one means or another, US scientific programs that might have military application had to be slowed down and a way found to gain access to Western technology. One of the solutions was arms-control negotiations, which made possible General Mishuk's visit.

In the early 1970s, as now, there were difficulties in the Soviet economy. Another law of war states that victory or defeat depends on the correlation of the economic strength of the warring sides. The Soviet Union had experienced one crop failure after another. Purchases of grain from the West were necessary. Trade on favorable conditions would help maintain Soviet economic growth. As was the case in the scientific-technical arena, greater contact was needed with the outside world to help relieve economic difficulties. An atmosphere of "détente," created by arms-control negotiations, suited Soviet purposes well.

Many Sovietologists in the West believe that Soviet "hawks" lost out to Soviet "moderates" who pushed for SALT I. But it is equally probable that, if there are identifiable "hawks" in the Moscow leadership, they were the ones who—seeing the laws of war turning in favor of the West—had been proponents of arms-control negotiations as a means of changing the trend in their favor.

Significance of the Laws

Mention laws of war in the United States and the listener will assume they have something to do with the Geneva Convention, or perhaps with rules of engagement. In the Soviet Union, members of the armed forces are taught that an understanding of the laws of war is essential for survival in war.

Soviet textbooks assert that Marxist-Leninist teachings have proved that the course of war, like all other social phenomena, is not a matter of accident, but is a process governed by definite laws. They claim that only the scientific methodology of Marxism-Leninism makes it possible to gain a correct appreciation of these laws of war and laws of armed conflict and can strengthen the defense of the Soviet Union and its allies. Should war take place, they conclude, these same laws will show the way to victory over the "imperialist aggressors."

Such statements may sound like pure gibberish to many in the West. In the context of concern about the very real military power of the Soviet Union, these Marxist-Leninist abstractions seem remote, perhaps even irrelevant, except in some scholarly sense. The armed forces of the Soviet Union, however, are designed and led by men who act according to these concepts and who take them most seriously.

"The known laws of war," the Soviets hold, "are taken into account by the military policy of the Party; they are expressed in the military doctrine of the socialist state, serve as the basis of military science, and lie at the base of the principles of waging war and the activities of the command staff and of all personnel of socialist armies. Without such a foundation, military work would be limited to empty hopes of favorable coincidences of circumstances, to hopes on chance."

In Soviet textbooks, the laws of war are described as "objective," applying universally to all armed forces of all states. The "laws" affect NATO forces in the same manner as they affect those of the Warsaw Pact. Soviet writers are careful to explain, however, that the Soviet armed forces still have an advantage. First, though, the laws must be recognized, and the people guided by them. The unscientific nature of the ideology and methodology "of the imperialist bourgeoisie" limits their capability to understand the laws of warfare. Questions about the laws of war can be resolved only by Marxism-Leninism.

Soviet strategists distinguish between "laws of war" and "laws of armed conflict." Subordinate to these are laws of military operations at strategic, operational, and

tactical levels. Distinctions among them are often blurred. As one writer explained, "Each law of war is more or less a law of armed conflict, and each law of armed conflict is more or less a law of war. Still, there is a difference between the two."

Unlike military doctrine, about which there can be no differences of opinion openly expressed, many different views appear to be permitted about the laws of war and armed conflict. The Soviets admit that not all laws have been identified or interpreted correctly.

General Laws of War

The general laws of war that follow are from a 1984 Soviet book, *Marxist-Leninist Teachings on War and Army,* published in 1984 in the "Officer's Library" series.

- *The course and outcome of war are dependent upon the political goals of the warring sides.*

This is always listed as the first and primary law of war. Lenin, paraphrasing Clausewitz, stated that "war is a continuation of politics by other, *i.e.*, violent, means." Political goals determine the overall strategic plan of war as well as its economic, political, diplomatic, and ideological support. Politics determines whether or not nuclear weapons will be used and how the strategic goals will be achieved. If the political goals are not of vital interest, the intensity and scale of the conflict can be kept at a low level.

The influence of this law can be seen in past events. Soviet training personnel have been introduced in various areas of the world and then withdrawn under pressure. This law makes allowances for a limited war, with limited political goals.

- *The course and outcome of war are dependent on*

the relationship of economic forces of the belligerent sides.

To emphasize the importance of the economy in military affairs, Soviet military spokesmen quote Lenin's statement that "without most serious economic preparations, it is an impossible thing to conduct a modern war against advanced imperialism." The level of economic development determines the technical basis of armed combat, the quantity and quality of weapons, and the military equipment programmed for waging war.

Soviet spokesmen further state that "economic development also determines the amounts of the state reserves, and a superiority here is one of the important conditions for victory in modern war." Supplies of weapons, equipment, and materiel stockpiled before the outbreak of war are indispensable. All the territory of a nation, regardless of its location, can become a target for attack by nuclear weapons. The availability of food is critical. In time of peace, "It is necessary to create the required reserves and *stores of food* and raw materials in the event of extraordinary circumstances."

These statements are from textbooks published in the 1980s. It is doubtful that the Soviet explanation of this law of war is known to those in the United States who negotiate trade and grain sales with the Soviet Union.

• *The course and outcome of war are dependent upon the scientific potential of the belligerent sides.*

The Soviet people are assured that the Soviet Union stands at the forefront of the scientific-technical revolution, with 1,300,000 "scientific" workers. This "comprises one-quarter of all scientific workers in the world." Because capitalism uses science primarily to achieve military superiority over socialism, Soviet textbooks assert that the USSR is "forced" to pursue advances in science to strengthen its own defense capability.

Soviet writers admit that many "nonmilitary" scientific research centers are conducting research in the interests of the armed forces. The scientific revolution in military affairs brought about the introduction of nuclear weapons and required changes in the organization of the armed forces, in military art, and in troop training and indoctrination. Once again, Lenin is quoted to justify the actions taken: "Without science, it is impossible to build a modern army."

• *The course and outcome of war are dependent upon the relationship of social and moral-political forces and possibilities of the belligerent states.*

The Soviet people are taught that a future war involving capitalism will be the greatest in the history of mankind and will be an uncompromising clash between two opposed social systems. The use of nuclear weapons must be anticipated, and such an attack will require "unprecedented moral and psychological steadfastness from the people and the army." Nuclear war will strain the physical and moral strength of the people to a degree unprecedented in previous wars.

To achieve the moral-political strength required, the people must be indoctrinated "in total loyalty to the cause of communism and the motherland, in class hatred for the enemies, in proletarian internationalism, and in unshakable belief in victory over the aggressors."

It is difficult for Westerners to realize the scope of effort given to indoctrinating the Soviet population along these lines. This message is stressed daily in Soviet mass media. Many Americans, recalling our Vietnam experience and not realizing the extent of Party control of the news, cannot understand why the Soviet people are not marching in protest to demand withdrawal from Afghanistan.

• *The course and outcome of war are dependent upon the relationship of the military forces of the belligerent sides.*

It is important to note that, of the five general laws of war, the "relationship of the military forces of the belligerent sides" is put last! This is one of the great differences between Moscow and Washington in their concepts of war.

From the Soviet side, the military potential of a state means maintaining and improving its armed forces and continually increasing combat capability and the supply of modern weapons. Another major measure of military potential is mobilization capability, both in terms of industry and the pool of trained manpower. The Soviet Union is far ahead of the United States in its capability to mobilize rapidly.

Addressing the laws of war, a Soviet textbook of the 1980s stated: "Nuclear missile weapons . . . have become the main indicator and element in the military potential of the great powers." The implications of this are seen in basic Soviet arms-control positions.

Those in the West who are concerned with the world balance of power—expressed by the Soviets as "the correlation of forces in the world arena"—should find the Soviet laws of war of particular interest. Both the correlation of forces and the laws of war go far beyond the military balance and take into account the economic, scientific, moral-political, and—most important of all in Soviet calculations—the "political balance."

The stated Soviet laws of war offer great opportunities for the West to show the failures of the Soviet system. Two of the five laws of war, the ones concerned with economic and scientific potential, clearly favor the West. As for the law of political potential, the absolute control exercised by the Kremlin in determining the political goals of war might give the Soviets an initial advantage, but democracies have shown a remarkable capacity to work together when a serious threat can be identified clearly.

On the surface, the Soviets may appear to have an advantage in "moral-political potential." Their emphasis of this law may, in fact, indicate their realization of their weaknesses. Defects intrinsic to the Soviet system, for example, caused millions of Soviet citizens in 1941 at first to welcome the invading Germans with open arms. The Soviet leadership is inherently insecure, and to compensate they make a massive effort to convince the population of the superiority of an outmoded, reactionary, and oppressive regime.

The fifth law, dealing with military potential, drives the Soviet Union to great efforts to achieve and to maintain military superiority. This is why the Soviets are so concerned by the Strategic Defense Initiative now being discussed in the United States. This is also why the West should conduct arms-control negotiations with care.

General Laws of Armed Conflict

The laws of armed conflict are defined as "the concrete expression of the general *laws of war,* especially the law of the dependence of the course and outcome of war on the military potentials of the belligerent sides." Laws of armed conflict further relate to scientific potential, which results in quantitative and qualitative changes of weapons and military equipment, as well as to the moral-political potential.

- *The law of the dependence of the course and outcome of the armed struggle on the relationship of forces (combat might) of the belligerent sides.* This is the basic law of armed conflict. In any battle, in each operation, and in war as a whole, victory will go to the side that achieves superiority over the enemy. Soviet strategists assert that superiority can be realized in different ways, but one cannot defeat the enemy without surpassing him militarily. Superiority can be achieved in training and combat experience of troops, in the quality and quantity of weapons, or in skill in the conduct of war.
- *The law of the interrelationship of military actions, of their correspondence to political and military goals.* Political and military objectives must be interrelated and clearly understood. Military forces must not be committed unless political goals are first specified and related to the military force that is to be applied.
- *The law of the unity of military actions.* All military actions must be in accordance with a well-constructed, workable plan that incorporates effective command and control. The importance given to this law may account for the peacetime establishment of theaters of military operations (TVDs), and, within the past few months, designation of TVD commanders. Unity of military actions must follow the political plan of the war, to which combat actions are subordinate.
- *The law of the unevenness of the distribution of men and equipment.* Victory is achieved by concentrating overwhelming forces in the decisive place, at the decisive moment, and in the decisive direction.

Experienced NATO officers probably regard these "laws of armed conflict" as standard military fundamentals and would have no serious disagreement with them. They would find it difficult to see any special relationship to Marxist-Leninist teachings.

Particular Laws of Armed Conflict

Next in the hierarchy of principles are *particular* laws of armed conflict. These apply at various levels of combat (battles or army and front-level operations), to types of combat operations (offensive, defensive), and to arenas of combat (air, ground, and sea). They are not always spelled out explicitly in Soviet military writings, but some of them can be identified through careful research.

Soviet military analysts believe that armed conflict can be explained in terms of statistical norms, which can be derived by "generalizing" the experience of previous wars and examining the various levels of engagement. While military history is relatively neglected by the US armed forces, the study of past wars is pursued avidly in the Soviet Union. Campaigns, battles, and skirmishes are researched in great detail. Soviet analysts engaged in operational research go over each military action carefully, seeking common characteristics and comparing them to corresponding variables in similar actions. Statistical norms, or "omega factors," thus derived determine the proper steps for a commander to take in any situation to achieve victory.

A major technique of operational research in the Soviet Armed Forces is to put data derived from statistical norms into a computer, along with information on terrain, weather, and enemy order of battle, etc., and then to analyze the data to observe the operation of particular

laws of armed conflict. In combat, with basic data already in the computer, a commander might enter specific data depicting the relationship of his forces to those of the enemy. Computer outputs could then provide immediate guidance on which the commander can base his decisions.

Particular laws of armed conflict should be of interest to Western military planners, war colleges, training units, and those concerned with war games. Too often in such games, Soviet forces are portrayed simply as mirror images of NATO forces. A better understanding of Soviet perceptions of laws of war and armed conflict would substantially increase the worth of Western war games and war college study. Those preparing to face a Soviet adversary would be wise to learn all they can about Soviet military concepts and the Soviet approach to decision-making.

Nuclear Weapons and Laws of War

The preceding analysis of laws of war and armed conflict is based on recent Soviet writings. Although some specific attention has been given to nuclear weapons in those works, earlier writings had considered such weapons in greater detail. In general, the views then expressed still apply today; recent writers simply may not have been tasked to cover the same ground.

Soviet strategists state that the fifth general law of war—relative combat power of the opposing sides—will continue to operate in nuclear war. Each side will attempt to surpass the other in the power of nuclear strikes. Because nuclear weapons are decisive, each side will first attempt to seek out and destroy the other's means of nuclear attack. This law applies even if nuclear weapons are not being used at the time. The Soviets believe, then, that in the event of a nonnuclear war between the Warsaw Pact and NATO, destruction of the opponent's nuclear weapons would be the first and major goal for both sides.

The use, or even the presence, of nuclear weapons will "increase the contradiction between the tendency to concentrate troops and the tendency to disperse them." This leads to certain problems. The fifth general law of war requires superiority over the enemy. Normally, this is achieved primarily by the concentration of superior forces. Such concentration, of course, leaves a force vulnerable to destruction by nuclear weapons.

For this reason, troops will normally be dispersed. In certain regions and at certain times, it may be necessary to concentrate them, but care must be taken that they not become obvious targets for nuclear strikes. When concentration is essential, as in preparation for an attack, it must be for the shortest period possible. Dispersal must follow expeditiously.

When nuclear rocket forces are employed, there are still other changes. Simply by altering the aiming points (or trajectories) of weapons, it is possible in many instances to oppose the enemy with superior firepower without preliminary regrouping. Without change in launch sites, nuclear missiles can strike practically anywhere on earth. Under these conditions, the concentration of superior conventional forces, even in concentrated combat formations, "will cease to be necessary, and even will be dangerous."

In the early 1980s, there was great optimism, both in the United States and in Europe, that Soviet leaders had lessened their emphasis on the tactical use of nuclear weapons. It was generally believed that primary Soviet attention had shifted to deep nonnuclear thrusts into an opponent's territory by operational maneuver groups. That wishful thinking received a setback in December 1982 with the publication of a book, *Tactical Maneuver.* Written by a faculty member of the Frunze Military Academy, the book emphasized the use of nuclear weapons in the offensive. A series of articles in *Voyennyy Vestnik* (Military Herald), the journal of the Soviet

Ground Forces, continued in the same vein, as did a 1984 textbook by the deputy chief for combat training of the Ground Forces, titled *Tactical Training of Motorized Rifle and Tank Subunits.*

Soviet forces facing NATO today are equipped to fight with either conventional or nuclear weapons. Their laws of war and laws of armed conflict that relate, directly or indirectly, to the use of nuclear weapons deserve careful analysis.

In 1985, as increasing pressure is put on the White House to reach an arms-control agreement, will the pattern of the 1970s be repeated? As former Secretary of Defense Harold Brown has said, "When we build, they build; when we stop building, they build." If US policymakers assume that Soviet perceptions of peace and war are the same as ours, then any agreement reached is almost certain to be to our disadvantage.

If there are to be meaningful negotiations with the Soviets, we must take into account their laws of war and laws of armed conflict, as well as their military doctrine and strategy. A knowledge of these could provide sufficient insights to enable us to reach an agreement advantageous to both sides—or, at least, to avoid a treaty that would not be in our own best interests. ■

Dr. William F. Scott retired from the Air Force in 1972 as a colonel. He served two tours in the US Embassy in Moscow, first as Senior Air Attaché (1962–64) and later as Air and Defense Attaché (1970–72). Since then, he and his wife, Harriet Fast Scott, have made several trips across the Soviet Union and have traveled in China. They have coauthored a number of books; their most recent is The Soviet Control Structure. *Dr. Scott is presently a consultant to the Arms Control and Disarmament Agency and to a number of research institutions.*

Top Leaders Of the Soviet Armed Forces

Marshal of the Soviet Union Sergei Leonidovich Sokolov. Born 1911. Russian. Minister of Defense (December 1984). Entered service in 1932. Fought at Lake Khasan (1938). Served in armored units on the Western and Karelian Fronts in World War II. Chief of Staff, Moscow Military District (1960–64). First Deputy Commander (1964–65), then Commander of the Leningrad Military District. First Deputy Minister of Defense (1967–84). Candidate (1966), then Member (since 1968) of the Central Committee CPSU. Deputy of the Supreme Soviet 7th through 11th sessions. Military Academy of Armored and Mechanized Troops (1947). Academy of the General Staff (1951). "Hero of the Soviet Union" (1980).

Marshal of the Soviet Union Sergei Fedorovich Akhromeyev. Born 1923. Russian. First Deputy Minister of Defense and Chief of the General Staff since September 1984. Entered service in 1940. Graduated from naval school, but fought from Stalingrad to Berlin in infantry in World War II. Deputy Chief (1975–79), then First Deputy Chief (1979–84) of the General Staff. Candidate (1981), then Member of the Central Committee since 1983. Deputy of the Supreme Soviet 11th session. Military Academy of Armored Forces (1952). Academy of the General Staff (1967). "Hero of the Soviet Union" (1982). Lenin Prize.

Marshal of the Soviet Union Viktor Georgiyevich Kulikov. Born 1921. Russian. Commander in Chief of United Armed Forces of the Warsaw Pact (since 1977). First Deputy Minister of Defense since 1971. Member of the Central Committee CPSU since 1971. Deputy of the Supreme Soviet 7th through 11th sessions. Entered service in 1939. Commander of the Kiev Military District (1967–69), then Commander in Chief, Soviet Forces Germany (1969–71). Chief of the General Staff (1971–77). Frunze Military Academy (1953). Academy of the General Staff (1959). "Hero of the Soviet Union" (1981).

General of the Army Aleksei Alekseyevich Yepishev. Born 1908. Russian. Chief of the Main Political Directorate since May 1962. Entered service in 1930. Political officer of 38th and 40th Armies during World War II. Party work in the Ukraine (1946–51, 1953–55). Deputy Minister of State Security (MGB) (1951–53). Ambassador to Romania, then to Yugoslavia (1955–62). Candidate (1952–64), then Member of the Central Committee since 1964. Deputy of the Supreme Soviet 1st, 3d, 4th, and 6th through 11th sessions. Military Academy of Mechanization and Motorization (1938). "Hero of the Soviet Union" (1978).

Chief Marshal of Artillery Vladimir Fedorovich Tolubko. Born 1914. Ukrainian. Commander in Chief of Strategic Rocket Forces and Deputy Minister of Defense since 1972. Entered service in 1932. Tank brigade commander during World War II. From 1960 to 1968, he was First Deputy Commander in Chief of the Strategic Rocket Forces. After tours as Commander, Siberian Military District, and the Far Eastern Military District, he was given his current assignment. Candidate (1971), then Member (1976) of the Central Committee CPSU. Deputy of the Supreme Soviet 8th through 11th sessions. Military Academy of Mechanization and Motorization (1941). Academy of the General Staff (1951). Higher Academic Courses of the Academy of the General Staff (1968). "Hero of Socialist Labor" (1976).

Marshal of the Soviet Union Vasiliy Ivanovich Petrov. Born 1917. Russian. Commander in Chief of Ground Forces and Deputy Minister of Defense since December 1980. Entered service in 1939. In World War II, commanded a cavalry platoon, then chief of operations of a rifle division. In 1957, commanded a motorized rifle division. In 1966, First Deputy Commander and Chief of Staff of the Far Eastern Military District, and in 1972, Commander. In 1976, First Deputy Commander in Chief of Ground Forces. Commander in Chief of Troops of the Far East, 1978–80. Full Member of the Central Committee CPSU since 1976. Deputy of the Supreme Soviet 9th and 11th sessions. Frunze Military Academy (1948). Graduate of General Staff Academy's Higher Academic Courses (1969). "Hero of the Soviet Union" (1982).

Chief Marshal of Aviation Aleksandr Ivanovich Koldunov. Born 1923. Russian. Commander in Chief of Troops of Air Defense (Voyska PVO) and Deputy Minister of Defense (since July 1978). Entered service in 1941. Koldunov was one of the ten top Soviet fighter aces of World War II, destroying forty-six enemy aircraft. Flew 358 sorties, taking part in 96 air battles. In the postwar period, he commanded fighter aviation units. Commander of Moscow Air Defense District (1970–75). First Deputy Commander in Chief of National Air Defense (1975–78). Candidate (1971–76), then Member of the Central Committee (since 1981). Deputy of the Supreme Soviet 9th through 11th sessions. Military Air Academy (1952). Academy of the General Staff (1960). Twice "Hero of the Soviet Union" (1944, 1948).

Marshal of Aviation Aleksandr Nikolayevich Yefimov. Born 1923. Russian. Commander in Chief of the Air Forces since December 1984. Entered service in 1941. Flew 222 sorties in ground attack aircraft. Squadron commander in the 198th Air Attack Regiment of 4th Air Army. First Deputy Commander in Chief of Air Forces (March 1969–84). Deputy of the Supreme Soviet 2d and 9th through 11th sessions. Military Air Academy (1951). Academy of the General Staff (1957). Twice "Hero of the Soviet Union" (1944, 1945). Distinguished Military Pilot USSR (1970). Candidate of Military Sciences (1968).

Admiral of the Fleet of the Soviet Union Sergei Georgiyevich Gorshkov. Born 1910. Russian. He has held his present post as Commander in Chief of the Navy since 1956. Joined the Navy in 1927. Gorshkov took an active part in World War II landings in the Black Sea area and supported fighting in Hungary and Yugoslavia. In July 1955, he became First Deputy Commander in Chief, then, in January 1956, Commander in Chief of the Navy and Deputy Minister of Defense. From 1956, he was Candidate, and from 1961, a Member of the Central Committee CPSU. Deputy of the Supreme Soviet 4th through 11th sessions. Graduate of Frunze Naval School (1931) and higher commanders' courses at the Naval Academy (1941). Twice "Hero of the Soviet Union" (1965, 1982). Frunze Prize (1980).

—HARRIET FAST SCOTT

Organization of the SOVIET ARMED FORCES

The major elements of aerospace power that make up the US Air Force are, in the USSR, spread among three separate services. All combat and principal support functions are headed by serving officers who are also Deputy Ministers of Defense.

SOVIET Armed Forces are organized in five separate services: Strategic Rocket Forces, Ground Forces, Troops of Air Defense (Voyska PVO), Air Forces, and Navy, in that order of precedence. Functions performed by the US Air Force are spread across three of the Soviet services.

The five Soviet services do not include Troops of Civil Defense, Troops of the Tyl (rear services), Construction Troops, or other support organizations, all of which are under the Ministry of Defense. In addition to these forces, the Soviet Armed Forces also include the Border Guards, subordinate to the KGB, and the Internal Troops, subordinate to the Ministry of Internal Affairs (MVD).

A word of caution: The Soviets sometimes refer to the Strategic Rocket Forces, Ground Forces, Troops of Air Defense, and Air Forces as the Soviet Army.

The **Ministry of Defense** and the **General Staff** provide centralized command and control. Immediately subordinate to the Minister of Defense, who is roughly comparable in authority to both the US Secretary of Defense and the Chairman of the JCS, is the Chief of the General Staff, who heads a staff similar to that of prewar Germany, and the Chief of the Warsaw Pact Forces. *(See charts on the following two pages.)*

The **Strategic Rocket Forces,** established in 1959, operate all land-based ballistic missiles with ranges greater than 1,000 km—about 1,400 ICBMs and 600 IR/MRBMs. Little is known about the SRF outside the Soviet Union, but it is first among services, with its commander taking precedence over those of the other services, regardless of his actual rank. *The Military Balance,* published annually by The International Institute for Strategic Studies, London *(see December '84 issue of* AIR FORCE *Magazine),* credits the Strategic Rocket Forces with 415,000 personnel. Strength figures for the services below are from *The Military Balance* for 1984–85.

The **Ground Forces,** numerically the largest of the five services, are divided into motorized rifle and tank troops, airborne troops, rocket troops and artillery, troops of troop air defense, and army aviation. (The USSR now has seven airborne divisions.) The 186 Ground Forces divisions, with tanks, armored personnel carriers, self-propelled artillery, and personal equipment, are all designed for a CBR environment and are equipped and trained for combat with or without nuclear, chemical, and biological weapons. Ground Forces personnel, combined with Troops of Civil Defense, Troops of the Rear Services (logistical support), and various other support personnel that serve all the other services, number more than 1,800,000.

The **Troops of Air Defense** (Voyska PVO) was formed in 1948 as PVO-Strany. Its three major components are its 1,200 fighter-interceptors, 9,600 SAM launchers, and huge radar network. Two other components are anti-rocket defense (PRO) and antispace defense (PKO). Exceeding NORAD's capabilities several times, PVO has some 370,000 troops.

The **Soviet Air Forces** have been completely reorganized within the last several years. In border regions, aircraft that previously were assigned to PVO and to Frontal Aviation are now combined in "Air Forces of the Military District," consisting of approximately 6,000 aircraft. These have the same mission as the old tactical air armies and are subordinate to the Commanders of Theaters of Military Operations through the Commanders of Military Districts. These forces also include aircraft in the four Soviet "Groups of Forces Abroad."

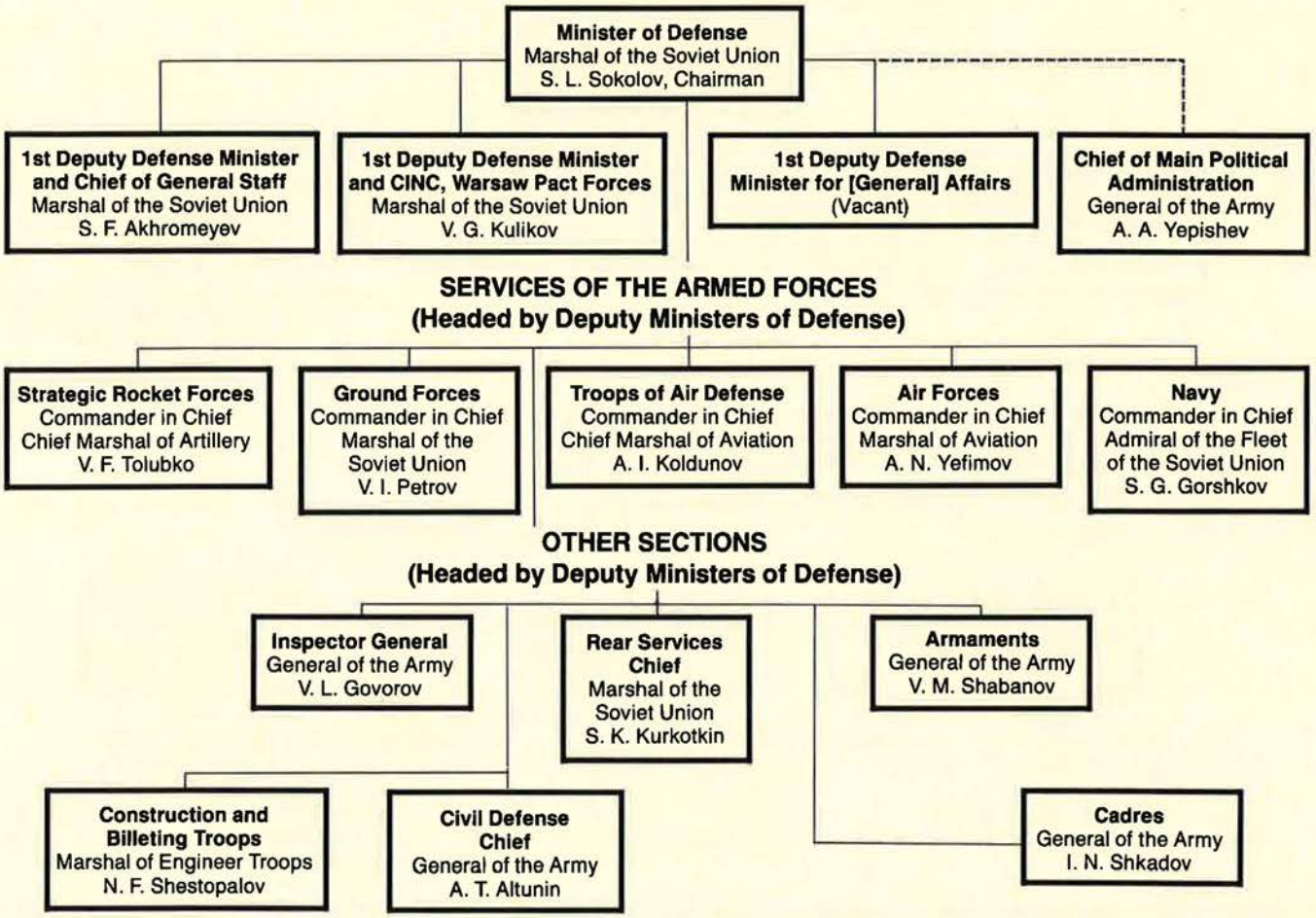
Elsewhere in the Soviet Union, long-range bombers and strike aircraft are combined into five air armies. Included in these air armies are approximately 300-plus Bison, Bear, and Backfire aircraft; 455 medium-range Blinder and Badger aircraft; 450 Fencer strike aircraft; some 530 tanker, reconnaissance, and ECM aircraft; plus fighter escort aircraft. Combat aircraft are equipped to carry either nuclear or conventional weapons. The 2,300 armed helicopters are also allocated to Air Forces of Military Districts.

Transport Aviation includes some 750 fixed-wing aircraft. The transport aircraft of the Soviet airline, Aeroflot, must also be included in this component, essentially as a full-time reserve.

The **Soviet Navy** is now a maritime superpower. With its aircraft carriers of the *Kiev* class, Soviet Naval Aviation has a mix of carrier-based helicopters and V/STOL aircraft. Naval Aviation also has land-based and reconnaissance fighters, a limited transport force, bombers, and surveillance aircraft. Navy personnel strength is about 490,000, including 70,000 in Naval Aviation and 16,000 in Naval Infantry.

The accompanying charts, prepared by Harriet Fast Scott and current as of February 1, 1985, show the top membership of the USSR's military organization. ■

MEMBERS OF THE MAIN MILITARY CIRCLE *(KOLLEGIYA)* OF THE MINISTRY OF DEFENSE



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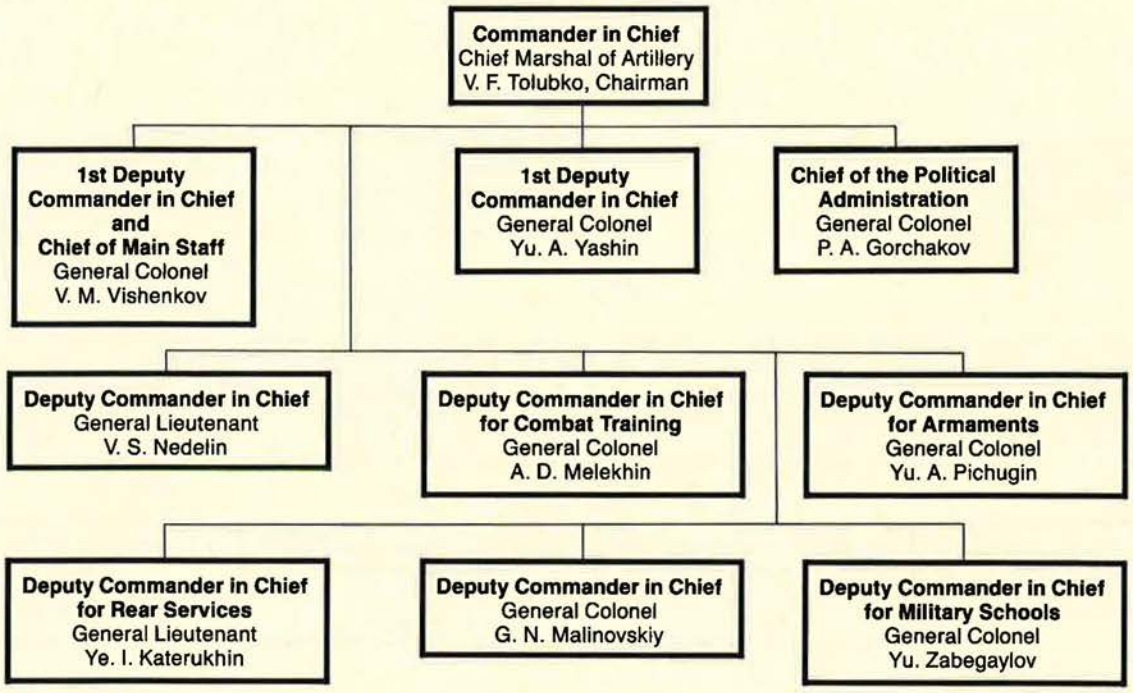
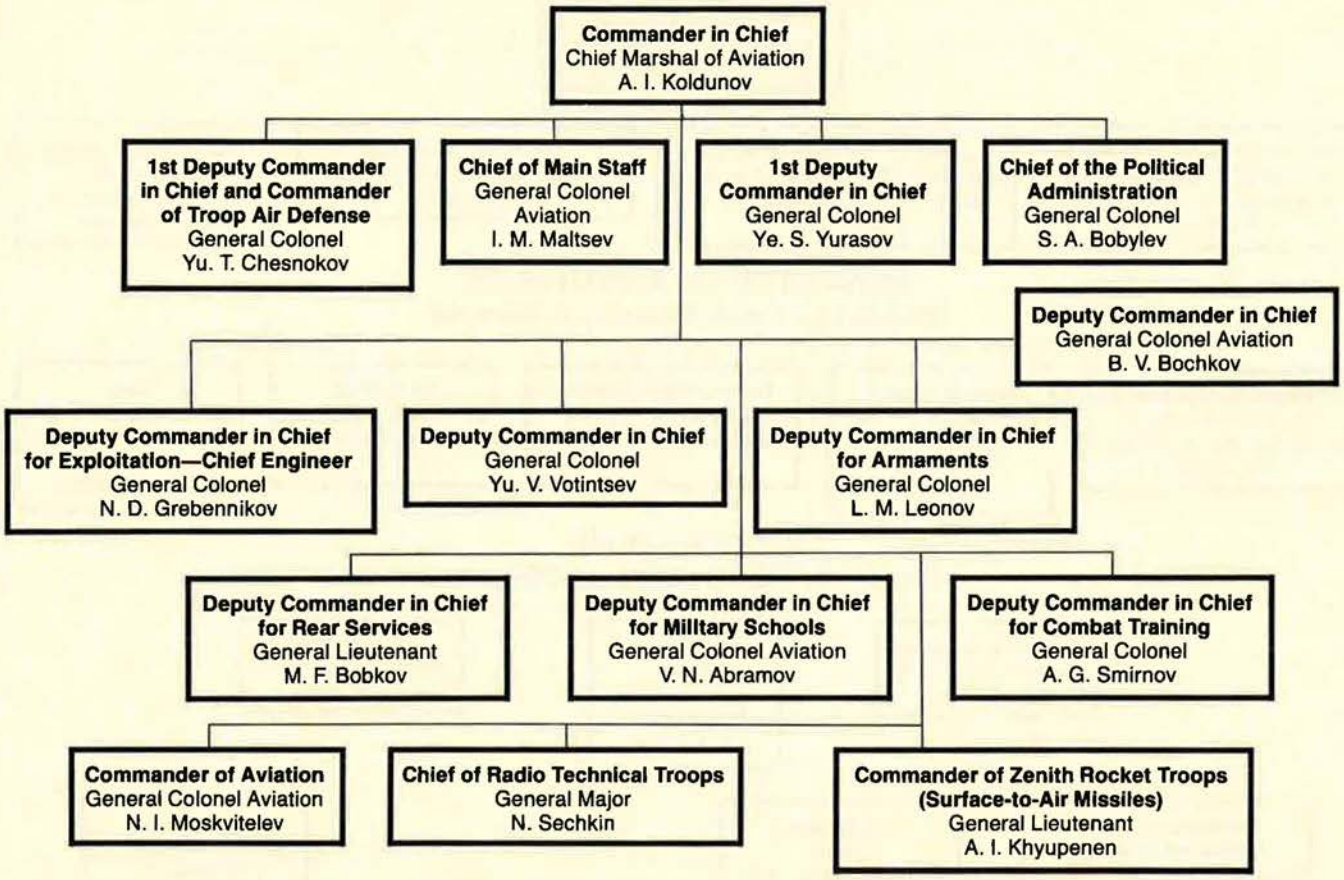
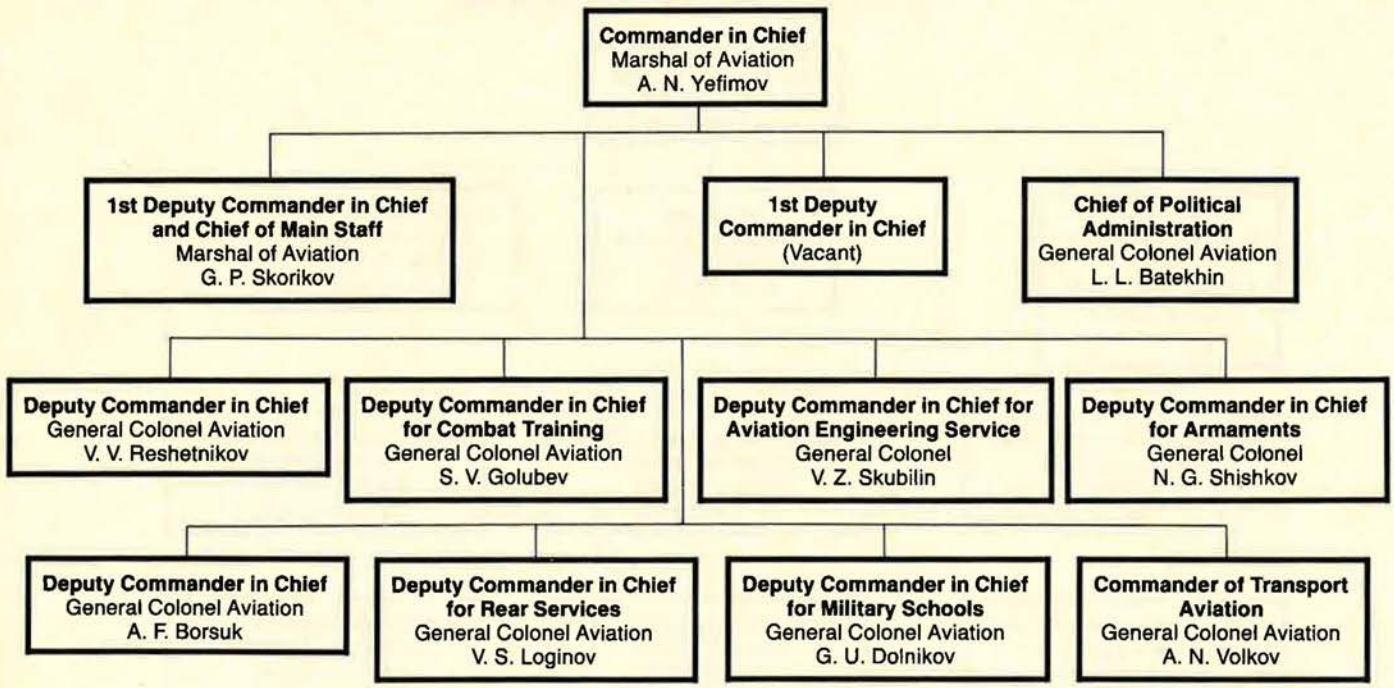


MEMBERS OF THE MILITARY COUNCIL OF COMMAND AND STAFF OF TROOPS OF AIR DEFENSE



MEMBERS OF THE MILITARY COUNCIL OF COMMAND AND STAFF OF THE AIR FORCES



—CHARTS COMPILED BY HARRIET FAST SCOTT

SCIENCE/SCOPE

Pilots can detect and attack radar-equipped vehicles or ground stations easily and accurately with a dual-mode TV Maverick missile, a U.S. Air Force flight test indicates. The air-to-surface missile uses an anti-radiation homing device and an electro-optical sensor mounted on a common gimbal in the missile's nose. Special hardware and software allows the missile to hand over from one guidance mode to the other automatically and autonomously. One feature of the dual-mode Maverick is that a pilot can launch the missile immediately if enemy radar detects him. In its single test firing, the dual-mode Maverick was launched from an F-4E aircraft after detecting a radar-equipped vehicle. The missile switched in mid-flight from anti-radiation homing to TV guidance and tracked the unmanned target to impact. Hughes Aircraft Company built three missiles under a feasibility program.

A new military tactical radio for vehicles or base stations is based on a dependable and proven high-frequency Manpack radio. The AN/GRC-213 extends the capabilities of the AN/PRC-104 Manpack to meet tough mobile applications. Large-scale integrated circuits and modern design add to the reliability and flexibility over earlier radios. The compact 20-watt unit can be easily installed in virtually any wheeled or tracked military vehicle. Fully automatic tuning reduces operator training requirements to a few simple operations. Now adopted as the U.S. military standard, the AN/GRC-213 is in production at Hughes for the U.S. Army, Navy, Marines, and Air Force. The radio meets international needs as well.

The sights, sounds, motion, and urgency of combat await pilots who learn to fly the F/A-18 Hornet strike fighter in the first computerized simulators of their kind. A pilot wears full flying gear and sits in an exact replica of an F/A-18 cockpit located inside of a 40-foot-diameter sphere. High-resolution pictures of earth, sky, and targets are projected onto the inner surface of the sphere and matched with appropriate sounds and vibration. Pilots thus experience runway vibration, aircraft stalls, buffeting, missile launches, cannon fire, dazzling aerial maneuvers, and enemy aircraft and missiles approaching at supersonic speeds. The Hughes simulator will save the U.S. Navy and Marine Corps millions of dollars by providing combat training without costly flight operations. The first trainer is operational at Lemoore Naval Air Station in California.

The U.S. Navy will improve the level of readiness and support of future weapon systems by using an advanced electronics support system. The goals of the proposed Consolidated Support System are improved test system reliability, simplified shop operations, and reduced maintenance time. Hughes, as subcontractor to Grumman Aerospace, has designed an electro-optical test system for testing laser and infrared devices. Hughes also is providing special instrumentation for testing VHSIC, spread-spectrum communications, and millimeter-wave devices for present and future systems.

Early production of the AMRAAM missile will be enhanced by the use of a workcell concept that teams an assembler, tester, test engineer, and missile design engineer in the same work area. This assembly/test workcell will allow the team members to work together efficiently and head off problems that could increase costs, affect reliability, or delay deliveries. Hughes designed and developed the Advanced Medium-Range Air-to-Air Missile for the U.S. Air Force and Navy.

For more information write to: P.O. Box 11205, Dept. 67-3, Marina del Rey, CA 90295

HUGHES
AIRCRAFT COMPANY

In no single year during the last thirty have there been so many changes in the top ranks of the Soviet power structure.

RED STARS IN MOTION

BY HARRIET FAST SCOTT

In 1984, more than half of the commanders and political officers of Soviet military districts and groups of forces abroad were replaced. This constituted more change in these senior ranks than had taken place in any one of the preceding thirty years. In addition, the Kremlin leadership appears to have designated commanders in chief for three new theater commands that have been formed in the western part of the USSR.

There were also major changes in the military high command. By the end of 1984, three of the top four marshals in the Ministry of Defense had been replaced: The Minister of Defense died, the Chief of the General Staff was ousted, and a First Deputy Minister of Defense was elevated to be the new Minister of Defense. At this level, only command of the Warsaw Pact Forces remained untouched. Two deputy ministers of defense—the Commander in Chief of Air Forces and the Inspector General—are new as well.

Three appointments of particular interest—Sergei Sokolov to Minister of Defense, S. F. Akhromeyev to Chief of the General Staff, and Aleksandr Yefimov to Chief of Soviet Air Forces—will be discussed in detail later in this article.

Military district and group commanders are always changing jobs. Nominally, appointments are for five years. As frequently happens, a vacancy in one district will be filled by a commander from another district, creating a ripple effect. One reassignment can generate two or three changes.

There have been 145 command changes in the last thirty years. The number of changes per year has varied from one (1966, 1974, 1983) to ten (1960), with the average being five. The sixteen changes that took place in 1984 made it an extraordinary year.

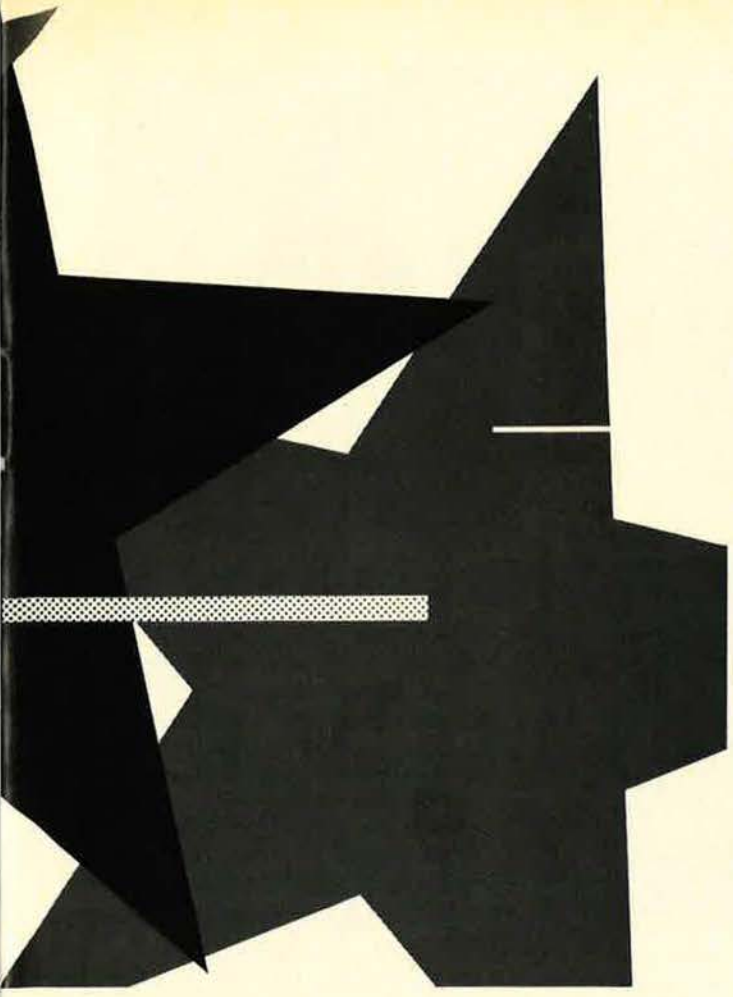
There are indications that commanders in chief of the three new TVDs (theaters of military operations) have been designated. In the Soviet organizational structure, a TV (theater of war) may comprise two or three TVDs. On occasion, peacetime TVDs have been formed. For example, from 1947 to 1953, the High Command of the Far East had its headquarters in Khabarovsk. A similar TVD, called simply "Troops of the Far East," was established in December 1978.

It appears that Marshal Nikolai Ogarkov, the former Chief of the General Staff who was abruptly dismissed from that post in September, has been assigned as commander in chief of the Western TVD. In addition, General of the Army I. A. Gerasimov, former commander of the Kiev Military District, is believed to command the Southwestern TVD. General of the Army Yu. P. Maksimov from the Turkestan Military District heads the Southern TVD.

All four TVDs, nine of sixteen military districts (the Ural Military District changed commanders twice in the last year), and two of four groups abroad received new leadership.

Role of a TVD

The importance of the TVD in Soviet military thinking is best explained by Marshal Ogarkov himself. In his 1982 booklet, *Always Ready to Defend the Fatherland*, he traced the growth of the organizational structure of



armed forces. Up to the year 1500, the regiment was the basic unit. Then brigades were created, followed by divisions. In the early 1800s, armies were established. The army was the basic unit in the Napoleonic War of 1812. By 1900, several armies were combined into a "front." The area of military conflict involved larger and larger areas. Skirmishes and battles were replaced by operations and campaigns by armies. In World War II, the frontal operation was the basic form of military action. Toward the end of that war, operations of two or three fronts were combined into a single operation.

But today, the focus of military operations is no longer the front, but the TVD. Soviet strategists anticipate that each front within the TVD will carry out two or more operations, one after the other, with little or no pause between them. The new TVD commands in the western part of the Soviet Union have taken final shape only since September of last year. TVDs, groups, and military districts are run by military councils. The commander or commander in chief serves as chairman, and members include the chief of the political directorate, the Party secretary of the republic or regional Communist Party, the first deputy commander (or deputy CINC), the chief of staff, and others as necessary.

In 1984, there were as many changes among political chiefs as among commanders. Although the average number of changes annually for political officers over the past thirty years is not readily available, it is believed that such officers normally change no more often than commanders, and frequently even less often. In 1984, however, there were fourteen newly assigned political chiefs. Even after subtracting five to account for the changes caused by the creation of TVD commands, more change than normal seems to have taken place.

As for first deputy commanders and chiefs of staff, evidence suggests that changes at that level were also significant, if only because many of the new commanders vacated those positions. Bear in mind that Soviet secrecy is such that there are no announcements of postings in the Soviet Armed Forces, apart from the very top positions. Information must be gleaned from casual references in the military press—names of officers reported attending an awards ceremony, for example, or a meeting of Party activists. Thus, district first deputies and chiefs of staff may not be identified by Western analysts for months or even years.

Portents of Changes

Do these changes reflect merely routine retirements because of age? That is highly improbable. The displaced commanders not subsequently identified in new assignments are generally in their mid-fifties to early sixties—young by Soviet standards. In addition, they are World War II veterans, and wartime service is a valuable asset in the Soviet military establishment.

Are these changes the result of changes in Party leadership? In Brezhnev's last year, 1982, only two minor districts were assigned new commanders. Three commanders (one of whom subsequently was replaced) were appointed while Yuri Andropov was General Secretary. But *fifteen* changes have taken place since Konstantin Chernenko became General Secretary. Eleven of these seem to have occurred since Ogarkov left the General Staff and after Dmitriy Ustinov, the late minister of defense, became seriously ill. And as this is written, reports are surfacing that Chernenko is seriously ill.

Were the changes long overdue, or do they mean that Chernenko is advancing officers loyal to him? Were they planned earlier but postponed because the Party leadership was unsettled? Or is the military taking advantage of weak political leadership? Does it mean that Sokolov and Akhromeyev want their own supporters in key assignments? If so, why are such moves necessary, and what do they hope to gain?

The massive reassignment of senior Soviet officers and the appointment of commanders of Western TVDs warrant close scrutiny. In all probability, a new Minister of Defense and a new Chief of the General Staff are merely continuing a scheme that has been under way for some time. On the other hand, a flurry of shifts of senior officers has, on occasion, preceded major military moves in the past.

In the nuclear age, Soviet secrecy does not enhance peace and security around the world, nor reduce tension. As a "confidence-building measure"—an expression frequently used in arms-control negotiations—the Soviets might give some explanation for Ogarkov's ouster and the many changes in the top military leadership. In the meantime, the West would do well to be alert to any moves by the Soviet Armed Forces.

Minister of Defense Sokolov

On Thursday evening, December 20, 1984, death claimed the Soviet Union's Minister of Defense, seven-

ty-six-year-old Marshal of the Soviet Union Dmitriy Fedorovich Ustinov. Two days later, First Deputy Minister of Defense and Marshal of the Soviet Union Sergei Leonidovich Sokolov was named to succeed him. The selection of Sokolov came as a surprise to many in the West who follow Soviet affairs. Top Soviet military appointments are usually meant to last a decade, and often longer. The naming of a seventy-three-year-old marshal to this key position seems to disregard this custom.

In 1967, Sokolov had become one of three First Deputy Ministers of Defense. Previously, there were only two. Sokolov's exact duties were never specified.

For fifteen years, from 1967 to 1982, Sokolov ranked fifth in precedence in the Soviet military hierarchy (after the Minister of Defense, the Chief of the General Staff, the Commander in Chief of the Warsaw Pact Forces, and the Chief of the Main Political Administration). Only after the death of Brezhnev did Sokolov inch ahead permanently to take the number-four spot.

Sergei Sokolov was born the son of a clerk in 1911 in Yevpatoria, on the coast of the Black Sea in the Crimea. He is Russian by nationality. In 1927, when almost sixteen years of age, he began work as a packer in a consumers' union. His affiliation with the Communist Party started before he entered military service. From 1930 to 1932, he served as secretary of the Komsomol (Young Communist League) of the Kotel'nikovo Industrial Combine in Kirov Oblast, and he subsequently became a member of the bureau of the regional Komsomol committee. He joined the Red Army in 1932, after the Komsomol was asked to select qualified members for military service. Sokolov went to Gor'kyy Armored Tank School, graduating in 1934. His first posting was to the Far East, where he served with the armored forces.

His advancement was rapid. His first command was a platoon, then a company. He became chief of staff, then commander of a detached battalion. In 1937, he joined the Communist Party.

Sokolov first saw combat in the summer of 1938, battling Japan in a territorial dispute along the Soviet border with Japanese-occupied Manchuria. Sokolov's commander in that action, the legendary Marshal G. K. Blyukher, was subsequently arrested and shot, on orders from Stalin, as "an enemy of the people." One wonders how the military purges of 1937–38 affected Sokolov, then in his twenties. In those two years, the majority of senior Soviet officers was killed—not by a foreign enemy, but on orders from the head of the Communist Party.

The War Years

On June 22, 1941, the day Hitler attacked the Soviet Union, Sokolov was chief of staff of a tank regiment on the western front. He rose steadily and, by 1944, commanded the Armored and Mechanized Troops of the 14th Army on the Karelian Front.

After the war, Colonel Sokolov entered the Military Academy of Armored and Mechanized Troops and graduated with a gold medal in 1947. Sokolov, then thirty-six, took command of a tank regiment and was chief of staff of a tank division within a year. He was soon off again to school, this time to the Military Academy of the General Staff, the highest of the Soviet military schools.

Upon graduating in 1951, General Sokolov was given

Sergei L. Sokolov became the Soviet Union's Minister of Defense after the death of his predecessor, Dmitriy F. Ustinov, last December 20. Sokolov's elevation surprised many Kremlinologists.

command of a mechanized division, was made chief of staff of an army, and then became an army commander. It was from this post that he was tapped in 1960 to take over as Chief of Staff and First Deputy Commander of the Moscow Military District. In July 1964, he was reassigned as First Deputy Commander of the Leningrad Military District. He was soon promoted to general colonel (three stars) and, in a little over a year, became military district commander.

As he climbed the military ladder, he also progressed politically. In 1966, Sokolov was a delegate to the 23d Congress of the Communist Party. There, he was elected a candidate member of the Party's prestigious Central Committee. Later that year, he was elected to the Supreme Soviet from the Karelian ASSR and served on the foreign affairs commission. His Party-military status marked him for still more advancement. In 1968, he became a full member of the Central Committee. He joined the important Mandate Commission of the Supreme Soviet in 1974.

Move to the Center

As already noted, Sokolov was moved to Moscow in 1967 as a First Deputy Minister of Defense. For the next seventeen years, he remained in that post. He was not the Chief of the General Staff or head of the Warsaw Pact Forces. What exactly did he do?

He traveled. No sooner had he unpacked in Moscow than he went off with President of the USSR Nikolai Podgornyy to visit Syria. In 1969, he went to Czechoslo-

vakia to sign an agreement on housing for Soviet troops who had come to stay in that country permanently in 1968. In rapid succession, he traveled with delegations to Bulgaria, Romania, and North Korea. He accompanied Podgornyy to Egypt, India, Burma, and North Vietnam. In 1972, Sokolov was again in Syria, a month later in Mali. After returning home, he took off for Peru, stopping in Cuba on the way. In July 1974, he and Podgornyy visited Somalia.

After a visit to Bulgaria in 1974, he did not travel again until 1976, but soon made up for lost time: Mali, Yemen, Mozambique, Jordan, Angola, Mozambique a second time, and, in December 1978, Cuba. In April 1978, Sokolov was promoted to Marshal of the Soviet Union. In between foreign trips, Sokolov entertained and traveled around the Soviet Union with visiting foreign military delegations. He also attended and frequently addressed military science conferences and other high-level meetings.

Sokolov's name stopped appearing in the Soviet press in December 1979. Except for appearances on May Day and November parade day, he was out of sight for almost a full year. The foreign press, however, reported that Marshal Sokolov masterminded the invasion of Afghanistan. Then, in July 1981, Sokolov visited Ethiopia. Shortly after that, he "disappeared" again. He was present at the November parade on Red Square, but then not mentioned again until just before May Day in 1982. Was he in Ethiopia all that time? Or somewhere else? When Marshal Ustinov was hospitalized in October 1984 for an illness that would eventually prove fatal, Sokolov filled in for him at important functions.

Sokolov's long tenure as a first deputy finally is over. As this is being written, he has not yet become a Politburo member, as were both his predecessors. There are a number of vacancies in the Politburo, and Sokolov's chances for membership, or at least alternate membership, are good. His patron is believed to be Politburo member and Party Secretary Grigoriy Romanov, formerly Leningrad Party leader. Many Kremlin watchers thought Romanov, who has close ties with the military, would be named Minister of Defense when Ustinov died. Romanov may have helped to promote Sokolov so that he himself could remain in contention with Mikhail Gorbachev and others to replace Chernenko when the time comes.

Chief of the General Staff Akhromeyev

Marshal N. V. Ogarkov, who occupied the powerful position of Chief of the General Staff until September 7, 1984, was relatively well known to the West. In the late 1960s, as First Deputy Chief of the General Staff, he headed the Soviet military delegation in the early rounds of SALT I. In contrast, little is known about his successor, Marshal of the Soviet Union Sergei Fedorovich Akhromeyev.

Born in 1923, Akhromeyev was a cadet at the Frunze Higher Naval School in Leningrad in 1940. When war started, the school was evacuated to Astrakhan, at the mouth of the Volga River. The senior classes were commissioned early and sent to sea. But the two junior classes, including Akhromeyev's group, graduated in 1942 and were sent to the infantry on the Stalingrad Front. (In later years, they were called the Stalingrad graduating class.) Nineteen-year-old Junior Lieutenant Akhromeyev was given limited infantry training and sent to a division in the southern section of the city. Akhromeyev, along with others of his group, stayed with their units all the way to Berlin and Vienna. In 1943, Akhromeyev joined the Communist Party. By the end of the war, he was a battalion commander.

His unexpected wartime entry into the Ground Forces determined Akhromeyev's career. In the late 1940s, he entered the Military Academy of the Armored Forces, graduating in 1952. For the next twelve years, he served as chief of staff of a regiment, commander of a tank regiment, deputy commander and chief of staff of a division, and commander of a tank division. He was again sent to school in 1965, to the Academy of the General Staff. Akhromeyev, by then a general major (one star) of tank troops, graduated with a gold medal.

After leaving the academy, he was posted to the Carpathian Military District, where he served first as chief of staff and first deputy commander of an army and later as commander. The District took an active role in the well-publicized 1967 "Dnepr" maneuvers, the largest to be held in the postwar period. The Carpathian Military District was also involved with the invasion of Czechoslovakia in 1968, but it is not known what role, if any, Akhromeyev played. By 1969, he had his second star and was posted to the Belorussian Military District.

Akhromeyev probably participated in even larger maneuvers, codenamed "Dvina," in Belorussia in 1970. He must have pleased both his military and Party superiors, for he was sent as a delegate to the 24th Party Congress in 1971, suggesting some unusual accomplishment. Soon afterward, Akhromeyev was assigned to the Far Eastern Military District as chief of staff and first deputy commander.

Move to Moscow

By 1974, Akhromeyev had been reassigned to Moscow as "chief of a main directorate" and Deputy Chief of the General Staff. The "main directorate" of the General Staff was the operations directorate, the most important in the entire Staff. His promotion in 1975 to general colonel (three stars) came with his assignment. In 1979, Akhromeyev was made First Deputy Chief of the General Staff and promoted to general of the army (four stars).

In 1981, his political career was also enhanced when he was selected as a candidate member of the Central Committee of the CPSU at the 26th Party Congress. At some time prior to 1981, Akhromeyev received a coveted Lenin Prize for unspecified accomplishments. And, in 1982, he was awarded the gold star of "Hero of the Soviet Union."

Then, in March 1983, Akhromeyev was suddenly promoted to Marshal of the Soviet Union. The move was without precedent. (As recently as 1976, V. G. Kulikov, who had been Chief of the General Staff for five years, was only a general of the army—a four-star rank. And now Akhromeyev, a mere First Deputy Chief of the General Staff, was made a marshal!) Yuri Andropov, who became General Secretary in 1982, must have approved the promotion as well as Akhromeyev's elevation in 1983 to full membership on the Central Committee.

Sergei F. Akhromeyev succeeded the ousted N. V. Ogarkov in the powerful position of Chief of the General Staff. Ogarkov had been relatively well known in the West, but little is yet known about Akhromeyev.

Akhromeyev was thus equal to his superior, Marshal Ogarkov, the Chief of the General Staff, in both rank and political position.

It is possible that Andropov moved Akhromeyev into position to fill a vacancy he planned to create at the top. The usual procedure, however, is to advance first and get promoted afterward. Apparently, Andropov's failing health delayed any surprise move he had envisaged in the Kremlin chess game. He died in February 1984, and Konstantin Chernenko became the new General Secretary of the Party.

Ogarkov's Ouster

The official announcement of Marshal Akhromeyev's appointment appeared in the newspapers on September 7, 1984. Marshal Ogarkov, the papers said, was no longer First Deputy Minister of Defense and Chief of the General Staff. He had been "assigned to other work." That was all.

Akhromeyev's first official duty reported in the press was seeing Dmitriy Ustinov, the seventy-six-year-old Defense Minister, off to Czechoslovakia for the "Shield-84" Warsaw Pact maneuvers. Five days later, he met Ustinov at the airport. Shortly thereafter, Ustinov—who would die in December—presented Chernenko his third "Hero of Socialist Labor" gold star in Kremlin ceremonies.

Since assuming his present position, Akhromeyev has met with Syria's President Hafez al-Hassad, the Indian Defense Minister, and the Libyan Armed Forces' Commander in Chief, and he has traveled to Budapest and attended five funerals. A number of significant changes in the "structuring" of the Soviet Armed Forces have also occurred since he took over. However, they seem to indicate that the new chief is only carrying out reforms planned by Ogarkov.

It is too early to tell if Sokolov and Akhromeyev will make an imprint of their own. Given their close association with their predecessors over such a long time, it is unlikely that any drastic changes are in the offing.

Chief of Soviet Air Forces Yefimov

In the media flurry surrounding the demise of Minister of Defense Dmitriy Ustinov, the death of Chief Marshal of Aviation Pavel S. Kutakhov on December 3, 1984, two weeks earlier, went almost unnoticed. Appointed as Commander in Chief of the Soviet Air Forces in 1969, Kutakhov served in the same job for fifteen years.

The officer designated as his replacement had been his first deputy for those same fifteen years. When Kutakhov was chosen to head the Air Forces, General Colonel of Aviation Aleksandr Nikolayevich Yefimov was named First Deputy Commander in Chief.

Like Kutakhov, Yefimov achieved fame as a combat pilot during the Great Patriotic War (the Soviets' designation of that part of World War II in which they participated). The two gold stars suspended from red ribbons above the array of medals on his chest signify that he is twice a Hero of the Soviet Union. Only seventy-one Soviet airmen were awarded this medal twice during the entire war. (Some awards were for actions prior to World War II. Two other airmen, both of whom are still alive, were awarded gold stars three times.)

Yefimov was born in 1923 in the village of Kantemirovka, south of Moscow. He comes from a family of railroad workers and is Russian by nationality. His early childhood was spent in Millerovo, west of Stalingrad.

In his autobiography, he writes about building model airplanes, powered by rubber bands, while in grade school. Later, a nearby military unit gave an old glider to a flying club that he had joined. Members of the club worked hard to get the glider in flying condition. On August 18, 1938, when he was fifteen years old, "Sasha" Yefimov made his first glider flight. In 1940, nine teenagers in the group were sponsored by the Komsomol to take a local aero club course.

After finishing basic training in the aero club, all nine youngsters went to advanced flying schools. Yefimov headed to the Voroshilovgrad Military Aviation School for Pilots.

Sturmovik Pilot

The rapid advance of the German invasion in 1941 made it necessary for the school to evacuate to the southern Urals. Training was intensified. Cadets were told about a new type of aircraft they would fly—an attack aircraft called the Il-2, designed by S. V. Il'yushin. Training was speeded up still more. A few orientation flights in the new aircraft, two or three simulated "combat" flights, and the class graduated. In August 1942, Senior Sergeant Yefimov joined a reserve regiment on the Western Front.

Chief of Soviet Air Forces Aleksandr N. Yefimov was promoted from First Deputy Commander in Chief to succeed Pavel S. Kutakhov, who died two weeks before Ustinov. Yefimov is a famed World War II combat pilot.

In the meantime, his home town was occupied by the Germans, and Yefimov lost contact with his mother and sister. From the airfield where he had learned to fly, German Me-109s and FW-190s took off to support the troops heading for Stalingrad.

The Il-2 Sturmovik flown by Yefimov was one of the most important and successful tactical air support aircraft of its day. It was designed originally as a single-place aircraft, but later models had room for a gunner to protect the rear. Armament consisted of two cannons, three machine guns, and rockets. Pilots were said seldom to fly above treetop level.

Yefimov's first combat flight was with a group of four Il-2s that attacked a supply train west of Moscow. He was soon promoted to flight leader and lieutenant. In 1943, he joined the Communist Party. Yefimov received major recognition for his strikes on enemy tanks, artillery positions, airfields, and railroad stations during the Battle of Kursk in 1943. He flew his 100th combat sortie in July 1944, and, three months later, Senior Lieutenant Yefimov, then a squadron commander in the 198th Attack Aviation Regiment, was awarded his first gold star as "Hero of the Soviet Union."

Following the Belorussian Operation in the summer of 1944, an account of Yefimov's combat flying appeared in the military newspaper *Soviet Wings*. Afterward, Yefimov wrote a series of articles for the paper. In March 1945, he led his Sturmoviks on an attack against Danzig. It was his 200th combat flight. On the final day of the war, May 8, 1945, he flew his 222d combat sortie. Promoted to captain, he was awarded his second gold star as a Hero of the Soviet Union on August 18, 1945. He was only twenty-two. On that day, he says, he decided to make a career in the Air Forces.

Commander-Scholar

His combat awards brought Yefimov to the attention of his superiors. In 1946, at age twenty-three, he was "elected" a Deputy of the Supreme Soviet.

Soon after, he was accepted by the Military Air Academy, graduating in 1951. After holding various command positions, he entered the Academy of the General Staff in 1955. Upon completion of this two-year course, he commanded an air regiment, then an air army. He was promoted to general major of aviation (one star) in 1960. His second star came in the mid-1960s, while serving a tour in the Carpathian Military District.

In 1968, he earned a "candidate of military sciences" degree—an academic credential requiring slightly more work than a master's degree in the United States. In 1969, Yefimov was assigned to Moscow as First Deputy Commander in Chief, Soviet Air Forces. In 1970, he was on a list of distinguished military pilots of the USSR. In 1975, he was promoted to Marshal of Aviation.

Yefimov's appointment as commander in chief of the Air Forces was not a surprise. He is twice a Hero of the Soviet Union, with a distinguished combat record. At sixty, an officer is not old by Soviet standards. His service in Moscow for more than a decade and a half must have provided many contacts among the Party-military hierarchy.

He has the background to do well. He seems much more at ease when talking with Westerners than did his predecessor, Marshal Kutakhov. It is somewhat unusual for an officer with so many command assignments to have found the time to earn an advanced degree. While his knowledge of the outside world is limited, he has traveled some—to India in 1972, to Mexico in 1976, to Cuba in 1978, and to Mexico again in 1983.

A Yefimov visit to the United States seems a distinct possibility. Soviet airmen have not forgotten that Gen. Nathan F. Twining, USAF Chief of Staff, went to the Soviet Union in 1956. A return visit was planned for Marshal Vershinin in 1960, but was canceled after the U-2 spy plane episode.

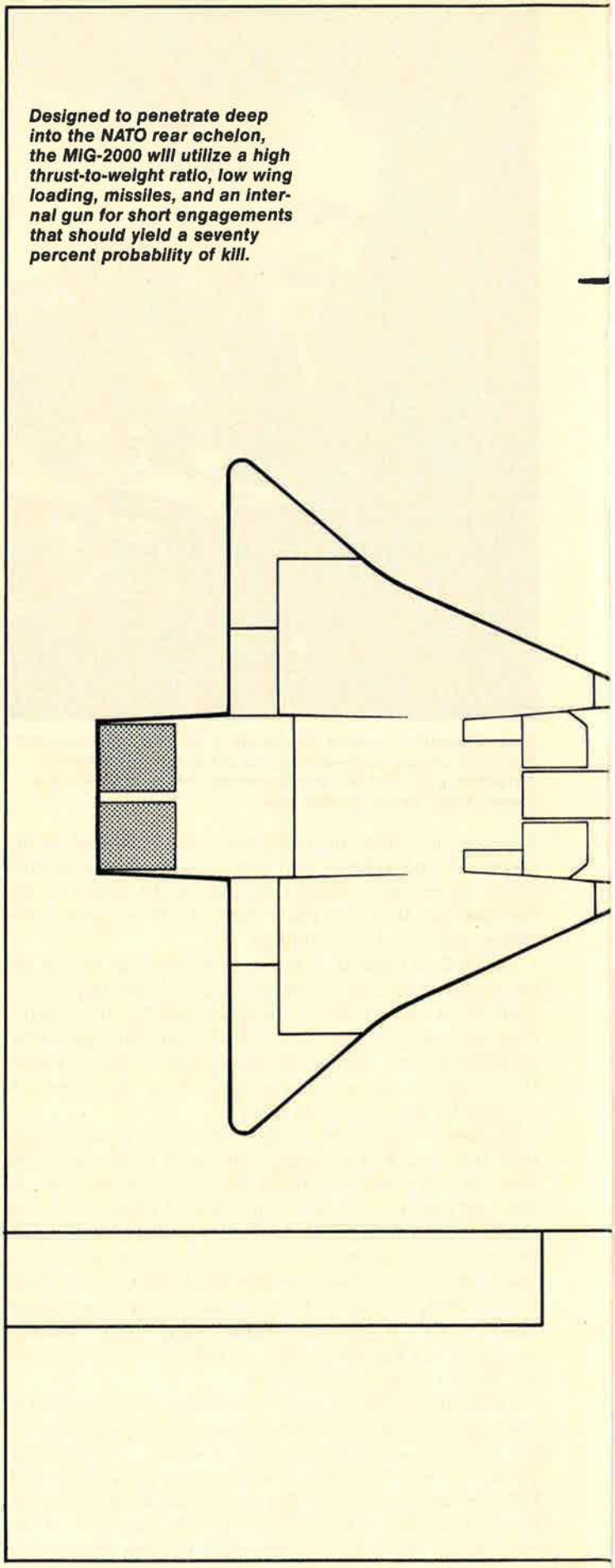
The fact that the USAF visit to Moscow has never been reciprocated was casually noted by the Soviets, both in 1963 and in the early 1970s. High-level US officials have mentioned that the time may be right for such a visit. Should that work out, it would seem appropriate for Marshal Yefimov, one of the few World War II air heroes still on active duty, to make the trip that Marshal Vershinin canceled so many years ago. ■

Harriet Fast Scott, a Washington consultant on Soviet military affairs, is a member of the General Advisory Committee on Arms Control and Disarmament. She has lived and traveled extensively in the USSR and maintains one of the largest private libraries in the US of Soviet military publications. Her translation and analysis of the Third Edition of Marshal V. D. Sokolovskiy's Soviet Military Strategy *is a standard reference, as are three of her other books—*The Armed Forces of the USSR, The Soviet Art of War, *and* The Soviet Control Structure, *all coauthored with her husband, Dr. William F. Scott.*

A preview of how the next Soviet air-superiority fighter is likely to look and perform.

MiG-2000

BY RICHARD D. WARD



Designed to penetrate deep into the NATO rear echelon, the MIG-2000 will utilize a high thrust-to-weight ratio, low wing loading, missiles, and an internal gun for short engagements that should yield a seventy percent probability of kill.

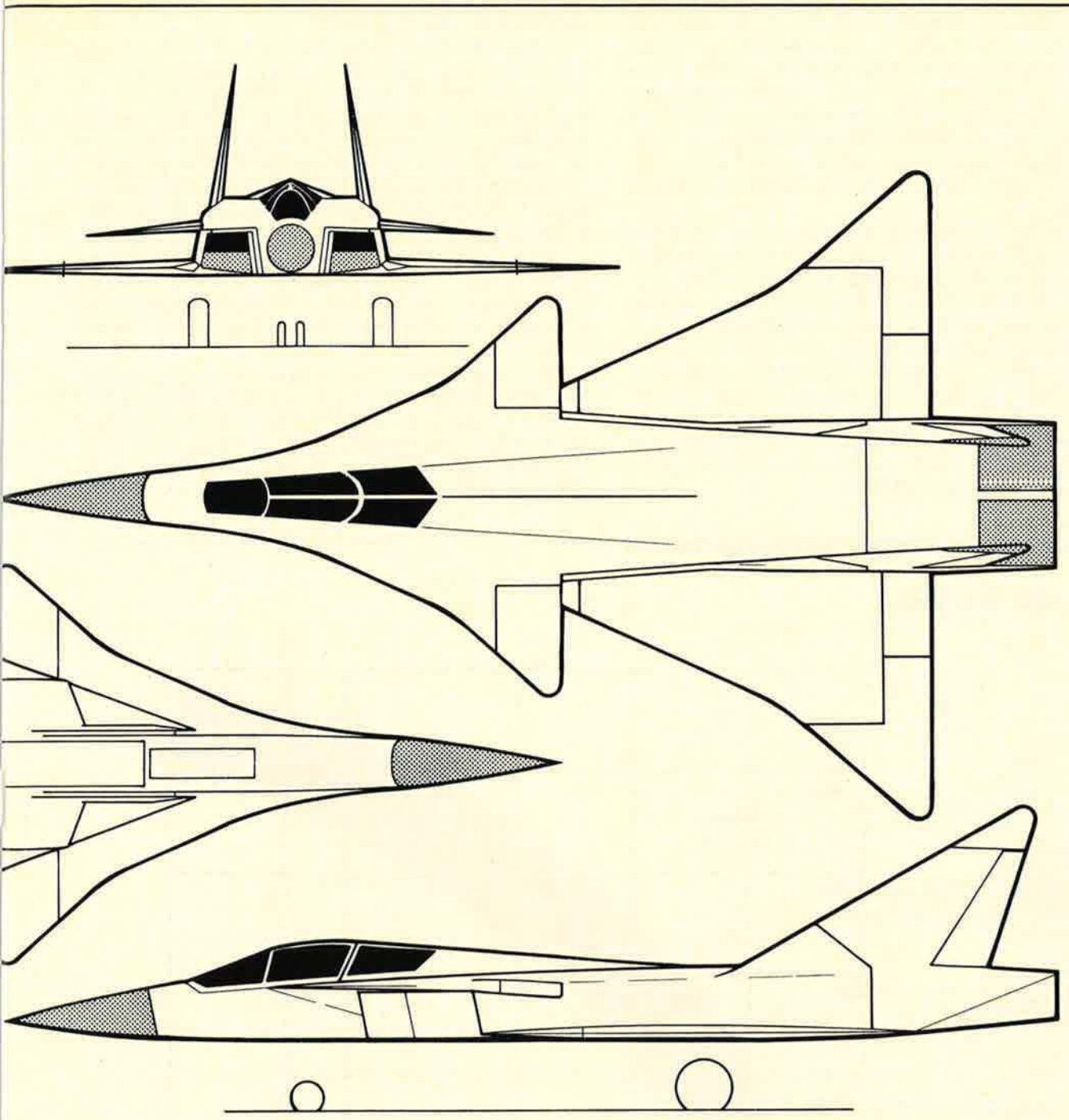
WESTERN analysts are already anticipating the next generation of Soviet military aircraft. The next counterair fighter is of particular interest, since it is that class of aircraft that has historically reflected the most advanced Soviet technology.

This article is a hypothesis about that forthcoming fighter. Extrapolation of Soviet development trends points to introduction of the aircraft around the turn of the century—thus the designation *MiG-2000* given it here.

A number of influences, constraints, and possibilities are taken into account in this prediction. In addition to the options offered by technology, these include Soviet military doctrine, Soviet forecasting and planning philosophy, mission profiles that are likely to be required, and the impact of Soviet design practices. *(See "The Structured World of the Soviet Designer," AIR FORCE Magazine, March 1984.)*

Marxist-Leninist doctrine permeates all aspects of Soviet society; it is the foundation for all governmental action and planning. This doctrine mandates that the military establishment be prepared to wage war successfully, according to the dictates of the Communist leadership. This generates a military doctrine that, in turn, determines the size, character, and goals of the armed forces and that ensures the integration of organization, tactics, training, and equipment. This all-encompassing philosophy is applied throughout the military system as an integral element of doctrine.

Basic to Communist doctrine is the concept of centralized economic planning and control. The Soviets regard forecasts of scientific development and directions of research as critical elements in their centralized



DIMENSIONS
- Wing Area . . . . . 545 Sq Ft.
- Length . . . . . 60 Ft.

WEIGHT AND LOADINGS
- Maximum Takeoff Gross Weight . . . . . 40,200 Lb.
- Internal Fuel . . . . . 16,000 Lb.
- Maximum Internal Weapons Load . . . . . 3,000 Lb.

PROPULSION
- Powerplant . . . . . 2 x R-2000 Turbofans
- Bypass ratio 0.6
- Dry Rating . . . . . 18,000 Lb.
- Augmented Rating . . . . . 27,000 Lb.

planning. They use these forecasts to plan when they will introduce new machinery, new production methods, and, in particular, new technologies. The models generated by the forecasting agencies are scrutinized by expert evaluators to ensure that the trends are realistic and within national capabilities. These models can be modified to account for unexpected events. Current forecasting methods also attempt to predict potential scientific breakthroughs.

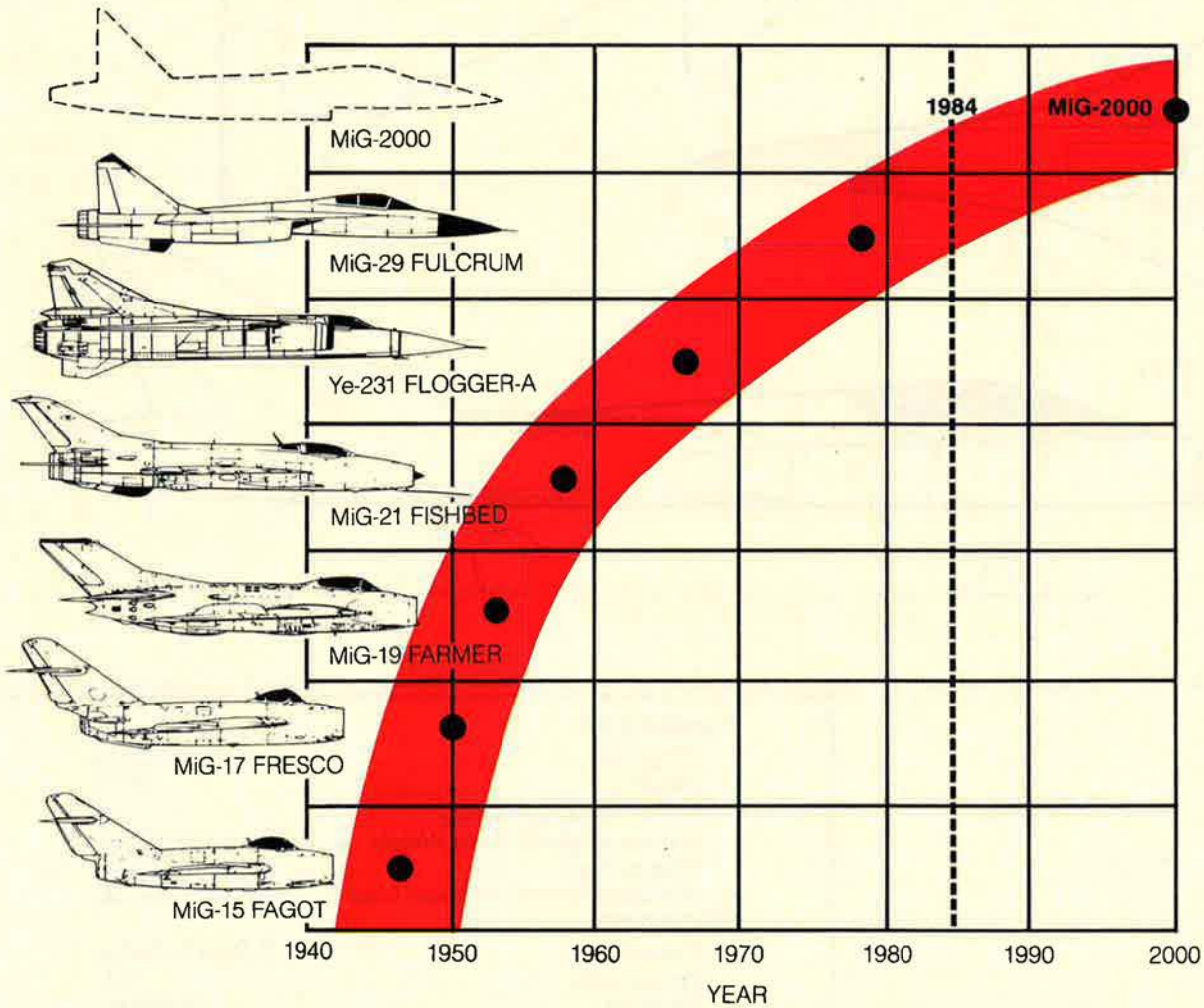
In short, the Soviet economic and military system is directed—and constrained—by a doctrinally directed planning philosophy that targets advanced technologies and that predicates future development on present knowledge. With the future thus predetermined, a Western analyst should be able to use trend plots to extrapolate future efforts—in this case, as they affect military aircraft. Until recently, the characteristics of Soviet fighters have been very well documented in the open press. Available data on the most current aircraft is less accurate, but that which has been revealed should be sufficient to establish trends.

New MiG by the Year 2000

A projected date for introduction of the next-generation fighter was obtained by extrapolating the past efforts of the Mikoyan/Gurevich Prototype Design Bureau (MiG OKB). This bureau was used as a baseline because it has designed virtually all Soviet air-superiority fighters produced since 1945. When the chronology is analyzed, it becomes apparent not only that each successive design is closely related, but also that each has incorporated a progressively larger percentage of new technology, with a longer span of time between the introduction of new designs. Taking each introduction as a statistical event, a trend emerges. An extrapolation of this curve indicates the next introduction of a MiG fighter to occur in approximately the year 2000.

These extrapolation methods are based on standard forecasting techniques. For instance, the importance of past events declines in relation to their chronological distance from the present. As an example, the MiG-17 Fresco of 1950 would have much less influence on the MiG-2000 than the MiG-23 Flogger of 1966. Conversely,

MiG Time Line



When introduction dates of MiG jet fighters are plotted, the statistical trend indicates a new design appearing in the year 2000.

for realistic projections, these methods allow for an increasing margin of error in a forecast in proportion to the length of time that the projection is made into the future. The resultant curves are then weighted accordingly. This combination of statistical analysis methods was used to determine the basic characteristics of the future Soviet fighter.

The best available open-source data on the characteristics of MiG production fighters was plotted against their introduction year. Such characteristics as Mach number, gross takeoff weight, wing loading, and thrust-to-weight ratio were then extrapolated to the year 2000.

One complication that had to be addressed was the accuracy of the data on the characteristics of the aircraft. More hard data was available on older aircraft, especially from Soviet sources, than on newer aircraft. Data on the Flogger, the Fulcrum, and in some cases the Fishbed is much softer because of the lack of Soviet data and the secrecy of official Western estimates. However, several reputable and semiofficial sources have made educated estimates, and these were represented by a span of available assessments rather than by single values. Discernible trends were easily established from Soviet aircraft data, in contrast to the randomness of the trends derived from data for contemporary Western aircraft.

MiG Technology Trends

Mach Number. Because of materials and aerodynamic limitations, maximum Mach number has stabilized in the 2.3 to 2.6 range. Since the Soviets use air-superiority fighters to supplement the point-defense interceptor force, the higher Mach number is more likely for the MiG-2000. However, it is interesting to note that the Soviets no longer consider maximum possible altitude and speed as the prime criteria for their fighters. Instead, high-energy maneuvering at lower altitudes is now considered equally important.

Takeoff Gross Weight. With the increasingly complex requirements of each new generation of aircraft, there has been a steady weight growth over time. As Soviet designers introduce more multimission capability into each new fighter and as range requirements increase with evolving military doctrine, takeoff gross weight has increased.

Wing Loading. Before data on the MiG-29 Fulcrum became available, an increased ratio of aircraft weight to wing area (W/S) would have been projected for the MiG-2000. However, the Fulcrum showed a marked reversal in this trend. Two key influences are responsible: more efficient engines that provide more available thrust to overcome the higher drag of a larger wing, and evolving Soviet tactics to counter Western trends and related successes. In fact, Soviet planners are now stating that maneuvering engagements are dependent on lower wing loadings as well as higher thrust-to-weight ratios. They are deemphasizing high-speed interception over the immediate front in favor of theater air superiority.

Thrust to Weight. The T/W trend in Soviet fighters reflects a steady improvement in engine technology. In the past, the Soviets have seemed to lag behind the West in many aspects of turbine technology, but this appearance is deceptive. Actually, they have pursued a wartime production philosophy that requires that, in such areas as engine design, low complexity and high reliability take precedence over the advanced technologies and their attendant high risk. In the past, Soviet designers have, to a degree, compensated for higher fuel consumption by increasing useful payload weight and lowering relative systems weight, thus allowing a larger percentage of the takeoff gross weight to be fuel. However, to fulfill the current long-range fighter mission, the Soviets are now concentrating their efforts on improving the fuel efficiency of their engines.

The Soviets have been evolving toward a tactical maturity that is being driven by new system capabilities and by the new offensive nature of their doctrine. Air combat is no longer viewed as an activity restricted to defense but rather as a fully integrated part of the combined arms offensive. The Soviet fighter pilot must now be an aggressive intruder, always taking the necessary initiative to defeat the enemy or at least to divert enemy attacks from bombers. Operations are no longer limited to friendly territory, but extend deep into enemy territory. The Soviet fighter pilot is expected to dominate the engagement upon arriving in these extended zones.

"Our Air Force has now become a powerful arm of the armed forces of the USSR," said Chief Marshal of Aviation P. S. Kutakhov, Commander in Chief of Soviet Air Forces until his death in 1984. "It is highly mobile and maneuverable, making it possible to shift the efforts of aviation from one sector of the theater of war to another, *to penetrate deep into the enemy rear,* to use different weapons and electronic warfare resources in all-weather conditions, at any time of the day or year, and to make sudden strikes against large permanent and small mobile targets."

The depth of these extended zones of operations can be determined by extrapolating the combat radius trends of the aircraft used for these missions. At first analysis, the trend is not obvious. The MiG-23 Flogger, with a radius of nearly 700 nautical miles, constitutes a notable departure from the much shorter ranges of fighters produced before and after its introduction.

The relatively long range of the Flogger can be explained, though. That aircraft came along at a time when Soviet doctrine had shifted emphasis to extended second-echelon operations. The Flogger was modified in development to take on a long-range role in addition to the traditional MiG interceptor role.

The MiG-29 Fulcrum constitutes a return to the lightweight, shorter-radius fighter philosophy. The longer-range fighter mission has apparently been given to the Su-27 Flanker. Therefore, assuming a short-range/long-range mix, the Fulcrum follow-on, the MiG-2000, is projected to have a *combat radius of approximately 500 miles.*

How the MiG-2000 Would Be Used

The MiG-2000 is seen as escorting fighters and bombers and conducting fighter sweeps. One postulation of Soviet air combat in the opening phases of a conflict is that unescorted attack helicopters and subsonic fixed-wing attack bombers would take care of operations at and immediately beyond the forward edge of the battle area (FEBA). Heavy concentrations of surface-to-air missiles (SAMs) make these zones a high-risk, low-payoff environment for escort fighters. MiG-2000 fighter sweeps would take place beyond this SAM belt.

Success in the combat phase of the mission, according to the Soviets, is achieved by first-pass kills. Older, limited-aspect infrared (IR) missiles required intercept within visual range and from the aft quadrant. Modern,

all-aspect missiles, when used by more capable aircraft, allow beyond-visual-range (BVR) tactics. As a result, Soviet tactics strive for a seventy percent probability of kill in the first pass by opening with a BVR engagement.

Long engagement time must be avoided. If a decision is not rapid, the Soviet pilot will disengage. General Tuzov of the Soviet Air Forces defines the initial maneuver and fire, as well as the number of weapons, as the crucial components of the air combat phase. In this context, the Soviets are placing a minimum of *four and as many as eight missiles* on each fighter and have *reinstalled the gun.*

The mission profile *(see adjacent diagram)* calls for acceleration to a supersonic Mach number to traverse the SAM belt, deceleration to optimum cruise speed, and then acceleration to supersonic speed prior to combat. At the maximum combat radius, the fighter must be able to make at least three high-energy maneuvers. These were defined by extrapolating basic F-16 maneuvering requirements. After disengagement, the fighter drops back to optimum cruise speed until it reaches the SAM belt, which it crosses in a supersonic dash. It should be able to loiter for five minutes before landing at its home base. There are several requirements for an aircraft to accomplish such a mission successfully, and they should be achievable with a design derived from the trend extrapolations.

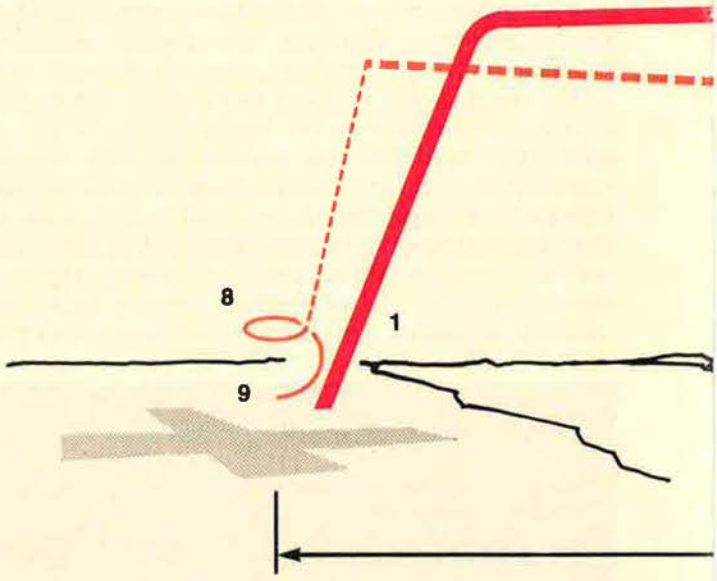
High-energy maneuvering capability is critical to successful combat. The Soviet tactician sees little advantage in continuing a combat encounter beyond two or three passes. This philosophy of very short combat engagements has evolved in consonance with the all-aspect missile, which reduces the importance of sustained maneuverability. Therefore, in order to achieve quick kills, the pilot must have a *high instantaneous-turn capability* so that he can quickly point his nose in the general direction of the target and fire.

These extreme, instantaneous maneuvers during the combat stage will produce very high G-loads. High thrust to weight must be coupled with a *sophisticated flight control system.* These maneuvers also emphasize the one limiting factor in all high-G environments—the pilot. Thus, to maximize the benefit of advanced maneuvering capabilities, there is a need for *high-G cockpit* design.

Basing should be as close to the front as possible to maximize the penetration depth. In accordance with standing Soviet criteria, the aircraft would be equipped with *rough field landing gear* to enable it to operate from austere, forward airfields. Additionally, to operate from locations other than airfields—roads, for example—short takeoff and landing (STOL) capability is required.

The aircraft must operate efficiently at supersonic speeds at medium to high altitudes and at high transonic speeds at lower altitudes. The aircraft propulsion system and overall configuration must present stealthy low-observables signatures in order to operate against an adversary whose sensors are increasingly capable. The aircraft must have advanced electronic warfare systems because of the extended time spent deep within enemy territory. Self-protection jammers, secure IFF, and secure data link communications would be required. Weapons must not degrade performance or increase observability while being carried.

MiG-2000 Mission Profile



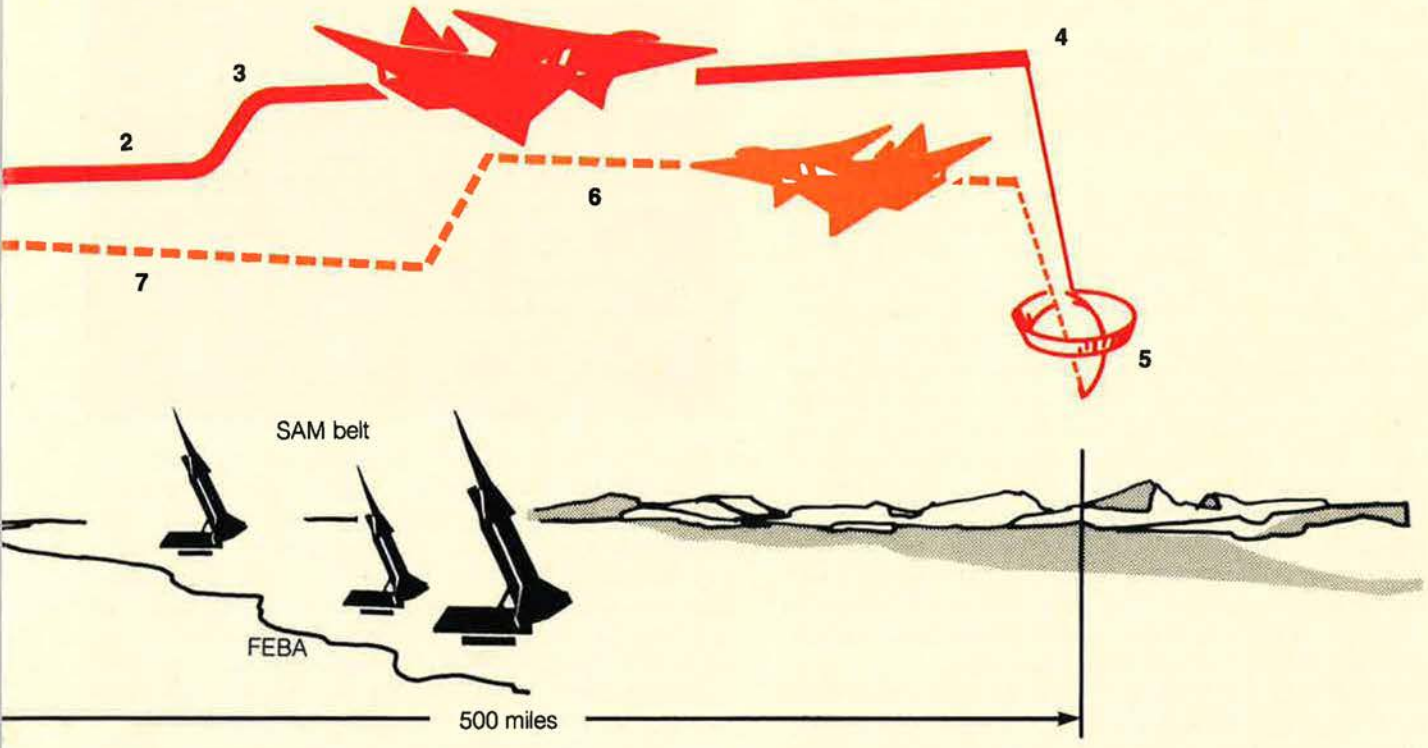
1 Take off and accelerate to supersonic dash altitude
2 Supersonic dash
3 Slow to optimum cruise
4 Accelerate to supersonic combat speed
5 Combat (slashing attack)

The Soviet engineer follows a doctrine of designing an aircraft that is adequate—but not excessive—to mission requirements, a rugged and reliable system using a limited but highly standardized variety of components. These components must be producible by low-skilled manpower under wartime conditions. In the past, the engineer has been able to develop clever solutions to fit these constraints.

Guidelines for the Designer

The designer will follow a number of guidelines: Meet design requirements while respecting the "production as if in wartime" doctrine; design for production with low-labor-skill levels, limited advanced materials and processes, and minimum reliance on outside sources; be conservative in rating the levels of component quality; pay close attention to design quality, but only where necessary; use only those technologies that have been proven and approved by the military customer; minimize maintenance and maximize availability during short, intense combat conditions; and limit performance to feasible, low-risk goals.

The configuration thus derived is a single-seat, cranked-delta-canard/wing, twin-engine design. This concept is based on the author's interpretation of Soviet military doctrine, historical trends in Soviet fighters, mission



6 Optimum cruise
7 Supersonic dash
8 Loiter
9 Land

In a typical mission profile, the MiG-2000 would accelerate to supersonic speed to traverse the SAM belt, be able to perform three high-speed high-energy maneuvers in the target area, egress supersonically, and be able to loiter for up to five minutes before landing.

requirements, Soviet design practices, and basic design considerations. In following this approach, each design consideration was investigated separately.

• *Propulsion.* Several Western advanced-cycle engines were considered as models for the prospective powerplant, since very little open-source data is available on present Soviet military engines. Because the Soviets tend to simplify designs of military systems—in keeping with the doctrine of high reliability and low systems complexity—an advanced but low-risk Western engine cycle was substituted for this study. The engine was simulated by an advanced Pratt & Whitney fighter/attack/interceptor parametric-performance propulsion system model. The engine cycle was matched with an appropriate two-dimensional, thrust-vectoring/reversing nozzle and a variable-geometry inlet to model a complete propulsion system.

Several benefits are possible with nonaxisymmetric nozzles. For example, both high-energy maneuvering and STOL capability are enhanced with the less complex vectoring possible with a two-dimensional nozzle, as contrasted to a symmetrical, or three-dimensional, nozzle.

• *Crew Station.* The cockpit layout incorporates several features to increase the G-tolerance of the pilot. Such items as variable seat-back angle, raised heel rest, and side arm controllers are included to sustain the nine-G-plus conditions encountered during extreme, instantaneous-turn-rate maneuvers.

• *Surfaces.* For some time, Soviet literature has shown a marked interest in wing/canard layouts. When a canard is combined with vectorable nozzles, fly-by-wire, and relaxed static stability, an interesting configuration results. Not only will the canard be an aerodynamic control device, but it can also be used to trim the vectored thrust during certain high-angle-of-attack maneuvers and STOL operations. The all-moving tips are another device in which the Soviets have shown an interest. One of their approaches has been to attach the surface along a hinge line rather than with trunnions.

• *Landing Gear.* Landing gear on Soviet military aircraft are designed for much more rugged operation than are those on Western aircraft. This feature is attributable to the unusually severe environment in which they must operate and the requirement for aircraft to be ready for military commanders to call upon, regardless of the terrain available for runway. Therefore, gear layout usually incorporates relatively low-pressure tires, in conjunction with lever suspension for operations on sod or packed ice.

• *Armament.* The Soviets have been increasing missile loadings on their aircraft as a result of the increased

reliability and enhanced capabilities of their missiles. However, the inherent drag of several externally mounted weapons can seriously degrade the performance of an otherwise high-performance design; thus, for drag considerations, the MiG-2000 incorporates an internal weapons bay. Guns are included as a hedge against electronic countermeasures, which could foil missiles. On the assumption that the Soviets will be returning to more lethal armament, two 30-mm cannons are included.

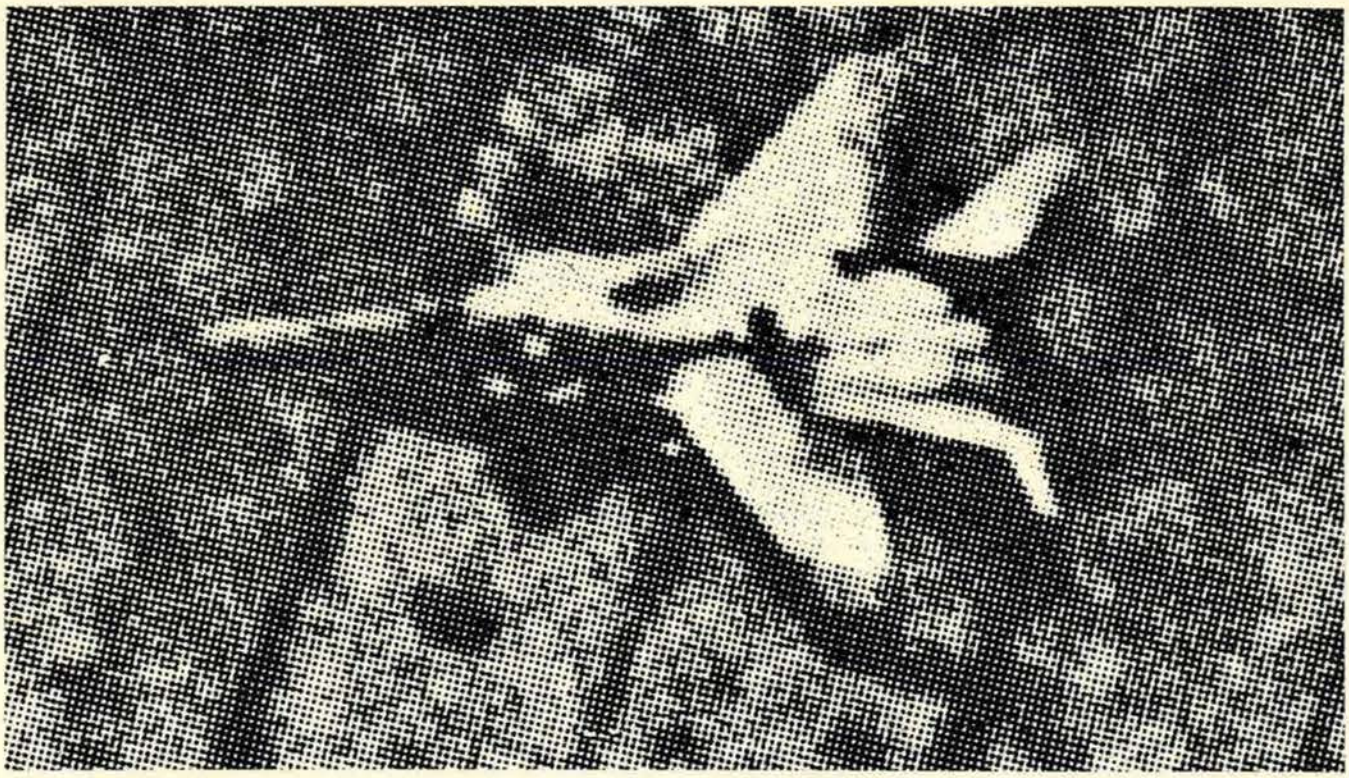
• *Systems.* In concert with the "production as if at war" philosophy, assured reliability is designed into all weapon systems. Additionally, since most new Soviet recruits possess little or no technical background, maintenance has to be "soldier-proof." Organizational-level maintenance is kept at a minimum by designing systems at the lowest level of technology possible. In fact, many systems are derated to maintain the required level of reliability. Most on-board systems are repaired at the depot level, virtually eliminating intermediate-level maintenance. Thus, the commander requires only a semitrained support cadre to maintain his assets, reducing the amount of time needed to integrate new recruits and recently recalled reservists into operational units. Additionally, without large maintenance facilities to support, air bases can be smaller, much more austere, and, importantly, much less vulnerable.

• *Materials.* The Soviets have for some time been developing a composites industry. By the year 2000, it should be mature enough to use this materials technology for most airframe components. The weight saving from the use of composites is well known; however, in the case of Soviet aircraft, the beneficial characteristics can be greater. This is because high composite strength, and therefore weight savings, is negated with cutouts. Western aircraft have a multiplicity of access panels, each requiring fasteners, in contrast to the few inspection ports and limited number of access panels in Soviet aircraft. Soviet emphasis on depot maintenance decreases the importance of easy flight-line access to internal components. It is expected that the MiG-2000 will incorporate a high percentage of composites.

• *Stealth.* To be effective, a military aircraft must be able to deliver a payload to its destination with a high probability of surviving enemy defenses while en route;

MiG-2000 Optimized Characteristics

Maximum Mach Number	2.6
Wing Loading (lbs./sq. ft.)	77
Thrust Loading	1.15
Fuselage Fineness Ratio (length to equiv. diameter)	11.1
Fuel Fraction	35%
Two BVR and Two IR Missiles Stowed Internally	
Two 30-mm Cannons with 300 Rounds of Ammunition	
Single-seat, High-G Cockpit	
Nonaxisymmetrical Vectored Nozzles with Thrust Reversing	
Rough-field Landing Gear	
Advanced Flight Control System	
Integrated Stealth Features	



The MiG-29 Fulcrum shows a design trend back to the lightweight, shorter-range fighter. About the size of the F-16, although almost an F-15 look-alike, the Fulcrum promises to deliver a "swing" capability with its ability to perform on an almost equal basis in the air-to-air or air-to-ground arenas.

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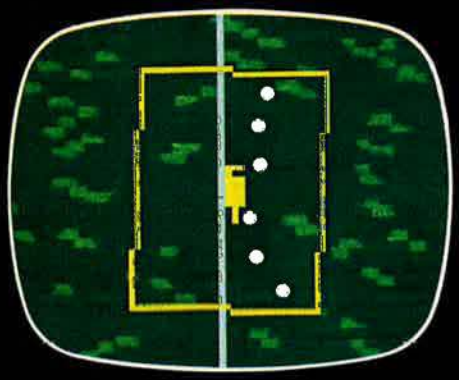

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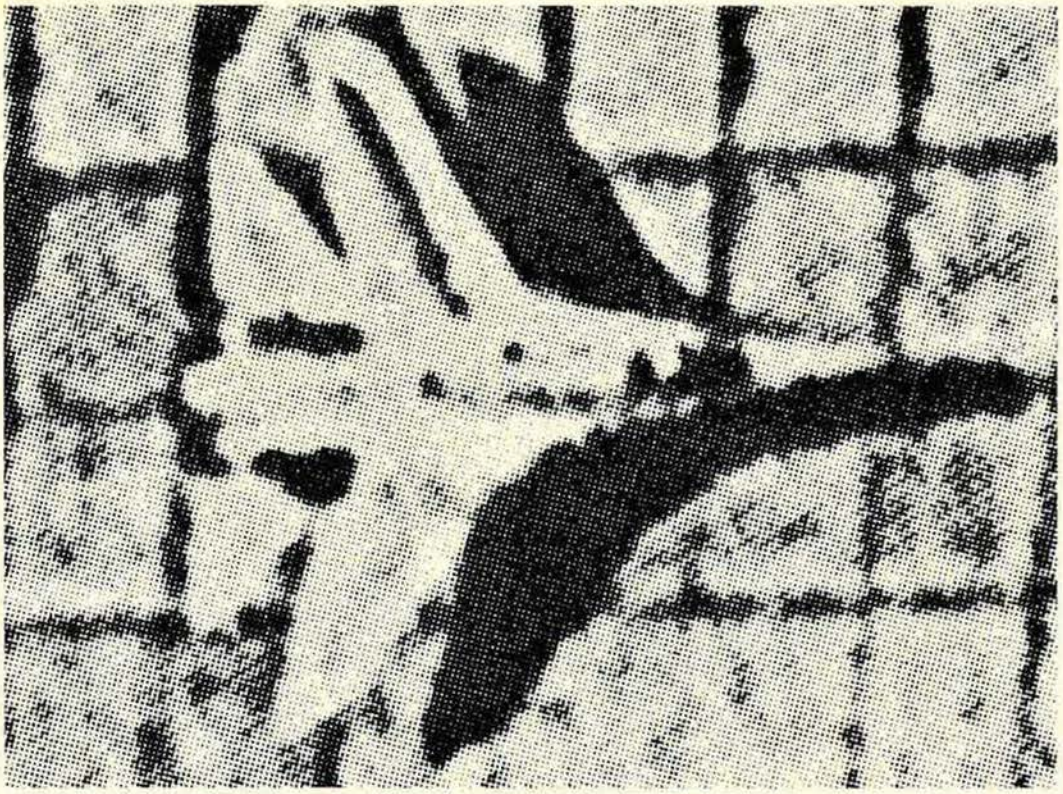

The Su-27 Flanker apparently has been assigned the longer-range mission given to one of its predecessors, the MiG-23 Flogger. Unlike the Flogger, which was modified to assume the long-range interceptor role, the Flanker was originally designed for it.

thus, the ability to evade enemy detection becomes paramount. In the past, electronic countermeasures, speed, and maneuverability have been the principal methods used to achieve this end, usually at some cost to performance or payload. However, if these methods and new low-observables technologies are integrated concurrently during the conceptual design stage, a lighter, lower-cost configuration would result. A more optimum balance among competing design features would be possible, and a number of Stealth features could be incorporated with much less penalty.

• *Maneuverability.* Rate of climb and rate of turn of the optimized MiG-2000 were plotted for comparison against the maneuvering capability of preceding aircraft. Rate of climb, better than 65,000 feet per minute, is consonant with the historical trend curve. However, rate of turn for the MiG-2000 is figured to be about twenty degrees per second. This is well below historical curve projections—if the data for the MiG-23 Flogger is included. The Flogger turns at only about half the rate foreseen for the MiG-2000. It should be remembered that the Flogger is something of an aberration in the trend pattern, as seen in the earlier discussion of combat radius. It appears that the Soviets, in the case of the Flogger, traded some maneuverability for range.

When postulating a future Soviet weapon system, there is a tendency to predict what the Soviets are capable of accomplishing and not what the trends indicate they will actually accomplish. The fact is that the Soviets are perfectly capable of conceiving any number of advanced weapon systems, but a projection based on that premise will be unrealistic, inaccurate, and unnecessary. The Soviets have shown and their doctrine dictates that they will follow preplanned patterns in virtually all national endeavors. Military aircraft are no exception. Therefore, if the trends and doctrine are interpreted correctly, the next generation of Soviet fighters should hold few surprises. The inertia and character of their system is such that deviations by Soviet designers from conservative, previously established plans are much less likely to occur than under the high-risk requirements imposed on Western designers.

The MiG-2000 design illustrated in this article is, of course, only hypothetical and is based solely on open-source data. Nevertheless, it does serve as a focus on Soviet aviation technology trends as well as on where future research may be concentrated. Therefore, the exact configuration of the next Soviet fighter is not as important as the determination of its potential performance. Several different configurations can provide similar performance levels, but military analysts are interested only in capabilities.

The Soviet leadership has always expressed the need for advanced combat aircraft and has shown little hesitation in providing whatever manpower, resources, or industry is required. To reach required military levels, the Soviets have supported procurement goals fully in the past. By all indications, they are still as determined as ever. ■

As a Senior Engineering Specialist at General Dynamics Corp.'s Fort Worth, Tex., facility, Richard D. Ward is the lead designer on advanced-design programs. A recipient of a B.S. degree in aeronautical engineering from the University of Oklahoma in 1962, his career in the aviation industry has included work with Rockwell and McDonnell Douglas. He has participated in the X-15, B-70A, F-4, F-15, and F-18 programs. For the past sixteen years, he has been a configuration designer on conceptual design programs that have included design analysis of foreign aircraft, with emphasis on Soviet design and procurement practices. He is the author of the article "The Structured World of the Soviet Designer" in last year's Soviet Aerospace Almanac.

A Soviet attack in Europe would come in two phases, the first being independent of ground forces.

New fighters like the MiG-29 Fulcrum would have key roles to play in any Soviet attack on NATO Europe.

FRONTAL AVIATION'S ONE-TWO PUNCH

BY JAMES P. COYNE, SENIOR EDITOR

A Soviet attack on NATO would be a preemptive one, analysts of Soviet affairs believe, that would come in two separate efforts. The first would be independent of ground forces and aimed principally at NATO's theater nuclear forces, as well as at targets critical to the nonnuclear defense of Western Europe. This attack would be carried out by more than 2,000 tactical aircraft flying in three waves, supported by about 1,000 air-to-air fighters. The second effort would be in support of a devastating ground attack, with remaining Soviet air assets providing close air support, reconnaissance, and battlefield air superiority.

Tactical aircraft carrying out the attacks would be the swingwing Su-24 Fencer-A, MiG-27 Flogger-D/J, and Su-17 Fitter-D/H, as well as the new Su-25 Frogfoot, which in Afghanistan has proved itself to be as good as the US A-10 is designed to be. The new MiG-29 Fulcrum would also be in operation. Air-to-air aircraft in support would be the MiG-23 Flogger-B/G, the MiG-25 Foxbat, and the old MiG-21 Fishbed-L, as well as two brand-new interceptor/air-superiority fighters—the Su-27 Flanker and the MiG-31 Foxhound.

Supporting the entire force would be An-12 Cub-C electronic warfare aircraft flying in orbits at about 35,000 feet fifty to sixty miles inside Warsaw Pact territory. The mission of these aircraft would be to jam all radar and radio transmitters in central Europe for as long as possible, keeping US Hawk antiaircraft missile batteries from firing and preventing, or at least making more difficult, the direction and employment of NATO air defense assets. Soon, significant numbers of the new Soviet AWACS, the Il-76 Mainstay, will be available for early warning, command and control.

The Soviet attack would be prosecuted by aircraft assigned to Frontal Aviation (composed of the air forces of the Military Districts), the tactical air arm of Soviet Air Forces. Aircraft of client states would probably be used primarily for home defense.

Analysis of current Frontal Aviation employment and doctrine reveals a major change in Soviet military thought toward tactical (as opposed to strategic nuclear) warfighting, especially over the last decade. As long ago as 1977, Frontal Aviation was getting about twice as much of Soviet defense spending as was the entire Strategic Rocket Forces. Today, the Soviets have reorganized their tactical air forces and the orientation of the mission has swung to deep offensive interdiction independent of ground forces while retaining the close air support and battlefield interdiction missions.

Four New Fighters

The four newest Soviet fighter aircraft—the Su-25 Frogfoot, Su-27 Flanker, MiG-29 Fulcrum, and MiG-31 Foxhound—are admirably suited to carrying out the Frontal Aviation mission. All have fixed-geometry wings, following the trend of recent Soviet designs.

The twin-engine Frogfoot is the Soviet counterpart to the US A-10. Subsonic, it operates in the very low altitude regime—as low as 250 feet—employing an internal, high-rate-of-fire gun, bombs, and rockets against point targets or for close air support. Sleeker than the A-10, the Frogfoot is almost 100 knots faster, with a top speed of 475 knots. Its radius of action is slightly shorter, 550 kilometers, but its bomb load, 4,000 kilograms, is the same as that of the A-10. Among the munitions the Frogfoot has been observed to expend in Afghanistan are 57-mm and 80-mm unguided rockets and various types of bombs, including antipersonnel and incendiary submunitions. No "smart bombs" are reported to have been employed from the Frogfoot in Afghanistan.

Over the months of its employment, its effectiveness has increased significantly as accuracy of the computing sight has improved. It is regarded as the most feared weapon system in Afghanistan. The Frogfoot would be a significant asset in a Soviet attack on NATO.

Even Better Than High Lark Radar?

The MiG-29 Fulcrum, a twin-engine, single-seat aircraft, is a little larger than its US equivalent, the F-16, although with its twin tails, it resembles somewhat a scaled-down F-15. Equipped with a head-up display (HUD) in the windscreen and a look-down/shoot-down radar capability, the Fulcrum seems ideally suited to be a "swing" fighter—able to perform either the air-to-air or air-to-ground role. Its estimated top speed is Mach 2.3, with a service ceiling of 65,000 feet. Thrust-to-weight ratio, carrying air-to-air missiles only, is 1.3 to 1, comparable to the F-16 or F-18.

The Fulcrum is probably equipped with something even better than the new High Lark radar, which is now on the MiG-23 Flogger-B. This new advanced radar should give the Fulcrum the capability of detecting head-on a low-flying aircraft with a radar cross section of only one square meter when it is forty kilometers away and locking onto the target at twenty kilometers.

It is probably equipped with the new AA-9 air-to-air missile, which is comparable to the latest version of the US AIM-7 Sparrow. This radar-guided Soviet missile is believed to have an effective look-down range of about seventeen kilometers head-on against a one-square-meter target and a tail-on range against the same target of about ten kilometers. For close-in engagements, the Fulcrum can employ the all-aspect AA-8 Aphid. This IR-seeker can be fired at head-on targets as far as seven kilometers away and as close as breakaway ranges. A typical air-to-air configuration would be four radar-guided missiles and two heatseekers.

The Fulcrum also is equipped with an internal cannon, probably the twin-barrel GSh-23. With a 3,000 round-per-minute rate of fire, the 23-mm gun has an effective range of about 500 meters and can be employed in either the air-to-air or air-to-ground role.

In the air-to-ground role, the Fulcrum can carry up to 4,000 kilograms of bombs on six hardpoints under the wings. For a typical interdiction mission, carrying up to four 500-kilogram bombs and an external fuel tank on a hi-lo-hi profile, the Fulcrum would have a combat radius of about 700 kilometers.

Air-to-Air

The Su-27 Flanker is the Soviet counterpart of the US F-15. Armed with eight air-to-air missiles, the Flanker has an estimated combat radius of more than 350 nautical miles. Like the Fulcrum, it is a single-seat, twin-engine fighter with twin tails. Thrust-to-weight ratio is about 1.2 to 1, or in the F-15/F-16 range. Like the F-15, the Flanker is considerably larger and heavier than the Fulcrum. Like the Fulcrum, it is equipped with a new pulse-Doppler radar with a track-while-scan capability and probably with infrared search and track capability as well. It is equipped with a new medium-range radar-guided air-to-air missile with active-radar terminal homing, probably the same equipment as on the MiG-29 Fulcrum.

Originally a swingwing aircraft like several earlier Soviet fighters, the Su-27 has gone into production with a fixed-geometry wing.

The Flanker is equipped with a high-rate-of-fire 23-mm internal gun. Like the F-15, it can also carry air-to-ground weapons, although it is believed it will be used principally in the air-to-air role. Unclassified observer reports credit the Su-27 with a combat radius of more than 300 miles, carrying up to twelve 500-kilogram bombs. The aircraft has a HUD that displays information and symbology for navigation as well as for air-to-air and air-to-ground weapons employment.

The largest of the new aircraft, and the one most optimized as an interceptor, is the MiG-31 Foxhound. Already in the field, it is an updated variant of the Mach-3 MiG-25 Foxbat (although US analysts believe the Foxhound's top speed is Mach 2.4). The MiG-25 fuselage has been extended to provide a second cockpit for this twin-engine, twin-tail aircraft.

It is believed the Foxhound was developed specifically to counter the US B-1B. Carrying eight radar-guided AA-9 missiles with active radar terminal guidance, the Foxhound has reportedly scored kills from above 20,000 feet on high-velocity targets below 200 feet. It is equipped with four wing pylons for carrying missiles (although it is believed some missiles are carried semi-conformally on the fuselage), while each outer pylon can carry a 2,000-liter fuel tank. Some sources credit it with a range of more than 1,000 miles. Because of its size and internal fuel capacity, it has significantly longer endurance than other new Soviet fighters, which is in keeping with its long-range interceptor role. ■

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Much improved over the past decade, naval airpower is expanding its scope of operations.

SOVIET NAVAL AIR MOVES UP AND OUT

BY NORMAN POLMAR

THE current modernization programs of Soviet military aviation and the Soviet Navy are jointly benefiting Soviet Naval Aviation (*Aviatsiya Voyenno-morskogo Flota*, or AV-MF). During the past decade, Soviet Naval Aviation has increased significantly, both qualitatively and quantitatively.

In total, Soviet Naval Aviation now flies more than 1,600 aircraft—an increase of more than fifty aircraft per year during the past five years. Thus, Soviet Naval Aviation is the world's second largest naval air arm, with just over 1,600 aircraft. That makes AV-MF larger than the air forces of Great Britain, France, or West Germany. (US naval aviation, which includes Marine Corps and Navy aircraft, has approximately 5,600 aircraft in active service.) As important as sheer numbers has been the significant infusion of new combat and support aircraft into Soviet Naval Aviation in the past few years. And Soviet shipyards are producing aircraft carriers—the largest warships to be built in the USSR, with the newest hull being the largest warship constructed since World War II by any nation other than the United States.

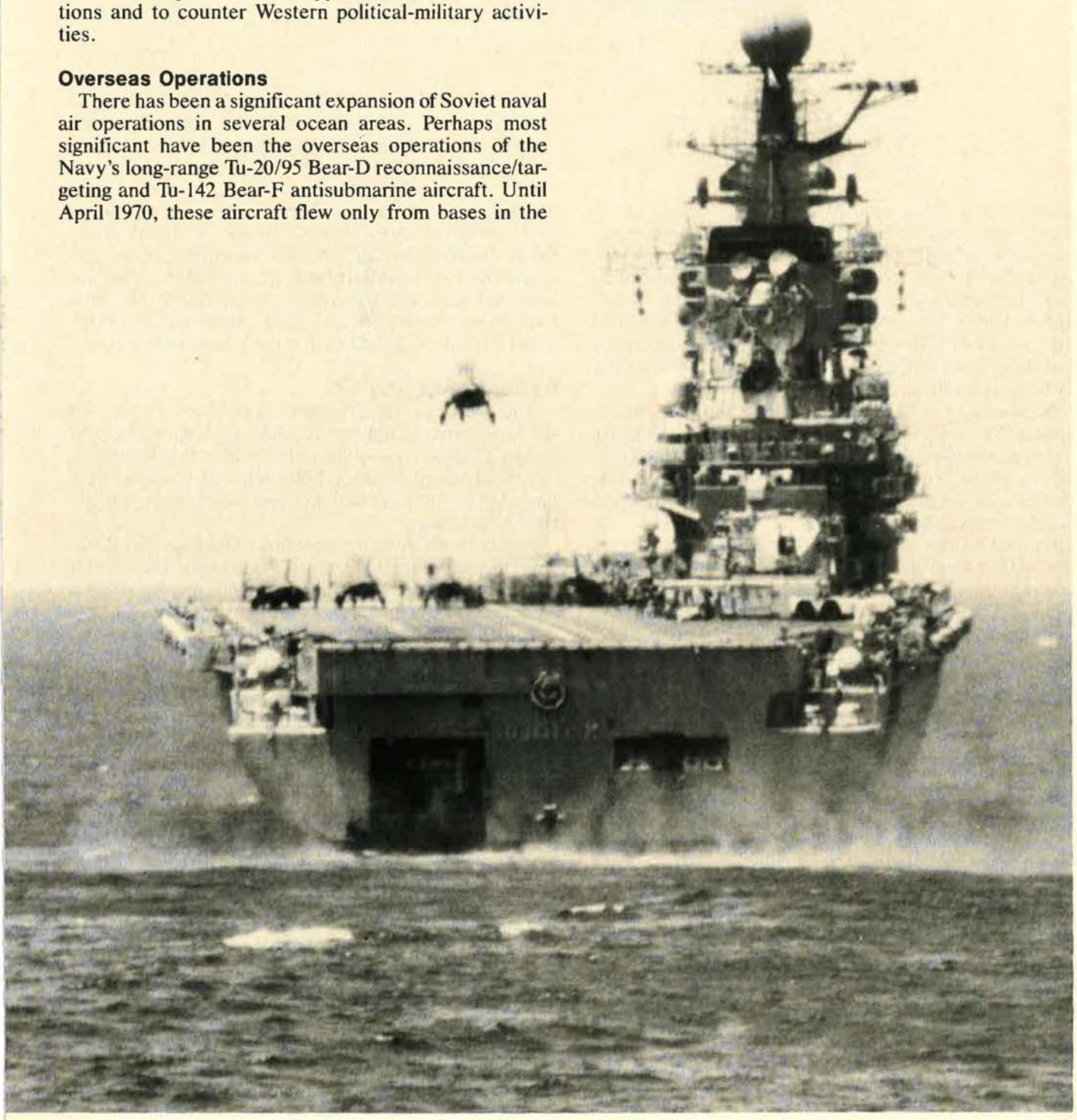
Still, there is evidence that the Soviet Navy will encounter problems over the long term because of the high

costs of modern warships and the changing political-military leadership in the Soviet Union. But at this writing, the Soviet investment in AV-MF continues at a high rate.

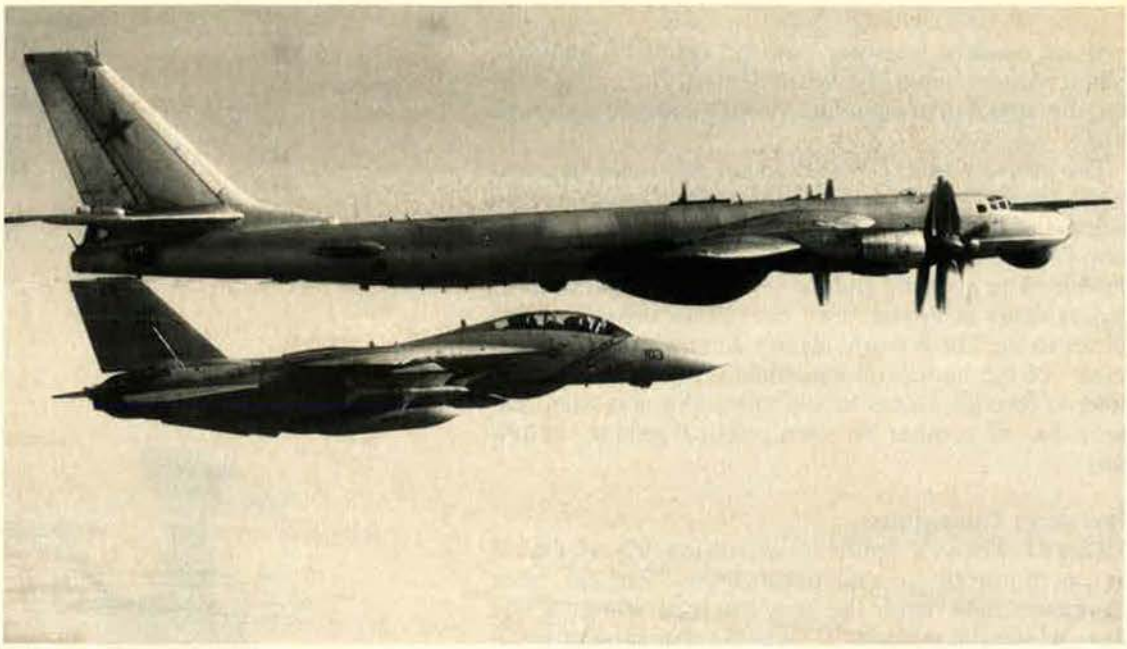
The primary role of Soviet Naval Aviation—like that of the Soviet Navy and of the other armed forces—is the defense of the Soviet homeland. However, Naval Aviation, like most components of a navy, tends to be highly flexible. The periodic and, in several areas, continuous deployments of Soviet naval aircraft as well as surface forces to the Third World clearly demonstrate that "defense" of the homeland now includes sustained operations in foreign waters to support client and allied nations and to counter Western political-military activities.

Overseas Operations

There has been a significant expansion of Soviet naval air operations in several ocean areas. Perhaps most significant have been the overseas operations of the Navy's long-range Tu-20/95 Bear-D reconnaissance/targeting and Tu-142 Bear-F antisubmarine aircraft. Until April 1970, these aircraft flew only from bases in the



Seen from astern, the Soviet carrier **Minsk** *makes way in the Pacific. This* **Kiev**-*class combatant, one of four now in service, carries Yak-38 transonic VTOL fighter-attack aircraft.*



Shadowed by a carrier-based US Navy interceptor, a Soviet Bear-D reconnaissance/missile-targeting aircraft has eyes for the US Atlantic Fleet. Bear-Ds have operated from a base in Cuba since 1981, routinely plying airspace off the US east coast as well.

Soviet Union. That year, as part of the *Okean* multiocean exercises, a pair of Bear-D reconnaissance aircraft took off from bases on the Kola Peninsula, flew around North Cape, overflew Soviet warships operating in the Iceland-Faeroes gap, and continued southward to land in Cuba. This nonstop flight of more than 5,000 miles marked the first time that Bear aircraft had landed outside of Soviet-bloc countries. The pair subsequently refueled and returned to their Soviet bases.

Another pair of Bear-D aircraft flew into Cuba in late April 1970, and a third pair in May, initiating a regular deployment schedule for the four-turboprop aircraft. In 1973, pairs of Bear-D aircraft began to land at Conakry, Guinea. On several occasions, Bears from Cuba and Conakry appear to have carried out coordinated reconnaissance of the south and central Atlantic. Bears ceased flying out of Conakry in 1977, calling instead at Luanda, Angola, and crossing the Atlantic between Cuba and Angola. Bear-D aircraft flying from Luanda conducted surveillance flights against British naval forces en route to Ascension Island during the 1982 Falklands conflict.

The Bear flights to Cuba continued on a regular basis, averaging five flights of two or more aircraft per year until 1981. Since November 1981, the Soviets have used Cuba's San Antonio de los Banos military airfield for regular operations by Bear-D recon aircraft and, since early 1983, for the antisubmarine Bear-F. En route to and from Cuba, the Bears regularly conduct surveillance off the US Atlantic coast, generally flying 200 to 250 miles offshore.

On the other side of the world, after the fall of South Vietnam, the Soviets began operating naval aircraft from the former US air base at Cam Ranh Bay. Bear-Ds and Fs have been flying from Cam Ranh Bay on a continuous basis since 1979. Also seen on the tarmac at Cam Ranh Bay are Tu-16 Badger missile-carrying strike aircraft, Badger electronic aircraft, antisubmarine aircraft, and fighters.

In addition to using airfields in Angola, Cuba, Ethiopia, Libya, South Yemen, Syria, and Vietnam, Soviet naval aircraft are now seen overseas on an increasing basis aboard aircraft carriers, cruisers, and destroyers. While the Soviet aircraft carriers are inferior in size and capability to US aircraft carriers, the Soviet ships' aircraft, missiles, and electronics probably provide them with more combat effectiveness than any warships afloat except for the thirteen large US aircraft carriers.

Strike/Bomber Aircraft

The primary strike elements of the Soviet Navy are the land-based strike aircraft and the large number of Soviet torpedo and cruise-missile attack submarines. The land-based aircraft, however, can concentrate a large strike force rapidly and can attack more quickly than submarines.

Soviet Naval Aviation now has more than 100 Backfire-B/C and 240 Badger strike aircraft, the former armed with the AS-4 Kitchen antiship missile. With a standoff range of more than 200 nautical miles, the AS-4 carries either a nuclear warhead or an estimated 2,000 pounds of high explosives. The missiles are released at medium altitudes by the bombers and then climb to perhaps 70,000 or 80,000 feet before plunging down at a steep angle against enemy warships. The AS-2 Kipper, AS-5 Kelt, and AS-6 Kingfish antiship missiles have also been observed on the Badgers.

The Navy receives about half of the Backfires as they come off the production lines. The total number of strike/bomber aircraft has been steady over the past few years, meaning that the older Badgers and Tu-22 Blinders are being retired as the Backfires enter service. The Badgers that carried only gravity bombs are fast disappearing from naval service; thus, older Badgers, as well as Blinders, which never carried missiles in naval service, are being slowly phased out in favor of the newer planes. The bomb-carrying Blinders have virtually no capability against a modern warship, but could be used effectively against undefended merchant ships and to support amphibious landings. They are now used primarily for reconnaissance.

It is anticipated that the Blackjack strike aircraft will

enter service with Soviet Naval Aviation later in this decade.

Reconnaissance/Electronic Aircraft

Targets for antiship missiles are detected by two types of satellites using active radar and passive electronic intelligence (ELINT) methods and by modified bomber-type aircraft. The Bear first entered naval service in the early 1960s as the Bear-D reconnaissance/targeting aircraft. This aircraft is fitted with the large Big Bulge surface-search radar in the ventral position and has the smaller Short Horn bombing-navigation radar under the nose. It has the small glazed nose of the Bear-A and a fixed refueling probe.

The Bear-D's mission is to seek out Western ships and provide targeting data for Soviet surface ships and submarines armed with the SS-N-3 Shaddock and newer SS-N-12 Sandbox antiship missiles. The Bear uses a video data link to provide a radar picture of the target ships to the missile shooter, permitting the launching ship or submarine to give in-flight guidance corrections to the missile. The Bear-D does not carry offensive weapons; however, it retains the defensive armament of up to seven 23-mm cannon. The aircraft is credited with a range of 9,000 nautical miles that could be extended through in-flight refueling.

The Soviet Navy also uses Badger-D/E/F reconnaissance aircraft, as well as a few Blinder-C variants. While these aircraft and the Bears would be vulnerable to enemy fighter aircraft during wartime, they could certainly perform during crises up to the moment of shooting—and beyond that point if the enemy cannot bring fighter aircraft to the area.

Since the 1970s, US Navy officials have spoken of Soviet satellites actually targeting Western warships for long-range missiles. Antiship missiles with longer ranges and lock-on after launch capability could further complicate defense against these weapons.

Strike aircraft are accompanied by Badger-H/J aircraft fitted as standoff jammers and escort jammers to help the missile shooters penetrate task force defenses. Each regiment of some twenty Badger strike aircraft also contains several specialized jamming aircraft. The newer Backfire aircraft may carry the equivalent of a jamming aircraft's electronic countermeasures (ECM) gear within its large tail fin, reducing the need for additional aircraft.

A final component of Naval Aviation's strike forces is the seventy-five Badger-A tankers. These planes can refuel any of the strike/bomber aircraft, as well as the Bear-D reconnaissance and Bear-F antisubmarine planes. (Although under US-Soviet agreements the Backfires do not have refueling probes fitted, they can be rapidly configured for in-flight refueling.)

Antisubmarine Aircraft

Since the early 1960s, when the first US Polaris strategic missile submarines went to sea, antisubmarine warfare (ASW) has been of major importance to the Soviet Navy. Soviet Naval Aviation has two types of ASW aircraft—fixed-wing patrol planes that are land based, and helicopters, which are based aboard ships and ashore.

In general, aircraft have limited submarine-search capabilities compared to submarines, surface ships, and sea-floor acoustic systems. Without a large sea-floor system like the Sound Surveillance System (SOSUS) serving the United States and its allies, the Soviet Navy has not seen fit to invest in a major force of patrol/ASW planes like the West's several hundred Lockheed P-3 Orions. Rather, the Soviets have about 200 fixed-wing ASW aircraft—fifty-five of the Bear-F version of Tupolev's turboprop giant; fifty Il-38 May four-turboprop aircraft, adapted from the Il-18 commercial airliner; and ninety-five of the older, twin-turboprop Beriev M-12 Mail flying boats.

The Bear-F began to enter service in the early 1970s. It is a slightly larger version of the Bear-D, with the fuselage stretched forward of the wing. The F variant has only a small ventral Wet Eye search radar and no nose radome. What appears to be a magnetic anomaly detection (MAD) device is mounted at the top of the tail fin. The Bear-F carries a large payload of sonobuoys and ASW torpedoes; presumably, it can also carry nuclear depth bombs. The Bear-F is the only Soviet fixed-wing ASW aircraft believed to be in production at this time.

While the Bear-Fs fly long-range searches over the Arctic, Atlantic, and Pacific Oceans, the Mail and May aircraft tend to fly coastal ASW patrols. Of all Soviet ASW forces, the ASW planes appear to pose the least threat to Western submarines.

Soviet* Moskva *helicopter carrier at anchor. Aft,* Moskva *and her sister ship* Leningrad *each carry up to fourteen Ka-25 Hormone antisubmarine warfare helicopters and a utility variant. Forward, each is outfitted and armed as a missile cruiser, deploying antiaircraft and ASW weapons.

Fighter/Attack Aircraft

The Soviet Navy has operated a land-based fighter force during most of its history. In the late 1950s, Naval Aviation was stripped of several hundred fighters, and they were transferred to the national air defense forces (then PVO-Strany).

During the 1970s, a regiment of about forty Su-17 Fitter-C/D fighter-attack aircraft was established in the Baltic Fleet. The exact mission of these aircraft has not been identified in the open press; however, they are probably intended to provide close air support for amphibious operations in the area. In the early 1980s, a second Fitter unit was established in the Pacific Fleet, bringing to some seventy-five the number of these land-based fighters flown by Soviet Naval Aviation.

In 1975, the Soviet Navy obtained a ship-based fighter-attack capability for the first time with the completion of the VTOL carrier *Kiev*. This 38,000-ton warship operates the transonic Yak-38 Forger VTOL aircraft. Ten to thirteen Forgers have been observed aboard these ships—generally one two-seat Forger-B model and the remainder single-seat A variants. Counting pipeline and training aircraft, some sixty Forgers are reported in service for the three operational *Kiev*-class ships.

The construction of a larger, at least 65,000-ton aircraft carrier, which will operate aircraft that can be catapulted and brought back aboard with arresting wires, will require the development of conventional high-performance aircraft. In 1979, *Aviation Week and Space Technology* magazine reported that US satellites were photographing what appeared to be a modified MiG-27 Flogger-D/J being used to test catapults and arresting gear at a shore base. The MiG-27 or another aircraft could be adapted for the large carrier, or a new aircraft may be in development. Again, the decision to construct such a large ship—which could embark more than sixty aircraft, a majority of them fighter or fighter-attack aircraft—indicates a major commitment of resources to Naval Aviation.

Helicopters, Transports, and Trainers

The Soviets, longtime leaders in rotary-wing aircraft development, are currently producing several helicopter types, with at least two naval models in series production. The Mi-14 Haze-A is an extensively redesigned Mi-8 Hip, with an amphibious "boat" hull and ASW sensors and stowage for ASW torpedoes. This helicopter is land-based (the lifts on Soviet helicopter and VTOL carriers are too narrow to accommodate the Haze).

For shipboard use, the Soviets have flown the Ka-25 Hormone-A for ASW and the B model for over-the-horizon targeting of enemy warships for ship-launched missiles for more than a decade. The Hormone-A has various ASW sensors and weapons; the B has a modification of the Big Bulge radar found in the Bear-D and equipment for relaying target pictures to missile-launching ships and submarines. The relatively few B-model helicopters are assigned to cruisers and possibly to destroyers armed with antiship missiles.

The ASW-configured Hormone-A is carried aboard several cruiser and destroyer classes and aboard the two *Moskva* ASW helicopter carriers and the larger *Kiev*-class VTOL carriers. Each *Moskva* normally has fourteen Hormone ASW helicopters and a Hormone-C utility variant. The *Kievs* have been observed with fourteen to sixteen ASW helicopters, one to three Hormone-Bs to help target the ship's SS-N-12 antiship missiles, and one Hormone-C.

The new Ka-27 Helix-A is a slightly larger version of the Hormone, having entered service in 1981 in the shipboard ASW role.

The Soviet carrier Kiev slices the sea off Iceland. She and her three sister carriers—Minsk, Novorossiysk, and Kharkov—are evidence of the Soviet Union's major commitment to carrier-based aviation as central to the USSR's expanding "blue-water" navy. Such evidence is now mounting. In 1983, at the Black Sea Shipyard in Nikolayev, the keel was laid for a carrier that is expected to displace 65,000 tons (nearly twice the 38,000-ton displacement of the Kiev-class carriers), to operate under nuclear power, and to launch fighters from catapults in US Navy fashion.

The Soviet Navy has also employed the Mi-8 Hip in the minesweeping role from a helicopter carrier at the southern approaches to the Suez Canal, and troop-carrying Hips have been observed with marine markings in amphibious exercises. No numbers have been published for these helicopters, and, in the accompanying table, they are listed under the transport and training totals.

The transport/training aircraft inventory has increased rapidly over the past few years from an estimated 290 aircraft in 1980 to the present 400. A variety of transport, training, and utility aircraft are included in this category; a significant number appear to provide specialized naval training to pilots and aircrewmen who have completed basic schooling under the auspices of the Air Forces.

The four Soviet fleet commands each have a variety of support aircraft assigned, as does naval headquarters in Moscow.

Organization and Manpower

The overall commander of Soviet Naval Aviation serves on the staff of the commander in chief of the Navy in Moscow and is presently Colonel General of Aviation G. A. Kuznetsov, who has held that post since 1982. A career naval aviator, he is sixty-two years old. He served previously as chief of staff of Soviet Naval Aviation—the number-four position in the air arm—and Kuznetsov commanded aviation in the Northern Fleet before that.

Each of the four fleets—Northern, Baltic, Black Sea, and Pacific—has an integral air arm commanded by a major general or colonel general of aviation. The fleet aviation commander has an appropriate staff to direct air operations, to coordinate with surface, submarine, and amphibious forces, and to support his aircraft.

The composition of the fleet air arms varies in size and type of aircraft assigned. Geography is the principal determining factor in aircraft assignment. For example, the Northern (Arctic) Fleet, with its aviation based mainly on the Kola Peninsula, and the Pacific Fleet have all of the long-range Bear aircraft. Strike aircraft are assigned to all four fleets. Both *Moskva*-class carriers are in the Black Sea Fleet, operating mainly in the Mediterranean, while two of the operational *Kiev*-class ships—with their Forgers and Hormones—are assigned to the Pacific Fleet, and one is assigned to the Black Sea Fleet. Most naval air training is conducted in the Black Sea Fleet area.

Naval Aviation is assigned approximately 70,000 officers, warrants, and enlisted men. They constitute some fifteen percent of total Navy personnel.

The Soviet Air Forces also support maritime operations, the most significant mission being the potential contribution of the strategic air arm (formerly Long-Range Aviation or *Aviatsiya Dalnovo Deistviya*) in attacking naval facilities ashore and ships at sea. Strategic bomber aircraft have been observed in antiship exercises, and older Bear aircraft (redesignated Bear-G) are now being configured to carry the AS-4 missile.

Additionally, strategic reconnaissance aircraft as well as tankers can be used to support maritime operations.

Aviation Ships

The Soviet Navy is embarked on a major program of

Soviet Naval Aviation, Early 1985

Strike/Bomber Aircraft	**(375)**
Backfire	100
Badger-C/G	240
Blinder-A	35
Fighter/Fighter-Bomber Aircraft	**(135)**
Fitter	75
Forger	60
Electronic Warfare Aircraft	
Badger-H/J	40
Reconnaissance Aircraft	**(100)**
Badger-D/E/F	40
Bear-D	45
Blinder-C	few
Aerial Tankers	
Badger-A	75
Anti-Submarine Aircraft	**(200)**
Bear-F	55
Mail	95
May	50
Helicopters	**(300)**
Haze-A	65
Helix-A	40
Hormone-A	120
Hormone-B	70
Hip	few
Transport/Training	**400**
Total Aircraft	**1,600+**

Note: Totals are rounded.

How Personnel and Aircraft Are Allocated Among the Four Fleets

FLEET	AIRCRAFT	PERSONNEL
Northern	440	119,000
Baltic	270	107,000
Black Sea	425	101,000
Pacific	475	134,000

Yak-38 Forger VTOL fighters arrayed with wings folded aboard the Kiev. The 901-foot Kiev-class carriers also feature antiair/antisurface/antisubmarine weapons similar to those on large Soviet missile cruisers, and can fight their own way out of trouble.

aircraft carrier construction. In the late 1940s, Soviet dictator Josef Stalin included aircraft carriers as part of his major fleet-building program. Those ships were never laid down, and his building program died with him in March 1953. Nikita Khrushchev, in writing about defense decisions of the 1950s, expressed a desire to build such ships, but noted that carriers would strain the country's resources and were becoming increasingly vulnerable to new forms of weapons.

As part of the Soviet anti-Polaris efforts of the early 1960s, the Navy began construction of 18,000-ton, 623.5-foot helicopter ships of the *Moskva* class. Forward, these ships are missile cruisers, with antiaircraft and antisubmarine weapons as well as extensive electronics and command facilities. Aft, the ships have a helicopter deck, with two lifts connecting the deck to an internal hangar.

The *Moskva* was completed in 1967, and her sister ship, *Leningrad,* the following year. No additional ships were built, probably because the increasing ranges of later Polaris missiles gave the US missile-carrying submarines too great an operating area to be countered by the helicopter ships.

However, shortly after these ships were completed, the Soviets completed design of a larger aviation ship, the 38,000-ton, 901-foot *Kiev* VTOL carrier. This ship, able to embark approximately thirty-five VTOLs and helicopters, was the largest warship ever completed in the USSR by a significant margin when she joined the fleet in 1975. Although the ship has a full, angled flight deck, she also carries antiair/antisurface/antisubmarine weapons similar to those on a large missile cruiser.

The *Kiev* was followed by three sister ships, the *Minsk,* completed in 1978, the *Novorossiysk,* in 1981, and the *Kharkov,* in 1985. The investment in these ships—in resources, industrial facilities, and manpower—is considerable. Similar ships built in the US today would cost on the order of $2 *billion* or more.

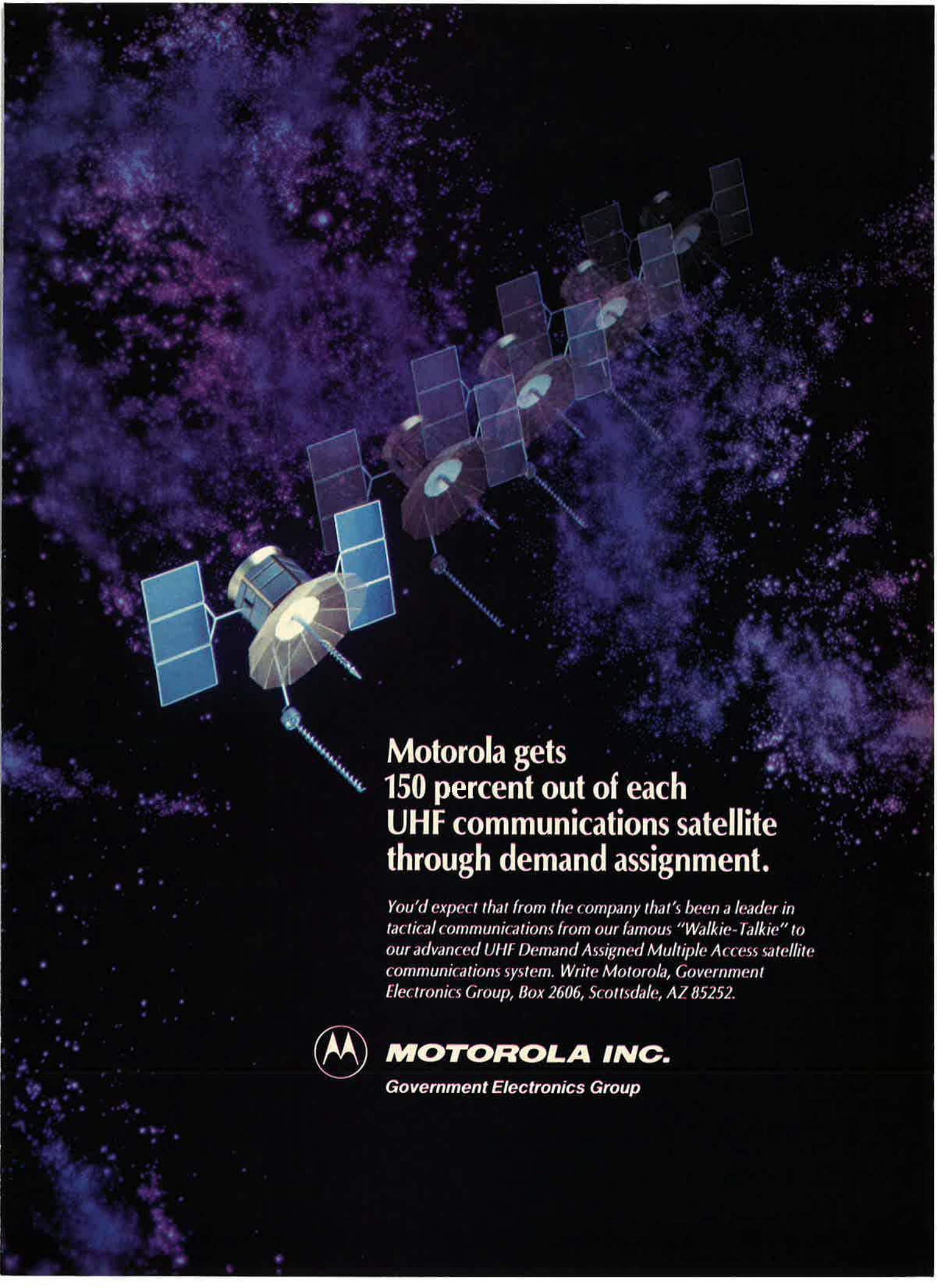
While the four *Kievs* indicate a major commitment to carrier aviation at the highest levels of the Soviet government, an even more costly project was planned. After the *Kharkov* was launched in 1982, the shipbuilding way on which she was constructed at the Black Sea Shipyard in Nikolayev was lengthened, and, early the following year, the keel was laid for a still larger carrier. This ship has been estimated to displace more than 65,000 tons and to have nuclear propulsion. The name *Kremlin* has been reported in some journals. The Department of Defense has published artist's concepts of the ship showing an angled flight deck, catapults, and arresting gear.

Again, the commitment of resources is considerable. The ship, which is estimated to be operational in 1988–89, will be inferior to US carriers in aircraft capacity and capability. But the deployment of a *Kiev*-class ship or the new carrier to a crisis area will demand that the US Navy send a carrier battle group to counter the Soviet ship.

The massive investment in Soviet Naval Aviation has been undertaken at a time when new classes of surface ships and submarines are entering the fleet. When weighed against the requirements of the Soviet strategic, ground, air, and air defense forces, it seems unlikely that this rate of spending can continue indefinitely. Further, while Khrushchev and Brezhnev were extremely well disposed toward the Navy, as was Marshal A. A. Grechko when he was Minister of Defense (from 1967 until his death in 1976), their successors—political and military—lack the naval ties that they had. Also, Admiral of the Fleet of the Soviet Union S. G. Gorshkov, who has been commander in chief of the Navy since 1956, can be expected to step down soon (he is now seventy-five years old). His successor will probably lack the political contacts and clout that have accrued to Gorshkov during his unprecedented twenty-nine years as CINC of the Soviet Navy.

The momentum, however, is considerable, and for the near term Soviet Naval Aviation will continue to increase in quality and quantity, and in so doing will become more of a political and military threat to Western interests. ■

Norman Polmar is an analyst and author specializing in US and Soviet naval and aviation subjects. He has directed or participated in several major studies in these areas for the Navy, various Defense Department agencies, and US and foreign aerospace and shipbuilding firms. He is currently a member of the Secretary of the Navy's Research Advisory Committee (NRAC) and is an advisor to the Director of the Los Alamos National Laboratory. His many books include the reference works Guide to the Soviet Navy *and* The Ships and Aircraft of the U. S. Fleet, *published at three-year intervals. Portions of this article are adapted from the fourth edition of the* Guide, *to be published next year.*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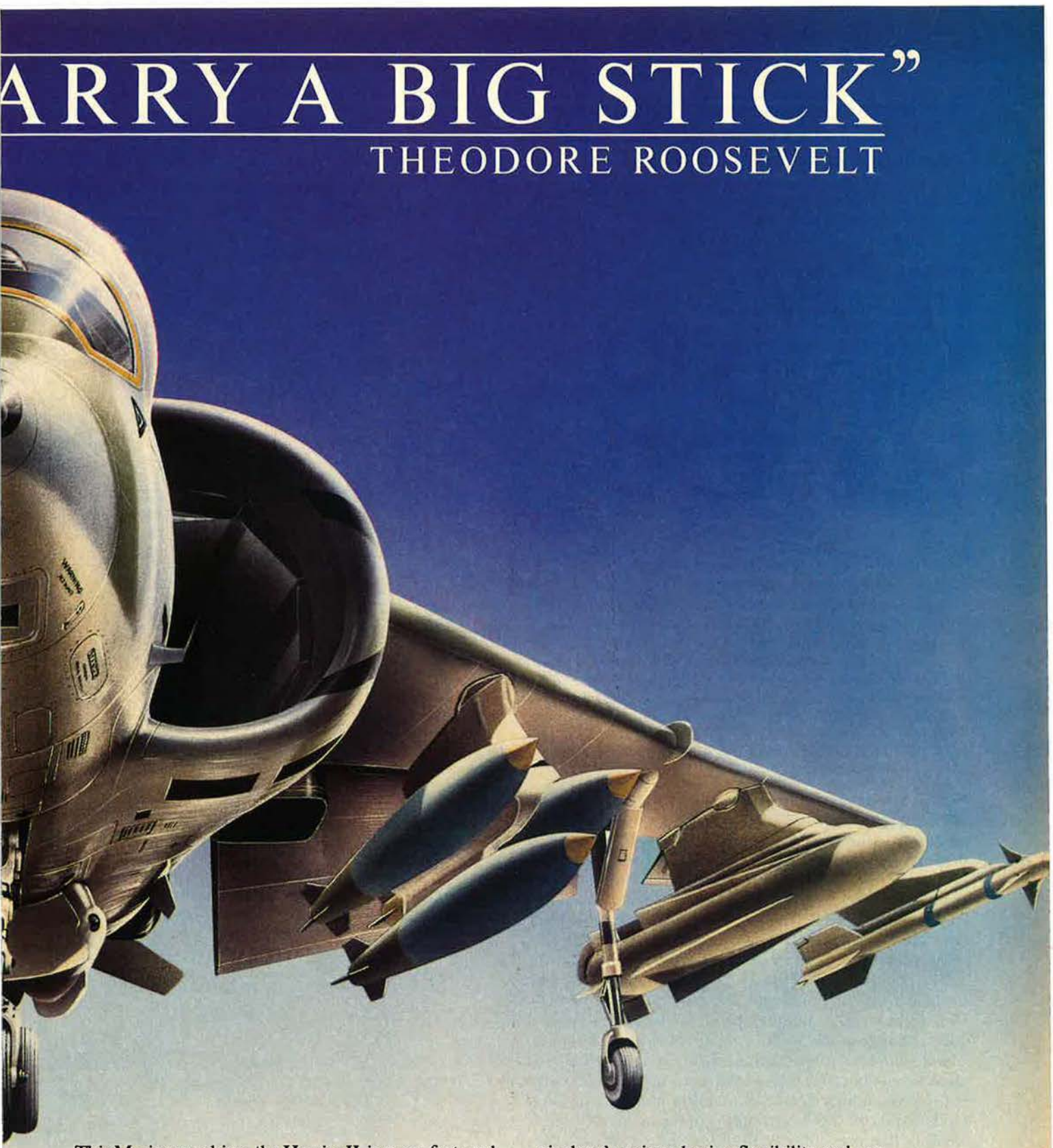

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The Mi-24 "Flying Tank" leads to even bolder concepts of helicopter employment with the Mi-28.

FROM HIND TO HAVOC

BY SERGEI SIKORSKY

> The attack helicopter will probably have as great an impact in some future war as the tank had in the last great war. The *Shturmovik* helicopter has played an important role in difficult terrain, such as jungles and mountains. And it could prove equally important in fighting in the sprawling cities of Europe and Asia—in fact, anywhere.
>
> —A Senior Soviet Officer

THE Soviets moved slowly into helicopters; it was not until the end of 1947 that a specific military requirement was generated and a machine (the Mi-1) entered quantity production. The subsequent development and growth of the helicopter in the Soviet Union caught many people by surprise. Most evidence seems to confirm that the Soviet Air Force accepted the helicopter with great reluctance. There is equal evidence that this initial reluctance has turned into innovative enthusiasm.

The proliferation of the Mi-24 Hind attack helicopter in the Soviet Air Force and subsequently with Warsaw Pact forces and a number of client nations signals a subtle change in the Soviet concept of close air support. The helicopter's role is increasing in Soviet Frontal Aviation simply because it gives the *Army* commander (who is the boss) a high degree of mobility and the precision he demands of "his" Air Force—precision even in poor weather that prevents accurate fire support from fixed-wing aircraft. In his mind, the helicopter does not compete with his aircraft—it reinforces his aircraft.

Today, the Hind has been exported to some fifteen nations, and the number of clients continues to grow. It is not impossible that Hinds already operational in Cuba will be joined by Hinds in other client nations in Central and South America. It is no coincidence that Soviet military writers are beginning to comment on the "inevitability" of aerial combat between helicopters and between helicopters and fixed-wing aircraft.

Soviet Mi-24 Hind-D attack helicopters hover menacingly on maneuvers in Carpathia. They exemplify the Soviet Army's exploitation of heavily armed helicopters as airborne tanks in taking and holding terrain.

It is not really important whether or not one agrees with the Soviet officer quoted at the opening of this article. However, it is helpful to see where those ideas came from and a challenge to predict what the Soviets could do to make them a reality.

Early Work With Helicopters

The Russians have been experimenting with helicopters for a long time. The earliest documented experiments go back to 1754, when a famous Russian scientist, Michael Lomonosov, proposed the construction of small unmanned helicopters to lift thermometers and other research equipment into the air. During the 1800s, a number of experimental helicopters were studied.

In 1899, Professor Nikolai Zhukovsky, often called the "Father of Russian Aviation," founded an aerodynamics laboratory at Moscow University. Zhukovsky had earlier visited with Ludwig Prandtl in Germany and had witnessed a number of Otto Lilienthal's gliding flights. Zhukovsky built a wind tunnel in 1902. Between 1904 and 1910, he published a number of scientific papers on the subject of rotary-wing aircraft.

One of Zhukovsky's earliest students, Boris Yuriev, began to study the challenge of rotary-wing flight. During this time, a number of Russian helicopters were attempted, including two designed by a young student, Igor Sikorsky. He built his first in 1909, the second one in 1910. Neither of them flew successfully, and Sikorsky postponed further work on helicopters, not realizing that the postponement would last nearly thirty years. With Professor Zhukovsky's support and encouragement, Yuriev designed and built a single-rotor helicopter in 1912 that was powered by a twenty-five-hp Anzani engine. When the project was abandoned at the beginning of World War I, the aircraft had never flown.

Following the Revolution in 1917, the Zhukovsky aeronautical research facilities were renamed "TsAGI" and were tasked with designing fixed-wing aircraft. Sometime after 1925, TsAGI started organizing research on autogyros and helicopters. In the early 1930s, TsAGI's 1-EA experimental helicopter (designed by Yuriev) reached speeds of nearly twenty miles per hour and an altitude of 2,000 feet on one flight. However, neither Yuriev nor his colleague Bratukhin, who was studying the side-by-side rotor, could make a complete technical breakthrough; the helicopters remained purely experimental. When the Germans invaded Russia in 1941, further helicopter research was abandoned, except by Bratukhin, who continued low-priority studies.

During World War II, Focke in Germany and Sikorsky in America finally solved the many problems of vertical flight. By the end of the war in 1945, helicopter technology in Germany and America had matured to the point where a number of different designs were in production and operational with their respective air forces.

The Emergence of Michael Mil

In late 1947, Josef Stalin summoned a number of the leading Soviet engineers to a conference in the Kremlin. When the conference was over, Bratukhin, Yakovlev, and a relatively unknown Michael Mil (previously a TsAGI autogyro specialist) had each been ordered to design and build a prototype two- or three-seat helicopter for military and utility use. Bratukhin decided on a

variant of his side-by-side concept. The Yakovlev design bureau proposed a machine similar to the Sikorsky S-51, while the Mil helicopter, the Mi-1, looked somewhat like an early Bristol 171 Sycamore. The Mi-1 helicopter easily won the flight competition and established Mil as a leading helicopter designer.

Another former TsAGI autogyro specialist, Nikolai Kamov, had built a small one-man helicopter in 1947. Of coaxial configuration, it used a modified forty-five-hp BMW motorcycle engine. Though clearly underpowered, it provided the technical base for the Kamov Ka-10, which first flew in September 1949, powered by a fifty-five-hp Ivchenko piston engine. Reportedly, only a dozen were built, and they saw limited use aboard whaling vessels and icebreakers. The Soviet Navy showed interest in the concept and in 1950 ordered the construction of a larger two-seat prototype with a 255-hp engine. When the Ka-15 flew in 1952, it started a tradition of Kamov helicopters serving with the Navy—a tradition that continues to the present day.

No sooner had the Mi-1 been "debugged" and established in production than Stalin once again summoned his aviation engineers to a Kremlin meeting in late 1951. Impressed by the performance of the American helicopters in the Korean War, Stalin demanded that Soviet industry move forward with the design of two new prototypes. Stalin announced requirements for a twelve-passenger single-rotor helicopter and a twenty-four-passenger twin-rotor machine. In retrospect, it is interesting to note that he decided to leapfrog the 7,500-pound gross weight helicopter (the Sikorsky H-19 Chickasaw), which was then the heaviest type being used in the Korean conflict.

Stalin personally drove the risky decision to go for 16,000- and 32,000-pound gross weight helicopters, knowing that in the US Frank Piasecki would soon fly the XH-21 and that Igor Sikorsky had started design work on the H-34, both of which were in the 12,000–14,-

Soviet border guards hit the ground running from a first-generation Mi-4 general-purpose helicopter. The Mi-4 is also used in the electronic-warfare jamming role. Troops on board can fire rifles through its portholes, and the "bathtub" under the fuselage can be used as a machine-gun nest. The Mi-4 was scaled up to produce the heavy-lift Mi-6 Hook.

000-pound class. Stalin intuitively sensed that Mil had the greater rotor know-how and hedged the risk by a draconian decision. The following evening, Stalin summoned Yakovlev and Mil to a private meeting. Stalin directed Mil to design and build a single-engine, single-rotor, twelve-passenger helicopter. He was to build three flight-test vehicles and one ground-test machine. However, he was also to build eight extra rotors and transmissions and immediately give them to Yakovlev, who was to use them in building four twin-rotor, twin-engine, twenty-four-passenger helicopters. Both designers were horrified as Stalin announced coldly that both helicopter projects were to be designed, built, and flown within twelve months!

Despite the unbelievable difficulties involved, both prototypes did fly within a year of that conference. After a series of modifications, the Mi-4 Hound entered large-scale production and became the workhorse of the Soviet Air Force and civil aviation. Well over 3,000 units were eventually produced by Russian, Polish, and Chinese factories. The Yak-24 went through a period of teething troubles and was quietly phased out after a limited production run.

Era of the Heavy Lifters

In late 1954, with Stalin dead and gone and the Mi-4 in quantity production, the Mil design office was directed to study the construction of a giant (forty-five-ton) helicopter capable of carrying a payload of twelve tons. At that time, the heaviest production helicopter was probably the Sikorsky S-56, which had a payload of some five tons and a gross weight of fifteen tons. Clearly, the Soviet government's perception of the helicopter was moving in a direction rather different from that in the West.

Mil wisely refused the risk of a radically new design. He simply scaled up the Mi-4, retaining the successful design technology of the smaller machine wherever possible. When the prototype Mi-6 Hook flew in September 1957, it was the world's largest helicopter by several orders of magnitude. On October 30, 1957, one short month after its first flight, the prototype broke all helicopter world records by carrying more than 26,400 pounds to an altitude of 6,560 feet and then a payload of 22,000 pounds to an altitude of just above 8,000 feet.

The uniquely Russian dedication to the heavy lift helicopter was further confirmed by the fact that the Mi-6 was quickly readied for production and a first block of thirty-odd machines authorized. When the first production units began to appear in 1960, not even the most enthusiastic Mil engineer would have dared to predict that this huge machine would continue in production for two decades and that, by 1985, well over 1,200 units would have been built. Approximately 600 of these machines are presently with the Soviet Air Force as logistics transports, some 300 are assigned to Aeroflot and various civil and industrial ministries and are scattered throughout Russia, while nearly 300 have been exported to Warsaw Pact air forces and other customers, including India, Egypt, Cuba, and Iraq.

In the early 1960s, a new generation of turbine-powered helicopters began to appear. Kamov developed the compact coaxial design into a larger, more powerful antisubmarine warfare helicopter. The Soviet Navy's Ka-25 Hormone was first shown, in prototype form, during the 1961 Tushino Air Show. After an extended development program, it was put into production in the mid-1960s as the Navy began to receive a new generation of destroyers and antisubmarine cruisers. This 16,000-pound gross weight helicopter became the basic ASW and utility helicopter for the Navy and is still operational on many fleet and auxiliary ships today.

Hip Production Begins

At the same time, the Mil design office was also involved with the design and manufacture of a new generation of twin-turbine helicopters. By 1964, the Mi-8 Hip had completed government tests and was authorized for production. The aircraft was introduced rapidly into military and civil use as production accelerated simultaneously in several state factories.

This machine has enjoyed a production run unequaled by any other helicopter design anywhere near its weight class. Almost 10,000 of these relatively big machines (ten-ton gross weight, twenty-six troops) have been manufactured, and an uprated version, the Mi-17, is entering quantity production. The Mi-8 Hip was also the first machine to start actively expanding Soviet air-mobile concepts. The proliferation of armament tested on the Mi-8 confirmed Soviet interest in helicopter warfare. As increasing numbers of the Mi-8 explored new tactics and concepts, Soviet commanders began to see the requirement for a new machine that would have the firepower of a tank, the mobility of a helicopter, and the tactical flexibility of an armored personnel carrier.

The appearance of the Mi-24 Hind series in late 1968 signaled a milestone in Soviet helicopter development. The Soviets were no longer simply experimenting with doctrine and tactics developed by US Army Aviation. Rather, Soviet Air Force helicopter thinking had progressed to the point that new machines were required to serve new concepts.

Mi-8 Hip-E assault helicopter bears down at point-blank range. About 10,000 of these choppers have been produced, in keeping with Soviet development and refinement of airmobile assault concepts. The Mi-17, an uprated variant of the Mi-8, is now entering quantity production.

Recently, a senior Soviet officer defected to England. Under the pen name of Viktor Suvorov, he wrote a remarkable book called *Inside the Soviet Army.* He explains the Mi-24 as follows:

The Flying Tank

Drive a tank onto an airfield and park it near a military aircraft. Next, put a helicopter between the tank and the aircraft. Now, look at each of them and then answer the question: Which does the helicopter resemble more, the tank or the aircraft?

I know what your opinion will be. You don't need to tell me. But the Soviet generals believe that to all intents and purposes the helicopter is a tank. In fact, they find it difficult to distinguish between the two. Certainly, there is very little in common between the helicopter and the aircraft. Small details, like the ability to fly, but nothing more. Of course, they are right. The helicopter is related to the tank, not to the aircraft. The reasoning behind this is simple enough—in battle, a tank can seize enemy territory, and a helicopter can do the same. But an aircraft cannot. An aircraft can destroy everything on the surface and deep below it, but it cannot seize and hold territory.

For this reason, the Soviet Army sees the helicopter as a tank—one which is capable of high speeds and unrestricted cross-country performance, but is only lightly armoured. It also has approximately the same firepower as a tank. The tactics employed in the use of helicopters and tanks are strikingly similar. An aircraft is vulnerable because in most cases it can only operate from an airfield. Both the helicopter and the tank operate in open ground. An aircraft is vulnerable because it flies above the enemy. A helicopter and a tank both see the enemy in front of them. In order to attack, a helicopter does not need to fly over the enemy or to get close to him.

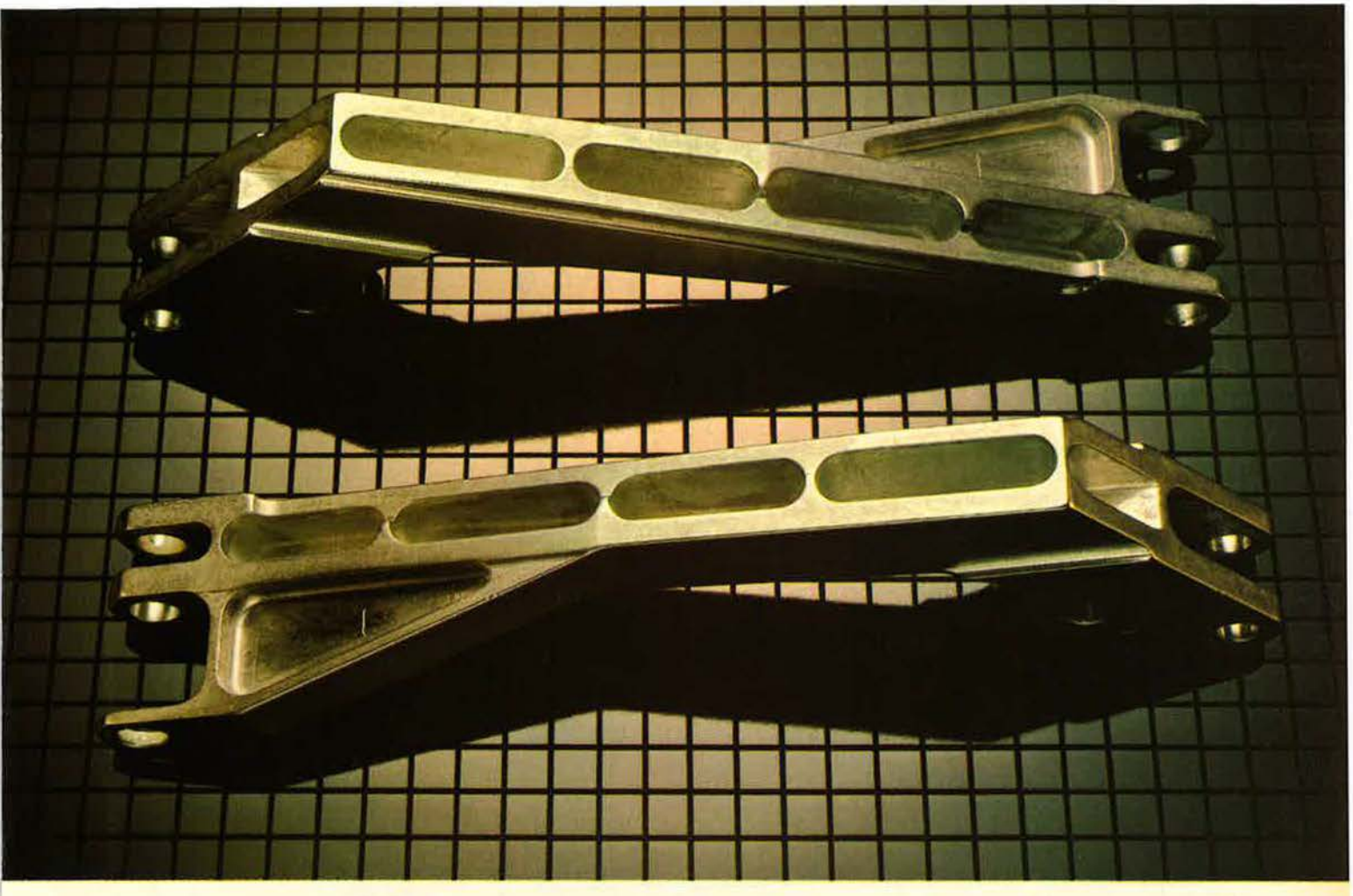
The introduction of the helicopter was not greeted with any particular enthusiasm by the Air Forces, but the Land Forces were jubilant. Here was a tank with a rotor instead of tracks, which need not fear minefields or rivers or mountains.

It is therefore not surprising that the assault brigades (which are carried by helicopter) form part of the complement of Tank Armies or of Fronts, which use them for joint operations with Tank Armies.

The Hind-A and B were quickly followed by an improved model, the Hind-D, in which the "greenhouse" cockpit in the nose was replaced by an elegant two cockpits in tandem. This improved visibility for the pilot and gunner and allowed a chin turret to be added while retaining the firepower of an antitank helicopter and the option of carrying six to eight soldiers or equivalent cargo. Production of Hind-Ds has accelerated, and some 1,600 have been delivered to date. In addition to Soviet forces, they are being operated by a number of other countries, including Afghanistan, Algeria, Bulgaria, Cuba, Czechoslovakia, Ethiopia, Iraq, Libya, South Yemen, and Syria. The list of countries operating the machine is expected to grow in the near future as the Soviets fill their own requirements and release a greater proportion of their production for export. With its ability to carry a group of assault commandos (or terrorists) to hit a target while protecting them with its heavy firepower, the Hind-D has the potential to support very lethal hit-and-run attacks.

The Development of Halo

In the early 1970s, the Mil team and the Soviet government reopened the question of the HLH, or heavy lift helicopter, which had been "temporarily postponed" following the cancellation of the Mi-12 Homer project. The continuing priority given to the HLH in Russia is understandable, given the vast construction projects launched with every Five-Year Plan and the lack of adequate surface transportation where most of them are located—east of the Urals, in Central Asia and Siberia.



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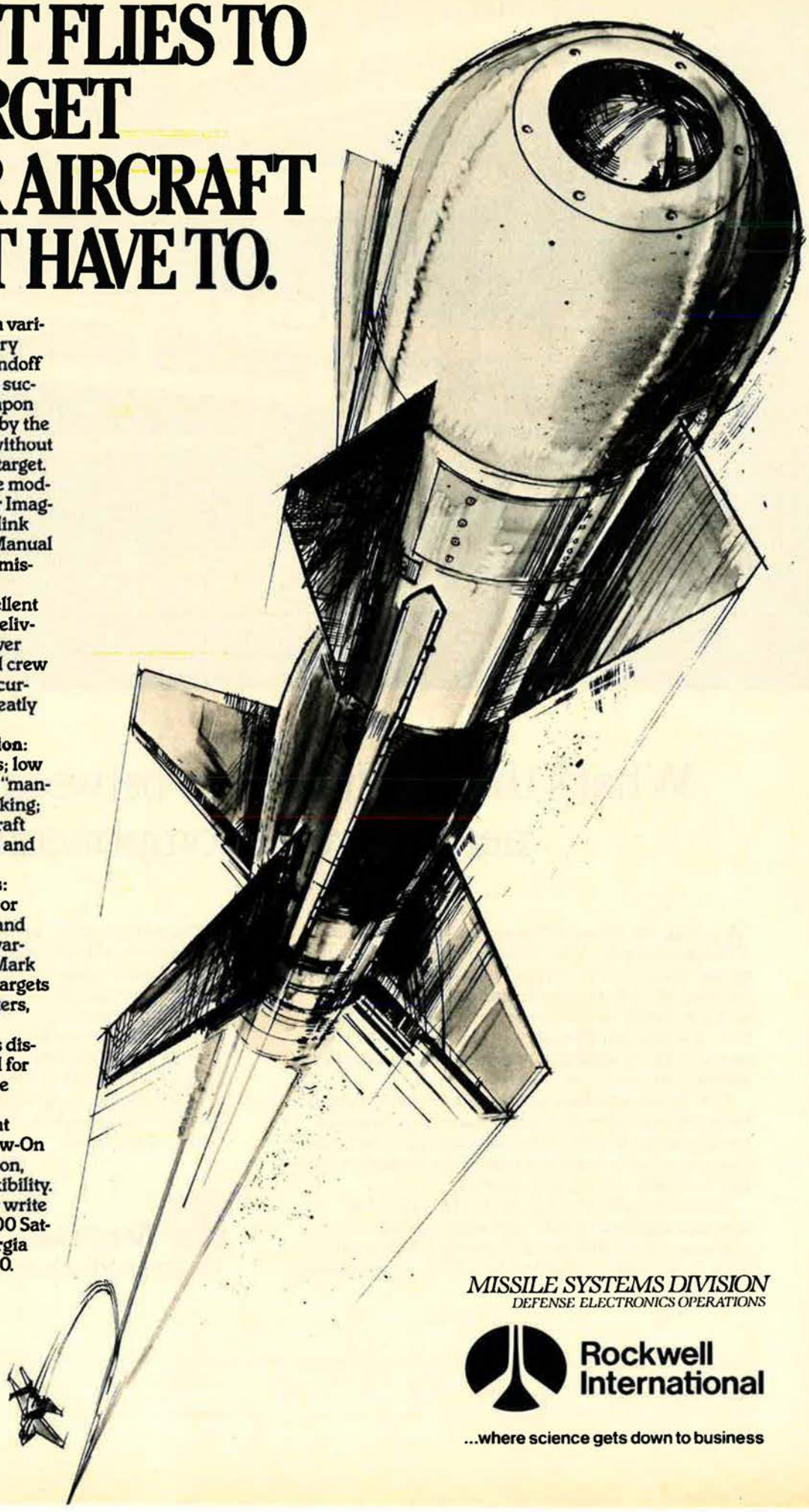

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In addition, the obvious military potential of a "flying freighter" capable of airlifting twenty or more tons of fuel, ammo, and other supplies over several hundred kilometers began to stimulate the imagination of the military authorities then creating the concept of the Operational Maneuver Group, or OMG.

At any rate, Soviet authorities authorized a major design effort that resulted in the Mi-26 Halo, and the prototype lifted into the air in December 1977. Powered by two Lotarev D-136 12,600-shp turbines, it grosses some 124,000 pounds on takeoff, of which roughly 44,000 pounds is available payload. The machine entered production in 1981, and "several dozen" are already operational in the Soviet Air Force. If history can be trusted, one can expect "several hundred" to be operational by 1990 and can count on them to grow roughly ten percent to fifteen percent in payload capability by that time.

Following the introduction of the Hind, Soviet military thinking began to speculate openly on the "inevitability" of air-to-air combat between helicopters. In addition, the Soviet Air Force began to accumulate valuable combat experience in Afghanistan.

There is much evidence that the Soviets suffered heavy helicopter losses in Afghanistan attributable to the hot, high altitudes and the rugged terrain. In the density altitudes prevailing in the summer months, with terrain that forces operation well above 8,000 feet and in temperatures of 78–80°F, major performance losses were inevitable. The Hips and Hinds were forced to fly with significantly reduced rocket and fuel loads. Maneuverability while under fire was compromised, and that led to further losses. The experience gained in Afghanistan resulted in the development of two new helicopters.

The Mi-17 was shown in the West for the first time in 1981 at the Paris Air Show. Basically, the Mil OKB installed uprated 1,900-shp Izotov turbines in the Mi-8 airframe. This increased high-altitude performance and allowed the helicopter to continue flight with one engine out by using the 2,200-shp emergency power rating. The higher horsepower (total 3,800 shp vs. 3,400 shp in the Mi-8) also improved the Hip's dash speed by some thirty miles per hour.

The Fighter-Helicopter

At the same time, the Soviets built a new helicopter that was optimized for air-to-air and air-to-ground combat: the Mi-28, which NATO code-named Havoc.

If one studies open Soviet literature and reads between the lines, one can make a number of educated guesses as to what Havoc will look like and what its future role might possibly be. If one assumes that the Mi-28's primary mission is the armed escort of troop and cargo helicopters, especially when operating in support of Operational Maneuver Groups, then speed, maneuverability, and firepower will be of primary importance. The Mi-28 Havoc will probably be equipped with a single-barrel (possibly twin-barrel) 23-mm cannon and a mix of eight to twelve missiles, some for antitank missions and others for air-to-air capability against other helicopters and slow, low-flying, fixed-wing aircraft. To fulfill its mission adequately, the aircraft will probably gross between 14,000 and 16,000 pounds.

The Mi-28 should go into production early in the 1985–90 Five-Year Plan. The Soviet Air Force will not reduce its inventory of Mi-24 Shturmoviks (Hinds), but it will introduce what Soviet military writers call the "Istrebitle," or fighter-helicopter.

Probably, Havoc will also test a new air-to-air missile designed specifically to destroy helicopters and subsonic fighters. Though the existence (or even practicality) of such a missile is questioned by many, the writer believes a high-speed subsonic missile, with extreme maneuverability following lock-on, may become part of the Soviet Air Force's future inventory.

Three Eras of Thought

In essence, one can "feel" three basic eras in Soviet helicopter thinking. The immediate postwar period saw the Soviet Union far behind the West in the design and exploitation of rotary-wing aviation. Starting in 1947–48, the Soviet government accelerated the manufacture of the first- and second-generation helicopters, the Mi-1 and Mi-4 and the Kamov prototypes. Then, in a unique effort unparalleled in the West, the Soviets started to create a fleet of heavy lift helicopters. Here, political-industrial needs clearly played a major role.

The second phase started as the first turbine-engine helicopters (Mi-6s, Mi-8s, Mi-2s, and Kamovs) became available. This period was marked by the introduction of the helicopter as a regular part of the Soviet Armed Forces. Air mobility, which was pioneered by the US Army and developed in South Vietnam, began to enjoy a priority in the Soviet Union as the concept of the OMG was further developed. The Navy began to use the helicopter at sea, operating from a new generation of destroyers and antisubmarine cruisers.

Phase three, the "breakthrough," came in the late 1960s as the Soviets developed enough confidence in their new concepts to generate new types of helicopters that were slightly different from those in NATO or in other Western countries. Different needs generated different specifications.

The deployment of Hind and Havoc is completely logical if one accepts the Soviet concept of a fast-moving battlefront forming literally within minutes of the start of a major war. In addition, the helicopter allows the Soviets to develop their Operational Maneuver Groups further and to provide them with still greater freedom of maneuver in the enemy's rear areas.

We can expect new helicopters to follow these machines, but there is no doubt that, in the past ten years, Soviet Air Force planners have introduced interesting new concepts in helicopter tactics, mobility, and firepower. The Mi-24 Hind will probably find its place in history as one of the more innovative concepts, supporting the emerging role of the helicopter in the Soviet Armed Forces. ■

Sergei Sikorsky, son of the aviation pioneer and helicopter designer Igor Sikorsky, served in a helicopter development squadron during World War II. He subsequently lived and traveled extensively in both Europe and the Far East on a variety of assignments connected with Sikorsky helicopter programs. His technical experience and fluency in five languages, including Russian, allow him some unique insights into Soviet aviation. He is presently an executive at Sikorsky Aircraft in Stratford, Conn.

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Gallery of Soviet Aerospace Weapons

BY JOHN W. R. TAYLOR
EDITOR, JANE'S ALL THE WORLD'S AIRCRAFT

Bombers and Maritime

Again this year, this Gallery has been prepared exclusively for AIR FORCE Magazine by a world-renowned authority on aerospace systems. Newly revised, it contains much new information on Soviet planes and missiles. Some specifications are necessarily estimated or approximate.

Antonov An-12 (NATO 'Cub')

The Soviet Naval Air Force has evaluated the prototype ASW version of the An-12 shown in an accompanying photograph. Equipment includes a large cylindrical nose radome; a long ogival tailcone, presumably for MAD, aft of the gun turret; and various small antennae.

Beriev M-12 (NATO 'Mail')

Eighty survivors of the estimated 100 M-12s acquired by Soviet Naval Aviation since the early 1960s remain operational. Deployed primarily at coastal bases of the Soviet Northern and Black Sea fleets, they are responsible for antisubmarine and surveillance missions out to some 230 miles from shore. Their uniqueness as amphibians in a landplane age, as well as their capability, is emphasized by the fact that M-12s have continued to set new records, and raise existing records, during the 1980s. As a result, they now hold 22 FAI records listed in Class C3 Group II for turboprop amphibians, and 22 Class C2 Group II records for turboprop flying-boats. No other aircraft holds records in these categories.

Power Plant: two Ivchenko AI-20D turboprop engines; each 4,190 ehp.
Dimensions: span 97 ft 6 in, length 99 ft 0 in, height 22 ft 11½ in, wing area 1,130 sq ft.
Weight: gross 64,925 lb.
Performance: max speed 378 mph, service ceiling 37,000 ft, max range 2,485 miles.
Accommodation: crew of five.
Armament and Operational Equipment: variety of weapons and stores for maritime search and attack carried in internal bay aft of step in bottom of hull and on four pylons under outer wings. Radar in nose 'thimble'; MAD (magnetic anomaly detection) tail-sting.

Ilyushin Il-38 (NATO 'May')

The airframe of this antisubmarine/maritime patrol aircraft was developed from that of the Il-18 airliner in the same way that the US Navy's P-3 Orion was based on the Lockheed Electra. Its lengthened fuselage retains few cabin windows. Il-38s of the original production series each have a large radome under the forward fuselage and a MAD tail-sting, with an internal weapon/stores bay aft of the radome. On some aircraft seen recently, the weapon-bay doors are replaced by a second, longer, blister fairing. To compensate for the effect on the CG position of these changes, and equipment inside the cabin, the wing had to be moved forward.

Il-38s of the Soviet Naval Air Force are encountered frequently over the Atlantic and Mediterranean, together with longer-range Tu-142s. A Soviet Treaty of Friendship and Co-operation, signed with the People's Democratic Republic of Yemen in October 1979, permits patrols over the Indian Ocean from a base in that country. Missions over the Red Sea, Gulf of Aden, and Arabian Sea are flown from the airfield at Asmara in Ethiopia. About 60 Il-38s are in service, including three that were passed on to No. 315 Squadron of the Indian Navy, based at Dabolim, Goa.

Power Plant: four Ivchenko AI-20M turboprop engines; each 4,250 ehp.
Dimensions: span 122 ft 9¼ in, length 129 ft 10 in, height 33 ft 4 in.
Performance: max speed 400 mph at 27,000 ft, max range 4,473 miles, patrol endurance 12 hr.
Accommodation: crew of twelve.

Myasishchev M-4 (NATO 'Bison')

Although the four-turbojet M-4 could never match the all-round capability of its turboprop contemporary, the Tu-95, about 75 remain available to the long-range bomber force for maritime and Eurasian missions. Most are updated 'Bison-As', supplemented by a few maritime reconnaissance 'Bison-Bs and Cs', identified by modified nose configurations. Forty-three M-4s are nominally strategic bombers, likely to be replaced by the first operational 'Blackjacks'. The other 30 have each been fitted with an internal probe-and-drogue hose-reel, enabling them to serve as in-flight refueling tankers for the 'Backfire/Bear/Bison' attack force. Their replacement by tanker versions of the Il-76 is considered imminent. *(Data for 'Bison-A' strategic bomber follow.)*

Power Plant: four Mikulin AM-3D turbojet engines; each 19,180 lb st.
Dimensions: span 165 ft 7½ in, length 154 ft 10 in.
Weight: gross 350,000 lb.
Performance: max speed 620 mph at 36,000 ft, service ceiling 45,000 ft, range 4,970 miles at 520 mph with more than 12,000 lb of bombs, max unrefueled combat radius 3,480 miles.
Armament: ten 23 mm guns in twin-gun turrets above fuselage fore and aft of wing, under fuselage fore and aft of weapon-bays, and in tail. Three weapon-bays in center-fuselage, for free-fall weapons only.

Tupolev Tu-16 (NATO 'Badger')

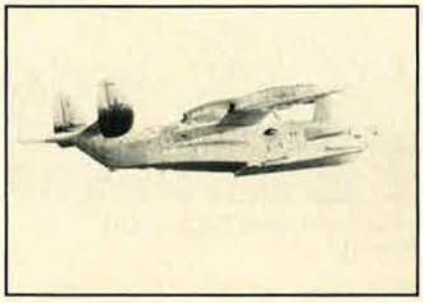
When considering the Tu-16, it is wise to forget that the prototype flew 33 years ago and to concentrate instead on the advanced weapons and equipment carried by current air force and naval versions. They constitute the major part of the 455-strong medium-range 'Badger/Blinder' bomber force of five air armies. Hundreds more are flown by Soviet Naval Aviation, carrying antiship cruise missiles with stand-off ranges varying from 90 to more than 300 km. The versatility of the design is emphasized by regular participation of the air army 'Badgers' in naval exercises and by the variety of tanker, reconnaissance, and ECM variants operated by both the air force and navy. The 1984 edition of the DoD's *Soviet Military Power* document noted that about ten strike, tanker, and ECM variants of the Tu-16 had been deployed to Cam Ranh Bay, the former US naval base in Vietnam, during the past year. This suggests that the following list of eleven identifiable versions of 'Badger' may be incomplete:

Badger-A. Basic strategic jet bomber, able to carry nuclear or conventional free-fall weapons. Crew of six. Glazed nose, with small undernose radome. Armed with seven 23 mm guns. Some equipped as in-flight refueling tankers, using a unique wingtip-to-wingtip transfer technique. About 120 operational with Chinese Air Force (still being built in China as Xian H-6).

Badger-B. Generally similar to 'Badger-A', but equipped originally to carry two turbojet-powered aeroplane-type antishipping missiles (NATO 'Kennel') underwing. Still serves as conventional free-fall bomber.

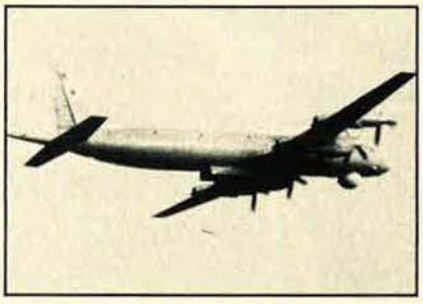
Badger-C. Antishipping version, first shown in 1961 Aviation Day flypast. 'Kipper' winged missile carried in recess under fuselage, or 'Kingfish' missiles underwing. Wide nose radome, in place of glazing and nose gun of 'Badger-A'. No provision for free-fall bombs. Nearly 200 operational with Soviet Northern, Baltic, Black Sea, and Pacific fleets.

Badger-D. Maritime/electronic reconnaissance version. Nose like that of 'Badger-C'. Larger undernose

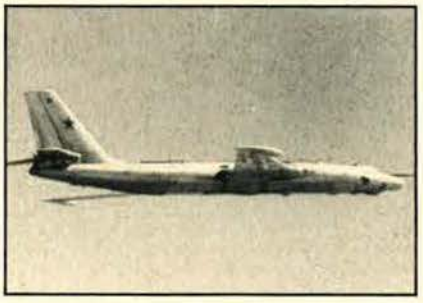


Beriev M-12 (NATO 'Mail') (Royal Norwegian Air Force)

Prototype ASW variant of Antonov An-12



Ilyushin Il-38 (NATO 'May') dropping a sonobuoy (Swedish Air Force)



Myasishchev M-4 (NATO 'Bison-B') (Royal Norwegian Air Force)

radome. Three blister fairings in tandem under centerfuselage.

Badger-E. Similar to 'Badger-A', but with cameras in bomb-bay.

Badger-F. Basically similar to 'Badger-E', but with electronic intelligence pod on pylon under each wing.

Badger-G. Similar to 'Badger-A', but fitted with underwing pylons for two rocket-powered air-to-surface missiles (NATO 'Kelt') that can be carried to a range greater than 2,000 miles. Free-fall bombing capability retained. Majority serve with antishipping squadrons of the Soviet Naval Air Force. A few operated previously by the Egyptian Air Force are believed to have been passed on to Iraq.

Badger-G modified. Specially equipped carrier for 'Kingfish' air-to-surface missiles. Large radome, presumably associated with missile operation, under center-fuselage. Device mounted externally on glazed nose might help to ensure correct attitude of Tu-16 during missile launch. Total of about 85 standard and modified 'Badger-Gs' believed operational with Soviet Northern, Black Sea, and Pacific fleets.

Badger-H. Stand-off or escort ECM aircraft, with primary function of chaff dispensing. The chaff dispensers are probably located in the weapons-bay area. Hatch aft of weapons-bay. Two teardrop radomes, fore and aft of weapons-bay. Two blade antennae aft of weapons-bay.

Badger-J. Specialized ECM jamming aircraft, with at least some of the equipment located in a canoe-shape radome protruding from inside the weapons-bay.

Badger-K. Electronic reconnaissance variant. Two teardrop radomes, inside and forward of weapons-bay. *(Data for 'Badger-A' follow.)*

Power Plant: two Mikulin RD-3M (AM-3M) turbojet engines; each 20,950 lb st.

Dimensions: span 108 ft 0½ in, length 114 ft 2 in, height 35 ft 6 in, wing area 1,772.3 sq ft.

Weights: empty 82,000 lb, normal gross 158,730 lb.

Performance: max speed 616 mph at 19,700 ft, service ceiling 40,350 ft, range with max fuel 4,470 miles.

Accommodation: crew of six.

Armament: seven 23 mm guns; in twin-gun turrets above front fuselage, under rear fuselage, and in tail, with single gun on starboard side of nose. Up to 19,800 lb of bombs in internal weapons-bay.

Tupolev Tu-22 (NATO 'Blinder')

About 250 Tu-22s were built, and these were the first Soviet operational bombers capable of supersonic performance for short periods. More than half of these are said to remain operational with medium-range units of the air armies. The Soviet Navy has around 40 for maritime reconnaissance and ECM duties, based mainly in the Southern Ukraine and Estonia to protect the sea approaches to the USSR. Versions identified by NATO reporting names are as follows:

Blinder-A. Original reconnaissance bomber version, first seen in 1961, with fuselage weapons-bay for free-fall nuclear or conventional bombs. Limited production only.

Blinder-B. Similar to 'Blinder-A', but equipped to carry air-to-surface missile (NATO 'Kitchen') recessed in weapons-bay. Larger radar and partially-retractable flight refueling probe on nose. About 145 'Blinder-As and Bs' remain in service with Soviet air armies, including 12 equipped for reconnaissance. Seven serve with Libyan Air Force, 9 with Iraqi Air Force.

Blinder-C. Maritime reconnaissance version, with six camera windows in weapons-bay doors. New dielectric panels, modifications to nosecone, etc., on some aircraft suggest added equipment for ECM and electronic intelligence roles.

Blinder-D. Training version. Cockpit for instructor in raised position aft of standard flight deck, with stepped-up canopy. Used by Soviet and Libyan Air Forces.

Power Plant: two Koliesov VD-7 turbojet engines in pods above rear fuselage, on each side of tail-fin; each 30,900 lb st with afterburning. Lip of each intake is extended forward for takeoff, creating annular slot through which additional air is ingested.

Dimensions: span 90 ft 10½ in, length 132 ft 11½ in, height 35 ft 0 in.

Weight: gross 185,000 lb.

Performance: max speed Mach 1.4 at 40,000 ft, service ceiling 60,000 ft, max unrefueled combat radius 1,925 miles.

Accommodation: three crew, in tandem.

Armament: single 23 mm gun in radar-directed tail mounting. Other weapons as described for individual versions.

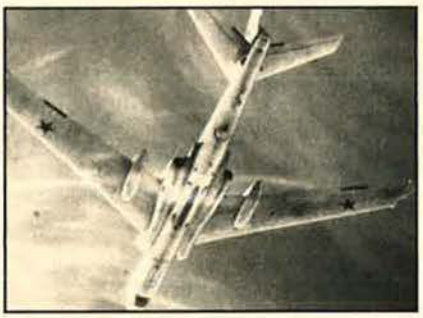
Tupolev Tu-22M/Tu-26 (NATO 'Backfire')

Although Soviet delegates to the SALT II Treaty talks referred to 'Backfire' as the Tu-22M, its correct service designation is believed to be Tu-26. Controversy concerning its range has ended. The 1984 edition of *Soviet Military Power* states that the variable-geometry 'Backfire' is "a long-range aircraft capable of performing nuclear strike, conventional attack, antiship, and reconnaissance missions. Low-level penetration features make it a more survivable system than its predecessors. The 'Backfire' has sufficient range/radius capabilities to be employed effectively against the contiguous United States on high-altitude subsonic missions. Its low-altitude supersonic dash capabilities make it a formidable weapon in support of military operations in Europe and Asia as well." Its range can be increased by fitting a nose probe to permit in-flight refueling.

The total number of 'Backfires' in service is about 270, of which two-thirds oppose NATO in Europe and over the Atlantic, with the others in the far east of the Soviet Union. The latter are seen frequently over the Sea of Japan, and 30 of them are reportedly drawn from the 105 'Backfires' operated by the Soviet Naval Air Force. The threat posed by these maritime aircraft caused DoD to comment as long ago as 1979 that "the Soviet bomber and cruise-missile force may be overtaking their submarine force as a threat to our fleet and to our forces necessary for the resupply of Europe. They can concentrate aircraft, coordinate attacks with air, surface, or submarine-launched missiles, and use new technology to find our fleet units, jam our defenses, and screen their approach." Production continues at the rate of 30 per year, and DoD has warned that "the 'Backfire's' capabilities will continually improve during its expected in-service life." The AS-15 air-launched cruise missile, with 1,600 nm range, will add to its low-level stand-off attack capability in the near future.

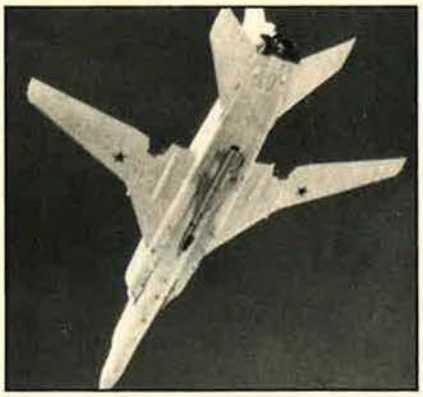
Three versions have been identified, as follows:

Backfire-A. Initial version, with large landing gear fairing pods on wing trailing-edges. Observed in prototype form on the ground near the manufacturing plant at Kazan, in Central Asia, in July 1970. Equipped a single squadron.



Tupolev Tu-16 (NATO 'Badger-J') (Swedish Air Force)

Crew with Tupolev Tu-22 (NATO 'Blinder')



Tupolev Tu-26 (NATO 'Backfire-B') with AS-4 'Kitchen' (Swedish Air Force)

Backfire-B. Extensively redesigned, with increased span and with landing gear pods eliminated except for shallow underwing fairings, no longer protruding beyond the trailing-edge. Mainwheels retract inward into bottom of intake trunks.

Backfire-C. Advanced version with wedge-type engine air intakes, similar to those of MiG-25. No photograph yet available. *(Data for 'Backfire-B' follow.)*

Power Plant: two unidentified engines, reported to be uprated versions of the 44,090 lb st Kuznetsov NK-144 afterburning turbofans used in the Tu-144 supersonic transport. Optional in-flight refueling nose-probe.

Dimensions: span 113 ft spread, 86 ft swept; length 140 ft; height 33 ft.

Weight: gross 270,000 lb.

Performance: max speed Mach 1.92 at high altitude, Mach 0.9 at low altitude, max unrefueled combat radius 3,400 miles.

Armament: twin 23 mm guns in radar-directed tail mounting. Nominal weapon load 26,450 lb. Primary armament of one to three 'Kitchen' or 'Kingfish' air-to-surface missiles semirecessed in the underside of the center-fuselage and/or under the fixed center-section panel of each wing. 'Backfire' can also carry the full range of Soviet free-fall nuclear and conventional weapons, and some aircraft photographed since 1978 have carried multiple racks for external stores under the front of their air intake trunks. Soviet development of decoy missiles has been reported, to supplement very advanced ECM and ECCM.

Tupolev Tu-95 and Tu-142 (NATO 'Bear')

No other combat aircraft in the world has matched the production record of Andrei Tupolev's huge four-turboprop 'Bear', which continues to come off the assembly line at Taganrog 31 years after the first flight of the original strategic bomber prototype. From the start, it flew at speeds 100 mph faster than anyone had expected a propeller-driven aircraft to achieve. As the years passed, the size and payload potential of the basic Tu-95 and its maritime reconnaissance counterpart, the Tu-142, enabled them to accommodate the largest air-to-surface missiles and radars yet carried by operational aircraft. The newly-announced 'Bear-H' version will be the first launch vehicle for the Soviet Union's new-generation long-range air-launched cruise missiles with nuclear warheads.

The long-range attack force of the five Soviet air armies has more than 100 Tu-95s. Soviet Naval Aviation units operate about 95 Tu-142s for overwater reconnaissance and antisubmarine warfare. Flying from places like Cuba and Angola, they have demonstrated their ability to cover the North and South Atlantic from the Mediterranean approaches westward to the US east coast, and southward to the Cape of Good Hope. Others operate regularly from Cam Ranh in Vietnam. Eight major versions can be identified by unclassified NATO reporting names, as follows:

Bear-A. Basic long-range strategic bomber. Chin radome. Internal stowage for two nuclear or a variety of conventional free-fall weapons. Defensive armament of six 23 mm guns in pairs in remotely-controlled rear dorsal and ventral turrets, and manned tail turret.

Bear-B. As 'Bear-A', but able to carry large air-to-surface winged missile (NATO 'Kangaroo') under fuselage, with associated radar in wide undernose radome replacing glazed nose. Defensive armament retained. A few 'Bs' operate in maritime reconnaissance role, with flight refueling nose probe, and, sometimes, a streamlined blister fairing on the starboard side of the rear fuselage.

Bear-C. Third strike version, with ability to carry 'Kangaroo', first observed near NATO ships in 1964. Differs from 'Bear-B' in having a streamlined blister fairing on each side of its rear fuselage. Has been seen with a faired tail as mentioned under 'Bear-D' entry. Refueling probe standard.

Bear-D. Identified in 1967, this was the first version fitted with I-band radar in large blister fairing under center-fuselage. Glazed nose like 'Bear-A', with undernose radome and superimposed refueling probe. Rear fuselage blisters as on 'Bear-C'. Added fairing at each tailplane tip. I-band tail-warning radar in enlarged fairing at base of rudder. Tasks include pinpointing of maritime targets for missile launch crews on board ships and aircraft that are themselves too distant to ensure precise missile aiming and guidance. About 45 serve with Soviet Naval Air Force.

A 'Bear-D' photographed in the second half of 1978 had in place of the normal tail turret and associated radome a faired tail housing special equipment.

Bear-E. Maritime reconnaissance bomber. Generally as 'Bear-A', but with rear fuselage blister fairings and refueling probe as on 'Bear-C.' Six or seven camera windows in bomb-bay doors. Few only.

Bear-F. Much-refined antisubmarine version, identified in 1973. Smaller I-band radar fairing, further forward than that of 'Bear-D'. Large blister fairings absent from rear fuselage. Lengthened fuselage forward of wings, with shallow undernose radome on some aircraft only.

Enlarged fairings aft of inboard engine nacelles on a few early aircraft to improve aerodynamics; later 'Fs' have standard size nacelles. Armament reduced to two guns, in tail mounting. Two stores bays in rear fuselage, one replacing ventral gun turret. Bulged nosewheel doors, over larger or low-pressure tires. About 50 operational in 1984, with production continuing to balance attrition of 'Bear' force.

Individual aircraft photographed by NATO and Swedish interceptors over international waters have displayed significant new equipment configurations additional to those listed. They include a MAD 'sting' projecting from the rear of the fin tip of some 'Bear-Fs', which lack the fairings seen at the tailplane tips of earlier 'Ds' and 'Fs'.

Bear-G. Generally similar to 'Bear-B/C', but reconfigured to carry the supersonic 'Kitchen' air-to-surface missile instead of the subsonic 'Kangaroo'.

Bear-H. First mentioned officially in 1984, this new production version is equipped to carry long-range cruise missiles, including the AS-15. It is believed to have achieved initial operational capability.

Power Plant: four Kuznetsov NK-12MV turboprop engines, each 14,795 ehp.

Dimensions ('Bear-A'): span 159 ft 0 in, length 155 ft 10 in, height 39 ft 9 in.

Dimensions ('Bear-F'): span 167 ft 8 in, length 162 ft 5 in, height 39 ft 9 in.

Weight ('Bear-A'): gross 340,000 lb.

Weight ('Bear-F'): gross 414,470 lb.

Performance ('Bear-A'): max speed 575 mph at 41,000 ft, range 7,800 miles with 25,000 lb of bombs, max unrefueled combat radius 5,150 miles.

New Tupolev Bomber (NATO 'Blackjack')

'Blackjack' is the long-awaited supersonic successor to the M-4 'Bison' and Tu-95 'Bear-A' strategic bombers. Apart from DoD artists' impressions, the only perspective picture of 'Blackjack' yet released is a poor-quality reconnaissance photograph taken over Ramenskoye flight test center on November 25, 1981. Showing the aircraft parked alongside two Tu-144 supersonic airliners, this enables its overall length, including nose probe, to be calculated as around 166 ft. What this implies in terms of weapon load and fuel tankage is alarmingly apparent. 'Blackjack' is about 25% bigger than Tupolev's 'Backfire', 13% larger than USAF's B-1B, and longer than even the B-52. It is in no way a simple scale-up of 'Backfire'. Common features include low-mounted variable-geometry wings and large vertical tail surfaces with a massive dorsal fin, but 'Blackjack's' horizontal tail surfaces are mounted higher, at the intersection of the dorsal fin and main fin. The fixed root panel on each wing seems to be long and very sharply swept, like the inboard section of the Tu-144's delta wing. The engine installation also seems to resemble that of the now-retired airliner rather than 'Backfire', leading to suggestions that 'Blackjack' might be powered by four Koliesov single-shaft turbojets of the kind that gave the developed Tu-144D an increased range (these might be related to the Type 57 engines tested in the unidentified 'Aircraft 101'). Such assessments should be regarded with caution, as the Tu-144D was designed to cruise at around Mach 2 throughout its flight, whereas the bomber would need to cruise at subsonic speed to conserve fuel and accelerate to supersonic speed at high altitude, or transonic speed at penetration height, only as it approached and left the target area. Major differences in flight profile normally call for different engines. However, it is Soviet policy to uprate or adapt an existing engine for a new aircraft rather than develop a new design, whenever this is possible. If the engines are mounted in pairs inside two divided underwing ducts, as on the Tu-144, the gap between the ducts will determine the type and size of weapons that 'Blackjack' can carry. DoD expects the Soviet Union to build a production series of about 100, with an initial operational capability in 1987. The AS-15 air-launched cruise missile, with a range of 1,600 nm, will be 'Blackjack's' primary weapon.

Power Plant: possibly four 'Type 57' engines; each 44,100 lb st.

Dimensions: span 172 ft spread, 110 ft swept; length 166 ft; height 45 ft.

Weight: gross 590,000 lb.

Performance: max speed Mach 2.1 at high altitude, max unrefueled combat radius 4,535 miles.

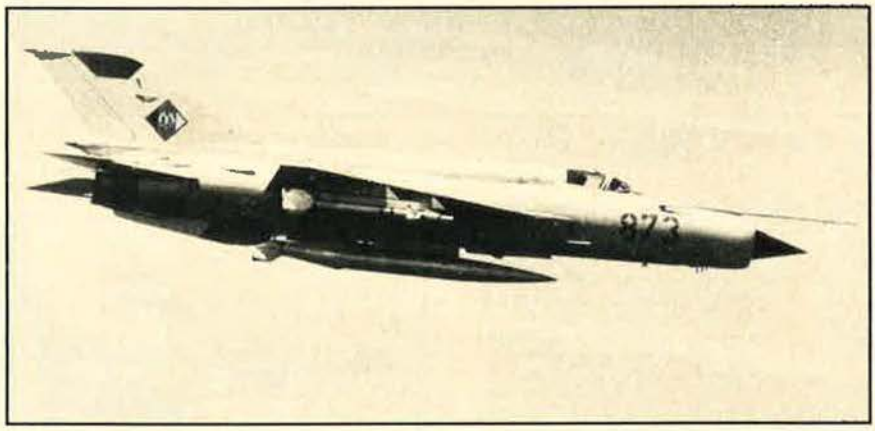
Armament: up to 36,000 lb of free-fall bombs or ALCMs.

Fighters

MiG-21 (NATO 'Fishbed')

MiG-21s continue to be flown by at least 36 air forces worldwide, but replacement with the MiG-23 and other types has left only 700 in first-line units of the Soviet tactical air forces, including 70 of the reconnaissance models known to NATO as 'Fishbed-H'. Early MiG-21F/PF/PFM variants (NATO 'Fishbed-C/D/F') are flown by various Warsaw Pact air forces, but the major versions deployed with Soviet air forces of the military districts (MDs) are as follows:

Tupolev Tu-142 (NATO 'Bear-F') with MAD tail 'sting' (Royal Norwegian Air Force)



MiG-21 of East German Air Force (NATO 'Fishbed') (Royal Norwegian Air Force)

MiG-21PFMA ('Fishbed-J'). Multirole development of PFM, with improved radar (NATO 'Jay Bird'; search range 18 miles) and four underwing pylons instead of two. Armament can include GP-9 underbelly pack, housing GSh-23 twin-barrel 23 mm gun, instead of external fuel tank. Deepened dorsal spine fairing above fuselage contains some tankage, but internal fuel totals only 687 gallons. Two additional pylons carry either 130-gallon fuel tanks or radar-homing 'Advanced Atoll' missiles to supplement infrared K-13As on inboard pylons. Above-nose pitot boom offset to starboard. Zero-speed, zero-altitude ejection seat. Later production PFMAs can have GSh-23 gun installed within fuselage, with shallow underbelly fairing for the barrels, and splayed cartridge ejection chutes to permit retention of centerline tank.

MiG-21MF ('Fishbed-J'). Differs from PFMA in having lighter-weight, higher-rated Tumansky R-13-300 turbojet. Rearview mirror above canopy. Entered service in 1970.

MiG-21SMT ('Fishbed-K'). As MiG-21MF, but deep dorsal spine extends rearward as far as parachute brake housing to provide maximum fuel tankage and optimum aerodynamic form. Provision for ECM equipment in small removable wingtip pods. Deliveries believed to have started in 1971.

MiG-21*bis* ('Fishbed-L'). Third-generation multirole air combat fighter/ground attack version, with wider and deeper dorsal fairing, updated avionics, and generally improved construction standards. Internal fuel capacity increased to 766 gallons.

MiG-21*bis* ('Fishbed-N'). Advanced version of 'Fishbed-L' with Tumansky R-25 turbojet engine, rated at 16,535 lb st with afterburning. Enhanced avionics indicated by 'bow and arrow' antenna on nose. Rate of climb at T-O weight of 15,000 lb, with 50% fuel and two 'Atoll' missiles, is 58,000 ft/min. Armament uprated to two radar-homing 'Atolls' and two 'Aphids'. *(Data for MiG-21MF follow.)*

Power Plant: one Tumansky R-13-300 turbojet engine; 14,550 lb st with afterburning.

Dimensions: span 23 ft 5½ in, length 51 ft 8½ in, height 14 ft 9 in, wing area 247 sq ft.

Weight: gross 20,725 lb.

Performance: max speed Mach 2.1 above 36,000 ft, Mach 1.06 at low altitude; practical ceiling about 50,000 ft; range 683 miles on internal fuel, 1,118 miles with three external tanks.

Accommodation: pilot only.

Armament: one twin-barrel 23 mm GSh-23 gun, with 200 rounds. Typical underwing loads for interceptor role include two K-13A ('Atoll') and two 'Advanced Atoll' air-to-air missiles; two K-13As and two UV-16-57 (sixteen 57 mm) rocket pods; two drop tanks and two missiles. Typical ground attack loads are four UV-16-57 rocket packs; two 1,100 lb and two 550 lb bombs; or four S-24 240 mm rockets.

MiG-23 (NATO 'Flogger')

An estimated 2,100 MiG-23 interceptors form the backbone of the slimmed-down Voyska PVO air defense force and air combat elements of the tactical air forces. Versions are flown by all of the non-Soviet Warsaw Pact air forces and have been exported to at least nine other nations. The full list of MiG-23 variants identified by unclassified NATO reporting names is as follows:

MiG-23 ('Flogger-A'). Prototype, shown in 1967 Aviation Day flypast. Lyulka AL-7F-1 afterburning turbojet, rated at 22,046 lb st.

MiG-23S ('Flogger-A'). Preproduction version with AL-7F-1 engine. Issued to complete fighter regiment in 1971 for development.

MiG-23SM ('Flogger-A'). As MiG-23S, but with four APU-13 pylons for external stores added under fixed inboard wing panels and engine air intake ducts.

MiG-23M ('Flogger-B'). First series production version. Single-seat air combat fighter with Tumansky R-27 turbojet, rated at 22,485 lb st with afterburning. Wings moved forward 2 ft to compensate for lighter engine, increasing gap between wing and tailplane. Length of rear fuselage reduced; size of dorsal fin increased; wing chord increased on movable panels, giving large dogtooth. Deliveries began in 1972.

MiG-23MF ('Flogger-B'). Generally similar to MiG-23M, but with more powerful R-29 turbojet and uprated equipment, including J-band radar (NATO 'High Lark'; search range 53 miles, tracking range 34 miles) in nose, ECM in fairings forward of starboard underwing pylon and above rudder, infrared sensor pod beneath cockpit, and Doppler. Described as the first Soviet aircraft with a demonstrated ability to track and engage targets flying below its own altitude. Standard version for Soviet Air Force from about 1975 and for other Warsaw Pact air forces from 1978.

MiG-23U ('Flogger-C'). Tandem two-seater for both operational training and combat use. Identical to early MiG-23M (with R-27 engine), except for slightly raised second cockpit to rear, with retractable periscopic sight for occupant, and modified fairing aft of canopy.

MiG-23 ('Flogger-E'). Export version of 'Flogger-B', equipped to lower standard. Smaller radar (NATO 'Jay Bird'; search range 18 miles, tracking range 12 miles) in shorter nose radome. No infrared sensor or Doppler. Armed with 'Atoll' missiles and GSh-23 gun.

MiG-23BN ('Flogger-F'). Export counterpart of Soviet Air Forces' MiG-27 ('Flogger-D') ground attack/interdictor. Has the nose shape, raised seat, cockpit external armor plate, and larger, low-pressure tires of the MiG-27, but retains the power plant, variable-geometry intakes, and GSh-23 twin-barrel gun of the MiG-23MF.

MiG-23MF ('Flogger-G'). First identified when six aircraft from Kubinka air base made goodwill visits to Finland and France in the Summer of 1978. Although basically similar to 'Flogger-B', these aircraft had a much smaller dorsal fin. Absence of operational equipment suggested that only a few aircraft had been modified to this standard for improved aerobatic capability as a display team. 'Flogger-G' has since been confirmed as a standard operational variant, with lighter-weight radar and, on some aircraft, an undernose sensor pod of new design.

MiG-23BN ('Flogger-H'). As 'Flogger-F', but with small avionics pod added on each side at bottom of fuselage, immediately forward of nosewheel doors.

MiG-23MF (NATO 'Flogger-G') (Jahn Charleville, Swedish Air Force)

On all versions, wing sweep is variable manually, in flight or on the ground, to 16°, 45°, or 72°. Full-span single-slotted trailing-edge flaps are each in three sections, permitting continued actuation of outboard sections when wings are fully swept. Upper-surface spoilers/lift dumpers operate differentially in conjunction with horizontal tail surfaces (except when cut out at 72° sweep), and collectively after touchdown. Leading-edge flap on outboard two-thirds of each main (variable-geometry) wing panel. Horizontal tail surfaces operate differentially and collectively for aileron and elevator functions respectively. Conventional rudder. *(Data for current Soviet AF MiG-23MF follow.)*

Power Plant: one Tumansky R-29B turbojet engine, rated at 27,500 lb st with max afterburning. Variable-geometry air intakes and variable nozzle. Provision for external fuel tank on centerline pylon.

Dimensions: span 46 ft 9 in spread, 26 ft 9½ in swept; length 59 ft 6½ in; wing area 293.4 sq ft spread.

Weight: gross 35,275–41,670 lb.

Performance: max speed Mach 2.35 at height, Mach 1.2 at sea level, service ceiling 61,000 ft, combat radius 560–805 miles.

Accommodation: pilot only.

Armament: one twin-barrel 23 mm GSh-23 gun in belly pack. One pylon under center-fuselage, one under each engine air intake duct, and one under each fixed inboard wing panel, for rocket packs, air-to-air missiles, or other stores. Use of twin launchers under air intake ducts permits carriage of four AA-8 (NATO 'Aphid') missiles, in addition to two AA-7 (NATO 'Apex') on underwing pylons.

MiG-25 (NATO 'Foxbat-A, C, and E')

First flown more than 20 years ago, the MiG-25 remains, so far as we know, the fastest armed combat aircraft ever introduced into squadron service. The fact that it is sighted routinely in the hands of pilots from India and those who fly under the national markings of Algeria, Libya, and Syria reflects great credit on the team headed by the late Artem Mikoyan that succeeded in making a Mach 3 aeroplane so manageable. Five versions have been identified.

MiG-25 ('Foxbat-A'). Basic interceptor designed to attack high-flying targets. Built mainly of steel, with titanium only in places subject to extreme heating, such as the wing leading-edges. Slightly reduced wing sweep towards tips, which carry antiflutter bodies housing ECM and CW target-illuminating radar. Nose radar (NATO 'Fox Fire') of MiG-25 examined in Japan in 1976, after the defection of its pilot, was the most powerful fitted to any interceptor of that period, but embodied vacuum tubes rather than modern circuitry, with emphasis on antijamming capability rather than range. Armament comprises four air-to-air missiles on underwing pylons. Known also in USSR as E-266. About 375 operational with Voyska PVO, others with air forces of Algeria, Libya, and Syria. Production cut back in 1977–78, reflecting new emphasis on interception of low-flying targets. Many uprated to 'Foxbat-E' standard.

MiG-25R ('Foxbat-B'). Reconnaissance version. Described separately in *Reconnaissance, ECM, and EW Aircraft* section.

MiG-25U ('Foxbat-C'). Trainer, of which first photographs became available in late 1975. New nose, containing separate cockpit with individual canopy, forward of standard cockpit and at a lower level. No search radar or reconnaissance sensors in nose. In service with air forces of Soviet Union and India (two). The aircraft designated E-133, in which Svetlana Savitskaya set a women's world speed record of 1,667.412 mph on June 22, 1975, and three subsequent speed and height records, is believed to have been a MiG-25U.

MiG-25M (NATO 'Foxbat-E')

Sukhoi Su-15 (NATO 'Flagon-F') (Swedish Coast Guard/Air Patrol)

MiG-25R ('Foxbat-D'). Reconnaissance version. Described separately.

MiG-25M ('Foxbat-E'). Converted 'Foxbat-A' with changes to radar and equipment to provide limited look-down/shootdown capability comparable with that of 'Flogger-B'. Undernose sensor pod. Engines uprated to 30,865 lb st. Developed via aircraft known as E-266M, which recaptured two time-to-height records from the F-15 *Streak Eagle* in 1975 and subsequently set the current absolute height record of 123,524 ft. *(Data for 'Foxbat-A' follow.)*

Power Plant: two Tumansky R-31 (R-266) turbojet engines, each 27,010 lb st with afterburning. Internal fuel capacity approx 4,600 gallons. Electronically-controlled variable ramps in intakes.

Dimensions: span 45 ft 9 in, length 78 ft 1¾ in, height 20 ft 0¼ in, wing area 611.7 sq ft.

Weights: basic operating 44,100 lb, gross 82,500 lb.

Performance: never-exceed combat speed, with missiles, Mach 2.83, max speed at low altitude, with missiles, Mach 0.85, service ceiling 80,000 ft, max combat radius 900 miles.

Armament: four air-to-air missiles. These may comprise one infrared and one radar homing example of the AA-6 (NATO 'Acrid') under each wing. Alternatively, one AA-7 (NATO 'Apex') and one AA-8 ('Aphid') can be carried under each wing.

MiG-29 (NATO 'Fulcrum')

First of a completely new generation of Soviet fighters to enter service, in early 1984, the single-seat MiG-29 is a twin-engine aircraft comparable in size to USAF's F-16 Fighting Falcon. An important difference is that the MiG is fitted from the start with a large pulse-Doppler look-down/shootdown radar that gives it day and night all-weather operating capability against low-flying targets as well as freedom from the outmoded ground control interception techniques that restricted Soviet air defense effectiveness in the past.

References to this fighter first appeared in the Western press in 1979, after a prototype had been identified in photographs taken over Ramenskoye flight test center by a US reconnaissance satellite. From the start, it was plain that the MiG-29 (NATO 'Fulcrum') represented a concerted effort by the Soviet Union to close the technology gap with the West. Combat radius and sustained turn rate are much improved over earlier Soviet fighters, and thrust-to-weight ratio is better than one. Although intended primarily as a counterair fighter, it is likely to have a full dual-role air combat/attack capability, and a combat capable two-seater is also in production. Manufacture is centered at a factory in Moscow. Its status and scale are evident from reports that the Indian government has decided to purchase MiG-29s (in flyaway form initially; for license manufacture later) to meet its requirement for aircraft to match Pakistan's F-16s.

Power Plant: two turbojets, possibly related to R-29; each 19,000 lb st with afterburning.

Dimensions: span 33 ft 7½ in, length 50 ft 10 in, height 17 ft 2 in.

Weights: empty 17,250 lb, gross 36,375 lb.

Performance: max speed at height Mach 2.2, at S/L Mach 1.06, combat radius 500 miles.

Accommodation: pilot only (tandem two-seater to follow).

Armament: six AA-10 medium-range radar homing air-to-air missiles, bombs, rocket pods, or other stores on two pylons under each wing and one under each engine air duct.

MiG-31 (NATO 'Foxhound')

The MiG-31 is the first Soviet fighter to offer true look-down/shootdown capability. It inherited its general configuration from the MiG-25 and is believed to have two of the same Tumansky R-31 afterburning turbojets as 'Foxbat-E', but is a tandem two-seater with a reduced maximum speed. The basic wing structure of the two types may be similar, but the fuselage is longer forward of the wings and has an extended rear section. The air intake ducts are also longer and much changed. Enhanced capability stems from 'Foxhound's' new pulse-Doppler radar, allied to an armament of eight advanced air-to-air missiles.

Deployment of MiG-31s with Voyska PVO air defense regiments had started by early 1983, and more than 50 are currently operational, near Moscow and Murmansk, and at Dolinsk on Sakhalin Island, north of Japan. Production is centered at the Gorkiy airframe plant.

Power Plant: two Tumansky R-31 turbojets; each 30,865 lb st with afterburning.

Dimensions: span 45 ft 10½ in, length 77 ft 1¼ in.

Weights: empty 48,115 lb, gross 90,725 lb.

Performance: max speed Mach 2.4 at height, combat radius 930 miles.

Accommodation: two crew, in tandem.

Armament: eight air-to-air missiles, including new radar homing AA-9.

Sukhoi Su-15 (NATO 'Flagon')

The economy of Soviet design was well demonstrated by the initial production version of the Su-15, which entered service in the late 1960s. Its wings, tail surfaces, and cockpit section were inherited (with modest changes) from the now-retired Su-11; main innovations were the two side-by-side engines and large conical nose radome, which necessitated side intake boxes with splitter plates. Continuous refinement through the 1970s through modernization of the avionics and added armament led to a succession of variants. About 750 of the 'Flagon-E/F' models remain in service. Unconfirmed US sources have suggested that these much-redesigned variants are designated Su-21 in the Soviet Union.

Flagon-C. Two-seat training version, probably with combat capability. Individual rearward-hinged canopy over each seat.

Flagon-E. Single-seat interceptor. Longer-span wings than those of original 'Flagon-A', with compound sweep. R-13F-300 turbojets, each rated at 14,550 lb st, increasing speed and range. Uprated avionics. Major production version, operational since second half of 1973.

Flagon-F. Latest version in service, identified by ogival nose radome instead of conical type on earlier variants. Generally similar to 'Flagon-E', but with uprated engines. *(Data for 'Flagon-F' follow.)*

Power Plant: two afterburning turbojets, reported to be Tumansky R-13F2-300s; each 15,875 lb st.

Dimensions: span 34 ft 6 in, length 68 ft 0 in.

Weight: gross 35,275 lb.

Performance: max speed Mach 2.5 above 36,000 ft, service ceiling 65,600 ft, combat radius 450 miles.

Accommodation: pilot only.
Armament: one radar homing and one infrared homing air-to-air missile (NATO 'Anab') on outboard underwing pylons; infrared homing close-range missile (NATO 'Aphid') on each inboard pylon. Gun pods or fuel tanks on two underbelly pylons.

Sukhoi Su-27 (NATO 'Flanker')

Responsibility for the larger of two new-generation Soviet fighters, equivalent to USAF's F-15 Eagle, was assigned to the Sukhoi design bureau. Its Soviet designation of Su-27 was quoted by official sources in the West in 1982, and it received the NATO reporting name of 'Flanker'.

Like the MiG-29, it is described by DoD as a supersonic all-weather counterair fighter with lookdown/shootdown weapon systems and beyond-visual-range air-to-air missiles, and with a possible secondary ground attack role. Few details may be published, but the Su-27's range, thrust-to-weight ratio, and maneuverability are all said to be improved by comparison with earlier Soviet fighters. Its large pulse-Doppler radar and heavy armament should also give it formidable potential against low-flying aircraft and cruise missiles, particularly when it is deployed in partnership with the new Soviet AWACS aircraft, which is based on the Il-76 transport and is known to NATO as 'Mainstay'.

Series production of the Su-27 is centered at a plant in Komsomolsk, Khabarovsk territory. The fighter was expected to achieve operational capability during 1984–85. It is also considered likely to equip, in a naval form, the large Soviet aircraft carrier now under construction.

Power Plant: two unidentified turbojets, possibly related to Tumansky R-31; each 30,000 lb st with afterburning.
Dimensions: span 47 ft 7 in, length (excl nose probe) 69 ft 0 in, height 18 ft 0 in.
Weight: gross 44,000–63,000 lb.
Performance: max speed Mach 2.35 at height, Mach 1.1 at S/L, combat radius 715 miles.
Accommodation: pilot only.
Armament: eight radar homing AA-10 air-to-air missiles under fuselage and wings, or 13,225 lb of external stores (*e.g.*, twelve 1,100 lb bombs) for secondary attack role.

Tupolev Tu-28P/Tu-128 (NATO 'Fiddler')

'Fiddler' is the largest purpose-designed interceptor yet put into service. One report suggests that it will remain operational until replaced by a supersonic cruise interceptor resembling the Tu-144 airliner. True or not, an estimated 120 still equip first-line units of the Voyska PVO. These are generally designated Tu-28P in the press, but the Department of Defense prefers Tu-128. When **'Fiddler-A'** was first displayed in public, at Tushino in 1961, it carried two missiles (NATO 'Ash'), each 17 ft long, had a large blister fairing under its fuselage, and was fitted with two ventral fins. The production **'Fiddler-B'** dispensed with the fairing and ventral fins, but appeared at Domodedovo in 1967 with armament increased to four missiles.

Power Plant: two unidentified afterburning turbojet engines; each estimated at 27,000 lb st. Half-cone shock-body in each air intake.
Dimensions: span 59 ft 4½ in, length 89 ft 3 in.
Weight: gross 100,000 lb.
Performance: max speed Mach 1.75 at 36,000 ft, ceiling 65,600 ft, range 3,100 miles.
Accommodation: crew of two in tandem.
Armament: four air-to-air missiles (NATO 'Ash') under wings, two radar homing, two infrared homing.

Yakovlev Yak-28P (NATO 'Firebar')

About 150 Yak-28P all-weather interceptors remain operational in the Voyska PVO fighter force. The longer dielectric nosecone fitted retrospectively to some aircraft does not indicate any increase in radar capability or aircraft performance, but simply a change of material and shape.

Power Plant: two turbojet engines, related to the Tumansky R-11 fitted in some MiG-21s; each 13,120 lb st with afterburning. Each intake houses a centerbody shock-cone.
Dimensions: span 42 ft 6 in, length 75 ft 5½ in, height 12 ft 11½ in.
Weight: gross 44,000 lb.
Performance: max speed Mach 1.88 at 35,000 ft, service ceiling 55,000 ft, combat radius 575 miles.
Accommodation: crew of two in tandem.
Armament: two air-to-air missiles (NATO 'Anab') under outer wings, with alternative infrared or semiactive radar homing heads.

Yakovlev Yak-38 (NATO 'Forger')

The designation Yak-36MP, which was applied to this naval combat aircraft until 1984, has now been dropped in favor of Yak-38. Far more significant is that the aircraft's original vertical takeoff technique has been superseded by a STOL type with a short forward run, which can be assumed to offer improved payload/range capability. This has been made practicable by an automatic control system that ensures "that the lift engines are brought into use, and the thrust vectoring rear nozzles rotated, at the optimum point in the takeoff run."

Known to NATO as 'Forger', this aircraft was first reported on board the carrier/cruiser *Kiev* during the ship's maiden voyage through the Mediterranean and North Atlantic in July 1976. With small refinements, it has since become standard equipment also on the *Kiev*'s three sister ships. There are two operational versions:

Forger-A. Basic single-seat combat aircraft. Prototype was completed in 1971 and production began in 1975. Twelve appear to be operational on each Soviet carrier/cruiser, in addition to about 19 Kamov Ka-25 helicopters. Primary operational roles are assumed to be reconnaissance, strikes against small ships, and fleet defense against shadowing, unarmed maritime reconnaissance aircraft.

Forger-B. Two-seat trainer, of which one is deployed on each carrier/cruiser. Second cockpit forward of normal cockpit, with its ejection seat at lower level, under a continuous canopy. Rear fuselage lengthened to compensate for longer nose. No ranging radar or weapon pylons. Overall length about 58 ft 0 in.

The Yak-38 has a single large turbojet, exhausting through a pair of rotating nozzles aft of the wing roots. Two lift-jets are mounted in tandem aft of the cockpit, inclined at an angle so that their thrust is exerted both upward and slightly forward. All three engines are used for vertical or short takeoff. Landing procedure begins with a gradual descent from far astern, with the last 1,300 ft flown essentially level, about 100 ft above the water. The aircraft crosses the ship's stern with about a 6 mph closure rate, 35–45 ft above the flight deck, then flares gently to a hover and descends vertically. Precise landings are ensured by the automatic control system, perhaps in association with laser devices lining each side of the rear deck. Puffer-jets at the wingtips and tail help to give the Yak-38 commendable stability during takeoff and landing.

Power Plant: one Lyulka AL-21 turbojet, without afterburner, exhausting through two vectored-thrust nozzles that can turn up to 10° forward of vertical for VTOL; 17,985 lb st. Two Koliesov lift-jets; each 7,875 lb st.
Dimensions: span 24 ft 0 in, length 50 ft 10¼ in, height 14 ft 4 in.
Weights: basic operating (incl pilot) 16,500 lb, gross 25,795 lb.
Performance: max speed Mach 0.95 at height, Mach 0.8 at S/L, service ceiling 39,375 ft, combat radius 115–230 miles.
Accommodation: pilot only.
Armament: four pylons under inner wings for 5,730–7,935 lb of stores, including 'Kerry' short-range air-to-surface missiles, armor-piercing antiship missiles, 'Aphid' air-to-air missiles, gun pods each containing a 23 mm twin-barrel GSh-23 cannon, rocket packs, bombs, and auxiliary fuel tanks.

Attack Aircraft

MiG-27 (NATO 'Flogger')

This single-seat ground attack aircraft has many airframe features in common with the MiG-23, but differs in such important respects that its Soviet designation was changed to MiG-27. It has the same basic power plant as the Soviet Air Force's MiG-23MF, but with a fixed nozzle and fixed engine air intakes, consistent with the primary requirement of transonic speed at low altitude. Two versions are operational in Soviet tactical air force regiments:

Flogger-D. Basic version, with forward portion of fuselage completely redesigned by comparison with interceptor versions of MiG-23. Instead of having an ogival radome, 'Flogger-D' nose is sharply tapered in side elevation, with a small sloping window covering a laser rangefinder and marked target seeker at the tip. Additional armor on flat sides of cockpit. Seat and canopy raised to improve view from cockpit. Six-barrel 23 mm Gatling-type underbelly gun replaces GSh-23 of interceptor. Bomb rack under each side of rear fuselage in addition to five pylons for external stores, including tactical nuclear weapons and, probably, the air-to-surface missile known to NATO as 'Kerry'. Provision for external fuel tank for ferry flights under each outer wing, which must be kept fully-forward when tanks are in place. Bullet-shape ECM antenna above each glove pylon.

Flogger-J. Identified in 1981. New nose shape, with lip at top and blister fairing below. ECM antennae above glove pylons deleted. Wing-root leading-edge extensions on some aircraft. Armament includes two gun pods on underwing pylons, with gun barrels that can be depressed for attacking ground targets.

A total of about 730 'Flogger-Ds' and 'Js' is deployed with Soviet tactical air forces, plus at least one squadron with the East German Air Force. The somewhat similar aircraft known to NATO as 'Flogger-F' and 'H' are MiG-23s. Both have been operated by Soviet units, but are basically export counterparts of the MiG-27, equipped to lower standards. *(Data for 'Flogger-D' follow.)*

Power Plant: generally similar to MiG-23MF, but R-29B engine rated at 25,350 lb st with afterburning.
Dimensions: span as MiG-23, length 52 ft 6 in.
Weights: max external weapon load 6,615 lb, gross 39,685 lb.
Performance: max speed Mach 1.7 at height, Mach 1.1 at S/L, service ceiling 52,500 ft, combat radius (lo-lo-lo, with underbelly tank, four 1,100 lb bombs, and two 'Atoll' missiles) 240 miles, max ferry range (3 external tanks) 1,550 miles.
Armament: described above.

Sukhoi Su-7 (NATO 'Fitter-A')

This big single-seat ground attack fighter can still be seen in action in support of Soviet forces in Afghanistan; about nine other air forces continue to fly Su-7s. However, the number deployed with Soviet regiments has diminished to about 130, in the following versions:

Su-7BM. Compared with the original Su-7B of the late 1950s, this introduced two slim duct fairings along top of fuselage and has an offset (to starboard) pitot boom. Progressive changes included switch to a zero-altitude ejection seat, addition of Sirena tail-warning radar, a second pair of underwing stores pylons, larger blast panels forward of wing-roots, JATO attachments under rear fuselage, twin brake-chutes in a container at base of rudder, and an uprated engine.

Su-7BKL. Introduced low-pressure nosewheel tire, ne-

Yakovlev Yak-38 (NATO 'Forger-A') (Royal Navy)

Sukhoi Su-7BM (NATO 'Fitter-A') (Denis Hughes)

cessitating bulged doors to enclose it when retracted, and small extensible skid outboard of each mainwheel for operation from short, unprepared fields.

Su-7BMK. As Su-7BKL, but with further equipment changes. *(Data for this version follow.)*

Power Plant: one Lyulka AL-7F-1 turbojet engine; 22,046 lb st with afterburning. Internal fuel capacity 777 gallons. Provision for two external tanks under belly, combined capacity 317 gallons. Two JATO rockets can be fitted under rear fuselage to shorten takeoff run.

Dimensions: span 29 ft 3½ in, length 57 ft 0 in, height 15 ft 0 in.

Weights: empty 19,000 lb, gross 29,750 lb.

Performance: max speed Mach 1.6 clean or Mach 1.2 with external stores at 36,000 ft, or 530 mph at sea level without afterburning, service ceiling 49,700 ft, combat radius 155–215 miles.

Accommodation: pilot only.

Armament: two 30 mm NR-30 guns in wing roots, each with 70 rounds; underwing pylons for two 1,650 lb and two 1,100 lb bombs, including nuclear weapons, or rocket pods. External weapon load reduced to 2,200 lb when two underbelly fuel tanks are carried.

Sukhoi Su-17, Su-20, and Su-22 (NATO 'Fitter-C, D, E, F, G, H, and J')

The original prototype of this family of aircraft, known to NATO as 'Fitter-B', was simply an Su-7 with about 13 ft of each wing pivoted outboard of a very large fence. By the time the Sukhoi Bureau had introduced also a more powerful engine and improved avionics, the variable-geometry 'Fitter' was seen to be in a completely different class from 'Fitter-A'. A doubled external load could be lifted from strips little more than half as long as those needed by the original fixed-wing aircraft; it could then be carried about 30% farther and delivered with greater accuracy. The resulting ground attack fighter was put into series production for the Soviet tactical air forces, which have about 850 in first-line units, and Soviet Naval Aviation, which deploys about 65 in the Baltic Sea area Air Force. Generally similar to 'Fitter-D', without electronics pod, but entire fuselage forward of wing drooped slightly to improve view from rear seat. Deepened dorsal spine fairing, almost certainly providing additional fuel tankage. Port wing-root gun deleted.

Su-17 ('Fitter-G'). Two-seat trainer variant of 'Fitter-H', with combat capability. Deepened dorsal spine fairing and drooped front fuselage like 'Fitter-E'. Shallow ventral fin (removable). Starboard gun only. Laser target seeker fitted.

Su-17 ('Fitter-H'). Improved single-seater for Soviet air forces. Basically as 'Fitter-C', but with wide and deep dorsal fairing aft of canopy, like 'Fitter E/G'. Doppler said to be fitted internally in deepened undersurface of nose. Taller fin with dorsal fin. Removable ventral fin. Retains both wing-root guns. Additional pylon for AS-7 (NATO 'Kerry') air-to-surface missile or other external store under wing center-section on each side.

It was deduced for some years that certain export versions of the variable-geometry 'Fitter' series had different engines from the five Su-17 variants listed above. 'Fitter-C/D/E/G/H' operated by the Soviet Air Force and some other air forces have a rear fuselage of basically constant diameter and are powered by a Lyulka turbojet. Versions exported to Libya, Peru, Syria, and North and South Yemen were seen to have a more bulged rear fuselage, now known to house a Tumansky R-29B turbojet, as fitted in the MiG-27, with rearranged external air ducts and a shorter plain metal shroud terminating the rear fuselage. This change of power plant, together with variations in equipment standard, is covered by the following changes to the Soviet type designation:

Su-20 ('Fitter-C'). Generally similar to Soviet Air Force 'Fitter-C', with Lyulka engine, but with reduced equipment standard. Supplied to Algeria, Czechoslovakia, Egypt, Iraq, Poland, and Vietnam.

Su-22 ('Fitter-F'). Export counterpart of 'Fitter-D', with modified undernose electronics pod. Tumansky R-29B turbojet, rated at 25,350 lb st with afterburning, in increased-diameter rear fuselage. Gun in each wing-root. Weapons include 'Atoll' air-to-air missiles. Aircraft supplied to Peru had Sirena 2 limited-coverage radar warning receiver, virtually no navigation aids, and IFF incompatible with that nation's SA-3 (NATO 'Goa') surface-to-air missiles.

Su-22 ('Fitter-G'). Export counterpart of Su-17 'Fitter-G', with R-29B engine.

Su-22 ('Fitter-J'). Generally similar to 'Fitter-H', but with Tumansky engine. More angular dorsal fin. 'Atoll' air-to-air missiles. Supplied to Libya.

The Soviet press published photographs of a further variant in late 1984. Generally similar to 'Fitter-H', it has an air intake at the base of the dorsal fin and a modified tailpipe shroud. *(Data for Su-17 'Fitter-C' follow.)*

Power Plant: one Lyulka AL-21F-3, turbojet, rated at 24,700 lb st with afterburning. Internal fuel capacity 1,200 gallons. Up to four 211-gallon drop-tanks under fuselage and wings.

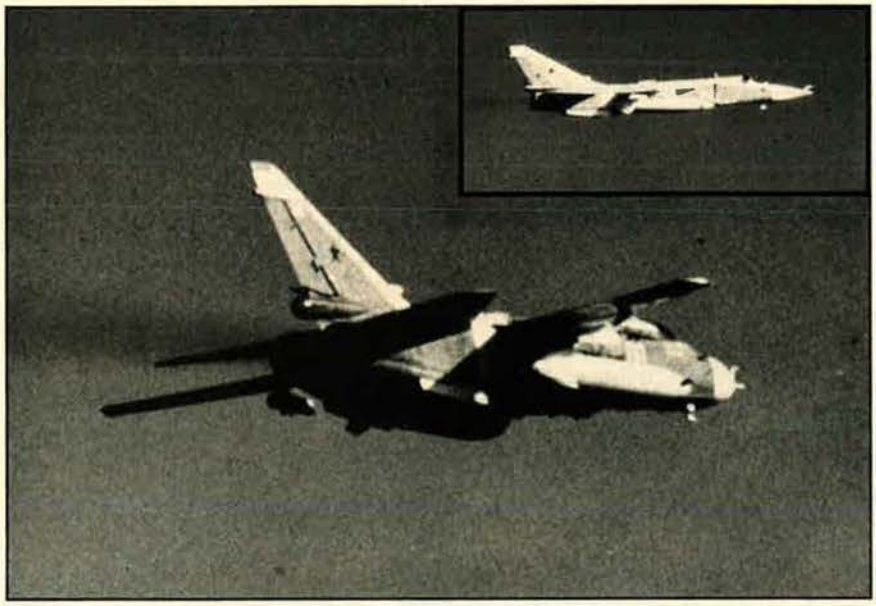
Dimensions: span 45 ft 11¼ in spread, 34 ft 9½ in swept; length 61 ft 6¼ in; height 15 ft 7 in; wing area 431.6 sq ft spread, 400.4 sq ft swept.

Weights: empty 22,046 lb, takeoff clean 30,865 lb, gross 39,020 lb.

Performance: max speed Mach 2.09 at height, Mach 1.05 at sea level, ceiling 59,050 ft, combat radius (lo-lo-lo) 224 miles, (hi-lo-hi) 391 miles.

Accommodation: pilot only.

Armament: two 30 mm NR-30 guns in wing-roots; eight pylons under fuselage and wings for up to 6,615 lb of bombs, including nuclear weapons, rocket pods, and such guided missiles as the air-to-surface AS-7 (NATO 'Kerry').



Two views of Sukhoi Su-24 (NATO 'Fencer-C') (Swedish Air Force)

for antishipping strike and amphibious support roles. Despite suggestions to the contrary (reflected, unfortunately, in the 1984–85 *Jane's* and our December 1984 *Jane's* Supplement), all those aircraft in Soviet service appear to be designated Su-17. Differences between the various versions identified to date are as follows:

Su-17 ('Fitter-C'). Basic single-seat attack aircraft for Soviet air forces, with Lyulka AL-21F-3 turbojet. Manual wing sweep control. Fuselage diameter constant between wing and tailplane. Curved dorsal fin between tail fin and dorsal spine fairing. Equipment said to include SRD-5M (NATO 'High Fix') I-band centerbody ranging radar, ASP-5ND fire control system, Sirena 3 omnidirectional radar homing and warning system, and SRO-2M IFF. Operational since 1971. Serves also with Soviet Navy.

Su-17 ('Fitter-D'). Generally similar to 'Fitter-C', but forward fuselage lengthened by about 1 ft 3 in. Added undernose electronics pod, probably for Doppler nav equipment. Laser marked target seeker in intake centerbody.

Su-17 ('Fitter-E'). Tandem two-seat trainer for Soviet

Sukhoi Su-25 (NATO 'Frogfoot')

Sukhoi Su-24 (NATO 'Fencer')

Although smaller and lighter than USAF's F-111, this variable-geometry attack aircraft brought entirely new capability to Soviet tactical airpower. Lt Gen Donald R. Keith (then US Army Deputy Chief of Staff for Research, Development and Acquisition) said that 'Fencer' is credited with having terrain-avoidance radar, in addition to nav/attack radar, and "has the capability to deliver ordnance in all weather within 180 ft of its target". The radar dish appears to have a diameter of at least 49 in and is reported to be of the pulse-Doppler type. Equipment includes a laser rangefinder and marked target seeker.

Three variants have been identified by NATO reporting names:

Fencer-A. Identifiable by rectangular rear fuselage box enclosing jet nozzles.

Fencer-B. Rear fuselage box around jet nozzles has deeply dished bottom skin between nozzles.

Fencer-C. Introduced in 1981. Important equipment changes. Multiple fitting on nose instead of former simple probe. Triangular fairing forward of each fixed wing root, on side of air intake, presumably housing equipment of the kind seen on the fuselage sides, forward of the nosewheel doors, of ground attack MiG-23/27 'Floggers'.

'Fencer' entered squadron service in December 1974 as a replacement for the Yak-28 ('Brewer'). More than 650 are now serving with first-line squadrons, including two full regiments at Tukums in Latvia, near the Gulf of Riga, and at Chernyakhovsk, near Kaliningrad on the Soviet Baltic coast. There are two more at Starokonstantinov and Gorodok in the Ukraine and a single regiment in the Soviet Far East. No 'Fencer' was allowed to fly outside the Soviet Union or its home waters until July 1979, when an Su-24 regiment was deployed briefly with the 16th Air Army at Templin Air Base north of Berlin in East Germany. Not until 1982 was the first fully-operational unit of 30 Su-24s deployed to East Germany as a regular component of the Soviet air forces stationed in Europe.

The Su-24 was the first modern Soviet fighter designed specifically for ground attack and the first to carry a weapon systems officer, in the side-by-side two-seat cockpit. Wing sweep appears to be about 16° in the fully spread position and 68° fully swept, with an intermediate sweep angle of 45°. The outer panels carry the first pivoting pylons seen on a Soviet variable-geometry aircraft. RAF assessment suggests that it has five times the weapon load and five times the range of its immediate predecessor, enabling it to reach any target in England from East German advanced bases. Some aircraft are assigned to strategic missions.

Unconfirmed reports suggest that the Lyulka engines in early 'Fencers' have been replaced by Tumansky engines in current production aircraft. The following data apply to the Lyulka-powered aircraft:

Power Plant: two afterburning turbojets; believed to be related to Lyulka AL-21F fitted in Su-17. Internal fuel capacity estimated at 3,435 gallons. Provision for large drop-tank on each glove pylon.

Dimensions: span 56 ft 7 in spread, 32 ft 9½ in swept; length 69 ft 10 in; height 18 ft 0 in.

Weights: empty equipped 41,885 lb, gross 87,080 lb.

Performance: max speed Mach 2.18 at height, Mach 1.2 at S/L, service ceiling 57,400 ft, combat radius (lo-lo-lo) over 200 miles, (hi-lo-hi, with 4,400 lb weapons and two external tanks) 1,115 miles.

Armament: one gun on port side of belly; eight pylons under fuselage, wing-root gloves, and outer wings for

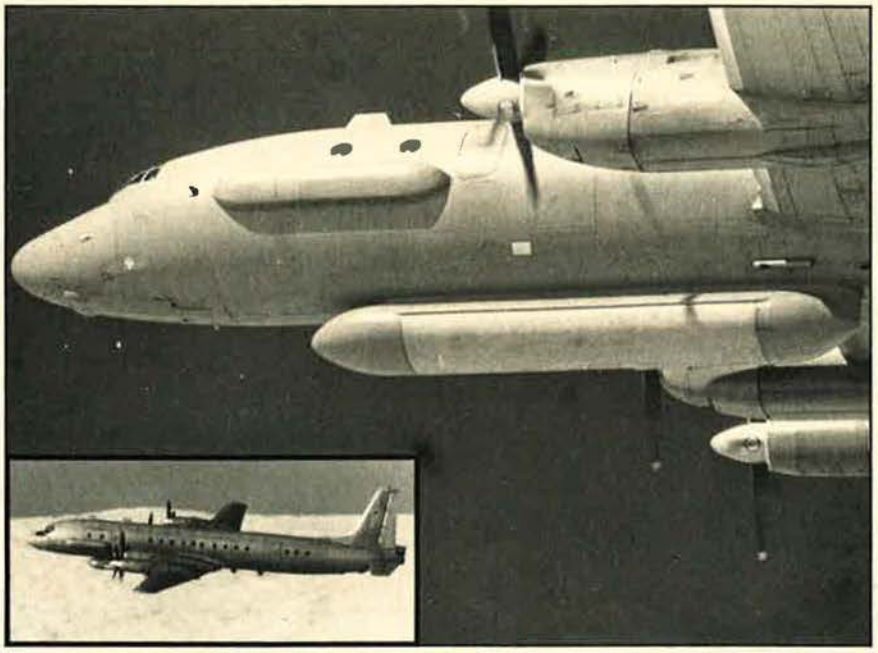
17,635 lb of guided and unguided air-to-surface weapons, including nuclear weapons.

Sukhoi Su-25 (NATO 'Frogfoot')

First photographs of this Soviet counterpart to USAF's single-seat A-10 Thunderbolt II became available in December 1982, following deployment of Su-25s to Afghanistan to support the Russian ground forces fighting in mountain terrain. They confirmed that the configuration of the Su-25 is more like that of the Northrop A-9A (*see 1972–73 Jane's*) than the A-10. In particular, the non-afterburning turbojet engines are mounted in long nacelles at the wing-roots. Their rating is believed to be in the range of only 5,620–9,000 lb st. Even so, the Su-25 can be expected to have a slightly higher overall performance than the larger A-10. Features evident from available photographs include a front fuselage similar in form to that of the MiG-27, a single fin and rudder, and ten hardpoints for external stores under the 20° swept wings. Total armament weight is estimated at 8,820 lb and includes a heavy-caliber gun, which may be installed or podded. The rear portion of each wingtip pod splits to form speed-brakes that project above and below wing when extended, like those of the US Navy's A-6 Intruder.

First observed by satellite at Ramenskoye flight test center in the late 1970s, the Su-25 was given the provisional US designation Ram-J. The NATO reporting name 'Frogfoot' was released in 1982, and the Su-25 is thought to have attained full operational capability. The emphasis in Afghanistan is said to be on techniques for coordinating low-level close support by fixed-wing aircraft and Mi-24 helicopter gunships. About 75 Su-25s are in current service. Production is centered at the Tbilisi airframe plant.

Dimensions: span 50 ft 10 in, length 47 ft 6 in.
Weight: gross 36,050 lb.
Performance: max speed 546 mph, combat radius 345 miles.



Two views of Ilyushin Il-20 (NATO 'Coot-A') (Above, Royal Air Force; inset, Royal Norwegian Air Force)

Reconnaissance, ECM, and Early Warning Aircraft

New Reconnaissance Aircraft

Among new Soviet military aircraft said to have been observed at Ramenskoye flight test center is a high-altitude reconnaissance vehicle in the class of USAF's Lockheed TR-1. It is known at present as Ram-M, a designation which suggests a development status somewhere between the MiG-29 (Ram-L) and the Tupolev bomber known to NATO as 'Blackjack' (Ram-P). No details are yet available, except that it has twin tail fins.

Antonov An-12 (NATO 'Cub-B, C, and D')

The large hold of this four-turboprop transport can accommodate a wide variety of equipment for special duties. Three variants may be identified by NATO reporting names:

Cub-B. Conversion of 'Cub-A' transport for electronic intelligence (elint) missions. Examples photographed over international waters by the crews of Norwegian and Swedish combat aircraft each had four additional blister fairings under the forward- and center-fuselage, plus other antennae. About 10 produced for Soviet Naval Air Force.

Cub-C. ECM variant carrying several tons of electrical generation, distribution, and control gear in the cabin, and palletized jammers for at least five wavebands faired into the belly, plus ECM dispensers. Glazed nose and undernose radar of transport retained. An ogival 'solid' fuselage tailcone, housing electronic equipment, is fitted in place of the usual gun position.

Cub-D. This further variant of the An-12 reflects the huge efforts being made by the Soviet Union to ensure effective handling of every conceivable ECM task. Special electronics include equipment under a large blister fairing on each side of the fuselage, forward of the landing gear fairing, and others under the front of the loading ramp/door and rear turret. Up to 40 'Cub-C and D' aircraft are believed to serve with the Soviet Air Force and Navy.

Ilyushin Il-20 (NATO 'Coot-A')

This ECM or electronic intelligence (elint) aircraft appears to be a conversion of the standard Il-18 four-turboprop transport. An under-fuselage container, about 33 ft 7½ in long and 3 ft 9 in deep, is assumed to house side-looking radar. Smaller containers on each side of the forward fuselage each contain a door over a camera or other sensor. About eight antennae and blisters can be counted on the undersurface of the center and rear fuselage, plus two large plates projecting above the forward fuselage.

MiG-25R (NATO 'Foxbat-D and B') (Tass)

Tupolev Tu-126 (NATO 'Moss') (Swedish Air Force)

Ilyushin Il-76 (NATO 'Mainstay')

An AWACS (airborne warning and control system) version of the Il-76 has been under development since the 1970s as a replacement for the Tu-126s operated by the Voyska PVO home defense force and tactical air forces. Known to NATO as 'Mainstay', it is said by DoD to provide the Soviet forces with the capability to detect aircraft and cruise missiles flying at low altitude over land and water, to help direct fighter operations over European and Asian battlefields, and to enhance air surveillance and defense of the USSR.

Unconfirmed reports suggest that 'Mainstay' has a conventionally located rotating 'saucer' radome, lengthened fuselage forward of the wings, and flight refueling probe. DoD stated in the 1984 edition of *Soviet Military Power* that four 'Mainstays' had been built, and that a production rate of at least five aircraft per year was to be expected.

MiG-21 (NATO 'Fishbed-H')

Two versions of this single-seat fighter are operated by the Soviet Air Forces and their allies as specialized tactical reconnaissance aircraft:

MiG-21R ('Fishbed-H'). Basically similar to MiG-21PFMA, but with a pod housing forward-facing or oblique cameras, infrared sensors, or ECM devices, and fuel, carried on the fuselage centerline pylon. Suppressed antenna at mid-fuselage; optional ECM equipment in wingtip fairings.

MiG-21RF ('Fishbed-H'). Generally similar to MiG-21R, but based on MiG-21MF. Total of 70 'Fishbed-Hs' of both models estimated in service with Soviet tactical air forces.

MiG-25 (NATO 'Foxbat-B and D')

Although generally similar to the basic MiG-25 interceptor, the reconnaissance variants have a modified wing and, carrying no external weapons, are not limited to Mach 2.8. Two versions have been identified in service, as follows:

MiG-25R ('Foxbat-B'). Basic reconnaissance version, with five camera windows and various flush dielectric panels aft of very small dielectric nosecap for radar. Equipment believed to include Doppler navigation system and side-looking airborne radar (SLAR). No armament. Slightly reduced span. Wing leading-edge sweep constant from root to tip. Total of about 170 'Foxbat-Bs and Ds' estimated in service with Soviet tactical air forces. 'Foxbat-B' also operational in Algeria, Libya, Syria, and with No. 106 Squadron of the Indian Air Force.

MiG-25R ('Foxbat-D'). Similar to 'Foxbat-B', but with larger SLAR dielectric panel, further aft on side of nose, and no cameras. Supplied also to Libya.

Dimension: span 44 ft 0 in.
Weights ('Foxbat-B'): basic operating 43,200 lb, gross 73,635 lb.
Performance: max speed Mach 3.2 at height, service ceiling 88,580 ft, operational radius 560 miles.

Mil Mi-8 (NATO 'Hip-D, G, J, and K')

This medium-size helicopter has been adapted for electronic duties, under the following NATO reporting names:

Hip-D. For airborne communications role. Generally similar to 'Hip-C' transport, but with canisters of rectangular section on outer stores racks, and added antennae.

Hip-G. Airborne communications version. Rearward inclined antennae projecting from rear of cabin and from undersurface of tailboom, aft of box for Doppler radar.

Hip-J. Additional small boxes on sides of fuselage, fore and aft of main landing gear legs, identify this ECM version.

Hip-K. Communications jamming ECM version with large antenna array on each side of cabin. No Doppler radar box under tailboom.

Sukhoi Su-17 (NATO 'Fitter-H')

About 180 Su-17 ('Fitter-H' model) fighters serving with Soviet tactical air force units are thought to be equipped for reconnaissance duties.

Tupolev Tu-126 (NATO 'Moss')

The Tu-126 is the Voyska PVO's counterpart to USAF's Boeing E-3A AWACS (Airborne Warning and Control System). About ten are operational, with airframe and power plant based on those of the now-retired Tu-114

turboprop airliner rather than the smaller-fuselage Tu-95 bomber. The 36 ft diameter rotating radar 'saucer' above the fuselage is 6 ft larger than that of the E-3A; however, the Tu-126 is believed to have only limited effectiveness in the warning role over water and to be ineffective over land.

Power Plant: four Kuznetsov NK-12MV turboprop engines; each 14,795 ehp. In-flight refueling probe standard.

Dimensions: span 168 ft 0 in, length 181 ft 1 in, height 52 ft 8 in, wing area 3,349 sq ft.

Weight: gross 374,785 lb.

Performance: max speed 528 mph, normal operating speed 404 mph, max range without flight refueling 7,800 miles.

Accommodation: crew of twelve.

Armament: none.

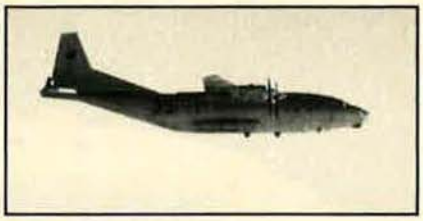
Yakovlev Yak-28 (NATO 'Brewer')

Versions of this two-seat tactical aircraft still operational in support roles are as follows:

Brewer-D. Reconnaissance aircraft, carrying cameras or other sensors, including side-looking airborne radar, instead of weapons in its internal bomb-bay. Blister radome under fuselage forward of wings. About 200 operational.

Brewer-E. Deployed in 1970 as the first Soviet operational ECM escort aircraft, with an active ECM pack built into its bomb-bay, from which the pack projects in cylindrical form. No radome under front fuselage, but many other additional antennae and fairings are apparent. A rocket pod can be carried under each outer wing, between the external fuel tank and balancer wheel housing. About 40 estimated in service.

Dimensions, weight, and **performance** should be in the same order as those of the Yak-28P ('Firebar') interceptor (which see).



Antonov An-12 (NATO 'Cub-B') (Swedish Air Force)

Antonov An-26 (NATO 'Curl') (Austin J. Brown)

Two views of Antonov An-72 (NATO 'Coaler') (Air Portraits)

Transports

Antonov An-12BP (NATO 'Cub')

The An-12BP (NATO 'Cub-A') has served as a standard paratroop and freight transport with the Soviet VTA (Military Transport Aviation) service since 1959. About 320 continue to form the largest component of its current force of 650 aircraft, but such statistics are misleading. The assets of VTA can quite properly be boosted on paper by another 200 An-12s and Il-76s, about 1,300 medium- and long-range passenger transports, and several thousand short-range transports and helicopters belonging nominally to the national airline Aeroflot. An-12s also serve with nine other air forces and are in production in China as Y-8s.

The An-12BP has a conventional freighter configuration, with access to the hold via a ramp/door which forms the bottom of the upswept rear fuselage when closed. This ramp/door is made in two longitudinal halves, which can be hinged upward inside the cabin to permit direct loading from trucks on the ground or airdropping of supplies and equipment. A full load of 100 paratroops can be dispatched via this exit in under one minute. The 'Cub-B, C, and D' elint and ECM versions, and a prototype ASW conversion, are described separately.

Power Plant: four Ivchenko AI-20K turboprop engines, each 4,000 ehp.

Dimensions: span 124 ft 8 in, length 108 ft 7¼ in, height 34 ft 6½ in, wing area 1,310 sq ft.

Weights: empty 61,730 lb, gross 134,480 lb.

Performance: max speed 482 mph, service ceiling 33,500 ft, range 2,236 miles with max payload.

Accommodation: crew of six; 44,090 lb of freight, vehicles, or 100 parachute troops. Built-in freight handling gantry with capacity of 5,070 lb.

Armament: two 23 mm NR-23 guns in manned tail turret.

Antonov An-22 (NATO 'Cock')

The prototype of this giant turboprop freighter flew for the first time on February 27, 1965; more than 50 production An-22s remain in service with the military air transport force and Aeroflot. Each can carry a payload of up to 176,350 lb, including missiles like 'Ganef' on their tracked launchers; the An-22 will remain the only Soviet transport capable of lifting such vehicles as a T-62 tank until Antonov's new An-400 enters service. Production of the An-22 ended in 1974.

Power Plant: four Kuznetsov NK-12MA turboprop engines; each 15,000 shp.

Dimensions: span 211 ft 4 in, length 190 ft 0 in, height 41 ft 1½ in, wing area 3,713 sq ft.

Weights: empty 251,325 lb, gross 551,160 lb.

Performance: max speed 460 mph, range 6,800 miles with 99,200 lb payload.

Accommodation: crew of five or six, 28–29 passengers in cabin forward of main freight hold. Four traveling gantries and two winches to speed freight handling.

Armament: none.

Antonov An-26 (NATO 'Curl')

The An-26 twin-turboprop freighter was the first aircraft to embody Oleg Antonov's unique rear-loading ramp. This forms the underside of the rear fuselage when retracted, in the usual way, but can be slid forward under the rear of the cabin to facilitate direct loading on to the floor of the hold, or when the cargo is to be airdropped. An OPB-1R sight is available to ensure pinpoint delivery into the dropzone. Max payload is 12,125 lb; conversion of the standard freighter to carry troops or litters takes 20 to 30 minutes in the field. More than 200 Aeroflot An-26s are available to the Soviet Military Transport force; others are flown by about 27 foreign air forces.

Power Plant: two Ivchenko AI-24VT turboprop engines; each 2,820 ehp. One 1,765 lb st RU 19A-300 auxiliary turbojet in starboard nacelle for turboprop starting and to provide additional power for takeoff, climb, and cruising flight, as required.

Dimensions: span 95 ft 9½ in, length 78 ft 1 in, height 28 ft 1½ in.

Weights: empty 33,113 lb, gross 52,911 lb.

Performance: cruising speed 273 mph at 19,675 ft, service ceiling 24,600 ft, range 683 miles with max payload.

Accommodation: crew of five, plus station for load supervisor or dispatcher. Electrically-powered mobile hoist, capacity 4,409 lb, and conveyor to facilitate loading and airdropping. Provision for carrying 40 paratroops or 24 litters. Improved An-26B version has rollgangs and mechanical handling system, enabling two men to load and unload three 8 ft long standard freight pallets in 30 minutes.

Armament: none.

Antonov An-32 (NATO 'Cline')

The Indian Air Force was first to order this specialized 'hot and high' short/medium-range transport, for which there may not be a Soviet Air Force requirement. The basic airframe is similar to that of the An-26, except for having triple-slotted trailing-edge flaps, automatic leading-edge slats, much enlarged ventral fins, and a full-span slotted tailplane. When fitted with two 5,180 ehp Ivchenko AI-20DM turboprops, the An-32 is able to operate from airfields 13,000 to 14,750 ft above sea level in an ambient temperature of ISA + 25°C and can transport 3 metric tons of freight over a 683 mile stage length, with fuel reserves. Maximum payload is 14,770 lb.

Alternatively, the An-32 can be fitted with 4,195 ehp AI-20M engines for operation in moderate climatic conditions. *(Data for version with AI-20DM engines.)*

Dimensions: span 95 ft 9½ in, length 77 ft 8¼ in, height 28 ft 8½ in.

Weight: gross 59,525 lb.

Performance: normal cruising speed 329 mph, service ceiling 29,525 ft, range with max payload 497 miles, with max fuel 1,367 miles.

Accommodation: crew of five; freight, or 39 troops, 30 paratroops, or 24 litters and a medical attendant.

Armament: none.

Antonov An-72 (NATO 'Coaler')

Until an An-72 set 16 height, time to height, and payload to height records in November/December 1983, there had been no news of the aircraft since 1981. Even now there is no firm evidence that it has progressed beyond pre-series testing, although the An-74 (which see) appears to be a production development.

The An-72 was conceived as a STOL replacement for the An-26 that would be able to operate from unprepared airfields or from surfaces covered with ice or snow. The high location of the engines was adopted primarily to avoid problems caused by foreign object ingestion. Their efflux is ejected over the wing upper surface and then down over large multislotted flaps to provide a considerable increase in lift for short-field operation, using the so-called 'Coanda effect'. The first prototype flew on December 22, 1977; the second was shown at the 1979 Paris Air Show, by which time just over 1,000 flying hours had been logged by the two aircraft in about 300 flights. Handling in the air was described as outstanding, and a completely automatic Doppler-based navigation system is standard. A brochure distributed at the 1981 Paris Air Show suggested that a special 'slide-forward' ramp of the kind fitted to the An-26 would be standard also on any future production An-72.

Power Plant: two Lotarev D-36 high bypass ratio turbofan engines; each 14,330 lb st.

Dimensions: span 84 ft 9 in, length 87 ft 2¼ in, height 27 ft 0¼ in.

Weights: max payload 22,045 lb, gross weight 72,750 lb.

Performance: max cruising speed 447 mph, service ceil-

ing 36,100 ft, range 2,360 miles with max fuel, or 620 miles with max payload.
Accommodation: crew of two or three on flight deck. Folding seats for 32 passengers along walls of freight hold. Provision for carrying 24 casualties and attendant in ambulance role.
Armament: none.

Antonov An-74

In February 1984, the Soviet newspaper *Pravda* referred to a new transport aircraft, designated An-74, which will be operated in the Arctic and Antarctic regions. Unlike the Il-18D turboprop transports used currently to carry men and equipment between Leningrad and the Antarctic base of Molodejnaya, the An-74 has a wheel-ski landing gear for operation on snow and ice landing strips. It appears to be a development of the An-72 (which may also be designated An-74 in standard production forms), as *Pravda* described it as a STOL transport powered by two Lotarev D-36 engines of 14,330 lb st, with a max T-O weight of about 66,140 lb and max payload of 16,535 lb.

The An-74 is an all-weather aircraft, equipped with the latest available radio navigation aids, and with de-icing equipment on the wings, tail unit, and engine air intakes. In the Arctic and Antarctic, its duties will include assistance in setting up scientific stations on Arctic ice floes, airdropping supplies to motorized trans-Antarctic expeditions, and reconnaissance to observe changes in the icefields.

Antonov An-400 (NATO 'Condor')

Intended as an urgently needed replacement for the An-22 strategic freighter, the An-400 is the largest aeroplane flying currently in the USSR. A drawing prepared by DoD suggests that, except for having its tailplane mounted on the rear fuselage, its configuration is very like that of USAF's C-5A Galaxy, with four underwing podded engines. These are understood to be Lotarev D-18T turbofans, each rated at 51,650 lb st. Lack of an engine in this category had long been one of the major problems confronting Soviet designers of large military and commercial transports. The APU, mounted in the tailcone, is likely to be less prominent than that shown in DoD drawing. Also conjectural is the main landing gear, shown as comprising five pairs of wheels in tandem in a pod on each side of the cabin.

According to DoD, the An-400 will carry its max payload of 275,575 lb over a range of 2,110 miles. As a personnel transport, it will accommodate 345 fully equipped troops or 270 paratroops. Far more important will be its ability to transport the largest Soviet tanks and other heavy equipment, for which it has a rear loading ramp/door but no confirmed provision for nose loading. Of particular significance is that it can almost certainly carry all elements of the SS-20 mobile intermediate-range ballistic missile system. Flight testing is believed to have started in early 1983. Initial operational capability is foreseen by the mid- to late-1980s.
Dimensions (provisional): span 230 ft, length 223 ft.

Ilyushin Il-76 (NATO 'Candid-B')

The Il-76 is the Soviet counterpart to USAF's C-141 StarLifter. Its designers, led by G. V. Novozhilov, were given the task of producing an aircraft able to transport 40 metric tons of freight for a distance of 3,100 miles (5,000 km) in under six hours, in the harsh operating conditions of the USSR's Siberian regions. This implied that the new aircraft would carry twice the payload of the An-12BP that it was intended to replace over five times the range. The prototype flew for the first time on March 25, 1971. An indication of the capability of the type was given in July 1975, when Il-76s set a series of 25 official records, including a payload of more than 70 metric tons (154,590 lb) lifted to a height of 38,960 ft and a speed of 532.923 mph around a 1,000 km circuit with the same load.

Design features include rear-loading ramp/doors, a T-tail, full-span leading-edge slats and triple-slotted flaps for good field performance, a navigator's station in the glazed nose, with ground-mapping radar in a large undernose fairing, and a unique and complex 20-wheel landing gear. The entire accommodation is pressurized, making it possible to carry 140 troops as an alternative to freight. Advanced mechanical handling systems are fitted for containerized and other freight. Equipment for all-weather operation includes a computer for automatic flight control and automatic landing approach.

The unarmed Il-76/76T/76TD versions are known to NATO as 'Candid-A'. Deliveries to a development squadron of military Il-76Ms ('Candid-B'), with rear guns and small ECM fairings, began in 1974. To date, about 250 have been delivered to the VTA transport force as An-12BP replacements. Aeroflot has more than 50 Il-76Ts and Ms. The air forces of Iraq, Czechoslovakia, and Poland already operate Il-76Ms, with India soon to follow. Others are entering service with the Soviet Air Force in an AWACS role (see entry on 'Mainstay') and will be joined in the near future by Il-76 in-flight refueling

Ilyushin Il-76M (NATO 'Candid-B') (Anton Wettstein)

tankers deployed in support of both strategic and tactical combat forces.

The following data refer to the basic military Il-76M. Also in service is an improved version, designated Il-76MD, with either increased fuel or more fuel-efficient engines.
Power Plant: four Soloviev D-30KP turbofan engines, each 26,455 lb st. Fuel capacity 21,615 gallons.
Dimensions: span 165 ft 8 in, length 152 ft 10¼ in, height 48 ft 5 in, wing area 3,229.2 sq ft.
Weight: gross 374,785 lb.
Performance: cruising speed 466–497 mph at 29,500–39,350 ft, nominal range 3,100 miles with payload of 88,185 lb, max range 4,163 miles.
Accommodation: crew of seven, incl two freight handlers; up to 140 passengers.
Armament: two 23 mm NR-23 guns in tail turret.

Trainers

Aero L-29 Delfin (NATO 'Maya')

About 3,600 L-29 two-seat basic and advanced jet trainers were manufactured in Czechoslovakia between 1963 and 1974 for standardized use by the air forces of all Warsaw Pact nations except Poland, which preferred its own TS-11 Iskra, and for export. Replacement with another Czech-designed trainer, the L-39, has been under way since 1974, but L-29s remain in large-scale service in the Soviet Union.
Power Plant: one M701c500 turbojet engine; 1,960 lb st.
Dimensions: span 33 ft 9 in, length 35 ft 5½ in, height 10 ft 3 in.
Weights: empty 5,027 lb, gross 7,804 lb.
Performance: max speed 407 mph at 16,400 ft, service ceiling 36,100 ft, range 555 miles with external tanks.
Accommodation: crew of two, in tandem.
Armament: provision for two bombs of up to 220 lb, eight air-to-ground rockets, or two 7.62 mm machine-gun pods under wings.

Aero L-39 Albatros

The first prototype of the L-39 flew on November 4, 1968, and series production began in 1972 to replace the L-29 as the standard trainer of the Soviet and other air forces. Well over 1,500 have been delivered, and the eventual production total is expected to match that of the L-29. There are four current versions:

L-39. Basic and advanced flying trainer; operators include the air forces of Afghanistan, Czechoslovakia, the German Democratic Republic, and the USSR.

L-39V. As basic L-39, but with added winch for target towing.

L-39Z0. Weapon training version, with four underwing weapon stations. Strengthened wings. Exported to Iraq, Libya, and Syria. Production continues.

L-39ZA. Ground attack and reconnaissance version, with underfuselage gun and underwing weapon stations. Strengthened wings and landing gear. Operational with air forces of Czechoslovakia and Romania. Production continues.

A completely new version, with improved airframe, engines, and equipment, is scheduled to fly this year.
Power Plant: one Ivchenko AI-25-TL turbofan engine; 3,792 lb st.
Dimensions: span 31 ft 0½ in, length 39 ft 9½ in, height 15 ft 7¾ in, wing area 202.36 sq ft.
Weights (L-39ZA): empty 8,060 lb, gross (clean) 10,029 lb, max 12,346 lb.
Performance (L-39ZA): max speed 469 mph at 16,400 ft, service ceiling 36,100 ft, range 621 miles on internal fuel.

MiG-15UTI (NATO 'Midget') (Tass)

Accommodation: crew of two, in tandem.
Armament (L-39ZA): underwing bombs, rockets, air-to-air missiles, or reconnaissance packs, on four hardpoints, and a 23 mm GSh-23 twin-barrel cannon in an underfuselage pod.

MiG-15UTI (NATO 'Midget')

After completing their basic and initial advanced training on the L-29 or L-39, pupil pilots of the Soviet Air Force graduate to this tandem two-seat version of the MiG-15 jet fighter. The airframe differs from that of the original single-seater mainly in having a rear cockpit for an instructor in place of some fuselage fuel tankage. Armament is reduced to a single gun on most of the trainers, which continue in service with more than thirty air forces. Next stage of training after the MiG-15UTI is normally on one of the two-seat adaptations of current operational aircraft listed after this entry.
Power Plant: one RD-45F turbojet engine; 5,000 lb st.
Dimensions: span 33 ft 0⅞ in, length 33 ft 1½ in, height 12 ft 1⅝ in.
Weights: empty 7,716 lb, gross (clean) 10,692 lb.
Performance: max speed 631 mph at sea level, range 590 miles (clean) or 833 miles (with two underwing tanks) at 32,800 ft.
Accommodation: crew of two, in tandem.
Armament: normally one 23 mm NR-23 gun or one 12.7 mm UBK-E machine-gun under port side of nose.

MiG-21U (NATO 'Mongol')

Nearly twenty of the air forces equipped with MiG-21 single-seat fighters also fly this two-seat training version of the same type. The basic **MiG-21U** (NATO 'Mongol-A') is generally similar to the MiG-21F, but has two cockpits in tandem under a sideways-hinged double canopy, larger mainwheels and tires, a one-piece forward airbrake, and repositioned pitot boom, above the air intake. It carries no guns and exists in two forms, later production models ('Mongol-B') having a wide-chord fin and deeper dorsal spine fairing. A third variant is the **MiG-21US,** which adds SPS flap-blowing and a retractable periscope for the instructor. The **MiG-21UM** is a trainer counterpart of the MiG-21MF, with R-13 turbojet and four underwing stores pylons.

MiG-23U (NATO 'Flogger-C')

(See page 99.)

MiG-25U (NATO 'Foxbat-C')

(See page 100.)

Sukhoi Su-7U (NATO 'Moujik')

The Soviet and seven other air forces use this tandem two-seat adaptation of the Su-7B as an operational trainer for their ground attack pilots. Changes are minimal. The forward fuselage fuel tank is deleted, and the fuselage lengthened slightly, to make room for the second

ejection seat, the occupant of which has a periscopic sight for improved forward view. The aft cockpit is fitted with a slightly-raised canopy, from which a prominent dorsal spine extends back to the base of the tail-fin. Versions in service are the **Su-7UM** and **Su-7UMK**, corresponding to the single-seat 'M' and 'MK' respectively.

Sukhoi Su-15 trainer (NATO 'Flagon-C')
(See page 100.)

Sukhoi Su-17 trainer (NATO 'Fitter-E and G')
(See page 102.)

Tupolev Tu-22U (NATO 'Blinder-D')
(See page 98.)

Yakovlev Yak-18 (NATO 'Max')
The prototype of this primary trainer first flew in 1946. About 8,000 were built subsequently, for use mainly at the civilian or paramilitary schools at which pilots of the Warsaw Pact air forces receive their primary training, including the Soviet DOSAAF centers. The original tandem two-seat Yak-18 had a 160 hp M-11 radial engine and tailwheel landing gear. The **Yak-18U** introduced a nosewheel and longer fuselage. **Yak-18A** switched to a 300 hp AI-14RF engine and was generally cleaned up. The **YAK-18P** and **PM** were refined single-seat aerobatic variants of the -18A, and the **Yak-18PS** a tailwheel counterpart of the PM. All can still be seen. *(Data for Yak-18A follow.)*

Power Plant: one Ivchenko AI-14RF piston engine; 300 hp.
Dimensions: span 34 ft 9¼ in, length 27 ft 4¾ in, height 11 ft 0 in, wing area 191.6 sq ft.
Weights: empty 2,259 lb, gross 2,910 lb.
Performance: max speed 186 mph, service ceiling 16,600 ft, max range 435 miles.
Armament: none.

Yakovlev Yak-28U (NATO 'Maestro')
Although the operational Yak-28P ('Firebar') is a tandem two-seater, it was not possible to adapt the existing rear cockpit in order to produce a dual-control training version. Instead, the Yakovlev Bureau had to design a completely new front fuselage for the Yak-28U. This has two individual single-seat cockpits in tandem, each with its own blister canopy. The front canopy is sideways hinged, to starboard. The higher rear canopy is rearward-sliding. A very large conical probe projects forward of the nosecone.

Yakovlev Yak-38 trainer (NATO 'Forger-B')
(See page 101.)

Yakovlev Yak-50
The Yak-50 single-seat aerobatic trainer flew for the first time in 1975 and virtually swept the board in both the men's and women's events at the 1976 World Aerobatic Championships. Its configuration is almost identical to that of the earlier Yak-18PS, but it has a more powerful engine, a reduced span with no wing center-section, and a semi-monocoque rear fuselage instead of the Yak-18's fabric-covered steel tube structure.

Power Plant: one Vedeneev M-14P piston engine; 360 hp.
Dimensions: span 31 ft 2 in, length 25 ft 2¼ in.
Weights: empty 1,686 lb, gross 1,984 lb.
Performance: max speed 199 mph, service ceiling 18,045 ft, max range 307 miles.
Armament: none.

Yakovlev Yak-52
Announced in 1978, the Yak-52 is a tandem two-seat variant of the Yak-50, with generally similar overall dimensions but with a tricycle landing gear that leaves all three wheels fully exposed when retracted to reduce damage in a wheels-up landing. Large-scale production has been centered at the Intreprinderea de Avioane Bacau works, in Romania, to provide replacements for the old Yak-18s of DOSAAF and other training organizations. The 500th Yak-52 was delivered in 1983, and production continues.

Power Plant: one Vedeneev M-14P piston engine; 360 hp.
Dimensions: span 30 ft 6¼ in, length 25 ft 5 in, height 8 ft 10¼ in, wing area 161.5 sq ft.
Weights: empty 2,205 lb, gross 2,844 lb.
Performance: max speed at 1,650 ft 186 mph, econ cruising speed 118 mph, service ceiling 19,685 ft, max range 341 miles.
Armament: none.

Yakovlev Yak-53
This fully-aerobatic single-seater is identical dimensionally to the Yak-50, and has the same power plant, but utilizes the semiretractable tricycle landing gear of the Yak-52. After a period of initial manufacture in the Progress Factory at Arsenyev in the USSR, production is expected to be transferred to Bacau, alongside the Yak-52. The Yak-53 is intended as a 'long life' trainer, whereas the Yak-50 is a maximum performance high-*g* aircraft supplied exclusively to State Cooperatives.

Weights: empty 1,985 lb, gross 2,337 lb.
Performance: max speed 186 mph, cruising speed 143 mph, max endurance 50 min.

Sukhoi Su-7UM (NATO 'Moujik') (Denis Hughes)

Kamov Ka-25 (NATO 'Hormone-A') (Royal Norwegian Air Force)

Yakovlev Yak-52 (Romanian-built)

Helicopters

Kamov Ka-25 (NATO 'Hormone')
The cluttered inelegance of the Ka-25 should not be allowed to disguise the ingenuity of its designers. By adopting a compact twin-turbine/coaxial-rotor configuration, the Kamov Bureau was able to package extensive equipment permutations into aircraft that can operate from small platforms on naval and merchant ships. Three versions of the Ka-25 may be identified by NATO reporting names, as follows:

Hormone-A. Basic ship-based ASW version, with large flat-bottomed housing for undernose search radar, and racks for small stores, including canisters of sonobuoys, on the starboard side of the fuselage. Other equipment varies from one aircraft to another. Some have an underfuselage weapon bay, which can be extended downward as a container for wire-guided torpedoes. Most have an electro-optical sensor in the tailboom, under a 'flower pot' housing with a transparent top, and over a corresponding window in the undersurface of the boom. Each of the four wheels of the landing gear can be enclosed in an inflatable pontoon, surmounted by inflation bottles. The rear legs are pivoted, so that the wheels can be moved into a position where they offer least interference to signals from the nose radar. Dipping sonar is housed in a compartment at the rear of the cabin, but the Ka-25 is unable to operate with this at night or in adverse weather. A towed magnetic anomaly detector is carried. Ka-25s fly from cruisers of the *Kara* and *Kresta* classes, the nuclear-powered guided missile cruiser *Kirov*, the carrier/cruisers of the *Kiev* class, each of which can carry about 19 'Hormone-As and Bs', and the helicopter cruisers *Moskva* and *Leningrad*, each of which accommodates about 18 aircraft.

Hormone-B. Special electronics variant able to provide over-the-horizon targeting information for cruise missiles launched from the ship on which it is deployed. Larger undernose radome with more spherical undersurface. Cylindrical radome under rear of cabin. Data link equipment.

Hormone-C. Utility and search and rescue model, generally similar to 'Hormone-A' but with inessential operational equipment and weapons removed. This version sometimes has a yagi aerial mounted on the nose; it has been photographed in nonoperational red and white paint finish.

About 460 Ka-25s were built in 1966–75 to replace Mil Mi-4s in the Soviet Navy's ship- and shore-based force of around 250 helicopters. About 120 of these remain operational; others have been exported in small numbers to such countries as India, Syria, and Yugoslavia. Some are reported to be armed now with small 'fire and forget' air-to-surface missiles. *(Data for 'Hormone-A' follow.)*

Power Plant: two Glushenkov GTD-3F turboshaft engines; each 900 shp (later aircraft have 990 shp GTD-3BMs).
Dimensions: rotor diameter (each) 51 ft 8 in, length of fuselage 32 ft 0 in, height 17 ft 7½ in.
Weights: empty 10,500 lb, gross 16,500 lb.
Performance: max speed 136 mph, service ceiling 11,500 ft, range 250–405 miles.
Accommodation: crew of two on flight deck; other crew in main cabin, which is large enough to contain 12 folding seats for passengers in transport role.
Armament: ASW torpedoes, nuclear depth charges, and other stores in underfuselage weapon bay, when installed.

Kamov Ka-27 (NATO 'Helix')
A Kamov helicopter for civilian operation, designated Ka-32, was first demonstrated in public at Minsk Airport during the fourth CMEA scientific/technical conference on the use of aircraft in the national economy in late 1981. It was claimed to be able to lift an 11,000 lb slung load and to have a range of 115 miles with such a load. The first reference to a military version of this helicopter appeared in the 1981 edition of *Soviet Military Power*, published by DoD. This mentioned "Hormone variant" helicopters that could be carried in a telescoping hangar on the *Sovremennyy* class of Soviet guided missile destroyers for secondary ASW missions. Photographs were released after two of them had been observed on the stern platform of the *Udaloy*, first of a new class of Soviet ASW guided missile destroyers, during the *Zapad-81* (West-81) series of exercises in the Baltic. Soon afterwards, NATO gave the new helicopters the reporting name 'Helix', and DoD began referring to them by the designation Ka-27, which suggests that the civil and military variants may have different design bureau designations. At least 16 were observed on board the *Kiev* class carrier/cruiser *Novorossiysk* during its maiden deployment in 1983. The first two military models are identified as follows:

Helix-A. Basic ASW version. Probable crew of three.
Helix-B. Missile target acquisition and midcourse guidance version to replace 'Hormone-B'.

A third military version seen on the *Novorossiysk* is a

search and rescue and plane guard helicopter. Features include an additional large rectangular blister fairing on each side of the cabin, as on the civil Ka-32, and a winch over the port cabin door.

'Helix-A' follows closely the configuration of 'Hormone', but has a longer fuselage pod, only two tail fins, and a smaller undernose radome. Some components, such as the main units of the four-wheel landing gear and the sliding cabin door on the port side, look identical to their counterparts on 'Hormone'. Overall dimensions of the two types also appear to be similar, enabling 'Helix' to use hangars and deck-lifts built for its predecessor. Its rotor diameter is only marginally greater, and the three blades on each contrarotating rotor fold rearward in the same way for stowage, but the blades are different in form. The power plant comprises two 2,225 shp Isotov TV3-117V turboshaft engines mounted above the cabin. Other features include an 'inverted flower pot' fairing, similar to that of 'Hormone-A', above the rear of the power plant cowling; a box under the tailboom that could house a towed MAD 'bird'; a rectangular container, probably for sonobuoys, on each side of the center-fuselage; and a ventral weapons-bay for torpedoes and other stores. The increased volume of the cabin could provide an answer to the Soviet Navy's longtime need for an infantry assault and vertical replenishment shipboard helicopter.

Dimensions: rotor diameter 54 ft 11½ in, length of fuselage 36 ft 1 in, height 18 ft 0½ in.

Performance: max speed 161 mph, combat radius 186 miles.

Kamov Ka-? (NATO 'Hokum')

It became known in Summer 1984 that the Kamov Bureau had begun flight testing a new combat helicopter that has been given the NATO reporting name 'Hokum'. No details are available, except that it has co-axial contrarotating main rotors, a takeoff weight in the 12,000 lb class, and probable two-man crew. Duties are likely to include attack and air-to-air antihelicopter combat.

Mil (WSK-PZL Swidnik) Mi-2 (NATO 'Hoplite')

Manufacture of this smallest helicopter in the current Mil range was transferred to the WSK-PZL at Swidnik in Poland in 1964. More than 4,000 have been delivered for military and commercial service, with the air forces of Cuba, Czechoslovakia, Poland, Romania, and the Soviet Union among known operators. The USSR has received well over 2,000, and production is continuing at the rate of approximately 300 a year.

Power Plant: two Polish-built Isotov GTD-350P turboshaft engines; each 400 or 450 shp.

Dimensions: rotor diameter 47 ft 6¾ in, length of fuselage 37 ft 4¾ in, height 12 ft 3½ in.

Weights: basic operating 5,213 lb, gross 8,157 lb.

Performance: max speed 130 mph at 1,640 ft, service ceiling 13,125 ft, range 360 miles with max fuel, 105 miles with max payload.

Accommodation: pilot on flight deck; eight passengers, 1,543 lb of freight, or four litters and medical attendant in cabin.

Armament: provision for air-to-surface rocket pod, or two 'Sagger' missiles, on each side of cabin.

Mil Mi-6 (NATO 'Hook')

When announced in the Autumn of 1957, the Mi-6 was the world's largest helicopter. It was also the first Soviet production helicopter fitted with small fixed wings to offload the main rotor in cruising flight. These wings are normally removed when the aircraft operates in a flying crane role, carrying external freight. More than 860 production Mi-6s are believed to have been delivered for commercial and military service, the latter with the air forces of Algeria, Egypt, Ethiopia, Iraq, Peru, the Soviet Union, Syria, and Vietnam. Task of these helicopters is to haul guns, armor, vehicles, supplies, freight, or 70 fully equipped troops at a time in combat areas.

Power Plant: two Soloviev D-25V turboshaft engines; each 5,500 shp.

Dimensions: rotor diameter 114 ft 10 in, length of fuselage 108 ft 10½ in, height 32 ft 4 in.

Weights: empty 60,055 lb, gross 93,700 lb.

Performance: max speed 186 mph, service ceiling 14,750 ft, range 385 miles with 17,637 lb payload.

Accommodation: crew of five; up to 90 passengers, 26,450 lb of freight, or 41 litters and two medical attendants.

Armament: some aircraft have a 12.7 mm gun in the nose.

Mil Mi-8 (NATO 'Hip')

Production of the Mi-8, for military and commercial use, totaled 8,100 before this helicopter was superseded by the uprated Mi-17 (see separate entry). An estimated total of 1,615 support Soviet armies in the field. Teamed with Mi-24 gunships, these aircraft make up the most formidable helicopter attack force in the world. Primary combat task of the Mi-8, for which the crews are well trained, is to put down assault troops, equipment, and supplies behind enemy lines within 15–20 minutes of a nuclear or conventional bombardment/strike. Versions serving with about 40 air forces are as follows:

Hip-C. Basic assault transport. Twin-rack for stores on each side of cabin, able to carry 128 × 57 mm rockets in four packs, or other weapons.

Hip-D. For electronic warfare duties; see page 103.

Mil Mi-6 (NATO 'Hook') with Vostok capsule

SAR and plane guard version of Kamov Ka-27 (NATO 'Helix-A') (Royal Navy)

Mil Mi-14 (NATO 'Haze-A') (Royal Norwegian Air Force)

Hip-E. Standard equipment of Soviet tactical air forces. One flexibly-mounted 12.7 mm machine-gun in nose. Triple stores rack on each side of cabin, able to carry up to 192 rockets in six suspended packs, plus 4 'Swatter' homing antitank missiles on rails above racks.

Hip-F. Export counterpart of 'Hip-E'. Missile armament changed to six 'Saggers'.

Hip-G. For airborne communications duties; see page 103.

Hip-H. See entry on Mi-17.

Hip-J and K. ECM versions; see page 103.

Power Plant: two Isotov TV2-117A turboshaft engines; each 1,700 shp.

Dimensions: rotor diameter 69 ft 10¼ in, length of fuselage 59 ft 7¼ in, height 18 ft 6½ in.

Weights: empty 16,007 lb, gross 26,455 lb.

Performance: max speed 161 mph at 3,280 ft, service ceiling 14,760 ft, range 311 miles as passenger transport.

Accommodation: crew of two or three; up to 32 passengers, 8,820 lb of freight, or 12 litters and attendant.

Armament: see individual model descriptions.

Mil Mi-14 (V-14) (NATO 'Haze')

Comparison of photographs of this aircraft and the Mi-8 transport helicopter shows that the Mi-14 has shorter engine nacelles, with the intakes positioned above the mid-point of the sliding cabin door. Such nacelles, found also on the Mi-24 'Hind' and Mi-17, house TV3-117 turboshaft engines in place of the lower-rated TV2s of the Mi-8. Overall dimensions and dynamic components of the Mi-14 are generally similar to those of the Mi-8, from

which it was derived, except that the tail rotor is on the port side of the vertical stabilizer. New features to suit it for its role as a shore-based antisubmarine aircraft include a boat hull of the kind used on the Sikorsky Sea King and a sponson on each side at the rear to confer a degree of amphibious capability. The landing gear is fully retractable. Operational equipment can be seen to include a large undernose radome, a retractable sonar unit housed in the starboard rear of the planing bottom, forward of what appear to be two signal flare chutes, and a towed magnetic anomaly detection (MAD) 'bird' stowed against the rear of the fuselage pod. Weapons include torpedoes and depth charges carried in a weapons-bay in the bottom of the hull. About 100 Mi-14s are currently in service with the Soviet Naval Air Force for antisubmarine duties and are designated **Haze-A** by NATO. Ten others (NATO **Haze-B**) are reported in service for mine countermeasures duty, with a fuselage strake and pod on the starboard side of the cabin, and no MAD. Three Mi-14s have been exported to Bulgaria, four to Cuba, six to Libya, and others to Poland and East Germany.

Mil Mi-17 (NATO 'Hip-H')

Revealed at the 1981 Paris Air Show, the Mi-17 combines the airframe of the Mi-8 with the uprated power plant, short nacelles, and port-side tail rotor of the Mi-14. The engine air intakes can be fitted with deflectors to prevent the ingestion of sand, dust, or foreign particles at unprepared landing sites. If an engine fails, the output of the other is increased automatically to 2,200 shp for sustained single-engine flight. Deliveries include 16 to Cuba.

Power Plant: two Isotov TV3-117MT turboshaft engines; each 1,900 shp.
Dimensions: rotor diameter 69 ft 10¼ in, length of fuselage 60 ft 5¼ in, height 15 ft 7¼ in.
Weights: empty 15,653 lb, gross 28,660 lb.
Performance: max speed 155 mph, service ceiling 11,800 ft, max range 590 miles with auxiliary fuel.

Mil Mi-24 (NATO 'Hind')

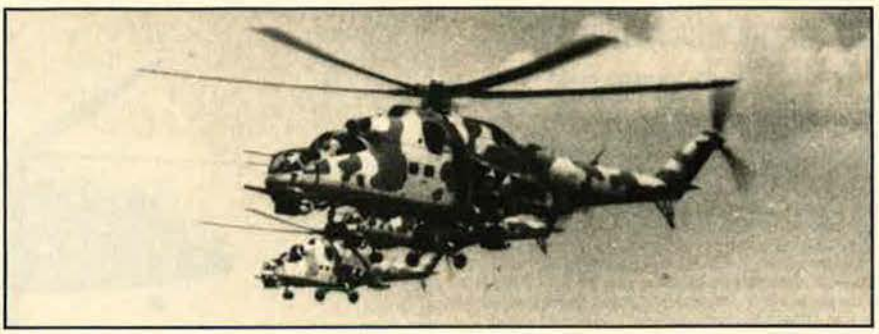
The Mi-24 was designed originally to deliver a squad of eight assault troops into a battlefield. Its weapons were intended then to clear a path past any tanks, antiaircraft guns, or other obstructions to its progress, but it was not long before training exercises caused a major change in tactics. Today, the Mi-24 is regarded as not only an antitank weapon, but capable itself of functioning as a high-speed, nap-of-the-earth 'tank', and of destroying enemy helicopters in air-to-air combat. During exercises, Mi-24s have operated usually as escorts to troop-carrying Mi-8s. A report in *Red Star* has claimed that they are also "superior to other antitank weapons in terms of field of view, maneuverability, and firepower; and capable of hitting armored enemy targets while remaining out of reach of antiaircraft weapons. The correlation between tank and helicopter losses is 12:1 or even 19:1 in the helicopter's favor." To exploit the Mi-24's potential, steel and titanium have been substituted for aluminum in critical components, and glassfiber-skinned rotor blades have replaced the original metal blade-pocket design. Variants identified to date are as follows:

Hind-A. Armed assault transport, with large enclosed flight deck for crew of four, and places for up to eight fully-equipped troops in main cabin. Dynamic components and TV2-117 engines of Mi-8 fitted initially. Fully retractable landing gear. Auxiliary wings of this version have considerable anhedral. One 12.7 mm machine-gun in nose, slaved to undernose sighting system; four hardpoints under stub-wings for 32-round packs of 57 mm rockets, or bombs; four AT-2 (NATO 'Swatter') homing antitank missiles on wingtip launchers. Antitorque rotor, originally on starboard side of offset tail pylon, repositioned to port side when TV2 engines were replaced by TV3s on later and converted aircraft. Initial production Mi-24s were of this model.

Hind-B. Similar to 'Hind-A' except that auxiliary wings have neither anhedral nor dihedral and carry only the two inboard weapon stations on each side. This version preceded 'Hind-A' and was not built in quantity.

Hind-C. Generally similar to late-model 'Hind-A', but without nose gun and undernose blister fairing, and no missile rails at wingtips.

Hind-D. Basically similar to late-model 'Hind-A', with TV3-117 engines and tail rotor on port side, but with front fuselage completely redesigned for primary gunship role, although transport capability retained. Tandem stations for weapon operator (in nose) and pilot have individual canopies, with rear seat raised to give pilot an unobstructed forward view. Probe fitted forward of top starboard corner of bulletproof windscreen at extreme nose may be part of low-airspeed sensing device to indicate optimum conditions for minimum dispersion of 57 mm rockets. Under nose is a four-barrel Gatling-type 12.7 mm machine-gun in a turret with a wide range of movement in azimuth and elevation, providing air-to-air as well as air-to-surface capability. Undernose pack for sensors, including radar and low-light-level TV.



Mil Mi-24 (NATO 'Hind-D')

Wing armament retained. Many small antennae and blisters. Nosewheels semiexposed when retracted.

Hind-E. As 'Hind-D', for Soviet armed forces, but with four laser-homing AT-6 (NATO 'Spiral') tube-launched antitank missiles instead of 'Swatters', and enlarged undernose sensor pod on port side. More than 100 of this version deployed in Warsaw Pact forward areas in Europe by early 1981, with others in Far East. Modified 'Hind-E', first shown in service with Soviet forces in photographs published in 1982, has the nose gun turret replaced by a twin-barrel cannon mounted inside a semicylindrical pack on starboard side of fuselage. Bottom of nose smoothly faired above and forward of sensors.

Under the Soviet designation A-10, the Mi-24 has set a number of major FAI-approved records, including the current world speed record for helicopters of 228.9 mph over a 15/25 km course.

Deliveries of all models of the Mi-24 exceed 1,500, from plants in Arsenyev and Rostov, with production continuing at the rate of more than 15 per month. In addition to the Soviet armed forces, operators include the air forces of Afghanistan, Algeria, Angola, Bulgaria, Cuba, Czechoslovakia, East Germany, Hungary, Iraq, Libya, Poland, Vietnam, and South Yemen.

Power Plant: two Isotov TV3-117 turboshaft engines; each 2,200 shp.
Dimensions: rotor diameter 55 ft 9 in, length 60 ft 8½ in, height 18 ft 8½ in.
Weights: empty 18,520 lb, gross 24,250 lb.
Performance ('Hind-D' with full military load): max speed 199 mph, range 99 miles.
Accommodation ('Hind-A'): crew of four; eight combat-equipped troops.
Armament: see individual model descriptions.

Mil Mi-26 (NATO 'Halo')

Design of the Mi-26 heavy-lift helicopter began in the early 1970s to meet the requirement for an aircraft of greater capability than the Mi-6, for day and night operation in all weathers. Except for the four-engined twin-rotor Mi-12, which did not progress beyond prototype testing, it is the heaviest helicopter yet flown anywhere in the world. Its rotor diameter is smaller than that of the Mi-6, but this is offset by the fact that the Mi-26 is the first helicopter to operate successfully with an eight-blade main rotor. Other features include a payload and cargo hold very similar in size to those of a C-130 Hercules, loading via clamshell doors and ramp at the rear of the cabin pod, and main landing gear legs that are adjustable individually in length to facilitate loading and to permit landing on varying surfaces. The Mi-26 is in production, and has been undergoing in-field testing and development with the Soviet Air Force for at least two years. In the course of establishing five world helicopter payload-to-height records, in 1982, it lifted a total mass of 125,154 lb to a height of 2,000 m, including a payload of 25,000 kg (55,115 lb).

Power Plant: two Lotarev D-136 turboshaft engines; each 11,400 shp.
Dimensions: rotor diameter 105 ft 0 in, length of fuselage 110 ft 8 in, height to top of main rotor head 26 ft 8¾ in.
Weights: empty 62,170 lb, gross 123,450 lb, max payload, internal or external, 44,090 lb.
Performance: max speed 183 mph, service ceiling 15,100 ft, range 497 miles.
Accommodation: crew of five; about 40 tip-up seats along side walls of hold; max seating for more than 100 troops. Other loads include armored fighting vehicles.

Mil Mi-28 (NATO 'Havoc')

The existence of this new Soviet combat helicopter was confirmed in the 1984 edition of DoD's *Soviet Military Power* document. A simple side elevation drawing showed an aircraft similar in general configuration to the US AH-64A Apache, but larger. However, the Mi-28 is believed to resemble the US Lockheed AH-56A Cheyenne of the early 1970s more than the Apache. This suggests that it could represent an air-to-ground/air-to-air combat partner for the Mi-24, with much improved agility and a greatly reduced cross section as a result of deleted transport capability. The power plant, but not the rotor system, may be common with that of the Mi-24. The Mi-28 is expected to be operational by the late 1980s.

Dimensions: rotor diameter 55 ft 9 in, length 57 ft 1 in.
Performance: max speed 186 mph, combat radius 150 miles.

Strategic Missiles

SS-4 (NATO 'Sandal')

Based on German wartime V-2 technology, this is the medium-range ballistic missile (MRBM) that precipitated the Cuba crisis in 1962. An estimated 224 remain operational, near the western borders of the Soviet Union. Replacement with SS-20s is being maintained at a steady pace. About 12 tractors with special trailers, and 20 men, are needed to transport, erect, and fire the SS-4.

Power Plant: one four-chamber RD-214 liquid-propellant (nitric acid/kerosene) sustainer; 163,142 lb thrust in vacuo.
Guidance: inertial.
Warhead: alternative nuclear (1 megaton) or high-explosive.
Dimensions: length 68 ft 0 in, diameter 5 ft 3 in.
Launching weight: 60,000 lb.
Performance: max speed Mach 6.7, max range 1,200 miles.

SS-11 (NATO 'Sego')

Despite earlier reports to the contrary, DoD believes that three versions of this 1966–70 vintage 'light' ICBM remain operational. Although considerably less capable than later generations of Soviet strategic weapons, and housed in less survivable silos, DoD states that "their destructive potential against softer area targets in the US and Eurasia is significant". Following replacement of a proportion of the original force with SS-17s, a total of 420 SS-11 Mod 2/3s and 100 SS-11 Mod 1s are deployed. Differences are as follows:

SS-11 Mod 1. Single reentry vehicle, of slightly higher yield than that of the comparable US Minuteman, but considerably less accurate, with CEP of 1.4 km (0.87 miles).

SS-11 Mod 2. As Mod 1 but with added penetration aids.

SS-11 Mod 3. First operational Soviet missile with MRVs (three 300 kiloton). CEP 1.1 km (0.7 miles).
Power Plant: two-stage storable liquid-propellant.
Guidance: inertial.
Warhead: single nuclear (Mod 1 and 2); three MRVs (Mod 3).
Dimension: length 66 ft 0 in.
Performance: max range Mod 1 6,835 miles, Mod 2 8,075 miles, Mod 3 6,585 miles.

SS-13 (NATO 'Savage')

In the Minuteman category; only 60 SS-13 ICBMs are deployed, in Mod 2 configuration.
Power Plant: three-stage solid-propellant.
Guidance: inertial, offering CEP of 2 km (1¼ miles).
Warhead: nuclear (750 kilotons).
Dimensions: length 66 ft 0 in, max diameter 6 ft 6 in (first-stage skirt).
Performance: range 5,840 miles.

SS-17 (Soviet designation RS-16)

Known in the Soviet Union as the RS-16, this 'light' ICBM (which the US designates SS-17) is designed for cold launch. This means that it is "popped" out of its silo

by a gas generator before the main booster motors are fired. As a result, the silo is not heavily damaged and could be reloaded, although this would be a slow process. Since 1975, a total of 150 SS-11 silos have been modified to accept SS-17 missiles, all of which are thought to have been upgraded to Mod 3 standard with four MIRVs. The silos, like those for the SS-18 and SS-19 ICBMs, are hardened to resist very high overpressure.
Power Plant: two-stage storable liquid-propellant.
Guidance: inertial.
Warhead: four MIRVs (each 750 kilotons).
Dimensions: length 68 ft 0 in, max diameter 8 ft 6 in.
Performance: max range 6,200 miles.

SS-18 (Soviet designation **RS-20**)

There are 308 of these cold-launched 'heavy' missiles in the Soviet ICBM force. All have been upgraded to Mod 4 standard, with ten MIRVs, each with more than 20 times the destructive power of the nuclear bombs dropped on Hiroshima and Nagasaki in 1945. DoD believes that the SS-18 force, by itself, has the capability to destroy more than 80% of US ICBM silos, using two nuclear warheads against each silo. A CEP of under 1,000 ft has been quoted.
Power Plant: two-stage liquid-propellant.
Guidance: inertial.
Warhead: ten MIRVs (each 500 kilotons).
Dimensions: length 104 ft 0 in, max diameter 10 ft 0 in.
Performance: max range 6,835 miles.

SS-19 (Soviet designation **RS-18**)

The Soviet Union's 360 SS-19 Mod 3 missiles are classified as light ICBMs, but the SS-19 force is judged by DoD to have nearly identical capabilities to the 308 larger SS-18s, with the added flexibility of being able to attack targets in Eurasia as well as the US. The hot-launched Mod 3 carries six MIRVs and offers a CEP of under 1,000 ft.
Power Plant: two-stage liquid-propellant.
Guidance: inertial.
Warhead: six MIRVs (each 500 kilotons).
Dimensions: length 75 ft 0 in, max diameter 9 ft 0 in.
Performance: max range 6,200 miles.

SS-20

This mobile solid-propellant IRBM represents the most formidable Soviet threat to NATO nations in Western Europe and would not have been subject to any restrictions under SALT II, as its range is less than 5,500 km (3,417 miles). According to DoD, a total of 378 had been deployed by April 1984, of which some 243 were opposite NATO, with the others targeted on China and Japan. SS-20s could reach the Aleutian Islands and western Alaska from present and likely deployment areas in the eastern USSR, but could not attack the contiguous 48 States. Force expansion is continuing, and the number of deployed SS-20s could increase by at least 50% by the end of this decade. The missile is carried on a wheeled launcher capable of both on- and off-road operation, which renders detection and targeting difficult. Furthermore, the launcher has the capability of being reloaded, and refire rounds are known to be stockpiled. A CEP of about 1,300 ft is estimated when the SS-20 is fired from a presurveyed site.

With the addition of a third stage, the SS-20 was intended to become a three-stage single-RV ICBM known as the SS-16, which could be silo or vehicle based. Tests of the SS-16 took place in 1972–76, but this ICBM was to be banned from further production, test, or deployment under the nonratified SALT II agreement. DoD's official view is that available information does not allow a conclusive judgment on whether or not the Soviets deployed the SS-16, but does indicate probable deployment. The following data apply to the SS-20:
Power Plant: two-stage solid-propellant.
Guidance: inertial.
Warhead: three MIRVs (each 150 kilotons).
Dimension: length 54 ft 0 in.
Performance: max range 3,100 miles.

SS-X-24

In *Soviet Military Power,* DoD suggests that at least one additional modified version of each of the SS-18 and SS-19 ICBMs is likely to be deployed in existing silos in due course. Two completely new solid-propellant ICBMs are also being tested from the range head at Plesetsk, in the north of the Soviet Union. The first of these, designated SS-X-24 in the US, is about the same size as the US Peacekeeper (MX) and is expected to be silo based initially. It could achieve IOC in this form during 1985, with mobile deployment to follow in the late 1980s. The SS-X-24 is expected to be even more accurate than the current SS-18 Mod 4 and SS-19 Mod 3. Eight reentry vehicles were released during the missile's second successful test flight on November 22, 1983.

SS-X-25

This new ICBM is about the same size as the US Minuteman, with a single reentry vehicle. DoD states that it has apparently been designed for mobile deployment from a home base comprising launcher garages with sliding roofs. The system includes massive off-road wheeled transporter/erector/launchers and necessary mobile support equipment for refires from the launcher.

AS-3 (NATO 'Kangaroo')

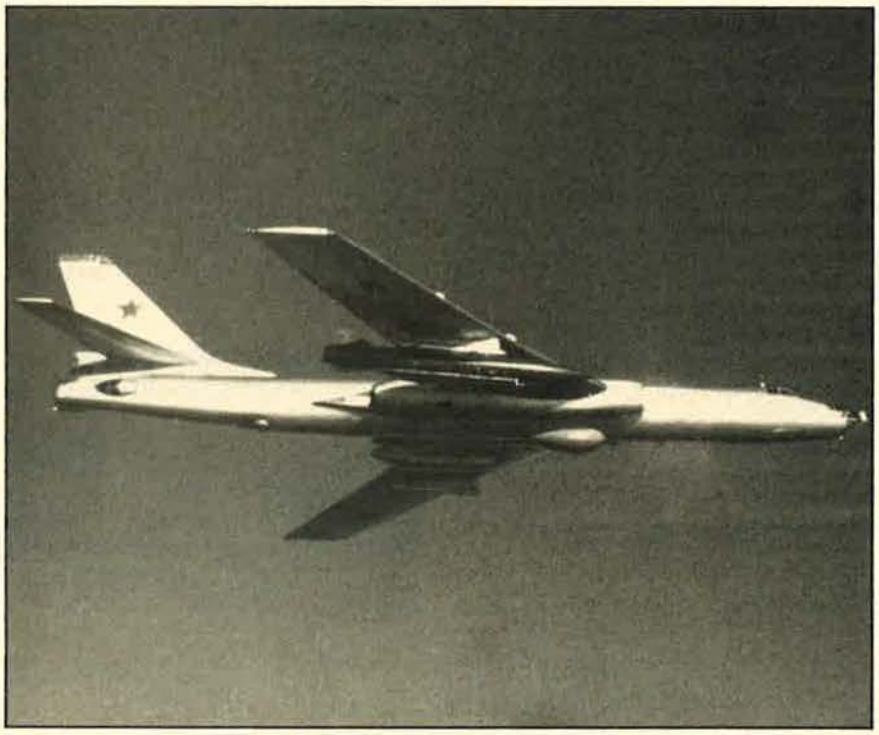
Largest Soviet air-to-surface missile yet put into service, 'Kangaroo' resembles a sweptwing jet fighter in size and configuration. It was displayed for the first time under a Tu-95 carrier aircraft on Aviation Day 1961 and became a standard weapon on the 'Bear-B and C' versions of this bomber, with alternative nuclear (800 kiloton) or high-explosive (5,070 lb) warheads. It is being replaced by the supersonic AS-4 'Kitchen' on aircraft uprated to 'Bear-G' standard.
Guidance: initial beam-riding; subsequent preprogrammed flight under autopilot control.
Dimensions: span 29 ft 6 in, length 49 ft 1 in.
Weight: 17,600 lb.
Performance: subsonic cruise, range 400 miles.

AS-4 (NATO 'Kitchen')

Developed as a standoff weapon for the Tu-22 strategic bomber, and now carried also by the Tu-95 ('Bear-G') and variable-geometry 'Backfire', the AS-4 was first seen on a single Tu-22 ('Blinder-B') in 1961. Most of the 22 Tu-22s which participated in the 1967 Aviation Day display at Domodedovo carried an AS-4, semisubmerged in the fuselage, and production by 1976 was stated by the UK Defence Minister to total around 1,000. The missile, which has been seen in more than one form, has an aeroplane configuration, with stubby delta wings and cruciform tail surfaces. Propulsion is believed to be by liquid-propellant rocket motor. Alternative nuclear (200 kiloton) or 2,200 lb high-explosive warheads can be assumed.
Guidance: inertial, with radar terminal homing.
Dimensions: span 9 ft 10 in, length 37 ft 0 in.
Weight: 13,225 lb.
Performance: max speed above Mach 2, range 185 miles at low altitude.

AS-6 (NATO 'Kingfish')

This advanced air-to-surface missile was first photographed by the pilot of a Japan Air Self-Defense Force F-86F in December 1977 under the port wing of a Tu-16 ('Badger'). It is standard armament of modified 'Badger-Gs', which carry a 'Kingfish' under each wing. Variable-geometry 'Backfire' bombers can carry up to three, as alternatives to 'Kitchens'. Propulsion is said to be by liquid-propellant rocket motor, with inertial midcourse guidance and active radar terminal homing, giving exceptional accuracy. The warhead can be either nuclear (200 kiloton) or 2,200 lb high explosive.
Dimensions: span 8 ft 2½ in, length 34 ft 6 in.
Weight: 11,000 lb.



AS-6 'Kingfish' missile on Tupolev Tu-16 (NATO 'Badger-G' modified) (Swedish Air Force)

AS-4 (NATO 'Kitchen') aboard Tupolev Tu-26 (NATO 'Backfire-B')

Performance: max speed Mach 3, range 135 miles at low altitude.

AS-X-15

Confirmation that the Soviet Union was developing a new generation of air-launched cruise missiles was given on February 1, 1979. US administration officials said that at least eight missiles had been test-launched from 'Backfire' bombers during preceding months, over ranges of about 750 miles. First known product of this effort is the AS-X-15, which is being developed to arm 'Blackjack', and is expected to be deployed initially on a new production version of the Tu-95 ('Bear-H'). It will provide the Soviet strategic attack force with greatly improved capabilities for low level and standoff attack in both theater and international operations. Configuration of the AS-X-15 is similar to that of USAF's much smaller General Dynamics ground-launched cruise missile. Submarine-launched and ground-launched versions are under development, as the SS-NX-21 and SSC-X-4, respectively. All have a guidance system similar to the US Tercom, making possible a CEP of about 150 ft, and a nuclear warhead. The AS-X-15 was expected to achieve initial operational status during 1984.
Dimensions: span 10 ft 8 in, length 23 ft 0 in.
Performance: range 1,850 miles.

Airborne and Tactical Defense Missiles

AS-2 (NATO 'Kipper')

First seen 24 years ago, at the 1961 Aviation Day display, this aeroplane-configuration missile, with underslung turbojet engine, was described by the commentator at Tushino as an antishipping weapon. Radar is carried in the nose of the Tu-16 carrier aircraft, and guidance is believed to comprise preprogrammed flight under autopilot control, with optional command override, and active radar terminal homing. A 2,200 lb high-explosive warhead is fitted.
Dimensions: span 15 ft 0 in, length 32 ft 10 in.
Weight: 9,260 lb.
Performance: max speed Mach 1.2, range 132 miles.

AS-5 (NATO 'Kelt')

According to the UK Minister of Defence, well over 1,000 AS-5s had been delivered by the Spring of 1976. About 25 were used operationally during the October 1973 war between Israel and the Arab states, when Tu-16s from Egypt launched them against Israeli targets. Only five eluded the air and ground defenses.

The transonic AS-5 has a similar aeroplane-type configuration to that of the turbojet-powered AS-1 ('Kennel'), which it superseded. The switch to liquid rocket propulsion eliminated the need for a ram air intake and permitted the use of a larger radar inside the hemispherical nose fairing. Guidance is said to be by autopilot on a preprogrammed flight path, with radar terminal homing that can be switched from active to passive as required. A 2,200 lb high-explosive warhead is standard.
Dimensions: span 14 ft 1¼ in, length 28 ft 2 in.
Weight: 7,715 lb.
Performance: max speed Mach 0.9 at low altitude, Mach 1.2 at 30,000 ft, range 100 miles at low altitude, 200 miles at height.

AS-7 (NATO 'Kerry')

Carried by the Su-17 'Fitter', Su-24 'Fencer', and Yak-38 'Forger', this tactical air-to-surface missile is said to have a single-stage solid-propellant rocket motor, radio command guidance system, and 220 lb high-explosive warhead.
Dimension: length 11 ft 6 in.
Weight: under 880 lb.
Performance: max speed Mach 0.6, max range 7 miles.

AS-X-9

A reported antiradiation missile, with a range of 50–56 miles, to arm the Su-24 ('Fencer').

AS-10

This is a semiactive laser homing weapon with a solid-propellant rocket motor. It is said to be operational on MiG-27, Su-17, and Su-24 attack aircraft.
Dimension: length 9 ft 10 in.
Performance: max speed Mach 0.8, max range 6.2 miles.

AT-2 (NATO 'Swatter')

This standard Soviet antitank weapon formed the original missile armament of the Mi-24 ('Hind-A and D') helicopter gunship and is carried by the 'Hip-E' version of the Mi-8. The solid-propellant 'Swatter' is steered in flight via elevons on the trailing-edges of its rear-mounted cruciform wings and embodies terminal homing.
Dimensions: span 2 ft 2 in, length 3 ft 9¾ in.
Weight: 65 lb.
Performance: cruising speed 335 mph, range 1,640–11,500 ft.

AT-3 (NATO 'Sagger')

In conformity with the Soviet practice of not supplying advanced equipment on its export aircraft, the wire-guided 'Sagger' replaces 'Swatter' on the 'Hip-F' version of the Mi-8, as well as arming the Polish-built Mi-2, and Gazelles of the Yugoslav services.
Dimensions: span 1 ft 6 in, length 2 ft 10¼ in.
Weight: 25 lb.
Performance: speed 270 mph, range 1,650–9,850 ft.

AT-6 (NATO 'Spiral')

Unlike previous Soviet helicopter-launched antitank missiles, 'Spiral' does not appear to have a surface-launched application. Few details are yet available, except that it is tube-launched and homes on targets illuminated by a laser designator. It equips the 'Hind-E' version of the MI-24 and is said to have a range of 4.3 to 6.2 miles.

AA-2 (NATO 'Atoll')

Designated K-13A in the USSR, 'Atoll' is the Soviet counterpart to the American Sidewinder 1A (AIM-9B), to which it is almost identical in size, configuration, and infrared guidance. It has long been standard armament on home and export versions of the MiG-21 and is carried by export models of the MiG-23 and Sukhoi Su-22. A solid-propellant rocket motor and 13 lb fragmentation warhead are fitted.

AA-3 'Anab' missile on Su-15 (Swedish Coast Guard/Air Patrol)

AT-3 'Sagger' antitank missiles on Yugoslav Gazelle helicopter

Dimensions: length 9 ft 2 in, body diameter 4.72 in, fin span 1 ft 8¾ in.
Weight: 154 lb.
Performance: cruising speed Mach 2.5, range 3 to 4 miles.

AA-2-2 (NATO 'Advanced Atoll')

The multirole versions of the MiG-21 (NATO 'Fishbed-J, K, L, and N') can carry a radar homing version of 'Atoll' on the outer stores pylon under each wing, in addition to a standard infrared homing 'Atoll' on the inboard pylon. The radar version is known as 'Advanced Atoll'. Length is increased to at least 9 ft 10 in.

AA-3 (NATO 'Anab')

This solid-propellant air-to-air missile was first observed as armament of the Yak-28P all-weather fighters that took part in the 1961 Aviation Day display at Tushino. Subsequently, it became standard also on Sukhoi Su-15 interceptors. Each aircraft normally carries one 'Anab' with an I/J-band semiactive radar seeker and one with an infrared homing head.
Dimensions: length 13 ft 5 in (IR) or 13 ft 1 in (SAR), body diameter 11 in, wing span 4 ft 3 in.
Performance: range over 10 miles.

AA-5 (NATO 'Ash')

Several thousand of these large air-to-air missiles were produced as armament for the Tu-28P interceptors of Voyska PVO. The version with infrared homing head is normally carried on the inboard pylon under each wing of the Tu-28P, with an I/J-band semiactive radar homing version on each outboard pylon.
Dimensions: length 17 ft 4½ in (IR) or 17 ft 0 in (SAR), body diameter 12 in, wing span 4 ft 3 in.
Performance: range 18.5 miles.

AA-6 (NATO 'Acrid')

This air-to-air missile was identified during 1975 as one of the weapons carried by the 'Foxbat-A' interceptor version of the MiG-25. Its configuration is similar to that of 'Anab' but it is considerably larger, with a 220 lb warhead. Photographs suggest that the version of 'Acrid' with an infrared homing head is normally carried on each inboard underwing pylon, with a radar homing version on each outer pylon. The wingtip fairings on the fighter, different in shape from those of 'Foxbat-B', are thought to house continuous-wave target illuminating equipment for the radar homing missiles.
Dimensions: length 20 ft 7½ in (radar version), 19 ft 0 in (IR version).
Weight: 1,650 lb.
Performance: cruising speed Mach 2.2, range at least 23 miles.

AA-7 (NATO 'Apex')

This long-range air-to-air missile is one of the two types carried as standard armament by interceptor versions of the MiG-23 and is reported to be an alternative weapon for the MiG-25. 'Apex' has a solid-propellant rocket motor and is deployed in both infrared and semi-active radar homing versions. Warhead weight is 88 lb.
Dimensions: length 15 ft 1¼ in, body diameter 8.75 in, wing span 3 ft 5½ in.
Weight: 705 lb.
Performance: range 20 miles.

AA-8 (NATO 'Aphid')

Second type of missile carried by the MiG-23, and also by late-model MiG-21s, Su-15s, and Yak-38s, 'Aphid' is a highly maneuverable close-range solid-propellant weapon with infrared homing guidance and a 13.2 lb warhead.
Dimensions: length 7 ft 2½ in, body diameter 4.75 in, wing span 1 ft 3¾ in.
Weight: 121 lb.
Performance: range under 1,650 ft min, 3–4.3 miles max.

AA-9

This radar homing long-range missile is reported to have achieved successes against simulated cruise missiles after 'lookdown/shootdown' launch from a MiG-25M interceptor. It is standard armament on the MiG-31.
Performance: range 25–28 miles at height, 12.5 miles at S/L.

AA-10

The AA-10 has generally similar capabilities to those of the AA-9, but is intended for use over medium ranges. It will form the basic interception armament of the new MiG-29 and Sukhoi Su-27 counterair fighters.

Antihelicopter 'Grail'

In addition to AT-3 antitank missiles, Gazelle helicopters license-built by SOKO for the Yugoslav Air Force carry SA-7 'Grail' tube-launched IR homing missiles for use against other helicopters. A similar installation on some Mi-24 helicopters has been reported.

Surface-to-Air Missiles

ABM-1 (NATO 'Galosh')

Keeping within the terms of the SALT I agreement, as amended by the 1974 Moscow Summit meeting, the USSR maintains around Moscow the world's only operational ABM (antiballistic missile) system. Its purpose is to provide a measure of protection for Soviet military and civil central command authorities during a nuclear war, and this has required major upgrading of the system in the past five years. When fully operational in the late 1980s, it will provide a two-layer defense based on a total of 100 silo-based launchers for long-range modified ABM-1 'Galosh' interceptors designed to engage targets outside the atmosphere and high-acceleration interceptors to engage targets within the atmosphere. The launchers may be reloadable and will be supported by engagement and guidance radars, plus a large new radar at Pushkino designed to control ABM engagements.

Missiles purported to be 'Galosh' have been paraded through Moscow inside containers about 65 ft long with one open end on frequent occasions since 1964. No details of the missile could be discerned, except that the first stage has four combustion chambers. A single nuclear warhead is fitted. Missile range is said to be more than 200 miles.

ABM-1 'Galosh' in its launch container

ABM-X-3

The Soviet Union is believed to have at least two new ABM development programs under way. One, designated ABM-X-3 by DoD, is said to be a rapidly deployable system using a phased-array radar, missile-tracking radar, and a new missile. Its availability would permit the Soviets to deploy a nationwide ABM system relatively quickly, should they decide to do so. In addition, the SA-10 and SA-X-12 surface-to-air missiles may have the potential to intercept some types of US strategic ballistic missiles.

SA-2 (NATO 'Guideline')

This land-mobile surface-to-air missile has been operational since 1959 and continues in first-line service in some 20 countries. It was used extensively in combat in North Vietnam and the Middle East and has been improved through several versions as a result of experience gained. SA-2 launchers are thought to remain operational at 350 sites in the Soviet Union, although the number declines annually. Data for export version:

Power Plant: liquid-propellant sustainer, burning nitric acid and hydrocarbon propellants; solid-propellant booster.
Guidance: automatic radio command, with radar tracking of target. Some late versions employ radar terminal homing.
Warhead: high-explosive, weight 288 lb.
Dimensions: length 34 ft 9 in, body diameter 1 ft 8 in, wing span 5 ft 7 in.
Launching weight: 5,070 lb.
Performance: max speed Mach 3.5, slant range 31 miles, effective ceiling 82,000 ft.

SA-3 (NATO 'Goa')

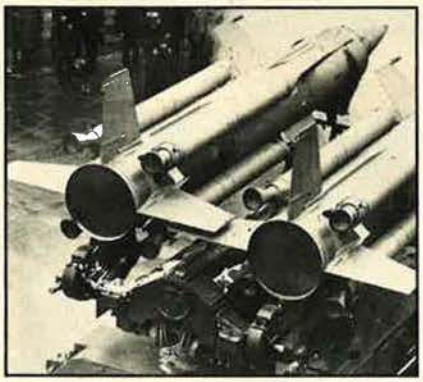
Soviet counterpart of the American Hawk, the SA-3 is deployed by the Soviet Union at more than 300 sites and by its allies and friends as a mobile low-altitude system (on two-, three-, and four-round launchers) to complement the medium/high-altitude SA-2. As the **SA-N-1,** it is also the most widely-used surface-to-air missile in the Soviet Navy and is fired from a roll-stabilized twin-round launcher.

Power Plant: two-stage solid-propellant.
Guidance: radio command, with radar terminal homing.
Warhead: high-explosive, weight 132 lb.
Dimensions: length 22 ft 0 in, body diameter 1 ft 6 in, wing span 4 ft 0 in.
Launching weight: 1,402 lb.
Performance: max speed Mach 2, slant range 15–18.5 miles, effective ceiling over 43,000 ft.

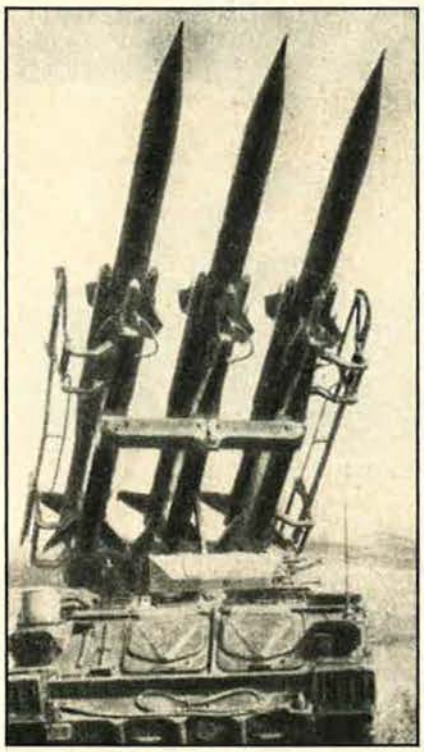
SA-4 (NATO 'Ganef')

Ramjet propulsion gives this antiaircraft missile a very long range. Its usefulness is further enhanced by its mobility, as it is carried on a twin-round tracked launch vehicle that is itself air-transportable in the An-22 military freighter. The SA-4 was first displayed publicly in 1964 and is a standard Soviet weapon (approx 1,400 launchers) for defense of combat areas. It is operational also with Bulgarian, East German, and Czech forces.

Power Plant: ramjet sustainer; four wrap-around solid-propellant boosters.
Guidance: radio command, with semiactive radar terminal homing.
Warhead: high-explosive, weight 220–300 lb.



SA-4 (NATO 'Ganef')



SA-6 (NATO 'Gainful')

Dimensions: length 28 ft 10½ in, body diameter 2 ft 8 in, wing span 7 ft 6 in.
Launching weight: approx 5,500 lb.
Performance: max speed Mach 2.5, slant range 43 miles, effective ceiling 80,000 ft.

SA-5 (NATO 'Gammon')

The SA-5 is described by DoD as a surface-to-air weapon to provide long-range, high-altitude defense for Soviet targets. A drawing released in Washington suggested that its configuration is unusual for a Soviet missile, with long-chord cruciform delta wings, small tail surfaces, and four wrap-around jettisonable boosters. Deployment within the USSR continues at a surprisingly slow pace. As a result, the most significant deployments have occurred outside the USSR, in Eastern Europe, Mongolia, and Syria.

Power Plant: two-stage solid-propellant, possibly with terminal propulsion for warhead.
Guidance: semiactive radar homing.
Dimensions: length 34 ft 9 in, body diameter 2 ft 10 in, wing span 9 ft 6 in.
Performance: max speed above Mach 3.5, slant range 185 miles, effective ceiling 95,000 ft.

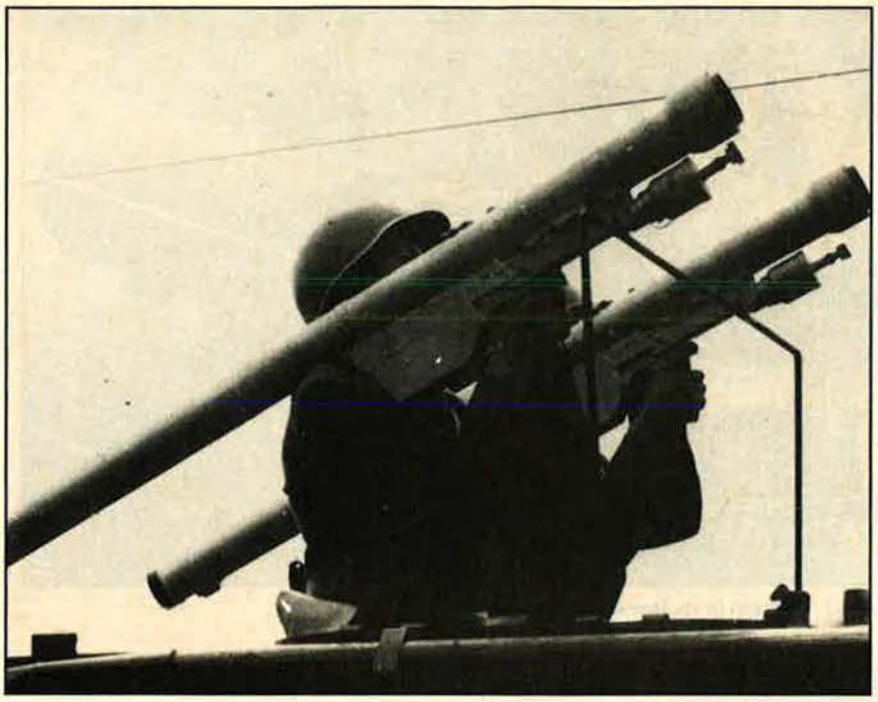
SA-6 (NATO 'Gainful')

This mobile weapon system took an unexpectedly heavy toll of Israeli aircraft during the October 1973 war. Its unique integral all-solid rocket/ramjet propulsion system was a decade in advance of comparable Western technology, and the US-supplied ECM equipment that enabled Israeli aircraft to survive attack by other missiles proved ineffective against the SA-6. First shown on its three-round tracked transporter/launcher in Moscow in November 1967, the missile has since been produced in very large quantities. Export models have been acquired by Algeria, Angola, Bulgaria, Czechoslovakia, Egypt, East Germany, Hungary, India, Iraq, Kuwait, Libya, Mozambique, Poland, Romania, Syria, Vietnam, South Yemen, and Yugoslavia.

Power Plant: solid-propellant booster. After burnout, its empty casing becomes a ramjet combustion chamber for ram air mixed with the exhaust from a solid-propellant gas generator.
Guidance: radio command; semiactive radar terminal homing.
Warhead: high-explosive, weight 176 lb.
Dimensions: length 20 ft 4 in, body diameter 1 ft 1.2 in.
Launching weight: 1,212 lb.
Performance: max speed Mach 2.8, range 18.5 miles, effective ceiling 59,000 ft.

SA-7 (NATO 'Grail')

This Soviet counterpart of the US shoulder-fired, heat-seeking Redeye first proved its effectiveness in Vietnam against slower, low-flying aircraft and helicopters. It repeated the process during the 1973 Arab-Israeli war, despite countermeasures. In addition to being a standard weapon throughout the Warsaw Pact forces since 1968, it has been supplied to about 20 other nations and is used by various guerrilla/terrorist movements. Designed for use by infantry, the tube-launched SA-7 is also carried by vehicles, including ships, in batteries of four, six, and eight, for both offensive and defensive employ-



SA-7 (NATO 'Grail')

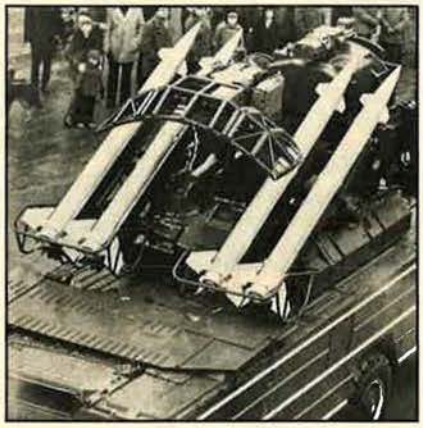
ment, with radar aiming. Some are deployed on helicopters for antihelicopter combat use. An uprated version has a more powerful motor, giving higher speed and an effective ceiling of about 14,000 ft. *(Data for basic version follow.)*
Power Plant: solid-propellant booster/sustainer.
Guidance: infrared homing with filter to screen out decoy flares.
Warhead: high-explosive, weight 5.5 lb.
Dimensions: length 4 ft 3 in, body diameter 2.75 in.
Launching weight: 20 lb.
Performance: max speed Mach 1.5, slant range 5–6 miles, effective ceiling 5,000 ft.

SA-8 (NATO 'Gecko')

First displayed publicly during the parade through Moscow's Red Square on November 7, 1975, this short-range, all-weather system is unique among Soviet tactical air defense weapons in that all components needed to conduct a target engagement are on a single vehicle. In the original SA-8A version, two pairs of exposed missiles were carried, ready to fire; the later SA-8B system has six missiles in launcher-containers. Missile configuration is conventional, with canard foreplane control surfaces and fixed tail-fins. Fire control equipment and four- or six-round launcher are mounted on a rotating turret, carried by a three-axle six-wheel amphibious vehicle. Surveillance radar, with an estimated range of 18 miles, folds down behind the launcher, enabling the weapon system to be airlifted by Soviet transport aircraft. The tracking radar is of the pulsed type, with an estimated range of 12–15 miles. The SA-8 is believed to use the same missile as the well-established but enigmatic naval SA-N-4 system. Each vehicle carries up to six reload missiles. About 600 SA-8 vehicles are thought to be in Soviet service; export customers include Jordan and Syria.
Power Plant: probably dual-thrust solid-propellant.
Guidance: command guidance by proportional navigation. Semiactive radar terminal homing.
Warhead: high-explosive, about 90–110 lb weight.
Dimensions: length 10 ft 6 in, body diameter 8.25 in.
Launching weight: 440 lb.
Performance: range 6–8 miles, effective ceiling 20,000 ft.

SA-9 (NATO 'Gaskin')

This weapon system, deployed initially in 1968, comprises a BRDM-2 amphibious vehicle carrying a box launcher for two pairs of infrared homing missiles. The launcher rests flat on the rear of the vehicle when not required to be ready for launch. Four reload rounds are stowed in the BRDM-2. In Soviet service, SA-9s are deployed at a level of 16 per division. Other operators include Algeria, Hungary, Poland, Syria, Vietnam, and Yugoslavia. (See also the SA-13 entry.)
Dimensions: length 5 ft 9 in, body diameter 4.33 in.
Launching weight: 66 lb.
Performance: range 5 miles, effective ceiling 16,400 ft.



SA-8A (NATO 'Gecko')

SA-9 (NATO 'Gaskin')

SA-10

If press reports are to be believed, this weapon threatens the viability of US cruise missiles. A single-stage rocket motor is said to accelerate the SA-10 at 100*g* to a cruising speed of Mach 6. A range of up to 60 miles and all-altitude capability are suggested, with active radar terminal homing and multiple target engagement capability. Reported dimensions are a length of 23 ft 6 in and body diameter of 17.7 in. By the Spring of 1984, the SA-10 was operational at some 40 sites in the USSR, with nearly 350 launchers and four missiles per launcher. A land-mobile version, carried on a four-axle truck, was expected to deploy during 1985.

SA-11

This new weapon system comprises a four-rail launch vehicle for Mach 3 radar-guided missiles with a reported ability to deal with targets at altitudes between 100 and 46,000 ft and at ranges up to 18.5 miles. SA-11s are said to be deployed already alongside SA-6s.

SA-12

This formidable container-launched weapon is considered capable of dual-mode operation against aircraft and intermediate-range and submarine-launched missiles. The SA-12 is in production. Little reliable information is available, but a DoD drawing has suggested a missile of fairly conventional configuration, about the same size as the SA-10. A complete fire unit could include two twin-round erector-launchers, a reload vehicle, two planar-array radar vehicles, and a command vehicle, all tracked for maximum capability. A range of 60 miles is expected.

SA-13 (NATO 'Gopher')

Deployed on a tracked vehicle in the late 1970s, the SA-13 is a replacement for the SA-9, providing improved capability in rough terrain and increased storage for reload missiles. Together with the ZSU-23-4 tracked gun vehicle, it equips the antiaircraft batteries of motorized rifle and tank regiments. Range is about 5 miles at altitudes between 165 ft and 16,500 ft.

New Infantry SAM

To overcome the limitations of shoulder-fired, infrared homing missiles like the SA-7, the Soviet Union has been developing improved infantry SAMs for some years. One type, of which deployment is about to start, uses a laser beam for beam-riding guidance.

SA-N-1 (NATO 'Goa')

Ship-launched variant of SA-3, carried on roll-stabilized twin launchers by 43 ships of the Soviet Navy.

SA-N-2 (NATO 'Guideline')

Ship-launched version of SA-2. On cruiser *Dzerzhinski* only.

SA-N-3 (NATO 'Goblet')

The twin-round surface-to-air missile launchers fitted to many of the latest Soviet naval vessels, including *Kiev* class carrier/cruisers, helicopter cruisers *Moskva* and *Leningrad*, and *Kara* and *Kresta II* cruisers, carry a new and more effective missile than the SA-N-1 ('Goa'). This is said to have an antiship capability and to carry an 88 lb high-explosive warhead. The original version has a range of 18.6 miles and effective ceiling of 82,000 ft. A later version has a range of 34 miles.
Dimension: length 19 ft 8 in.
Weight: 1,200 lb.

SA-N-4

Little is known about this naval close-range surface-to-air weapon system, although SA-N-4 installations are operational on at least eight classes of ships of the Soviet Navy. The retractable twin-round 'pop-up' launcher is housed inside a bin on deck. The missiles are similar to those used in the land-based mobile SA-8 system.

SA-N-5

At least 169 small Soviet ships have this simple air defense system, which carries four SA-7 'Grail' launch-tubes in a framework that can be slewed for aiming.

SA-N-6

This missile is housed in 12 vertical launch tubes under the foredeck of the Soviet battle cruiser *Kirov* and is carried also by *Slava* class cruisers. It is assumed to deal with the same multiple threats as the US Navy's Aegis area defense system. No authentic information on the SA-N-6 missile is available. Best estimates suggest a length of about 23 ft, effective ceiling of at least 100,000 ft, and range of 37 miles at Mach 6, carrying a 200 lb warhead. Likely features include multiple target detection and tracking, midcourse guidance, terminal homing, and high resistance to ECM and jamming.

SA-N-7

Two single-rail launchers for this new missile are fitted in each ship of the *Sovremennyy* class of guided missile destroyers. The sophistication and rapid-fire potential of the weapon system is indicated by the requirement for six associated fire control/target illuminating radars. The SA-N-7 itself is thought to be a naval equivalent of the landbased SA-11.

SA-N-8

Nothing positive is known about this vertically launched missile system carried by the new *Udaloy* class of antisubmarine ships and the second *Kirov* class cruiser. ■

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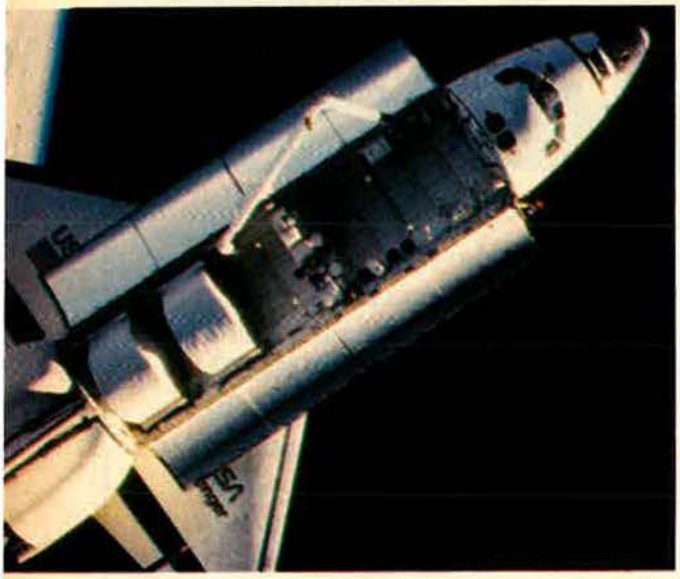
Senior USAF commanders assess where we stand on requirements and capabilities.

THE STATE OF THE FORCE



BY EDGAR ULSAMER
SENIOR EDITOR (POLICY & TECHNOLOGY)

SOVIET air-to-air tactics and training are slowly "drifting away from total pilot dependence on rigid command and control. They are becoming much more fluid, much more dynamic in their approach to air-to-air combat—in fact, they are becoming much more like us. If they ever match the quality of their pilots with the quality of their aircraft, they will be a much more potent adversary, and we will have to adjust our tactics accordingly."

This was how Gen. Jerome F. O'Malley, Commander of the Tactical Air Command, described the central challenge confronting this country's tactical air forces. He spoke at AFA's national symposium, "The US Air Force—Today and Tomorrow," which was held in Los Angeles, Calif., November 29–30, 1984.

USAFE's Commander in Chief, Gen. Charles L. Donnelly, Jr., portrayed the Soviets as sitting "with more than 700 nuclear warheads and enormous conventional power aimed at Western Europe—far more than they need to defend their territory. One must assume then that they have an offensive strategy." The Air Force's prescription for coping with the "dense array of the most capable and sophisticated fixed and transportable SAMs ever fielded [and] the highly trained, skilled pilots flying state-of-the-art machines armed with highly effective and lethal weapons" that make up the Soviet air defense network in Europe involves "varied and innovative approaches for defense penetration," according to General O'Malley.

"To counter the ground-based threat, we plan, as the first order of business, to systematically roll back enemy defenses in an orchestrated campaign using all of our defense suppression assets. Compass Call [a C-130 modified for the electronic warfare countermeasures mission] will go after tactical communications links, severing the nerve system that holds the Soviets' integrated air defense system together. The EF-111 will electronically blind the antiaircraft artillery [AAA] and SAM acquisition radars, forcing them into the visual acquisition mode—highly ineffective against high-speed, low-altitude penetrators."

Lastly, "against those radar-emitting defenses that can't be avoided or underflown by our penetrators, the F-4G Wild Weasels with antiradiation missiles will go to work, forcing [the enemy] either to shut down their acquisition and guidance radars or be destroyed."

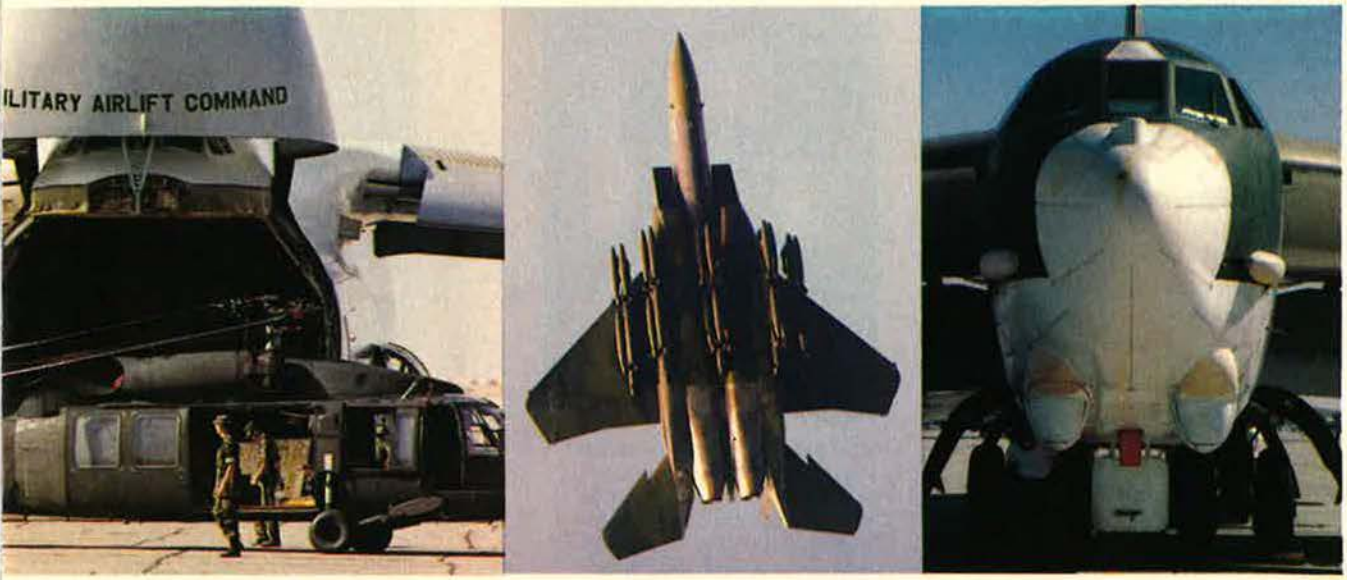
By penetrating enemy airspace at high speeds and low altitudes while taking maximum advantage of terrain masking, the Air Force expects to reap significant advantages over Soviet air defense aircraft, accord-

ing to the TAC Commander: "Today, the Soviet look-down/shoot-down capability is marginal, so, to stop us, they will have to come down to low altitudes. Soviet fighter pilots will have to convert their attack to the stern because [they] currently have only a limited all-aspect missile capability."

Stressing "how difficult it is to intercept a low-altitude, high-speed maneuvering target, convert the attack to the stern quadrant, track for the necessary period of time, and successfully fire a weapon," General O'Malley pointed out that all the while the EF-111 and Compass Call will be "blinding Soviet early warning and GCI [ground-controlled interception] radars and cutting communications links that Soviet fighter pilots depend upon heavily." The result, he suggested, will be "total confusion and disruption of the Soviet integrated air defense system." Although the task won't be easy, "We are convinced that these tactics will work against the current threat," General O'Malley suggested.

But adjustment of these tactics in the 1990s in response to the evolving threat appears foreordained: "For example, new Soviet SAM systems like the SA-10 and SA-11 [that appear far more effective than the fielded systems] may cause us to reevaluate the tactics incorporated into our rollback strategy." Also, by the mid-1990s, "much of the sanctuary that low altitude gives us now may have eroded." Impelling this erosion are "rapid advances in Soviet avionics and fire-control systems with look-down capability, coupled with long-range air-to-air missiles, [that] place the Soviets on the brink of a credible look-down/shoot-down capability."

Lastly, there is the prospect that new technologies on the US side "will alter our tactics, just as our reliance on Compass Call and the EF-111 was a factor in shaping the [current] rollback concept." Key systems that presage modification of current tactics, he suggested, include the Advanced Tactical Fighter (ATF), the Precision Location Strike System (PLSS), and JSTARS, the airborne radar that is to locate moving targets among second-echelon forces.



The Need for ATF

The Air Force's major new tactical programs, according to AFSC Commander Gen. Lawrence A. Skantze, pivot on ATF and the associated Joint Advanced Fighter Engine program. (The ATF program suffered a setback in December 1984 when the Defense Systems Acquisition Review Council [DSARC] delayed the program by requesting additional data before program go-ahead could be authorized.) General Skantze said the ATF program is moving toward its demonstration/validation phase. Seven contractors are working on the program's concept definition, but only three will be picked for demonstration/validation work.

At this time, the AFSC Commander said, it appears that ATF will have "fully integrated defensive and offensive avionics, greatly reduced observables, efficient supersonic cruise [to reduce exposure to hostile air defenses], better fuel economy, greater range, short takeoff and landing capability, high maneuver provided by integration of systems, new aerodynamic design, and vectored thrust." Generals O'Malley and Donnelly both stressed the importance of designing the aircraft as an air-superiority vehicle unencumbered by multirole features.

As the TAC Commander told the AFA symposium, "Air superiority has been—and always will be—the linchpin of combat operations, [even though long-term superiority] will be extremely difficult to maintain, considering the modernization improvements incorporated into the latest generation [of] Soviet fighters." The broad performance gain reflected by the "MiG-29 Fulcrum and Su-27 Flanker, two new Soviet supersonic, all-weather, night-capable fighters, has significantly narrowed . . . our current tacair advantage." Hence the need for ATF in the 1990s, based on a careful synthesis of several fundamental performance requirements that include "supersonic cruise and maneuver without the use of afterburner, low radar cross section, and low infrared and visual signals." The tactical air forces, he pointed out, "are not necessarily looking for a big fighter—we want to keep the size at an affordable level."

Emerging propulsion, aerody-

namic, and flight-control technologies, he suggested, appear to meet this range of requirements: "Very-high-speed integrated circuitry technology applied to avionics systems is one avenue to reducing size and weight while increasing capability and the mean time between failure of components." At the same time, the tactical air forces are aware of the fact that cost considerations militate against "pressing the forward edge of technology" too broadly and too hard.

General Skantze added that ATF's reliability and maintainability (R&M) are as important as its performance: "Availability, a function of R&M, is a force multiplier" that caused the Air Force to specify a sustained sortie-generation capability for the ATF at least twice that of the F-15. The Joint Advanced Fighter Engine (JAFE) powering ATF will have forty to sixty percent fewer parts and be three times as reliable as those in the current inventory, according to General Skantze. The JAFE, he added, will be designed for 6,000 TACs [Total Accumulated Cycles—a standard for simulating engine stresses during a typical mission], compared to the 4,000 TACs stipulated for the most advanced version of the F100 engine.

Reduced mobility requirements are another must for ATF. While it takes between fifteen and seventeen C-141s to move a squadron of F-15s, the Advanced Tactical Fighter will require only eight transport aircraft.

The two contractors involved in the demonstration/validation phase of the Joint Advanced Fighter Engine will be graded by the Air Force in terms of the warranties they are prepared to offer for their production engines. Asking contractors to make tangible commitments with regard to durability, reliability, and maintainability in the initial development phase of a program, General Skantze pointed out, is "good business [and] crucial to baselining a design that provides 'high-tech' leverage to the future force, but with a unit price that is affordable and wrings out every ounce of aerospace industry production genius."

In the case of both the JAFE and ATF, the Air Force plans to stress competition "right up to full-scale development. Relying on one source for required combat capability can be risky." Even after the selection of the prime contractors for the ATF airframe and engine, the Air Force will continue to seek competition at the subcontractor level, with the RFP (request for proposal) soliciting detailed information on "how respondents will compete subcontracts and maintain dual sources for critical items," General Skantze told the AFA meeting.

While there has been pressure from Capitol Hill to develop ATF in concert with the Navy, General Skantze said that the Navy's requirement for a new attack aircraft does not mesh with the performance criteria underlying the ATF air-superiority fighter. The design approaches of the two programs "actually are mutually exclusive," he added. The Air Force, as yet, is chary of considering the use of forward-sweptwing technology for ATF until after this aerodynamic feature has been proven out in flight test on the X-29 test-bed.

DONNELLY: The congressional decision to limit US presence in Europe poses both political and operational problems for USAFE, impacting directly on important growth programs.

O'MALLEY: Space offers almost unlimited opportunities for enhancement of tactical air capabilities, including command and control, navigation, and precision weapons delivery.

The Air Force's design approach to ATF is also cautious with regard to STOL characteristics. As General Donnelly put it, "We will look for ways to take off from and recover on shorter runways [than is possible with the present generation of fighters], but from a technological point of view, we can't see how STOL would help."

In a general sense, the Air Force is not inclined to build STOL fighters because they lack the capabilities of conventional designs, he said, adding that the Harrier, the only STOL aircraft in the US inventory, "really can't go against a MiG-25 or MiG-29." STOL also does not eliminate the problem of "flow," meaning moving aircraft to their hangarettes for rearming and refueling over taxiways that may have been damaged and then back again to the runway to fly another sortie. Only rapid runway and taxiway repair capabilities can meet that challenge.

The chances of ATF incorporating advanced "Stealth" features, on the other hand, are clearly good. These low-observable technologies show great promise, according to General Donnelly: "If a MiG-29 can't see you on his radar, then you obviously have a major advantage over him. The same is true with regard to [hostile] warning and SAM radars." The Air Force's interest in applying Stealth technology to ATF is not confined to the platform as such, according to General Skantze. The application of this technology to munitions and weapons "is an ongoing process" that might lead to ATF carrying such munitions, especially for the air-superiority mission.

He stressed that ATF's principal purpose is to ensure superior performance in the air-to-air mission. Like all air-superiority fighters, ATF can be expected to have residual air-to-ground capabilities that "can be exploited eventually." If and when this happens, it is likely that a number of new, smart weapons, such as advanced versions of

Maverick and new airfield interdiction munitions, will be compatible with ATF, he predicted.

General O'Malley added that the ATF, contrary to certain rumors, is not being considered by the tactical air forces for use as a close air support (CAS) aircraft. TAC's requirements experts, he said, are aware of the importance of expanding close air support capabilities. But the options under consideration boil down either to an upgraded version of the A-10 equipped with new engines or to a completely new close air support aircraft, according to General O'Malley.

In the view of General Donnelly, the continued availability of the A-10 will be determined by "how much we fly [these aircraft] and by [the parts stock available] to us to maintain them." He predicted that the "close air support mission will always be with us—and rightfully so; we must include CAS in planning our future force structure."

Force Improvements

A central tacair imperative stressed throughout the AFA symposium is the ability to operate at night and in adverse weather. Soviet doctrine, General O'Malley pointed out, "dictates all-weather, around-the-clock operations from the forward edge of the battle area, back deep in the second echelon, and beyond." At this time, USAF's only long-range, night, all-weather capability is furnished by the aging F-111.

The F-15E Dual-Role Fighter, General O'Malley said, will go a long way toward correcting this problem, "with its excellent range and payload, all the while maintaining its proven air-to-air capability." Both he and General Skantze predicted that the F-15E, which is equipped with the low-altitude navigation and targeting infrared for night (LANTIRN) system, "will have a significantly improved night capability over the F-111."

Tentatively slated for deployment on the A-10 and F-16 as well as the F-15E, LANTIRN will enable these aircraft to penetrate enemy defenses at low altitude and find targets at night and under the weather. The system, in effect, will double sortie rates during the winter months and eliminate night as "a sanctuary for Soviet combat operations." Development of LANTIRN has been slowed somewhat by technical problems, especially so far as the system's targeting pod, which is equipped with a laser designator, is concerned.

The other half of the LANTIRN system, the navigation pod, has come along smoothly according to General O'Malley: "It is superb, works well, and provides everything we asked for—except for laser designation." Although hesitant to make definitive forecasts, the TAC Commander suggested that the targeting pod may be delayed by about a year, due mainly to integration problems. By combining terrain-following radar with infrared sensing, LANTIRN allows the pilot—as tested on an F-16—"to take the aircraft down to 200 feet at 520 knots on a black night [and operate as if] night had been turned into day," according to General O'Malley.

SKANTZE: The Advanced Tactical Fighter, while temporarily on hold based on a DSARC request for more data, is moving into the demonstration/validation phase.

BAZLEY: Rapidly increasing Soviet strategic forces in the Far East pose a new threat to US Pacific interests. Their fighter assets have swelled dramatically in three years.

The system provides pilot information in pictorial form on the HUD (head-up display) from the FLIR (forward-looking infrared) and from what the terrain-following radar tells him in the "form of some symbology." At this time, there is no assurance that the targeting pod will be able to deal automatically with such moving targets as tanks. There also is a valid argument—as yet unsettled—over whether or not "all this sophistication is going to overload the pilot," according to the TAC Commander.

LANTIRN, according to General Skantze, will provide unprecedented tactical advantages, "especially when combined with some of the smarter weapons coming into the inventory." He cited specifically the Imaging Infrared Maverick and the GBU-15: "Once a fighter pilot gets to the target using the LANTIRN, he can employ the heat-seeking IIR Maverick to destroy tanks and other vehicles at night." Conceding that the Maverick program encountered technical difficulties and, concomitantly, considerable public criticism, the AFSC Commander pointed out that, in a recent series of ten test launches from an F-16, the IIR Maverick scored ten successes. He added that "there is no denying its technical advantage; when combined with LANTIRN, Maverick opens the night window."

The GBU-15, an unpowered, guided glide bomb, also promises to complement LANTIRN in an effective way: "While Maverick's leverage is against armor, [the GBU-15 is tailored to go] against communications nodes, bunkers, and [other] hardened sites. Like the Maverick, it uses either TV or infrared optics for pinpoint accuracy, day or night." This initially unpowered glide bomb can be dropped from as high as 30,000 feet, as well as from medium and low levels. The initial version of this weapon will be a 2,000-pound bomb, but follow-on designs will include dispensers of airfield attack submunitions, according to General Skantze.

Maverick, the GBU-15, and the low-level laser-guided bomb, Gener-

al O'Malley added, are essential present-generation weapons to go after well-defended, high-value targets. For the 1990s, however, weapons with extended ranges are needed: "The rocket-boosted GBU-15, currently in the concept validation stage, will more than double our current low-altitude standoff range capability and significantly reduce our exposure to enemy threats."

At the same time, the Army and the Air Force are developing the Joint Tactical Missile System (JTACMS), which will "move us well into the medium- to long-range standoff arena." Stressing that

DAVIS: US need for the MX Peacekeeper is "crystal clear": to enable us to narrow the Soviet lead in hard target attack capability. We need the small ICBM as well.

JTACMS may not turn out to be a ballistic missile—as widely suggested—but rather could resemble a "cruise missile or RPV [remotely piloted vehicle]," he said that above all else "it must be affordable, it must be very accurate, and it must be able to carry [various types of] submunitions to do many jobs that we can't perform at present."

C³ and Electronic Combat

An area of tactical air warfare that warrants special emphasis in terms of long-range planning is command control and communications, or C³, according to General O'Malley. Recent conflicts demonstrated vividly that jam-resistant communications are "vital to the successful command and control of tactical forces. For now, 'Have Quick' gives us jam-free tactical communications, but, as the threat grows, we must look ahead to the future needs for anti-jam communications."

The Joint Tactical Information Distribution System (JTIDS) will provide jam-resistant, secure communications by means of digital data links in the 1990s, but with only a "limited [secure] voice capability." General O'Malley warned that if the Soviet drive toward communications jamming continues at its present pace, an enhanced JTIDS becomes imperative, since going into combat without jam-resistant communications is, "pure and simple, a nonstarter."

Closely linked to the tactical C³ requirements of the next decade is the ability to locate and destroy tactical targets in real time, for "the battlefield of the 1990s will be dynamic and fast moving." JSTARS, the Joint Surveillance, Tracking and Attack Radar System under development by the Air Force and the Army and a companion system of JTACMS, will permit integrated, near real-time detection of rapidly moving Soviet second-echelon targets, General O'Malley said.

In this context, he suggested that the Air Force's future inventory may lack dedicated tactical reconnaissance aircraft, meaning follow-ons to the RF-4: "The technology is there to put some interesting recce [capabilities] into new pods. But, more than likely, we will put these pods on existing fighters, such as two-seat F-16s and F-15Es, and use these aircraft to do several jobs." He said that, in the current environment of sharply curtailed aircraft acquisitions, it is "unlikely that we will have a dedicated RF aircraft."

Just as the nineteenth century was the era of land warfare and the twentieth century the heyday of airpower, electronic combat will be the dominant force of the twenty-first century, General O'Malley predicted: "Soviet doctrine and tactics are committed to radioelectronic combat, and they postulate that if they neutralize only a small percentage of our force [by electronic means], all the rest will follow. That's sound doctrine and we intend to do the same." The Air Force, therefore, is working on means that will augment its offensive electronic combat capability and, at the same time, protect its tactical forces in a high-intensity jamming environment:

"To go on the electronic combat offensive, the Precision Location Strike System [PLSS] carried on the TR-1 will provide near real-time location of enemy emitters. PLSS, combined with the F-4G Wild Weasel, Compass Call, and the EF-111, will allow us to destroy vital components of the Soviets' integrated air defense system and disrupt their highly centralized command and control structure."

In the area of electronic self-protection, he added, the Airborne Self-Protection Jammer (ASPJ) is planned for the F-16C. The F-15 Tactical Electronic Warfare Suite (TEWS) upgrade will dramatically increase self-protection. Also, the F-111's internal jamming system is being upgraded, he said.

In reaching for new, enhanced capabilities, the tactical air forces won't overlook space in the years ahead, according to the TAC Commander: "Over the next decade, we expect significant increases in reliance on space-based assets for tac-air operations. The medium of space offers unlimited opportunities to expand traditional mission areas—communications, warning, command and control, navigation, and meteorology." Calling attention to the Navstar Global Positioning System (GPS), the US armed forces' next-generation navigation system, he said that "we are testing integration of the GPS into F-16 avionics systems" to increase navigation and weapons delivery accuracy significantly on a global basis.

Special Challenges

The decision by Congress to "limit our presence in Europe as a sign to the NATO allies that we need more support from them" has posed both political and operational problems for USAFE, according to General Donnelly. USAFE, he told the AFA meeting, "has met the ceiling limitation over the past two years by rescheduling growth programs and [by] accelerating planned reductions. But even with the concessions for manning our GLCM [ground-launched cruise missile] bases, we have not been able to reach the manning levels required to mount effective programs."

He complained that "in some areas we have had to send home entire units and their missions just to juggle enough authorizations to

man the modern weapon systems. We need to grow because the high-tech systems developed to make us more competitive on the battlefield require people." Every soldier or airman that goes back to the CONUS, General Donnelly pointed out, "is just one more we have to bring right back when our potential enemies decide we are weak enough to risk war."

Also, the European troop strength ceiling sends a "wrong" message to our allies at "a time when they are accepting the deployment of cruise missiles and the political problems this might cause for them." Asserting that mandatory manpower limitations force "us to cut into our warfighting capabilities," he said that "I can see the satisfied smiles on the faces of the Soviet military leaders when they see the US reducing combat strength without their having to lift a finger."

RYAN: Programmed numbers of C-5Bs are right on target, but MAC has a pressing need for the new C-17 to improve both inter- and intratheater airlift capabilities.

HERRES: The recently approved unified Space Command will integrate "the strategic aerospace defense missions of air, missile, and space defense."

On the plus side, he stressed that "USAFE is as ready as we have ever been—far more ready than we were five or six years ago. Our supply bins are filling up, we are getting new equipment, we have established new training facilities like the Warrior Preparation Center to train battle commanders with computer simulation, and we have increased flying hours for our pilots by nineteen percent."

So far as the European peace movement and the media attention it triggers are concerned, he said that "we are actually dealing with only a small number of people." In the case of West Germany, for instance, recent polls suggested that eighty-eight percent of the people there want US forces to remain in their country. By a similar margin, the German public favors keeping up that nation's defense spending, the head of USAFE said.

He applauded the accord between the US and the Federal Republic of Germany concerning the Patriot and Roland air defense systems, because "it will give [NATO] better air defense than [we] have now. In the case of Roland, we would buy the equipment, and the Germans would support it with people and spare parts. In return, the Germans would buy a portion of the Patriot system to fill gaps" in the Hawk air defense network.

In the technical area, General Donnelly stressed the importance of the inchoate Advanced Tactical Ballistic Missile (ATBM) program to NATO's Central Region. Such a conventionally armed ballistic missile might prove useful in coping with the Warsaw Pact's "follow-on forces that are arrayed as far back as Poland, [ready] to be moved up in case of conflict." He indicated that—initially, at least—the ATBM would be confined to fixed targets, because "we currently don't have the intelligence [means] to pinpoint mobile targets."

A vexing, lingering problem in the political arena is the inability of NATO members to agree on specific electromagnetic frequency ranges for an Alliance-wide IFF (identification friend or foe) system. In the absence of such a system, "the Army is going to shoot at whatever moves and sort out the tail numbers when the aircraft get on the ground. We also need [such a NATO-wide IFF] for the air-to-air mission."

General Donnelly also noted that interest is increasing on both sides of the Atlantic in theater ballistic missile systems capable of neutralizing the Soviet SS-20 intermediate-range ballistic missile and similar weapons.

The Pacific Theater

Stressing the economic and political ascendancy of the Pacific basin and America's increasing dependence on that region, Gen. Robert W. Bazley, Commander in Chief of Pacific Air Forces (PACAF), detailed Moscow's growing Pacific orientation: "The [Soviet] Far Eastern Military District is being reinforced at a rate in excess of even their Western Frontal Forces. Twenty percent of the Soviet ICBM force is based in the Far East." The Soviets, he pointed out, "now possess the ability to put US forces at risk far into the mid-Pacific and can threaten most of Alaska from homeland airfields and SS-20 bases." This strategic fact of life is new, he told the AFA meeting: "It didn't exist several years ago, and it's being applied at a rate that shows no prospects for slackening."

Soviet missile forces in the Far East are backed up by more than 300 bombers, including the Tu-22M Backfire. The US, by contrast, has only twelve B-52s assigned to the Pacific. Since the late 1960s, Soviet tactical ground attack forces in the region have swelled to more than 1,800 aircraft. In the last three years, General Bazley reported, the Soviets deployed "three times as many modern fighters to the Far East than we have in our Pacific inventory, [which numbers only] 300 fighter and reconnaissance aircraft. Typically, the Kremlin appears bent on using military strength to gain what it cannot win in the . . . political and economic arena." Moscow is subsidizing the Hanoi regime to the tune of $3 million a day, "which also underwrites the Vietnamese occupation of Kampuchea," he added.

While the US lags behind the So-

viets quantitatively in the Pacific theater, PACAF is building up the quality of its forces, according to General Bazley: "Today, more than two-thirds of our aircraft are modern A-10s, F-15s, and F-16s." By contrast, only twenty percent of the force had been modernized four years ago. Over the same period, PACAF was able to boost its combat aircraft inventory from 240 to 300 aircraft, and "that increase will continue to grow as we add two additional squadrons of F-16s at Misawa Air Base in Japan [this] summer." Munitions stocks increased by eleven percent over the last four years, according to General Bazley.

From the military point of view, General Bazley said, it would be "logical" to fold the Alaskan Air Command into PACAF. Political considerations have prevented this merger so far, but it will "probably" come about eventually, he suggested.

Strategic Challenges

The military need for the MX Peacekeeper, Gen. Bennie L. Davis, Commander in Chief of Strategic Air Command, told the AFA meeting, is "crystal clear. We need that missile badly to narrow the Soviet lead in effectiveness against hard targets." Complementing MX will be the small ICBM, which "opens up several basing options that would contribute to survivability and stability—important goals in deterrence." General Skantze added that by offering the choice of deployment in hardened mobile launchers and/or in superhardened silos, the "small ICBM could provide major gains in survivability."

The potential benefits inherent in the Strategic Defense Initiative (SDI), in General Davis's view, require careful assessment: "In my opinion, we are remiss if we can protect our people and deterrent forces, but fail to do so. But a comprehensive system is a long way off, and until it is in place, a secure nuclear retaliatory capability is going to serve as the primary basis for deterrence."

Turning to air-breathing components of the strategic deterrent, Generals Davis and Skantze stressed that acquiring the B-1B while pursuing the Advanced Technology Bomber (ATB, or "Stealth") makes for a logically paced approach. Low-observables techniques for the ATB have extraordinary military significance in terms of negating present and projected air defenses. As General Skantze put it, "By the 1990s, a combined force of B-1Bs, ATBs, B-52s, and advanced cruise missiles will put maximum stress on Soviet air defenses and give the US real leverage in long-term competition with the Soviets."

Turning to the intrinsic conventional capabilities of strategic bombers, General Davis said SAC is equipping two B-52 squadrons with the Navy's Harpoon surface-ship attack missile as well as working toward "a long-range conventional standoff land-attack capability." With such a capability, SAC can play an important role in decimating the Warsaw Pact's follow-on forces in case of a European conflict. SAC, he pointed out, could be operating such a force from the CONUS and could "attack important targets from outside the range of the most lethal defenses."

Gen. Robert T. Herres, addressing the AFA meeting coincidental with the Pentagon's announcement concerning the pending formation of a unified Space Command, predicted that the new organization will focus on two primary missions: "It will be the focal point for operational space activities, and it will integrate the strategic aerospace defense missions of air, missile, and space defense." He stressed the importance of integrating all military space operations into this new command that is to be formed this fall.

So far as the Air Force's cautious research effort—about $6 million in FY '86—toward a transatmospheric vehicle (TAV, previously known as the Aerospace Plane) is concerned, General Herres cautioned that "we know of no military mission that such a vehicle could carry out more efficiently than other platforms, but we can't afford not to exploit this technology because there might [crop up later] a national security requirement" for such hybrid systems that can operate both in the atmosphere and in space.

Airlift Requirements

The Military Airlift Command (MAC) has no requirement for C-5B airlifters beyond the fifty aircraft currently programmed, but does need the C-17 "right now" for both the inter- and intratheater missions, its Commander in Chief, Gen. Thomas M. Ryan, Jr., told the AFA symposium. Stressing that the C-5B is a "great airplane," he pointed out, however, that it can't meet "the full spectrum of requirements to the extent that the C-17 can."

The Defense Systems Acquisition Review Council (DSARC) is about to decide whether or not the C-17 will be entered into full-scale engineering development. Assuming a positive decision, the aircraft could reach an initial operational capability by 1992 and full operational capability (210 aircraft) by 1998. This schedule is predicated on a production decision in 1988.

The fate of the C-17 could presumably be affected in a fundamental manner by a congressionally mandated tactical airlift study that, according to General Ryan, is to be completed by February 1986. Preparation of this study, which is officially known as the World-Wide Intratheater Mobility Study, has been under way for about a year, involving, in the main, OSD, the Joint Chiefs of Staff, TRADOC (the Army's Training and Doctrine Command), and MAC. The two commands have set up a joint airlift concepts and requirements agency to provide basic information for the Defense Department's report to Congress on the tactical airlift issue, according to General Ryan.

MAC is working toward extended-range capabilities for the Special Operations Forces (SOF) by adding twenty-one Combat Talon II MC-130Hs over the next four and a half years. But, over the longer term, there is no doubt, according to General Ryan, that the tilt-rotor JVX aircraft is essential for the "infiltration, exfiltration, and resupply mission of unconventional warfare forces." He reported that MAC's seven remaining Pave Low HH-53H helicopters that were assigned to the SOF mission are being transferred to the Army, in accord with last year's agreement on mission alignments between the two services.

AFA's next Los Angeles Symposium is scheduled for October 24–25, 1985. ■

Out of the Wilderness

A courageous officer risked his career for a principle that had been honored more in the breach than in the observance.

BY JOHN L. FRISBEE

To fight with few allies for a principle opposed by a majority of the people and institutions of one's own country demands spiritual and moral resources that are rare, indeed—a kind of valor for which decorations are seldom given. Flying against the Luftwaffe's best fighters, some of the time with second-rate equipment, called for a different order of valor. Both battles were fought simultaneously by a tall, erect man of innate dignity. That man is Benjamin O. Davis, Jr., the first black man to graduate from the US Military Academy in the twentieth century, the first to lead an AAF group in combat, and the first black general officer in the Air Force. The principle for which he laid his career, and his life, on the line many times was racial equality. Success in the air war over Europe was a key to its attainment.

It is difficult for younger Americans to appreciate the depth of racial prejudice that existed in this country fifty years ago. Segregation was enforced rigidly in our military services. Ben Davis knew that when he accepted an appointment to West Point in 1932. His father was one of the Army's few black officers, later its first black general. During young Ben's years at West Point, he was "silenced" by his fellow cadets. Despite constant pressure to force him to resign, he graduated thirty-fifth in a class of 276 and hoped to enter flying training. But the Air Corps accepted no blacks in any capacity.

In late 1940, President Roosevelt directed the Army Air Corps to establish a flying program for blacks at Tuskegee, Ala. The field opened in July 1941 with Capt. Ben Davis as leader of the first class, which was to form the nucleus of the 99th Pursuit Squadron. Commanded by Davis, the squadron completed combat training, but for more than a year no theater commander would accept them. Finally, they were sent to North Africa, outfitted with obsolete P-40s, and sent into combat in July 1943 without the customary leavening of experienced pilots from other units. It was, as Davis told his men, their great opportunity for themselves and for all black Americans.

The squadron scored its first victory against a FW-190 a month later. Nevertheless, commanders in the theater and in Washington recommended that it be withdrawn from action and that no more black units be assigned to a combat theater. Davis successfully defended the performance of the 99th before a top-level War Department committee. By war's end, his 332d Group (which included the 99th), based in Italy and flying P-51s, had completed more than 1,500 missions, destroyed at least 250 enemy aircraft in the air and on the ground, and achieved the unique distinction of never losing a bomber to enemy aircraft in some 200 escort missions. Colonel Davis, who insisted that his men respond to indignities with performance rather than protest, led more missions than any other of his officers. The 332d proved not only that its commander but that many other blacks as well could compete successfully with whites in the most technical of the military services.

Lt. Gen. Benjamin O. Davis, Jr.: A courageous, often lonely, campaign.

Despite the record of Davis's group, the Army—and its Air Forces—clung to a policy of racial segregation after the war. Both Ben Davis and his father attacked that policy before a board of general officers in 1945. The younger Davis continued to fight for racial integration with an argument that commanders understood—efficiency. Segregation made it impossible to fill shortages by transferring people among operational units that had been decimated by demobilization.

In 1948, the Air Force, assured by the achievements of Davis's fighter group and spurred on by the urgency of rebuilding a shattered combat force, announced an end to segregation. Three months later, President Truman directed equal opportunity, though not racial integration, in the services. The other services moved slowly in the same direction as the Air Force, and the country as a whole quickened its long, painful march toward racial equality.

Discrimination within the services did not end with integration. Until his retirement in 1970 as a lieutenant general, Ben Davis worked toward truly equal opportunity for *all* races, based on ability and performance. On those criteria, he selected his subordinates in the integrated Air Force.

No man deserves more credit for narrowing the gap between a professed ideal and an imperfect reality than Benjamin O. Davis, Jr. With dignity, intelligence, and measured judgment, he waged a courageous, often lonely, campaign that helped change the character of America. ■

[Thanks to Col. Alan Gropman for sharing his short biography of General Davis that will soon appear in a book on Air Force leaders.—J.L.F.]

R&M (Reliability and Maintainability) now gets the same priority as cost, schedule, and performance.

Fourth Wheel on the Acquisition Wagon

BY LT. GEN. ROBERT D. RUSS, USAF
DEPUTY CHIEF OF STAFF FOR RESEARCH, DEVELOPMENT AND ACQUISITION

HISTORICALLY, cost, schedule, and performance have been the dominant management wheels in the acquisition process. To move forward, a system had to fit the acquisition budget, join the force when it was needed, and perform as advertised. A fourth and vital wheel—reliability and maintainability, or R&M—while not ignored, clearly received less emphasis than the other three. Because of this, many of our acquisition wagons didn't roll as well as they should have. The time has come to give that fourth wheel the same priority and emphasis that have been accorded the other three.

The desirability of reliable and maintainable systems has long been recognized, but pursuit of such reliability has been erratic. Life-cycle costs, which are strongly driven by R&M, have often assumed a secondary role in the effort to produce system performance within budgeted front-end costs. Given the options to pay now or pay later, the choice was almost always the latter. That practice is no longer acceptable.

To understand why the Air Force is so keenly interested in R&M, three factors that strongly affect Air Force capability must be considered. These are manpower, both in numbers and skills, the rising cost for maintaining large inventories of spare parts, and, most important of all, the need to get more combat effectiveness from each weapon system.

Constraints on Manpower

To generate sorties, many highly skilled technicians are required. Of the some 490,000 enlisted personnel in the Air Force today, one in three is involved in maintaining aircraft. As we add new capabilities to the force structure (with GLCM, for example) and as we increase the size of the force structure (as with the C-5B), we cannot expect large increases in our authorized strength. Even if we had the congressional authorizations and could afford the price for training and salaries, there is no assurance that larger numbers of high-quality people will be available. The future recruiting picture is less favorable than that of today because of demographic trends, private-sector competition, and changing attitudes.

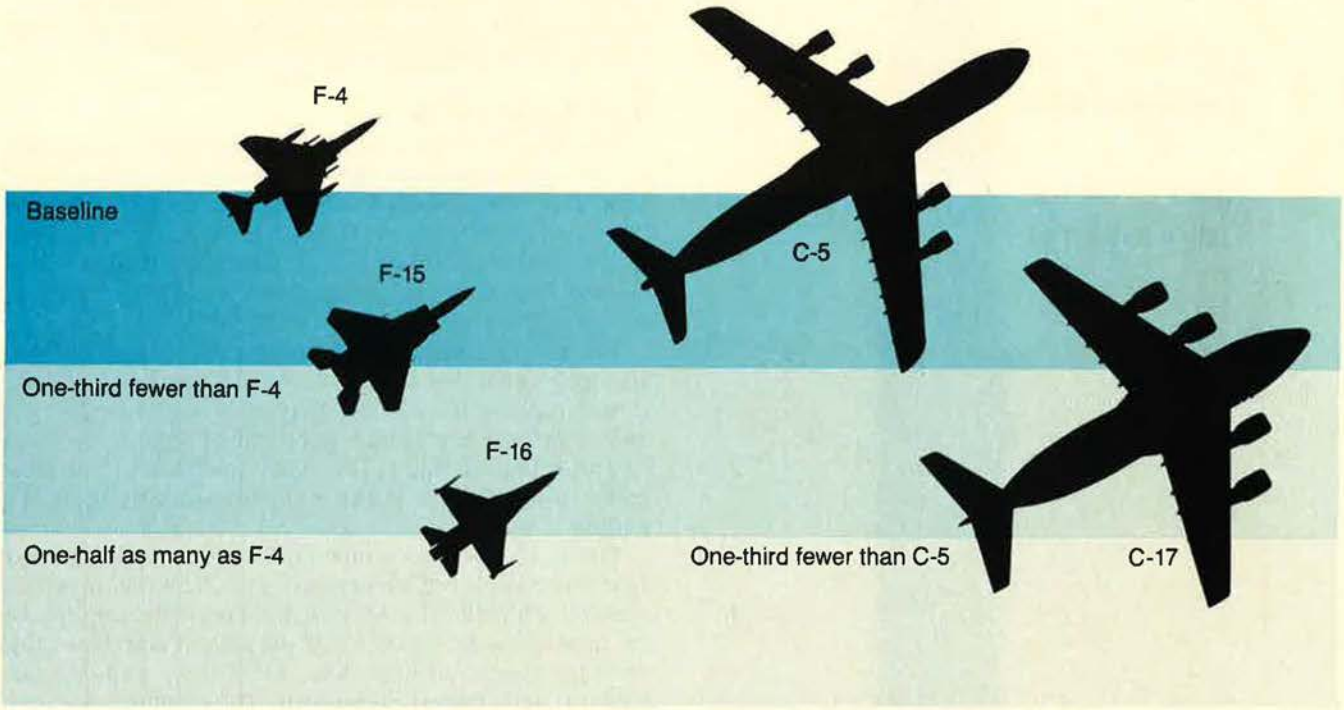
The manpower question is not just one of numbers; it's also one of skills. A smaller manpower pool with substantially better prospects for employment in the civilian sector means not only a tougher time in recruiting the number of personnel needed, but also an increased difficulty in obtaining personnel with the ability to master highly technical skills. Therefore, our new systems must be designed so they break less often and are easier to repair when they do break. Such systems will provide more capability through increased availability and reliability. Further, they will require fewer people and lesser skills to maintain the force structure.

We have made some significant improvements in recent years, and current systems are more reliable and maintainable than the systems they replaced. The F-15, our air-superiority fighter, needs one-third fewer maintenance man-hours per flying hour than the F-4. The F-16 requires only about half as many maintenance man-hours per flying hour as the F-4. Our newer systems will continue this emphasis on reduced manpower. The C-17 will require about a third of the C-5's maintenance man-hours.

However, we need to reduce manpower at an even faster rate, and the opportunities to do so are clearly

Source: USAF

Maintenance Man-Hours Per Flying Hour



available. Currently, an F-16 wing with seventy-two aircraft requires 206 people providing "hands-on maintenance" for the fire-control systems and engines. If we were able to improve the reliability of these systems twofold, we could reduce this group by forty percent. That means we could free eighty-two men and women to help support other needs of the Air Force.

The recent Alternate Fighter Engine competition resulted in a significant achievement in reliability and maintainability. Through an eminently successful competition between the two major engine contractors, the Air Force is now obtaining engines for the F-15 and F-16 aircraft that will save the government between $2 billion and $3 billion in support costs over the twenty-year life cycle. The overhaul period for the cores of these engines has been extended to more than eight years of operational use, compared to the approximately four-year overhaul interval for today's F-15 and F-16 engines. Benefits gained from the engine competition will continue to accrue through the use of comprehensive warranties. They contain positive and negative incentives that ensure that the contractors will deliver engines that continue to perform to specification levels in extended field use.

Spares and Readiness

Increasing system reliability also drives down life-cycle costs by reducing the number of spares required. And spare parts are big business. The Air Force manages some 835,000 different types, and the parts inventory is worth more than $38 billion. In Fiscal Year 1985, the budget contained more than $6 billion for spares. Management of spare parts involves a huge, complex system that employs hundreds of thousands of people.

The higher the reliability of our systems, the lower the requirement for spare parts, transportation assets, repair facilities, and storage locations. But better reliability means more than solving manpower and spare-parts problems. Its impact is on readiness and system effectiveness—in short, on our ability to fight.

Today's F-15 is quite a different aircraft from the F-15 delivered ten years ago. Configuration changes have improved the performance capability of the fire-control and electronic warfare systems. The plane's range is greater. Reliability of F-15 subsystems has improved to the point where the aircraft today can fly two and a half times longer between corrective maintenance actions than it could a decade ago.

Mission-capable rates are also affected by maintainability improvements. If systems can be designed to ease troubleshooting and repair, more sorties can be generated. The F-15 force in 1984 flew fifty percent more missions per month per aircraft than its counterpart in 1975.

A one percent increase in the mission-capable rate for a force of 700 F-15s is the equivalent of adding seven more F-15s to the inventory.

The F-15E will be even more capable than today's F-15, and with better field reliability. The aircraft will be equipped with a ring-laser gyro inertial navigation system that has the potential for a tenfold improvement in reliability. Another example of improved reliability and maintainability can be found in the F-15E engine monitor display. It deletes twenty cockpit instruments and puts the same information in one display. It im-

Improvements in the guidance system of the Minuteman I have resulted in a significant rise in Mean Time Between Failure (MTFB) rates. As the MTBF rate rose, so did missile availability.

proves flight operations by improving the pilot's visibility while saving nine pounds in aircraft weight. But, most important, the Mean Time Between Failure (MTBF) rates are projected to climb from a cumulative eighty-four hours for the twenty-instrument system to 1,000 hours with the new system, illustrating that intelligent application of modern technology allows us to improve both reliability and performance.

R&M and the B-1B

The new B-1B strategic bomber also provides some excellent examples of what can be done when proper emphasis is placed on R&M. As the Air Force begins taking possession of new B-1Bs this year, the benefits of R&M planning will become evident. Examples of subsystem improvements range from a complex oxygen-generating system to simple light bulbs.

The aircraft uses a new Molecular Sieve Oxygen Generating System that makes its own oxygen during flight. It will replace the old liquid-oxygen systems that required extensive ground equipment to replace the oxygen prior to each flight. This one improvement is anticipated to net the Air Force a savings of more than $17 million.

The B-1B also has a new built-in Central Integrated Test Subsystem, which can test and check out avionics systems while the aircraft is in flight or on the ground. In the ground mode, the integral subsystem eliminates the need for almost all flight-line, subsystem, and specialized test and support equipment. The result is a savings of more than a half billion dollars and a sixty percent reduction in specialized maintenance personnel.

An electronically steerable phased-array antenna will improve antenna system reliability on the B-1B by a factor of three. The rotary launcher, which will accommodate multiple weapons, is designed to be a common strategic system carrier. The commonality standardizes loading procedures, reduces training, and requires fewer spares and support equipment.

Even the light bulbs on the B-1B will be more reliable. With new push-button switches and dual high-reliability integral lamps, we expect life-cycle cost savings of more than $6 million in light bulbs alone. The lamps are so reliable that the control panels themselves will fail and require maintenance long before both bulbs in any one switch fail.

The limits on system reliability are often those limits we impose unknowingly on ourselves. We have seen in a number of subsystems that a concerted effort to build for reliability has yielded Mean Time Between Failure rates that are far better than expected. There is no reason we cannot double the maintenance interval rates on every system we have. Some could be improved manyfold.

Early Experience With Minuteman

Our experience with the Minuteman strategic missile is an example of what can be accomplished when a concerted effort is made to improve the reliability of a system.

When the Minuteman I was first deployed, the guidance system failed about every 600 hours. The guidance can was removed some fifteen times a year per missile. Moreover, maintenance people took seven days to re-

move, reinstall, calibrate, and warm up the guidance system and put it back on line. The average out-of-commission rate was 105 days a year.

In 1963, $150 million was invested to improve Minuteman reliability. As a result, Mean Time Between Failures of the guidance system rose to 9,000 hours. Less than one removal per year per silo became the norm for the fleet, and missile availability rose significantly. We saved $1.5 billion with that $150 million investment. Today's Minuteman guidance system has been further improved. It enjoys more than 10,000 hours Mean Time Between Failure.

At Vandenberg AFB, Calif., on October 17, 1984, the seventy-second Minuteman I missile ever built was launched in a research experiment. It was the first time that a twenty-year-old Minuteman had ever been launched. All three missile stages and the guidance set, built in 1964, performed exactly to original specifications.

Last September, the Secretary of the Air Force and the Chief of Staff of the Air Force issued a policy memorandum to all major commands that outlined the Air Force commitment to institutionalizing reliability and maintainability in all weapon systems. Two things were of special importance in this commitment. First, it related improved R&M directly to the need to lower manpower requirements, improve operational effectiveness, and reduce life-cycle costs. Secondly, it required development of an Air Force action plan to ensure that these important objectives were met.

Since issuance of the memorandum, an action plan has been developed to ensure that R&M will be a primary program objective throughout the acquisition process—from concept development and design to production and use.

Reliability and maintainability are not new subjects for the Air Force. In developing the plan, a wealth of information—including a thorough review of prior successes and failures—was examined. Existing policies came under close scrutiny, particularly those policies that might create "disincentives" or roadblocks. This review reaffirmed that R&M must be designed into new systems as well as into existing systems through modifications and the replacement of subsystems.

List of Needed Actions

The action plan is aimed at accelerating R&M improvements. To ensure that this vital fourth wheel on the acquisition wagon continues to receive proper emphasis, a list of needed actions was developed.

- First, Air Force objectives will be identified and established. By objectives, I refer to resource goals set at Headquarters Air Force level that relate directly to mobility, manpower, and life-cycle cost requirements. These objectives will be translated into firm program requirements at the major commands. These requirements will be monitored across the Air Force. To ensure that the Air Force stays on track, doctrine and policy will be updated to tie R&M to operational requirements.
- Second, organizational changes are being made to establish focus and accountability for R&M. Reliability and maintainability advocacy will offer a combination of technical expertise, improved program coordination, and greater R&M exposure.
- Third, a system to ensure integrated R&M planning throughout the Air Force is being created. Major commands will be responsible for R&M planning within their operations, and the planning will involve all weapon systems. In addition, planning will cover other areas, such as personnel levels. It will include technology roadmaps to ensure that new capabilities bring reliability and maintainability with them.
- Fourth, a long-range program for communicating our concerns and motivating our people about R&M must be part of this institutionalization process. We will explain our actions to Air Force people and to industry to ensure that there are no lingering doubts as to the Air Force commitment to R&M.
- The fifth area involves accountability and feedback. To ensure that R&M is being given consideration at least equal to that given the other acquisition wheels of cost, schedule, and performance, program reviews of reliability and maintainability factors will be scrutinized at all levels. Emphasis from the Inspector General and from the R&M staffs will be increased. Independent review teams will examine the weapon system R&M programs in detail. If R&M is to be an equal wheel, we must give it the same emphasis now provided cost, schedule, and performance. We will track, measure, and review R&M from cradle to grave, as it were.

Influencing Contractors

Finally, it is the contractor who designs and builds R&M into the systems. Therefore, we will influence the contractor's R&M performance directly. Addressing reliability and maintainability at conferences and in articles is useful, but we expect to gain industry's undivided attention to R&M through strong contractual incentives, both positive and negative. By raising the consideration level of R&M in source selection, increasing R&M incentives during development, insisting on warranties in production, and extending the contractor's participation and responsibility beyond the factory and into the field, we will be able to bring about the improvement that is desired.

This nation is fortunate to have been endowed with brilliant scientists and engineers who have developed and applied advanced technology that is the envy of the world. The capabilities of our systems have been our strong suit in the balance of power, enabling us to maintain credible deterrence in the face of superior numbers.

However, an equation based on the balance of cost, schedule, and performance pervades our acquisition system today from the drawing board through the assembly plant to the flight line. It has provided us with highly capable systems. But the price we have paid for manpower and training, for spare parts, for support equipment, for out-of-commission rates, and for mobility restraints is too high and can no longer be allowed to continue. We must strengthen this equation by including R&M as a prime management parameter. The technology—with the dedicated people who developed and applied that technology—can create reliability and maintainability.

The Air Force is committed to an acquisition wagon with four equal wheels, a wagon that runs smoothly and efficiently because R&M has been given proper emphasis from beginning to end. ■

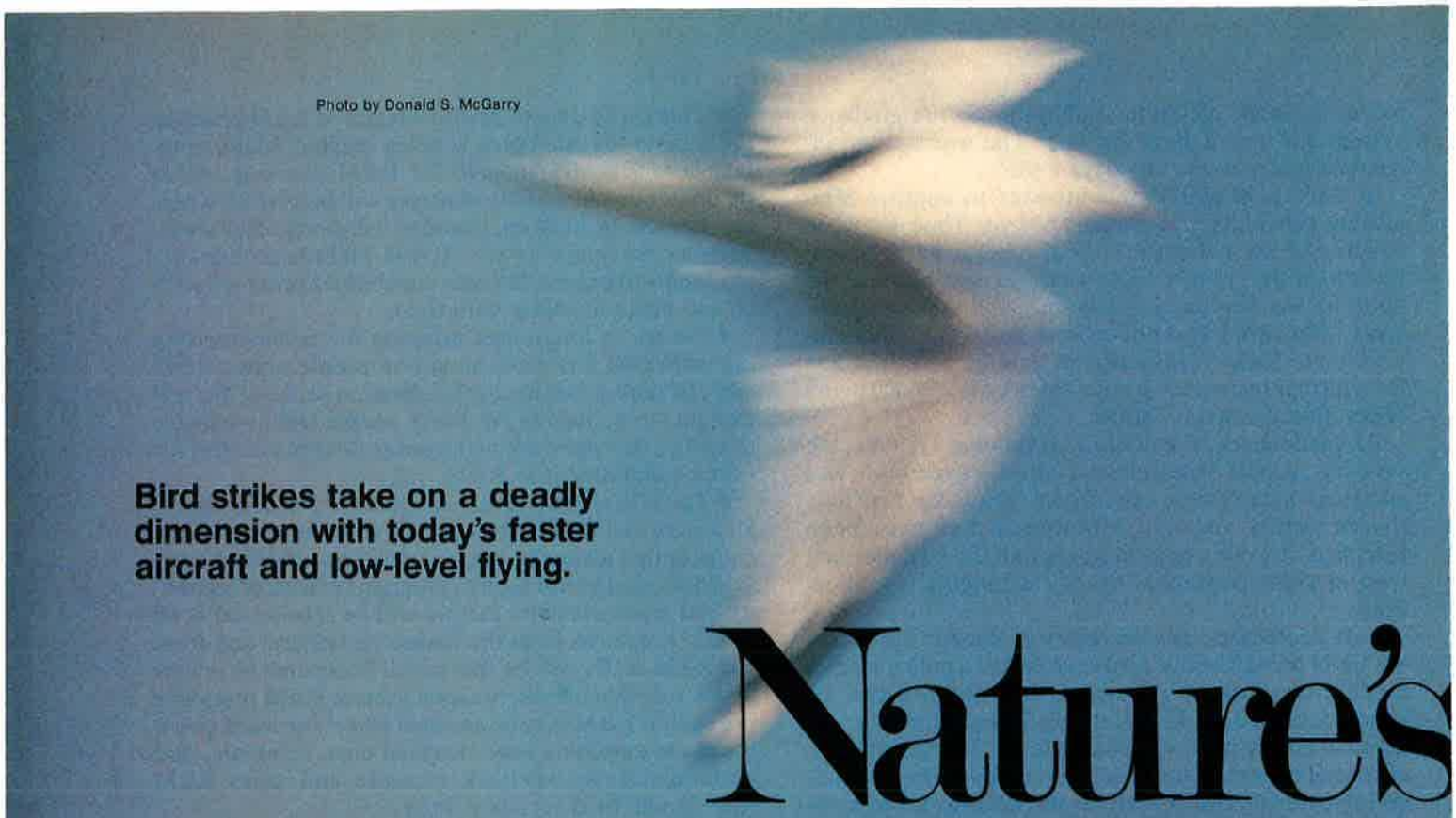


Photo by Donald S. McGarry

Bird strikes take on a deadly dimension with today's faster aircraft and low-level flying.

Nature's

BY CAPT. NAPOLEON B. BYARS, USAF, CONTRIBUTING EDITOR

An F-15 streaks across the sky at an altitude of 200 feet and a speed of 450 knots. Unknown to the pilot, a deadly presence is approaching—an aerial menace that has downed twenty-three USAF aircraft in the last twenty years, causing the death of eleven crewmen. It cannot be tracked with on-board radar, and once visible to the naked eye, it will almost surely be too late to avoid.

The menace is a bird—an ordinary bird—but if it collides with an aircraft in flight, the consequences can be catastrophic.

In an average year, Air Force pilots report more than 2,000 bird strikes. In 1984 alone, birds caused more than $20 million in damage to Air Force aircraft. The most serious bird-strike incident last year caused an F-111 to crash in England. Its crew ejected safely.

The phenomenon of birds colliding with aircraft dates back to the early days of aviation. Bird strikes grew more frequent as airplanes achieved faster speeds. It became a significant problem with the emergence of the terrain-following radar, which allows pilots to avoid early detection by enemy radar by flying fast and low—coincidentally, right down in the favored airspace of birds.

After the loss of several aircraft, including three F-111s in the 1970s, the Air Force began to attack the bird-strike problem on three fronts. The Aeronautical Systems Division (ASD) at Wright-Patterson AFB, Ohio, began looking into stronger aircraft windshields. Also, Arnold Engineering Development Center (AEDC) at Tullahoma, Tenn., began testing windshields. And a Bird Aircraft Strike Hazard (BASH) Team was formed at Tyndall AFB, Fla., to collect data on bird strikes and to recommend ways to reduce the hazard.

The windshield on the F-111 was improved to withstand a four-pound bird at 500 knots—up from the previous 140-knot tolerance. (Approximately ninety-nine percent of all bird species indigenous to the US weigh four pounds or less.) ASD is further improving windshields on the T-38, F-4, F-16, and F-111 aircraft.

"Our big improvement is with the F-4," said Capt. Robert J. Simmons, Program Manager for the Improved Windshield Program at ASD's Flight Dynamics Laboratory. The F-4 presently has a three-piece windshield that can withstand a four-pound bird strike at 190 knots. McDonnell Douglas Corp. and Goodyear Aerospace are developing a one-piece wraparound windshield to withstand a four-pound bird strike at 500 knots. "We're also looking into ways to provide 500-knot protection for the canopies on the F-16 fighter," Captain Simmons added.

A Flock of Technical Hurdles

Creating a "bird-proof" windshield is easy—unless the designer must also be concerned with weight limitations, optical requirements, durability, and affordability. Those factors make the task a monumental one for engineers. And windshield design will become even more difficult, given the supersonic cruise feature coming on the Advanced Tactical Fighter (ATF), an aircraft that may hit birds with much greater impact. To complicate matters, engineers at ASD are also working to incorporate into the ATF's windshield such features as hardening against enemy lasers. These new requirements could well compete with measures that allow for improved bird-strike protection.

As advances in technology have dictated the need for stronger windshields, ASD engineers have turned to computers to help expedite their windshield designs. Using the Materially and Geometrically Nonlinear

FAR LEFT: Sea gulls and other birds can be lethal to military aircraft flying low-level operations. LEFT: What's left of a pilot's helmet after a bird penetrated his cockpit windshield. (US Navy photo)

Aces

Analysis (MAGNA) program, engineers test experimental designs long before a model is constructed.

"Our goal is to protect the pilot and prevent the loss of an aircraft," Captain Simmons said. "You can pay for a lot of windshield research by preventing the loss of one airplane."

The primary Air Force bird-impact testing range is at AEDC. Arnold engineers, using a bird launcher nicknamed the "Rooster Booster," fire dead chickens at high speeds into windshields to test impact tolerances. The impact is calibrated using high-speed cameras, strain gauges, accelerometers, and temperature gauges.

AEDC is currently testing an artificial bird made of gelatin as a replacement for the chickens now being used. Eager to eliminate the messy clean-up caused by testing with the real thing and sensitive to criticisms from animal lovers, AEDC engineers look forward to working with the "jellybird."

"If it can be shown that there's no statistical difference between the jellybird and the real thing, we'll use the new one exclusively for development testing," said Jon H. Storslee, Calspan Project Engineer. Calspan operates the Von Kármán Gas Dynamics and Propulsion Wind Tunnel facilities at AEDC.

The Search for Safety Measures

The BASH Team has been studying bird habits and analyzing mounting bird-strike statistics to recommend safety measures that will reduce the number of bird strikes.

A close examination of BASH Team data reveals that most bird-strike incidents occur around airfields. A sizable number of bird strikes happen in the course of low-level operations. The most frequent bird-strike victims are Air Force fighter and trainer aircraft, which are involved in approximately two-thirds of all incidents. Most of these strikes occur below 1,000 feet, but no altitude is safe. The highest reported altitude for a bird strike is 37,000 feet. The majority of bird-strike fatalities occur when a bird penetrates the cockpit windshield. Still, birds frequently smash into engine inlets, wings, landing gear, or almost any external part of an airplane.

"In addition to providing bird-strike statistics for windshield and engine research, the BASH Team has initiated several investigative engineering projects," said Maj. Michael M. Thompson, BASH Team Leader.

Using a Bird Avoidance Model (BAM), the BASH Team has sought to reduce the probability of bird strikes. BAM is a computer-generated model based on forty years of waterfowl migration data. It can predict the probability of bird strikes on any low-level route relative to the time of day and year. The model is being modified to generate the probabilities of bird strikes by raptors, or birds of prey, such as eagles, falcons, hawks, and vultures. Because of their large size, these birds pose the most serious threat to Air Force pilots. The BASH Team is also studying ways to make airfields less attractive to birds as nesting and feeding grounds.

Strobe lights mounted on military aircraft are being tested for their effectiveness in warning birds of approaching aircraft in enough time for the birds to scatter. A ground-based radar to track flying birds and to warn approaching aircraft is also being considered. The Next-Generation Weather Radar (NEXRAD), which has the capability to detect birds, could well be the answer to reducing the high incidence of bird strikes.

Still, with improvements in Soviet radar impelling the move toward low-level flying to avoid detection, the threat from nature's "aces" is likely to be even more serious in the years ahead. ■

VIEWPOINT

Consensus and Force

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

We should not commit troops to combat without vital purpose and intent to win—but it is no longer easy to define what winning is.

Writing in the fifth century, St. Augustine had some timeless things to say. On the subject of war, he labeled as heresy the assertion that war is intrinsically immoral. "War and conquest," he wrote, "are a sad necessity in the eyes of men of principle, yet it would be still more unfortunate if wrongdoers should dominate just men." A just war, then, has the blessing of St. Augustine. The problem comes in determining when a war is just.

Secretary of State George Shultz, in a speech last fall, invoked another ecclesiastical source as justification for the use of military power. Addressing a Jewish audience, he quoted a passage from the Talmud: "If one comes to kill you, make haste and kill him first." The thought occurs that Talmudic study may have been responsible for the spontaneous rally in support of the New York City subway avenger. Anyway, there is substantial backing in Judeo-Christian philosophy for the use of force, given sufficient provocation. The question lies in determining when there is sufficient provocation, and—this being a wide-open democracy—who makes the determination?

As Secretary of Defense Caspar Weinberger said in another speech last fall, there is contention within our government over that question. Congress has been increasingly assertive in foreign affairs and in the employment of military forces. A President in these times does not have the same freedom as Commander in Chief enjoyed by an FDR. In Mr. Weinberger's view, decision-making authority has been diluted without a sharing of responsibility for the result.

Be that as it may, there are other complications to the employment of US military power, more nebulous but equally worrying. Mr. Weinberger touched on one of these when he stated the need for a "strong consensus of support and agreement for our basic purposes." He went on to say that the troops must have a clear understanding of what we hope to achieve. Without this, Mr. Weinberger sees distrust and scorn amongst the troops and, ultimately, the failure of the all-volunteer system.

Secretary Shultz said in his speech that there is no such thing as public support guaranteed in advance. If you are successful, you get the support.

There is, of course, something to be said for both views, which are not, in the true sense, that far apart. Of course troops perform better if they believe in what they are doing and know that the public is behind them. Equally, it is not always possible to make a convincing pitch. But no matter how confused the situation may seem to the man in combat, he usually thinks, or at least hopes, that someone higher up knows what is going on. With that modest self-assurance, he carries on.

The idea behind an all-volunteer, or regular, military establishment is that it is, or ought to be, relatively free of the doubts and pressures of a reluctant conscript force. When the United States relieved its citizens of military obligations, at least one motivation behind the change was to obtain disciplined and unquestioning professional armed services. A person voluntarily signs up with complete understanding of the conditions of employment. If, as has occasionally happened in the past, too few sign up, pay and other inducements are improved. However, the contract remains explicit on the basic conditions of service. You do what is ordered so long as the orders come from a competent source and are not illegal. There is no provision in the contract for democratic discussion in order to determine whether or not a policy is agreeable.

Mr. Shultz rightly believes that power and diplomacy must go together. In his opinion, diplomacy not backed by strength will always be "ineffectual at best, dangerous at worst." To those who are easily alarmed, this conjures up visions of a US war in Central America; yet it is simply a statement of the obvious. If we did not have the power to demolish Nicaragua, and Cuba, for that matter, our anti-Marxist policy in the region would have no credibility. Speak softly if you like, but be sure to carry that big stick.

The late 1970s saw the United States reach its modern nadir as a military power. Our NATO contingent, suffering from post-Vietnam hangover and a surfeit of substandard troops, was viewed with thinly veiled contempt by our allies. The great experiment of an All-Volunteer Force was off to a shaky start, and then there was Desert One, scarcely the performance of a superpower. That failed rescue mission in Iran severely damaged the already flawed image of the US military.

Happily, the past four years have seen a refurbished image. There have been two minor triumphs befitting a major power—the Navy vs. Qadaffi in the Gulf of Sidra and Grenada—along with the one big disaster in Lebanon. Presumably, it was the Lebanon tragedy that caused Mr. Weinberger to lay out his six conditions for the use of the military as an adjunct of diplomacy. The thrust of his first three conditions is both clear and, it seems to me, unarguable: We should never commit combat troops unless it is vital to our national interest, unless we have clear political and military objectives, and unless we intend to win. There is, of course, a problem in defining what constitutes winning. In World War II, it was unconditional surrender, a clear-cut stand that had some unforeseen consequences. We settled the Korean War on a draw, and in Vietnam—what more is there to say about Vietnam?

The debate between our Secretaries of State and Defense, if, in fact, it is a debate, is one of nuances rather than differences. President Reagan and Congress have spent enormous sums these past few years in restoring America's military to the status required of a great power. These refurbished armed forces are the unseen but powerful presence at diplomatic encounters, whether in China, in Geneva, or with NATO. As Mr. Weinberger infers, they should remain invisible, except as a last resort. ■

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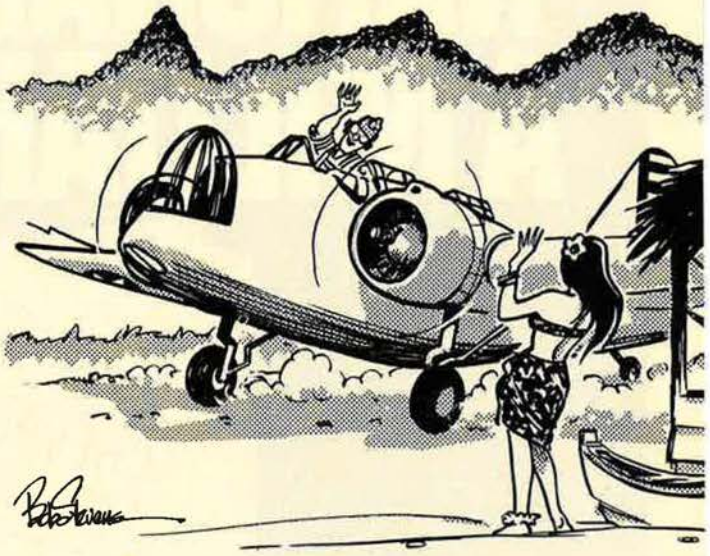
Commuting to work in what was probably the last operational B-10 in the Army Air Corps was fine for a while, but too good a deal to last forever.

But for The Captains



"Sometimes I would land in the emergency field behind our house . . ."

BY MAJ. GEN. DALE O. SMITH, USAF (RET.)
ILLUSTRATION BY BOB STEVENS

I STOOD in worshipful admiration as the glistening B-10 was towed from the overhaul hangar of the Hawaiian Air Depot at old Luke Field on Ford Island in Pearl Harbor. HAD prided itself on thorough and complete rebuilding of long-service warplanes, and this beauty with its shiny yellow wings and ocean-blue fuselage was as clean as the day it rolled off the Martin assembly line. Now it was my job to see that it flew properly before it was returned to its bombardment squadron.

Test Pilot was just one of several hats I wore at HAD in the late 1930s. I was also Assistant Engineering Officer under the redoubtable Maj. Barney Tooher, who related to me several times how he had killed a moonshiner with his service .45 a split second before the moonshiner had tried to blow off Barney's head with a double-barreled shotgun. Barney had been ordered by his CO to assist some revenuers in locating a still that was poisoning his troops. For those of tender years, this incident took place during the era of Prohibition.

Another hat I wore was Reclamation Officer. "Reclamation Officer" was a contradiction, because in truth I was principally the "destruction officer." I had just finished consigning to the Pacific deep the last of the ungainly B-4s—huge lumbering biplanes that looked like box kites and about which some wag said, with some truth: "They took off at ninety, cruised at ninety, glided at ninety, landed at ninety, and stalled out at ninety." One by one I had loaded B-4s onto a barge that was towed out beyond the mouth of Pearl Harbor. When the water turned deep blue, we hacked holes in the wings and fuel tanks and shoved the old bombers overboard to their watery graves.

I had trained in B-4s at Kelly Field, but had no love for the awkward beasts. However, the B-10s assigned to the 9th Bombardment Squadron at Hamilton Field, Calif., my first station, were something else. The B-10, a two-engine, all-metal (except for ailerons and tail) monoplane with retractable landing gear, was the first of the modern bombers. It cruised at the then-unheard-of speed (for bombers) of 140 mph, and it had two-position props.

It was love at first sight, and I worked my way up slowly from gunner to navigator to bombardier until I finally got into the one-man cockpit as pilot. And I flew it almost everywhere in the States, from Seattle to Miami, from New York to San Diego. On one flight, a wheel dropped off and I had to make a belly landing—one of the first, since retractable landing gears were so new. And like the honest girl she was, there was no fire—and no injuries. So at HAD it was with some reverence and familiarity that I slid back the canopy and stepped down into the comfortable seat—since I am afflicted with unusually long legs, this was something that especially endeared the airplane to me.

After I had put the graceful bird through its paces, marking down on a knee pad the minor adjustments necessary, I reported to Maj. Barney Tooher.

"Junk the B-10s!"

"Bad news, Dale," was his greeting. "We just got orders to junk the B-10s."

"Junk the B-10s! What for?"

"They say B-18s and B-17s are being assigned to all bomber squadrons. No point in keeping the B-10s."

I was thunderstruck. The thought of destroying those beautiful B-10s that flew as gracefully as snow geese was more than I could bear. And as Reclamation Officer, I would have to be the one to murder those lovely B-10s—chopping holes in their soaring wings and their seductively shaped fuselages and cruelly consigning them to the deep.

"What a waste!" I said. "Why don't we give them to somebody? South American countries, for instance?"

"The Army thought of that, but the State Department turned thumbs down. They want no Latin American country bombing one of its neighbors. So we drown the B-10s."

One B-10 after another was turned over to the Depot for disposal, and I performed my dismal duty. But we wheeled that last gorgeous overhauled job back into the hangar. It would be the last to go.

The Depot was assigned no aircraft, but now and then we had to deliver parts or mechanics to outlying airfields, and I found it convenient to fire up that beautiful B-10 to make the deliveries. When the time came to destroy that gleaming bird, I made Barney a proposition.

"Major," I said, "that B-10 number 621 has come in mighty handy in performing our mission. We've had several compliments on our rapid deliveries. Why don't we keep 621 as sort of a cargo airplane?"

"But the orders . . ."

"I know, Sir," I said, "but we could fix that up easily by just showing on the books that it was awaiting reclamation. There's no time limit set. Then we could keep it, and it would come in mighty handy for delivering supplies."

This made good sense to the practical Barney, and he agreed to the ruse. Number 621 was saved! She was probably the last operational B-10 in the Army Air Corps.

I didn't get much flying time testing overhauled aircraft or new aircraft that arrived as deck loads from the States, and flying time was the name of the game for young pilots. So I took every opportunity to fly 621 to the big island of Hawaii and anywhere else as required by our maintenance and supply mission. But it still wasn't enough. My contemporaries in the tactical squadrons were piling up flying hours and outstripping me. Most of my duties at HAD were on the ground.

Hickam Field had just been built, and the squadrons at Luke Field were moving to the new base. Someone had made a deal with the Navy, which owned half of Ford Island, whereby the Air Corps half, called Luke Field (we shared the one runway), would be taken over by Naval Aviation. I was ordered to vacate the comfortable tropical quarters on Luke where I lived with my wife and infant son. The HAD was to move to the new maintenance docks at Hickam after they were completed. In 1941, these huge hangars were aiming points for Yamamoto's bombers.

Commuting from Kaneohe

There were no quarters available for first lieutenants at Hickam, so I had to find a place to live on the economy. I decided to go for broke as a beach boy and rented a charming little cottage on Kaneohe Bay. It was located at what is now the east end of the Marine Corps Air Station runway. And there was a small emergency airstrip just behind the house.

But commuting over the treacherous Pali road each day was rapidly wearing out my ancient Oldsmobile. And it was a long drive—more than an hour each way. I also had to catch a ferry to get from Hickam to Ford Island. The ferry ride took twenty minutes. Not only was I wearing out my car, I was wearing out myself. Then I had another flash of inspiration and tried it out on Barney Tooher.

"Sir," I said, "I'm not getting enough flying time. This job keeps me on the ground most of the day. But I spend about three hours a day commuting from Kaneohe. That's wasteful, expensive, and tiring. Wouldn't it be all right for me to fly 621 over to Bellows Field [which was about twenty minutes from home] each evening and fly it back in the morning? I'd be able to put in a full day's work here and get flying time besides. And it would help me on commuting."

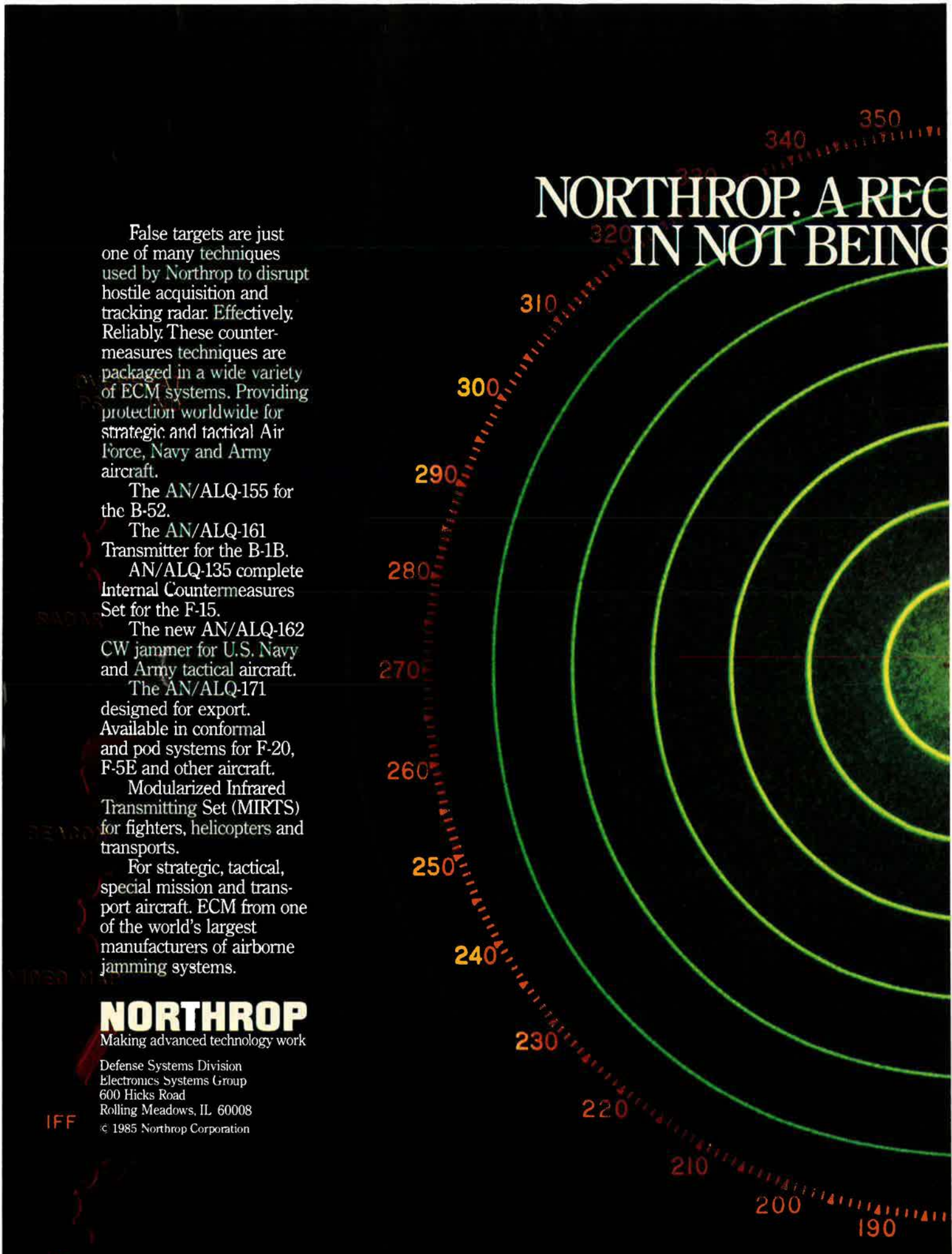
Well, Barney agreed, and I began to commute by air in that delightful B-10. I assured Barney that I'd get to work on time even if the weather turned bad. I could simply follow the shoreline and come in through the mouth of Pearl Harbor. I did that just once. In the rain and scud, the shoreline took on different dimensions than I had anticipated, and I had to do some fancy maneuvering and dodging to find Pearl Harbor.

In order to get home from Bellows, I'd fly over our beach house and shift the props to low pitch, which made a distinctive roar. This would signal my wife to drive to Bellows and pick me up. We had no phone out there. Sometimes I would land in the emergency field behind our house and pull my own preflight inspection in the morning, draining water from the gas tanks, kicking the wheels, etc. This was most convenient. I was probably the only lieutenant in the Air Corps who commuted in his own private plane. There was one minor problem that I soon corrected. The hard rubber wheel on the control column rubbed against my clean khaki trouser legs and made a mark. So I had the wheel painted white.

You may think this was too good for a first lieutenant, and you aren't alone. A deal as cushy as this couldn't be kept secret, and word eventually got out. The captains, particularly, were incensed. They couldn't see the reasonable logic involved. And they took action. Before long, orders arrived from the highest authority: "Destroy that B-10!"

With a sinking heart, I did my duty. ■

Maj. Gen. Dale O. Smith, USAF (Ret.), is a 1934 graduate of West Point. Following wartime service in England, he went on to a varied Air Force career, including command of two air divisions and a long stint of high-level assignments at the Pentagon. He retired from active duty in 1964 and went on to a second career as a writer, and he has authored a number of books on defense-related matters. His most recent offering for this magazine was "The Target Was Marienburg" in the September 1982 issue.



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THE BULLETIN BOARD

By James A. McDonnell, Jr., MILITARY RELATIONS EDITOR

Truly Special

An Air Force pilot, coach, instructor, and counselor has been named one of the Ten Outstanding Young Men of America (TOYM) for 1985 by the US Jaycees. The USAF Academy's Capt. Mike Gould, thirty-one, was selected by the group for his achievements as an Air Force officer and for his devotion to helping youth *(see photo).*

Capt. Mike Gould has been picked by the US Jaycees as one of the Ten Outstanding Young Men for 1985.

Captain Gould is head football coach at the USAFA Preparatory School, where his teams have won more than seventy percent of their games. He is also credited with assisting the Falcon varsity during their recent "good" years, during which they captured three post-season bowl victories. *(See also "The Bulletin Board," February '85 issue.)* Captain Gould, an Academy graduate himself, has personally arranged a number of Academy youth sports camps and has won numerous accolades for his willingness to help others, especially youth. His demonstrated leadership ability played a large role in his selection.

The TOYM program has been administered by the US Jaycees annually since 1938. Past honorees include such notables as Gerald Ford, Howard Hughes, Dr. Henry Kissinger, and Orson Welles.

Changes Possible for CHAMPUS

While no one's talking for the record, at press time it was virtually certain that the Administration will propose sweeping changes in the CHAMPUS program in order to help allay the budget deficit.

The following measures are said to be under consideration.

- An increased deductible for retirees of $100 per individual and $200 per family. This would double the present requirement.
- Designation by the government of a specific Health Maintenance Organization (HMO) for a given region. The HMO would have to be used by retirees in the given geographical area.
- A requirement that participating civilian hospitals charge CHAMPUS users no more than they do Medicare recipients. This could cause some hospitals to opt out of the program.

To sugarcoat this pill, there are indications that the Administration plan would also prescribe some goodies.

Said to be in the offing is a plan to waive all deductible costs for active-duty types, such as recruiters who are permanently assigned outside the forty-mile "availability" limit for military hospitals. Also hinted is a plan to cap catastrophic costs to the insured at $1,000 total for active-duty people and $5,000 for retirees. It's also rumored that a contributory dental plan is finally ready to be unveiled.

By the time this issue is in your hands, details should be available on any of the above programs that are actually proposed.

GI Insurance Dividend

The estimated annual dividend for 1985 for the some 3,500,000 veterans who still hold GI life insurance should total a record $798.8 million. The increased payout is attributed to the lower death rates among policyholders and high interest earnings on the insurance fund investments.

VA Administrator Harry N. Walters stresses that no application for the annual dividend is necessary. Each policyholder will automatically receive the dividend in the month of the policy anniversary date. Similarly, payments will be made in the manner selected previously by the holder and can range from cash to the purchase of additional paid-up life insurance.

The 61,751 holders of US Government Life Insurance policies with file numbers prefixed by "K" will receive an average dividend of $248. These are primarily World War I policies. National Service Life Insurance holders will receive, on average, dividends of $142 on Modified Life Plan Policies, $332 on other permanent plan policies, and $116 on term policies. These holders are World War II veterans, and their policies are prefixed with "V."

The newer Veterans Special Life Insurance policies prefixed with "RS" and "W" will pay out average dividends of $73 to "W" term holders, the "RS" term holders will receive $113, and the "W" permanent plan recipients will each get about $217.

Not affected by the dividend payout are Vietnam-era vets and post-Vietnam-era holders who carry Servicemen's Group Life Insurance, Veterans Mortgage Life Insurance, and Veterans Group Life Insurance. These group programs do not pay individual dividends.

Exact dividend return for each policyholder will differ according to age, plan selected, and length of time the policy has been in force.

Federal Pay Study Pushed

Two longtime proponents of the theory that female government employees are unfairly paid less than men have released a government study that, they say, bolsters their case.

According to a General Accounting Office (GAO) report released by Reps. Mary Rose Oakar (D-Ohio) and Pa-

tricia Schroeder (D-Colo.), women in the federal government are concentrated in the lowest grade levels while men dominate the higher-salaried positions.

Congresswoman Oakar chairs the House Subcommittee on Compensation and Employee Benefits, and Congresswoman Schroeder heads up the Subcommittee on Civil Service. With the GAO report in hand, they aim to kick off a congressional study of federal wage practices. "The GAO report establishes beyond question that a pay study of the federal government is absolutely essential and long overdue," said Representative Oakar.

The GAO report itself does not draw conclusions or make recommendations. It does affirm, however, that—for whatever reason—women hold seventy-five percent of the jobs at grade GS-6 while holding only twelve percent of the positions at grade GS-13. GS-6 salaries average about $17,000. Employees in grade GS-13 can earn up to $47,226.

If hearings are scheduled, the Office of Personnel Management—Uncle Sam's "people planners"—is expected to present its own study of women in the federal government. This is said to present a somewhat different picture than that painted by the two congresswomen.

Viet Vets Memorial Fund Bows Out

In a town where agencies, commissions, and other bureaucratic organizations seem to come but never go, a most unusual Washington happening took place recently—the Vietnam Veterans Memorial Fund closed its office and ceased operations. This was occasioned by the completion of the Memorial and the transfer of the site to the US government.

In a letter to all veterans organizations that supported the Memorial—AFA was one of the very first to get behind the concept that *some* type of monument was a necessity—VVMF President Jan Scruggs noted that the VVMF will continue in an unstaffed capacity to help the Park Service add additional names, if records should turn up any. It will also, according to Scruggs, "be a watchdog to make sure that there is proper care and maintenance of the Memorial." To fund this operation, profits from the sale of VVMF statue replicas and royalties from Scruggs's book, *To Heal a Nation*, will be donated to the cause.

Primarily, however, Mr. Scruggs expressed appreciation for the extraordinary efforts put forth by veterans groups and others in bringing this project to fruition. Truth to tell, though, it is the veterans groups—indeed, the entire nation—that owe thanks to this selfless veteran who had the tenacity to make a dream come true. He directed an effort that raised almost $9 million, navigated a truly complex tangle of government regulations and procedures, and overcame bickering on the part of many of the strong-willed principals involved. A truly impressive memorial and a solemn tribute to the nation's Vietnam veterans was the fitting result of his yeoman service.

Mr. Scruggs added that he plans to take off a few months to recover from his five-year effort and "to decide what to do with my life." Whatever that may be, AFA wishes you well, Jan Scruggs. You have helped heal a nation, and we salute you.

Amy Coverdale, daughter of MAC Vice CINC Lt. Gen. and Mrs. Robert F. Coverdale, will compete as Miss Missouri 1985 in the "Miss USA Pageant" at Lakeland, Fla., in May. "We're very proud of her," said Mrs. Coverdale. "She'll be a super ambassador for the state of Missouri."

Survivor Benefit Plan Studied

In 1985, DoD estimates that only fifty-five percent of all retiring military members will sign up for the Survivor Benefit Plan. This is not even close to the seventy-five percent that DoD would like to see in the program and believes would be if only the plan were changed slightly and were more widely publicized.

The SBP is a voluntary plan that provides for the continued payment of a portion of retired pay to the survivors of deceased retirees. The principal beneficiary is usually the member's spouse, who may receive up to fifty-five percent of the member's gross retired pay. The monthly cost to the living service member for the SBP is $7.50 for the first $300 of retired pay covered, and ten percent of the amount in excess of that.

During its review, DoD will look at how changes might be made to improve the cost formula and examine some of the administrative sticking points, such as methods to end coverage, once it is extended—right now, there's no way, short of death or divorce—and to provide for combined coverage for former spouses and children. DoD will also take a look at a problem that has dogged the program since its inception: the status of widows whose retired military spouse died before the program began in September 1972.

Finally, the study will search for better ways to get out the word about the plan to prospective retirees. DoD believes that if members were more aware of the benefits, costs, etc., of the program, much of the opposition to it would melt away.

New Schools Picked For AFJROTC

The Air Force has selected twelve high schools to host Air Force Junior ROTC units as the next vacancies occur. The schools were selected for their demonstrated interest in aerospace education, available facilities, overall enrollment to support the program, geographic location, and proximity to Air Force bases.

As vacancies occur during the 1985–86 school year, schools will be offered Junior ROTC units in the following order:

Cedar Ridge High School, Old Bridge, N. J.; Willingboro High School, Willingboro, N. J.; Garden City High School, Garden City, Mich.; Academy of Mathematics and Science, St. Louis, Mo.; Rim of the World High School, Lake Arrowhead, Calif.; Plainfield High School, Plainfield, N. J.; North Quincy High School, Quincy, Mass.; Westwood High School, Austin, Tex ; Western Hills High School, Fort Worth, Tex.; Wando High School, Mount Pleasant, S. C.; Perris Union High School, Perris, Calif.; and Tecumseh High School, New Carlisle, Ohio.

In related news, the Air Force is putting out a call for retired officers and NCOs to serve as AFJROTC aerospace science instructors. Open positions are located throughout the country. "This is an excellent opportunity for Air Force officers and NCOs who have been retired four years or less to get

back into uniform and at the same rate of pay as they were receiving before retirement," said a spokesman from AFJROTC Headquarters at Maxwell AFB, Ala.

The AFJROTC program, which does not lead to a service commitment, explores the civilian, industrial, and military aspects of aerospace and teaches the concepts of self-reliance, self-discipline, and leadership. Military retirees hired as teachers—and they must apply to the local school authorities—are paid by the government in the amount of the difference between their retired pay and the active-duty pay for their grade. Other salary or benefits, if any, offered by the school are a matter of private contract between the teacher and the school system.

Air Force retirees interested in AFJROTC instructor positions should call either Mr. John Edwards or Ms. Jean Jocelyn toll-free at (1-800) 633-8750, extension 7741, or write to them at AFROTC/OTJ1, Maxwell AFB, Ala. 36112-6663.

ERAU Elects New President

The Board of Trustees of Embry-Riddle Aeronautical University has elected retired Air Force Lt. Gen. Kenneth L. Tallman as ERAU president *(see photo)*. He succeeds Jack R. Hunt, the university's first president, who died in January 1984. General Tallman's varied background includes experience in higher education, the military, and aviation.

Lt. Gen. Kenneth L. Tallman, USAF (Ret.), has been named President of Embry-Riddle Aeronautical University.

Embry-Riddle Aeronautical University is the nation's only fully accredited aviation-oriented university. With residential campuses in Daytona Beach, Fla., and Prescott, Ariz., and the International Campus headquartered at Bunnell, Fla., the university currently has more than 13,000 students enrolled.

From 1977 to 1981, General Tallman, a West Point graduate, served as Superintendent of the United States Air Force Academy in Colorado. During his tenure, he instituted a number of changes in the Academy's programs that were designed to solve numerous challenges facing the institution. Some of these included a twenty-fifth anniversary review of the Academy's curriculum to ensure that academic standards were being met; the development of the Academy's athletic program, witnessed by its membership in the Western Athletic Conference; the full integration of women into the Academy; and the introduction of programs providing greater opportunities for minorities.

Prior to his appointment at the Academy, General Tallman was the Air Force's Deputy Chief of Staff for Personnel. He retired from the Air Force in 1981 and became the Executive Director of Pike's Peak YMCA-YWCA Junior Achievement Capital Development Campaign. General Tallman was directly responsible for organizing and directing a volunteer fund-raising campaign that generated more than $4 million for the construction of a new facility in Colorado Springs.

For the past two years, he has been president of the Spartan School of Aeronautics in Tulsa, Okla., a two-year aviation-oriented institution offering associate degrees.

His personal aviation experience includes more than 6,000 hours as a pilot in many types of aircraft, ranging from propeller-driven P-51 Mustangs to F-4 Phantom jets. He is still an active pilot in general-aviation aircraft.

THE BULLETIN BOARD

Short Bursts

Newly established by the Air Force is a **First Sergeant of the Year Award** to honor its top "first shirt." Selections will be based on leadership and performance, community involvement, and ability to serve as a "positive and articulate representative of the Air Force."

AFAers are sparking a drive to reverse the announced cancellation of ABC's Air Force-oriented television series "Call to Glory." Though critically acclaimed and praised by President Reagan, the show is due to die after an April two-hour finale, which will deal with President Kennedy's assassination. Shown above is series star Craig T. Nelson, pressure-suiting up at Beale AFB, Calif., with help from Sgt. Dean Davenport (upper right) and A1C Andrew McLean for an upcoming SR-71 sequence. (USAF photo by A1C Joseph Castellino)

A total of **100,000 reports a year!** That's how many the Pentagon estimates each Air Force base produces. Many contain only "nice-to-know" information, say officials, and all are being scrutinized for survival. Says one spokesman, "We have a gut feeling that we have more paperwork out there than we absolutely need."

Lt. Gen. Robert E. Kelley, TAC's Vice Commander, has been **named to the Lacrosse Hall of Fame.** A 1956 Rutgers University graduate, General Kelley earned first-team All-American honors as a center middlefielder in 1955 and 1956.

The Mayor of San Antonio has issued **a proclamation honoring the**

Air Force's Wilford Hall Medical Center for its pediatric hospice for terminally ill children and their families. The one-of-a-kind military program uses off-duty volunteers to care for children at home and to lend support to families.

Overeaters Anonymous is interested in expanding its programs **to help compulsive military overeaters.** The nonprofit group has no dues or fees and is patterned on Alcoholics Anonymous. For more information, write to R. Cornelison, Chairman, Conference Military Committee, OA, 124 Broadway, #4, Birmingham, Ala. 35209.

Civil Air Patrol racked up **a total of 121 in the "lives saved" column** in 1984. While not a record, the 121 who were rescued will undoubtedly testify that the official Air Force auxiliary lived up to its motto, "Always Vigilant."

TAC's **366th Services Squadron,** Mountain Home AFB, Idaho, **won first place in the Air Force's 1984 "Innkeeper" contest** for small units. The 86th SVS at Ramstein AB, Germany, took first place in the "large" category. The award measures excellence by base billeting groups.

VA is looking to give away **nurse scholarships for the 1985–86 school year.** The awards provide tuition, educational expenses, and a monthly stipend for nurses who agree to serve with VA for two years as full-time registered nurses. Both undergraduate and master's degree programs are available. Write to VA, Office of Academic Affairs, DM&S (14N), 810 Vermont Ave., N. W., Washington, D. C. 20420 for details.

The Air Force Accounting and Finance Center reminds retirees that a recent AFAFC survey found that only twenty percent of **pay complaints** that surfaced through the retiree's congressman were valid. If they had been able to look at the other eighty percent before they moved into congressional inquiry channels, the Center believes appropriate answers could have been given much faster. The moral—if you've got a complaint, **write or call AFAFC first.** ■

SENIOR STAFF CHANGES

PROMOTIONS: To be **Major General:** Melvin G. **Alkire;** Thomas A. **Baker;** Anthony J. **Burshnick;** Michael P. C. **Carns;** Alexander K. **Davidson;** James B. **Davis;** Larry D. **Dillingham;** Chris O. **Divich;** David W. **Forgan;** Gordon E. **Fornell.**

Lee V. **Greer;** Ralph E. **Havens;** Edward J. **Heinz;** Donald W. **Henderson;** Charles A. **Horner;** John M. **Loh;** Charles C. **McDonald;** Monte B. **Miller;** Stanton R. **Musser;** Richard M. **Pascoe.**

Jack W. **Sheppard;** Ralph E. **Spraker;** Richard E. **Steere;** John T. **Stihl;** Bernard L. **Weiss;** Ronald W. **Yates.**

To be **AFRES Major General:** Donald G. **Aten;** Robert G. **Mortensen;** Charles R. **Parrott;** James C. **Wahleithner.**

To be **ANG Major General:** Miles C. **Durfey,** OhioANG; Frank L. **Hettlinger,** IndANG; Bobby W. **Hodges,** TexANG; Donald L. **Owens,** ArizANG; Robert W. **Paret,** TexANG; Paul M. **Thompson,** IowaANG.

To be **Brigadier General:** Edward P. **Barry,** Jr.; Billy J. **Boles;** Chalmers R. **Carr,** Jr.; James E. **Chambers;** George E. **Chapman;** Edward D. **Cherry;** James R. **Clapper,** Jr.; Maralin K. **Coffinger;** Keith B. **Connolly;** John M. **Davey.**

Rufus M. **Dehart,** Jr.; Robert S. **Delligatti;** John P. **Dickey;** John R. **Farrington;** Thomas R. **Ferguson,** Jr.; Ronald R. **Fogleman;** Albert A. **Gagliardi,** Jr.; Roy M. **Goodwin;** James W. **Hopp;** Lawrence E. **Huggins.**

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Basil H. **Pflumm;** William J. **Porter;** James F. **Record;** James M. **Rhodes,** Jr.; David H. **Roe;** James G. **Sanders;** Wayne E. **Schramm;** Charles J. **Searock,** Jr.; William H. **Sistrunk;** John D. **Slinkard.**

Roger C. **Smith;** W. John **Soper;** Joseph K. **Spiers;** Joseph K. **Stapleton;** Charles F. **Stebbins;** Gorham B. **Stephenson;** Daniel A. **Taylor,** Jr.; David J. **Teal;** Walter E. **Webb** III; William T. **Williams** IV.

To be **AFRES Brigadier General:** Courtney W. **Anderson;** Dale R. **Baumler;** Clyde C. **Deckard,** Jr.; Robert S. **Dotson;** Dominick V. **Driano;** Jack P. **Ferguson;** Richard A. **Freytag;** Eugene C. **Galley;** Clarence B. H. **Lee;** Beverly S. **Lindsey.**

Jack L. **Lively;** William C. **Rapp;** John D. **Riddle;** Augustine A. **Verrengia;** Robert L. **Wright.**

To be **ANG Brigadier General:** Nicholas **Annicelli,** Jr., RIANG; Roland E. **Ballow,** IllANG; Richard E. **Bertrand,** NebANG; Emiel T. **Bouckaert,** CalifANG; Gene A. **Budig,** KanANG; Wayne O. **Burkes,** MissANG; Drennan A. **Clark,** NevANG; Thomas R. **Elliott,** Jr., AlaANG; Harold R. **Hall,** CalifANG; Charles W. **Harris,** ArkANG.

Richard R. **Hefton,** OklaANG; Thor A. **Hertsgaard,** NDANG; Harold C. **Morgan,** NJANG; David W. **Noall,** UtahANG; William R. **Ouellette,** MeANG; Dudley P. **Smidt,** IowaANG; Kenji **Sumida,** HawaiiANG; Charles W. **Taylor,** Jr., GaANG; Carleton B. **Waldrop,** WashANG.

RETIREMENTS: B/G Wilson C. **Cooney;** M/G Keith D. **McCartney;** M/G Kermit Q. **Vandenbos.**

CHANGES: B/G Thomas P. Ball, Jr., from Dir. of Medical Inspection, Hq. AFISC, Norton AFB, Calif., to Cmdr., Malcolm Grow USAF Medical Ctr., MAC, Andrews AFB, Md., replacing B/G Vernon Chong . . . **Col. (B/G selectee) Edward P. Barry, Jr.,** from Ass't DCS/Systems, Hq. AFSC, Andrews AFB, Md., to Dep. Cmdr. for Launch & Control Systems, Space Div., AFSC, Los Angeles AFS, Calif., replacing B/G Donald L. Cromer . . . **B/G Vernon Chong,** from Cmdr., Malcolm Grow USAF Medical Ctr., MAC, Andrews AFB, Md., to Command Surgeon, Hq. MAC, Scott AFB, Ill., replacing B/G (M/G selectee) Monte B. Miller . . . **B/G Donald L. Cromer,** from Dep. Cmdr. for Launch & Control Systems, Space Div., AFSC, Los Angeles AFS, Calif., to Vice Cmdr., Space Div., AFSC, Los Angeles AFS, Calif., replacing L/G Bernard P. Randolph . . . **Col. (B/G selectee) Larry R. Keith,** from Cmdr., 36th TFW, USAFE, Bitburg AB, Germany, to DCS/Ops., 2ATAF, Rheindahlen, Germany, replacing retired B/G Wilson C. Cooney.

B/G (M/G selectee) Monte B. Miller, from Command Surgeon, Hq. MAC, Scott AFB, Ill., to Cmdr., Wilford Hall USAF Medical Ctr., AFSC, Lackland AFB, Tex., replacing retiring M/G Kermit Q. Vandenbos . . . **Col. (B/G selectee) Richard C. Milnes II,** from Cmdr., 443d MAW, MAC, Altus AFB, Okla., to Spec. Ass't to CINC MAC for Mission Effectiveness, Hq. MAC, Scott AFB, Ill. . . . **Col. (B/G selectee) Thomas S. Moorman, Jr.,** from Vice Cmdr., 1st Space Wing, Hq. SPACECOM, Peterson AFB, Colo., to Dir., Office of Space Systems, OSAF, Washington, D. C., replacing Col. Paul F. Foley . . . **Col. (B/G selectee) William J. Porter,** from C/S, Hq. ATC, Randolph AFB, Tex., to Cmdr., USAF Recruiting Service, & DCS/Recruiting, Hq. ATC, Randolph AFB, Tex., replacing B/G Robert L. Rutherford . . . **B/G Gerald C. Schwankl,** from Dep. for Tac. Systems, ASD, AFSC, Wright-Patterson AFB, Ohio, to Air Force Competition Advocate General, OSAF, Washington, D. C. . . . **Col. (B/G selectee) William H. Sistrunk,** from Cmdr., 436th MAW, MAC, Dover AFB, Del., to IG, Hq. MAC, Scott AFB, Ill., replacing B/G Paul A. Harvey.

SENIOR ENLISTED ADVISOR CHANGES: CMSgt. Billy D. Hall, to SEA, Hq. AFSC, Andrews AFB, Md., replacing CMSgt. Robert H. Williamson . . . **SMSgt. (CMSgt. selectee) Roger Loughry,** to SEA, Hq. AFIS, Washington, D. C., replacing CMSgt. Richard H. Gantzler. ■

AIRMAN'S BOOKSHELF

The Crocodile's Eyes and Ears

Inside Soviet Military Intelligence, by Viktor Suvorov. Macmillan Publishing Co., New York, N. Y., 1984. 193 pages. $15.95.

Most Westerners, when asked, "Which country in the world possesses the most powerful secret intelligence service?" would forthrightly answer, "The USSR—the KGB." In responses to the question, "Which country has the second most powerful secret service?" opinions might differ. That country, according to Suvorov, is also the USSR, and the organization is the GRU.

Readers familiar with the earlier works of the former Soviet officer who writes under the pen name of Viktor Suvorov—*The Liberators* and *Inside the Soviet Army*—will again be rewarded by the insight and wit of his latest work, *Inside Soviet Military Intelligence.* (New readers are advised to make it a point to find and read his earlier volumes.)

Addressing the relationship between the KGB (the State Committee for Security) and the GRU (Soviet Military Intelligence), Suvorov supplies the prerequisite factual data. But, better still, he breathes life into the function and personality of the GRU organization. For instance, he reports the glee of General Ivashutin and the GRU staff—to the discomfort of the then head of the KGB, Yuri Vladimirovich Andropov—when it became apparent that the GRU Paris operation had recorded the Tu-144 crash at the Paris Air Show on film, while the KGB had not. Left with a severe disadvantage in terms of briefing items for the Politburo, Andropov, like all intelligence bureaucrats, was reduced to asking for a favor.

Suvorov envisions the Soviet military as a huge crocodile. The brain of the beast is the Soviet General Staff, and its eyes and ears are the GRU. Controlled by twin handlers, the Party and the KGB, the crocodile's mission is to defend and extend the swamp. The handlers clearly understand the nature of the crocodile, and, although they dislike the beast, they recognize their mutual dependency upon it. The Party cannot exist without the continuous repression of the people, and the KGB cannot exist without continuous legitimization by the Party. When control became micromanagement, as in the late 1930s and early 1940s, the crocodile's reactions slowed to the extent that it functioned sluggishly. The swamp was nearly lost to a more nimble Fascist reptile.

The specific role of the GRU is to prevent the collapse of the Soviet system as the result of external blows, in contrast to that of the KGB, which guards against collapse as a result of internal revolution. The seeming duplication testifies to Lenin's prescience regarding checks and balances and serves as a brake on institutional ambition.

As Suvorov points out, in the hands of Stalin, both organizations were their own worst enemies. Of the first fifteen heads of the KGB, one died in office, eight were destroyed (sometimes after extensive torture), and three were hounded out of government. Subordinates fared scarcely better. Correspondingly, the GRU was purged totally at least twice—down through the cooks and lavatory attendants—and partially in numerous other instances. The parallels between their early organizational histories and Ivan the Terrible's *Oprichina* spring to mind.

The contrast in their modern methodologies is carefully delineated by Suvorov: Aeroflot belongs primarily to the GRU because of its relationship to aviation technology, Intourist to the KGB because of its relationship to travelers to the Soviet Union. Soviet military attachés are uniformly GRU and are enthusiastically overworked in attempts to generate agent networks. (One recalls the expulsion from Washington of the Soviet Defense Attaché, General Shitov, for blowing an agent rendezvous in nearby Fairfax County in Virginia in 1981.)

All of the nitty-gritty details are covered meticulously: organization, funding, recruitment, illegals vs. agents, dead drops, residencies, "Spetsnaz," "younger brothers," as well as successful and unsuccessful GRU operations. Suvorov concludes with a dual appeal: to Western governments to expel GRU operatives, and to GRU officers to defect for the sake of the Soviet people.

Inside Soviet Military Intelligence is fascinating reading for any democratic adult—and a must for Sovietologists. It is the sort of book that has so much to offer that one will undoubtedly wish to read it again from time to time in order that it might all soak in.

—Reviewed by Col. Richard L. Kuiper, USAF. Colonel Kuiper served as Air Attaché in Moscow and presently teaches at the National War College, Washington, D. C.

New Books in Brief

Jane's Spaceflight Directory, edited by Reginald Turnill. With space activities on the upswing among an increasing number of nations, this newest addition to the *Jane's* family should prove a timely contribution to the literature. Covering the more than 2,500 launches that have taken place since 1957, the *Directory* addresses US and Soviet manned flights, national and international space programs, military programs, world space centers, spaceflight personnel, and contractors. In his introduction, editor Turnill reports that "while the US is undoubtedly well ahead in space technology, the Russians have been far more energetic and successful in applying the technology that they possess." With illustrations, notes, and index. Jane's Publishing Inc., New York, N. Y., 1984. 311 pages. $50.

Measuring Military Power: The Soviet Air Threat to Europe, by Joshua M. Epstein. This threat assessment relies on a simple mathematical model that posits a best-case scenario for the Soviets in a rapid, two-phase conventional air assault against NATO. The author's conclusions contradict the prevailing wisdom: The Soviets

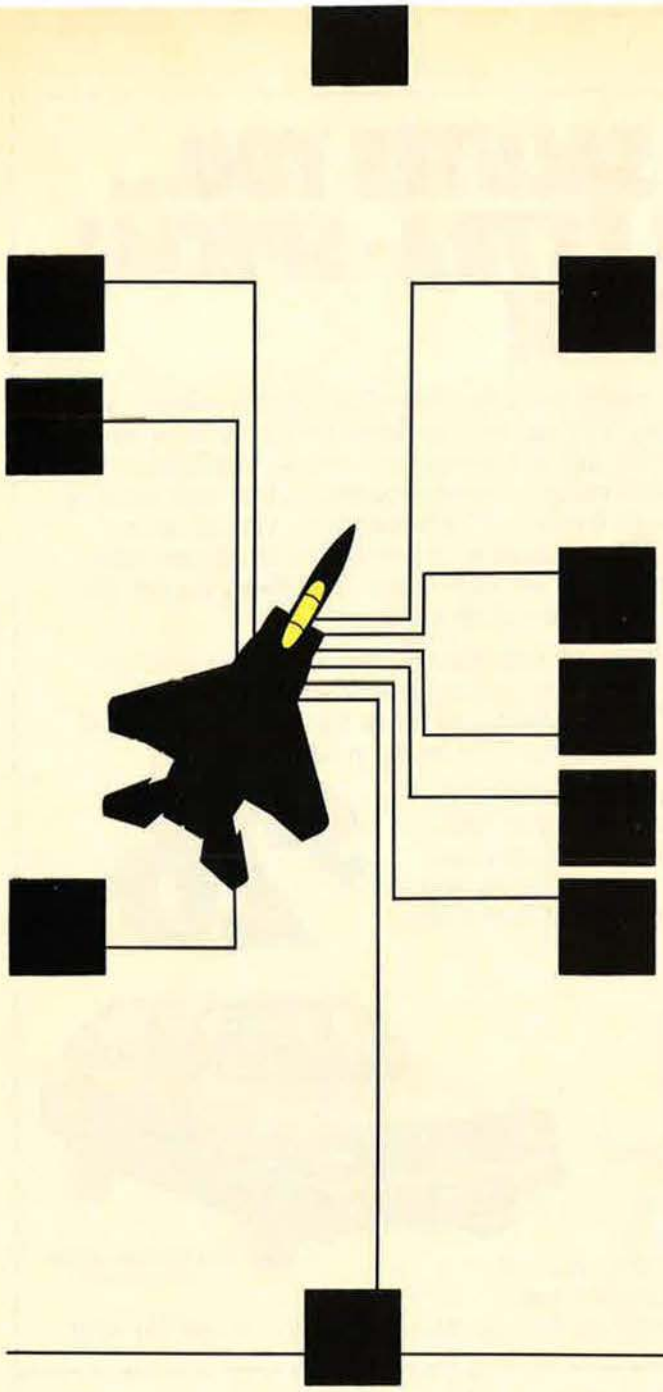
are too inflexible tactically to prevail in such a sophisticated offensive. Essentially, the author argues that institutional inertia and political rigidity militate against the successful execution of such a strike. Mr. Epstein makes a forceful case for his thesis. With tables, appendices, selected bibliography, and index. Princeton University Press, Princeton, N. J., 1984. 288 pages. $22.50.

Review of U.S. Military Research and Development 1984, edited by Kosta Tsipis and Penny Janeway. A critique of US military R&D, this volume features essays on such topics as the VHSIC program, ballistic missile defense, and antisubmarine warfare technologies. The US stress on R&D to produce "force multipliers" is examined, while a generally critical review of R&D procedures concludes that "there is little likelihood that the decision process for new weapons can be substantially improved." R&D specialists will find much to debate in this book. With illustrations and notes. Pergamon Press Inc., Elmsford, N. Y., 1984. 229 pages. $25.

When Hollywood Ruled the Sky, by Bruce W. Orriss. A catalog of the "aviation film classics of World War II," this book is a delightful film-by-film account of the movies that reflected and shaped American attitudes toward the air war. From the flag-waving patriotic potboilers of the war years to the more realistic studies and black comedies of more recent times, casts, crews, plots, production details, movie stills, and contemporary reviews are all featured in this paean to Hollywood's air war effort. With notes and selected bibliography. Available from B. W. Orriss, 705½ W. Hillcrest Ave., Inglewood, Calif. 90301, 1984. 228 pages. $16.95, plus $1 postage and handling.

Wings of War, edited by Laddie Lucas. An anthology of war stories by airmen of more than a dozen countries that participated in World War II, this sprawling book weaves a tapestry of aerial combat from a common thread: the transcendent experience of the combat flyer. Featuring accounts by such veterans as Adolf Galland, Sir Douglas Bader, and Gregory "Pappy" Boyington, the mosaic text invites random browsing, but can quickly ensnare the unwary reader with its tales of heart-thumping action. With photos and index. Macmillan Publishing Co., New York, N. Y., 1984. 409 pages. $19.95.

—Reviewed by Hugh Winkler, Assistant Managing Editor.



Announcing an AFA National Symposium . . .

Electronics and the Air Force

Our past three National Electronics Symposia in the Boston area have established a proud tradition. Both government and industry leaders have told us of their utility. Thus, we have scheduled another meeting on this important subject—"Electronics and the Air Force"—for April 1985.

WHO: National AFA, in conjunction with Air Force Systems Command and its Electronic Systems Division.

WHAT: An in-depth look at the major electronic requirements and developments and capabilities in electronics, C^3, and electronics warfare.

WHEN: April 25–26, 1985.

WHERE: In America's electronic heartland—the Conference Center at "The Hilton at Colonial," Wakefield, Mass. (on Interstate 95 and Route 128, near Hanscom AFB, Mass.).

Gen. Lawrence A. Skantze, Commander, Air Force Systems Command, will keynote this symposium. Leadoff speaker on the second day will be Dr. George Keyworth II, President Reagan's Science Advisor.

We are building the remainder of this balanced symposium program, which will include a nationally known dinner speaker, around the most authoritative officials in the Administration, DoD, and the Department of the Air Force. Make your plans now to attend! For further information, call Jim McDonnell or Dottie Flanagan at (703) 247-5800.

REGISTRATION FORM

A 1985 Air Force Association National Symposium

"Electronics and the Air Force"

Hilton at Colonial
Wakefield, Massachusetts
April 25–26, 1985

Registration closes Monday, April 8, 1985. No refunds can be made for cancellations after that date.

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I am enclosing my check for $225, payable to the Air Force Association, to cover the Symposium fee for an AFA individual or Industrial Associate member. This fee includes one (1) dinner and one (1) luncheon ticket.

(Note: Fee for non-member is $250)

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AFA INTERCOM

By Robin L. Whittle, AFA DIRECTOR OF COMMUNICATIONS

AFA's Global Impact Is Increasing Through Foreign Chapters

"We look every day to you to do our mission . . . to ensure that all the free people in the world have the opportunity to be what they would like to be," said Lt. Gen. Carl H. Cathey, Jr., USAF, Vice Commander in Chief of USAFE, during a talk before 170 members and guests attending the kickoff dinner for AFA's first chapter in Turkey. The dinner was held at the NCO Club at Incirlik AB on November 14. General Cathey told members to be aware of Incirlik's important location. "All you have to do is look at a map. You tell me where there are more things in a closer position with a potential to influence world affairs. I'm not just saying Turkey; I'm saying Incirlik."

Lt. Gen. Carl H. Cathey, Jr., USAF, Vice Commander in Chief of USAFE, addressed 170 members and guests who attended the kickoff dinner for AFA's first chapter in Turkey—the Incirlik Chapter. The event was held in November at the NCO Club at Incirlik AB, Turkey.

The kickoff dinner was the culmination of many hours of work by a small band of men and women who started the ball rolling to establish the first AFA chapter in Turkey.

Capt. Jim Quigley, deputy accounting and finance officer with the 7339th Comptroller Squadron, volunteered to help establish the new chapter after he heard that volunteers were needed.

"I heard that the idea of starting a chapter was addressed at a group staff meeting. Then a friend asked me if I'd be interested," Captain Quigley said. He and Capt. Tom Hotchkiss, another 7339th member, consulted with 39th Tactical Group Commander Col. William J. Hentges and then started the critical hunt for people who would work with them.

"People started calling us after we put out the word for volunteers on AFRTS [Armed Forces Radio and Television Service]," Captain Quigley said.

One person who came forward to help was A1C Wanda Hilyard of the 39th Supply Squadron, who volunteered to serve as treasurer until elections could be held. Explaining what she thought the Incirlik Chapter could accomplish, Airman Hilyard said, "We could create opportunities for TDY personnel to make presentations in their areas of expertise, enabling us to gain insight from individuals with firsthand knowledge and experience." A volunteer from the

A1C Wanda Hilyard, who served as treasurer of the Incirlik Chapter until formal elections were held, discussed the goals of AFA's first chapter in Turkey with Lt. Gen. Carl H. Cathey, Jr., USAF, Vice Commander in Chief of USAFE, during the Chapter's kickoff dinner.

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USAF Hospital, Maj. Barbara Martin, thought the local chapter could develop a speakers bureau for informal presentations on Air Force issues and programs and could cosponsor open houses for the community to foster better understanding of the Air Force mission at Incirlik.

More volunteers came forward to help and to serve as temporary officers until the formal elections were held at the November 14 dinner. Elected were Maj. Barbara Martin, President; Greg Miller, Vice President; A1C Paula Combs, Secretary; Capt. Jim Quigley, Treasurer; Capt. Tom Hotchkiss, Program Chairman; Maj. Marilyn Perry, Membership Chairman; and TSgt. James Sack, Organization/Publicity Chairman.

In other news from overseas AFA chapters, members of the Tokyo Chapter met with members of the Royal Air Force Association in Tokyo recently for a Battle of Britain fundraiser. RAFA and AFA members hold several joint gatherings each year.

AFA's newly chartered Capt. Joseph McConnell Chapter at Osan AB in Korea sponsored the first Osan Project Warrior Banquet on December 6. Guest speaker was retired US Army Col. Lewis L. Millett, a Medal of Honor recipient who spoke on duty, courage, and honor in defense of liberty. In 1951, then Captain Millett led 100 troops in a daring bayonet charge against 300 Chinese Communist soldiers. The battle was fought on the slopes of Hill 180, which sits in the center of what is now a major tactical airpower installation.

As part of the Project Warrior program at Osan, seven awards were presented at the banquet to winners of the first "Project Warrior Literary Contest." Sgt. Pete Lucero won in the artistic interpretation category; Kimiye Fisher, Seoul American School, and Troy Yamaguchi, Seoul American High School, won in the essay category for grades six through eight and nine through twelve, respectively. Kristin Moyles, Taegu American School, and Deborah Raines, Taegu American High School, won in the poetry category for grades six through eight and nine through twelve, respectively. The winner of both the essay and poetry categories for military personnel was Air Force Capt. Christina L. Lafferty of the 51st Tactical Fighter Wing at Osan. Her winning entry was dedicated to the courage and honor of retired Air Force Col. John R. McKone, who was shot down in 1960 by a Soviet MiG

Members of the Royal Air Force Association and AFA's Tokyo Chapter met recently for a Battle of Britain fundraiser. Pictured, from left, are Dr. (Col.) Thomas G. Gensler, Tokyo Chapter President; Mrs. Susan Geoffrey; Sir Sydney Giffard, British Ambassador to Japan; Lady Hazel Giffard; and F. A. Geoffrey, RAFA Tokyo Chapter President. (Photo by Maj. Paul Muehring, USAF)

AFA's newly chartered Capt. Joseph McConnell Chapter at Osan AB, Korea, sponsored a Project Warrior Banquet in December to honor winners of its Project Warrior Literary Contest. The winners were, from left, Kimiye Fisher, Deborah Raines, Kristin Moyles, Troy Yamaguchi, Sgt. Pete Lucero, USAF, and Capt. Christina L. Lafferty, USAF.

fighter and held for seven months in the infamous Lubyanka Prison in Moscow. Chapter officials say the contest will be an annual Project Warrior event.

At the AFA Mid-Winter Board of Directors meeting in Orlando, Fla., in January, Gen. Charles L. Donnelly, Jr., USAF, Commander in Chief of USAFE, told the Board that a total of twenty-three AFA chapters were chartered or were in the process of being chartered in Western Europe. General Donnelly said he was strongly in favor of AFA's expansion in Europe and elsewhere overseas "because it brings people together to talk Air Force issues and to get out into the community as well."

Mr. Edward E. P. Tseng, Chief of the Hong Kong Bureau of the Central News Agency and Managing Director of the Hong Kong *Times,* is the newest member of AFA's General Bruce K. Holloway Chapter in Tennessee. Recruited by Nationalist Chinese Maj. Gen. Fred Chiao, a Holloway Chapter member living in Knoxville, Mr. Tseng hopes to visit the United States in 1985 and has written Holloway Chapter President Walter "Bud" Bacon to touch base. Mr. Tseng knew General Holloway when Mr. Tseng covered the Fourteenth Air Force in Kunming during World War II.

Richard Hughes, a well-known correspondent for the London *Times,* wrote an article entitled "Eddie Tseng—So Often 'The First,' " in which he noted that Tseng, as a representative of the Central News Agency, was the first foreign correspondent to report to the world Japan's formal surrender to General Douglas MacArthur, the first Chinese to land in Japan after the Pacific War, the first Chinese to visit Hiroshima after the atomic blast, and the first Chinese to witness and report the surrender of the Japanese military forces at Inchon. Mr. Tseng also flew in the first US B-29 bombing raids on Anshan and Tokyo and the first B-25 bombing raids on a Japanese convoy in the Taiwan Straits and on Nagasaki. Tennessee State AFA President Jack Westbrook says they will plan a special chapter program if Mr. Tseng can visit this country in 1985.

AFA Leaders Use Local Newspapers to Explain The Need for MX

Ohio State AFA President Chester A. Richardson said it was "incredible that Congress would [consider canceling] the MX Peacekeeper after a successful development program and the expenditure of almost $10 billion." (A total of $1.5 billion of the $2.5 billion appropriated for the system by Congress was deferred until the spring, when both the House and Senate must vote twice—once to authorize funds and once to appropriate funds—to allow production of twenty-one MX missiles to proceed.) In a letter to the editor that appeared in several editions of the *Vindicator,* which reaches some 200,000 readers in the Trumbull County and Youngstown areas, Mr. Richardson said that if the Peacekeeper is canceled, "every rational American ought to take his congressman to task for such blatant irresponsibility." He also noted that cancellation would have an adverse economic impact on small industries, including one in Youngstown.

Peacekeeper has played a key role in convincing the Soviets to resume the arms-control dialogue, National Director Tom Bigger said in a letter to the editor that appeared in the Nashville *Banner,* the Tullahoma *News & Guardian,* the Tullahoma *Journal,* and the Knoxville *News-Sentinel.* "MX," Mr. Bigger noted, "is the only missile allowed under the SALT II treaty and is, therefore, a key ingredient in the negotiating process because it has proven to be a formidable weapon that responds effectively to the Soviet challenge. Our nation has no other alternative [for the] land-based leg of our triad for defense." About 100,000 Tennesseans subscribe to the newspapers in which Mr. Bigger's letter appeared. Mr. Bigger also clipped the letters and forwarded them to the state's congressional delegation.

In response to his letter to the editor about MX that appeared in the Eugene, Ore., *Register-Guard,* Oregon AFA leader Harry Hance received a letter of concern from a citizen who saw the MX as destabilizing and who wondered why more money wasn't being spent on "rifles, copters, and the like." Mr. Hance replied: "The Soviet Union has between 5,000 and 6,000 hard-target [counterforce] ICBM warheads with which to target 1,030 US ICBM silos. This gap is important, since it means the Soviets could destroy most of the US ICBM force using only a small fraction of their ICBM warheads while retaining a significant ICBM force in reserve to deter US retaliation. In fact, the Soviets could strike and largely destroy the US ICBM force and still have more ICBM warheads left in reserve than the US has to begin with. Peacekeeper will help offset that imbalance."

In a letter to the editor that appeared in the Redlands, Calif., *Daily Facts,* National Director Ed Stearn said that Air Force personnel from the Ballistic Missile Office at Norton AFB and many civilians in southern California "have provided the dedicated, expert leadership for the development of the Peacekeeper MX, and they know we have a good system." He noted that if the Soviets are willing to shrink their massive strategic arsenal, "then Peacekeeper could be negotiated."

The critical MX vote is expected in late March or early April.

An AFA Leader Talks to a Soviet Defector

A few months ago, Leo D'Arcy, former Communications Director for AFA's Cleveland Chapter and currently a radio talk-show host for WELW-AM's "Guestime" program, talked with Thomas Shuman, who worked for Novosti Press Agency in the areas of propaganda and the manipulation of public opinion prior to his defection from the Soviet Union in New Delhi, India, where he was working as a "journalist." The defection occurred in 1970. Following are excerpts from the show as it aired recently in Cleveland.

D'ARCY: This is Leo D'Arcy, and I am talking with Mr. Thomas Shuman. You defected from the KGB to the Western side?

SHUMAN: I didn't defect from KGB, I defected from the system. I was working for Novosti Press Agency. Novosti means "news" in the Russian language, but it has nothing to do with news. It is a propaganda front for the KGB. I was recruited by the KGB as a co-opted agent to work in the areas of propaganda and the manipulation of public opinion.

D'ARCY: Talking about disinformation, there are times when it seems we'd rather believe the Russian propagandists than we would our own government.

SHUMAN: Yes, it is certainly true. This is a double standard which is not something incidental. It doesn't happen overnight. It is the result of many, many years of changing the perception of reality in the minds of millions of Americans. Americans should be skeptical about their own government; it is a healthy skepticism. It's part of the American system. But they should be equally skeptical about anything that comes from the Soviet government. And the Soviet government is not "government." It's a

bunch of dictators, and this double standard of trusting the Soviet government and mistrusting the American government is, to my mind, the result of the Soviet subversion through your mass media, through your educational systems, through your intellectuals, through your entertainment industry, and through many other means or methods in which I was engaged personally.

D'ARCY: Aren't you afraid of getting bumped off here?

SHUMAN: Well, it is a danger, of course. I simply hope that if they didn't do me in in fourteen years, it's very unlikely that they would do me in now. But, on the other hand, I try not to be paranoid because otherwise my defection wouldn't be worth a penny. My motivation was to bring the message of . . . ideological subversion.

D'ARCY: Well, to carry that a step further, is there a possibility that the longer you live in America, the older your information is?

SHUMAN: Well, I'm not dealing in information. I'm trying to explain the methods, the opinions, and the tactics of subversion, and there's nothing new about it. I'm not revealing secrets or anything like that. And I don't need to. Basically, there's nothing new in what the KGB is doing. It's as old as mankind itself—to conquer a nation without a fight.

D'ARCY: Could you explain this?

SHUMAN: This is the basic tactic of subversion, and it has not been invented by Communists, Russians, or Soviets. If you read the Old Testament, you can see many examples of how the kingdoms were trying to outsmart each other first without fighting—and to go to arms only as a last resort. They tried to trick each other for the sake of power, territory, gold, camels, goats, beautiful women. It's just the nature of mankind. To achieve your goals by fighting on the battlefield is barbaric, primitive. The highest art of war is not to fight at all, but to subvert anything of value in your enemy's country. And that includes morals, principles, religion, established traditions. If you manage to disrupt the nation, to demoralize it, eventually you can take it over, and that's what Communists are doing.

D'ARCY: Do you believe the Politburo doesn't care about what you are doing because they already have a lot on us economically and so forth?

SHUMAN: Yes, possibly this is one of the reasons they didn't shoot me yet. But, on the other hand, they *do* care about American public opinion, and, unfortunately, to my shame I have not succeeded in the fourteen years since my defection in waking up the American people. I am trying it now, and I probably will keep on trying until I die because this is the main purpose of my defection.

D'ARCY: Thank you, Mr. Shuman.

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On the Scene in AFA's Busy and Active Grass Roots

National Director **Joe Falcone** has succeeded in forming another AFA chapter in Connecticut. It's the Central Connecticut Chapter, led by **Robert Heckman.** That makes five out of the seven chapters in Connecticut that Joe has helped to create . . . National Director **Dick Becker** has agreed to moderate a panel discussion on nuclear proliferation before 4,000 high-school students. The event, sponsored by the Christ Church of Oak Brook, Ill., will take place later this month . . . Fort Worth Chapter officials increased membership from 3,300 to 3,900 in 1984 and coordinated community appearances by the Carswell AFB, Tex., Speakers Bureau, Chapter President **Dan Heth** says in a one-page annual report to members . . . Congratulations to California State AFA and the Northeast Region for starting newsletters recently. California AFA is led by **Dave Graham,** and the Northeast Region by **Jack Kruse,** who also sits on the AFA Communications Committee . . . AFA's **General Doolittle/Los Angeles Area, Robert H. Goddard, Golden Gate, General Curtis E. LeMay, Merced County, David J. Price/Beale, San Bernardino Area, and Tennessee Ernie Ford Chapters** in California are contributing to honor the present and past Chief Master Sergeants of the Air Force as Jimmy Doolittle Fellows of AFA's Aerospace Education Foundation. The California State AFA organization is also contributing to the effort.

Gordon Cruickshanks, President, Kitty Hawk Chapter, N. C.; **Rocky Durso,** Past President, Concho Chapter, Tex.; **Dr. Dan Fulgham,** Past President, Alamo Chapter, Tex.; **Ed Fox,** Past President, Heart of the Hills Chapter, Tex.; **Charles Church,** National Vice President (Midwest Region); **Mary Ann Seibel,** President, Spirit of St. Louis Chapter, Mo., and Under-40 National Director; **Jimmy Doolittle,** AFA's first National President and former Board Chairman; and current National Director **John Brosky** were featured in the news as participating in the 1984 "Salute to Congress" . . . **Dr. Leroy A. Gibson,** President of AFA's Salt Lake City Chapter, Utah, served twenty years in the Air Force, and his career included stints as associate professor of electrical engineering at the Air Force Academy, department head and professor of engineering at the Pakistani Air Force College of Aeronautical Engineering, and manager of the Hill AFB Minuteman test facility . . . Thirty-nine percent of 222 out-of-state members solicited by Tennessee State AFA have affiliated with local chapters, says State President **Jack Westbrook** . . . A decade ago, a small group of AFA members

Col. Donald Wenzel, USAF (Ret.), former Vice Commander of the Keesler Technical Training Center, presented the John C. Stennis Chapter's Spirit of Keesler Award to Lt. Col. George Breault at the Chapter's annual banquet, held recently at Keesler AFB, Miss. See item, p. 145. (USAF photo by Bernard Brown)

met at a restaurant in Fairfield, Calif., to talk about reactivating the long-dormant Solano County Chapter. Now, the Chapter is one of AFA's most active and has been so for the last ten years. It's AFA's General Robert F. Travis Chapter in Vacaville/Fairfield, Calif., and eight members were honored recently for making the Chapter outstanding. They include **Betty Hazeleaf, Percy A. Haugen, William J. Reslie, Jerome L. Miller, Barbara Pansby, Curtis A. Burgan, Iver C. Vollmer,** and former Chapter President **Walt E. Scott.**

Jimmy Doolittle and **Ira Eaker,** who so generously allowed AFA's Aerospace Education Foundation to name two fellowship programs after them, now have another thing in common: a joint resolution in Congress authorizing the President to advance both men to the grade of general on the retired list. **Sen. Barry Goldwater** (R-Ariz.), Senate Armed Services Committee Chairman and Foundation Board Chairman, introduced the legislation on January 3 . . . **Rick George,** a pilot with Pan American World Airways, now leads the Donald W. Steele, Sr., Memorial Chapter in northern Virginia. He's a former AFA state and chapter officer from Georgia . . . **Lt. Col. George Breault,** director of professional and technical education at the Keesler medical center, received the John C. Stennis Chapter's Spirit of Keesler Award for outstanding leadership and initiative in both military and community affairs. Other Stennis Chapter award winners honored at a recent meeting were **Col. David Holt,** deputy base commander; **Maj. Gen. Thomas Hickey,** Commander, Keesler Technical Training Center; and **Lt. Col. Dean Todd,** who was named Member of the Year. The speaker for the event was **Lt. Gen. Winfield W. Scott, Jr.,** USAF, Air Force Academy Superintendent and former Keesler TTC Commander . . . AFA Life Member **Don Oulton** was honored with the Electronic Systems Division "Harold M. Wright Outstanding Civilian Achievement and Services Award" for significant contributions to ESD's ability to develop and support command control communications and intelligence systems for the international community. At present, he is the Staff Judge Advocate's Chief of Foreign Military Sales. The award is named for a career government employee who held key positions at Hanscom AFB, Mass.

Thomas B. McGuire, Jr., Chapter officials were honored with a plaque and recognition at New Jersey Governor Thomas H. Kean's office for sponsoring the 177th Fighter Interceptor Group's participation in the attempts on December 17, 1983, to set the "World Unlimited Course Record" for Class One, Group Three (turbojet) aircraft, as approved by the National Aeronautic Association. The record was set by a Convair F-106, which traveled at a speed of 743.36 mph over the course from Dayton, Ohio, to Kitty Hawk, N. C. McGuire Chapter President **Marvin Jones** received the honor from **Clifton F. Von Kann,** President of NAA. Mr. Jones presented the plaque to **Col. Richard Cosgrave,**

In recognition of the Thomas B. McGuire, Jr., Chapter's sponsorship of the 177th FIG's attempts to set the "World Unlimited Course Record" for turbojets, NAA President Clifton F. Von Kann, center, presented a certificate of merit to Chapter President Marvin Jones while New Jersey Governor Thomas H. Kean looked on.

Thanks to the efforts of Kansas State AFA President Clete Pottebaum, left, three World War I veterans were recently recruited as new AFA members. The recruits are, from left, J. L. Reeves, Phil McGough (seated), and Lt. Russell Jump. *See item, p. 147.*

Brig. Gen. Walter "Gibby" Vartan, USAFR, left, former Chicagoland-O'Hare Chapter President and current National President of the Reserve Officers Association, made his singing debut when he performed a duet with TSgt. "Gator" Allmond during the Chapter's Holiday Dinner Dance. (Photo by Lt. Col. Ben Minardi, CAP)

This Is AFA

The Air Force Association is an independent, nonprofit, aerospace organization serving no personal, political, or commercial interests; established January 26, 1946; incorporated February 4, 1946.

OBJECTIVES: The Association provides an organization through which free men may unite to fulfill the responsibilities imposed by the impact of aerospace technology on modern society; to support armed strength adequate to maintain the security and peace of the United States and the free world; to educate themselves and the public at large in the development of adequate aerospace power for the betterment of all mankind; and to help develop friendly relations among free nations, based on respect for the principle of freedom and equal rights for all mankind.

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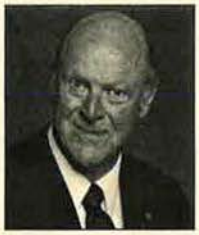

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Commander of the 177th FIG . . . "Common Fallacies on Defense" is a new pamphlet written by **Ernest G. Ross** for the Eugene, Ore., Defense Education Committee (of which AFA's Eugene Chapter is a part). The well-written pamphlet answers common public misunderstandings about defense issues and Soviet military doctrine . . . **J. David Grant,** President of AFA's Dobbins Chapter in Georgia, joins Texas State AFA, the Alamo Chapter, Travis Chapter Board Chairman **Don Disbrow,** Fort Worth Chapter President **Dan Heth,** Carl Vinson Memorial Chapter President **Joe Stafford,** and National Board Chairman **Dave Blankenship** as recent purchasers and distributors of AFA's 1985 Policy Book.

Kansas State AFA President **Clete Pottebaum** and Air Capital Chapter officials recruited three World War I veterans as new members from among the thirty-four vets they assembled to ride in antique cars in the Veterans Day parade. AFA state and chapter officials sponsored a Christmas party at the VA Center Auditorium, and the three new AFA members were there. They are **Phil McGough,** age ninety-eight, who was with the Observation Balloon Corps; **J. L. Reeves,** age eighty-eight, Commander of the World War I Barracks 1112, formed in 1927; and **Lt. Russell Jump,** World War I Air Corps pilot who flew Jennys over Los Angeles with **Walter T. Varney,** who started Varney Aviation, a forerunner of United Airlines . . . "Moods in Blue," the Air Force Academy Band, performed at the Chicagoland-O'Hare Chapter's Holiday Dinner Dance, which featured the singing debut of **Brig. Gen. Walter "Gibby" Vartan, USAFR,** who was selected by chance from the audience to sing a duet with **TSgt. "Gator" Allmond.** General Vartan, who is President of the Reserve Officers Association and past President of the Chicagoland-O'Hare Chapter, donned a cowboy hat and did "doggone well," according to Chapter officials. ■

Coming Events

April 12–13, **Alabama State Convention,** Mobile . . . April 12–13, **South Carolina State Convention,** Shaw AFB . . . April 26–27, **Massachusetts State Convention,** Boston . . . May 4, **Louisiana State Convention,** Barksdale AFB . . . May 17–18, **Mississippi State Convention,** Biloxi . . . May 17–18, **Tennessee State Convention,** Chattanooga . . . June 7–8, **Oklahoma State Convention,** Altus . . . June 14–16, **Georgia State Convention,** Savannah . . . June 21–22, **Ohio State Convention,** Cleveland . . . June 28–29, **New Jersey State Convention,** Cape May . . . July 12–13, **Colorado State Convention,** Air Force Academy . . . July 12–14, **Pennsylvania State Convention,** Pittsburgh . . . July 19–21, **Texas State Convention,** Austin . . . July 26–28, **Washington State Convention,** Bellevue . . . August 2–4, **New York State Convention,** Niagara Falls . . . September 15–19, **AFA National Convention and Aerospace Development Briefings and Displays,** Washington, D. C.

INTERCOM

UNIT REUNIONS

Ardmore AAF, Okla.
Ardmore Army Airfield personnel will hold a reunion on September 19–21, 1985, at the Lake Murray Resort Hotel near Ardmore, Okla. **Contact:** Hamilton Post, 998 Locust Ave., Washington, Pa. 15301.

Barksdale and Vance AFBs
Permanent party personnel assigned to Barksdale AFB, La., Vance AFB, Okla., or Hq. Air Training Command (1946–50) who were involved in pilot training will hold a reunion in September 1985 in Shreveport, La. **Contact:** Maj. Gen. David V. Miller, USAF (Ret.), 9505 Admiral Nimitz Ave., N. E., Albuquerque, N. M. 87111.

Goodfellow AFB
Instructors from Goodfellow AFB, Tex., will hold a reunion on October 7–9, 1985, in Las Vegas, Nev. **Contact:** Rod Wood, 5442 Ferrari, Las Vegas, Nev. 89122. Phone: (702) 453-5882.

Las Vegas AAF
Former students and military and civilian personnel who were assigned to the Air Corps Gunnery School, Las Vegas AAF, Nev. (now Nellis AFB, Nev.), will hold a reunion on November 14–16, 1985, at the Union Plaza Hotel in Las Vegas, Nev. **Contact:** Elmo F. Huston, 42 Villanova Dr., Oakland, Calif. 94611. Phone: (415) 339-1487. Frank D. Hathorn, 301 Ruthlynn, Longview, Tex. 75601. Phone: (214) 758-8889. CMSgt. Stanley R. Janesik, USAF (Ret.), 123 Palma Del Rio, Las Vegas, Nev. 89110. Phone: (702) 453-1680.

O'Reilly General Hospital
Former patients and staff of O'Reilly General Hospital are invited to join in a V-J Day

observance on August 15, 1985, on the former site of O'Reilly General Hospital (now Evangel College) in Springfield, Mo. **Contact:** Archie G. Klegseth, 106 Grove, Chatfield, Minn. 55923. Phone: (507) 867-4845.

Photo Mapping Ass'n
Former members of the 1370th Photo Mapping Group, the Air Photographic Charting Service (APCS), and the Aerospace Cartographic Geodetic Service (ACGS) will hold a reunion on September 26–28, 1985, in Dayton, Ohio. **Contact:** Roman Contos, 201 Orinoco St., Dayton, Ohio 45431. Phone: (513) 256-3387.

Reese AFB
Reese AFB, Tex., is hosting a reunion on June 14, 1985, for all personnel (nonstudent status) who were stationed there. **Contact:** Maj. W. S. Wrench, USAF, 64th Flying Training Wing (ATC), Stop 10, Reese AFB, Tex. 79489.

Santa Ana AAB
The tenth annual reunion of the Santa Ana Army Air Base Wing will be held on March 23, 1985, at the Orange Coast College in Costa Mesa, Calif. **Contact:** Adam Draugelis, Santa Ana Army Air Base Wing, Costa Mesa Historical Society, P. O. Box 1764, Costa Mesa, Calif. 92628.

Strategic Support Squadrons
Former members of the 1st, 2d, 3d, and 4th Strategic Support Squadrons will hold a reunion on October 4–6, 1985, at the Sacramento Inn in Sacramento, Calif. **Contact:** L. L. Jones, 3252 Sarah, Los Angeles, Calif. 71112. Thomas F. Wirth, Jr., 8541 Oakview Lane, Fair Oaks, Calif. 95628.

USAF Special Agents
Former members of the Office of Special Investigations will hold a convention on August 21–24, 1985, at the Sheraton Sand Key Resort Hotel in Clearwater, Fla. **Contact:** Col. James L. Doyle, USAF (Ret.), P. O. Box 14541, Clearwater, Fla. 34279. Phone: (813) 796-0192.

A-1 Skyraider Ass'n
The A-1 Skyraider Association will hold a reunion on October 4–6, 1985, in San Antonio, Tex. **Contact:** A-1 Skyraider Association, P. O. Box 633, Randolph AFB, Tex. 78148.

2d Bomb Group and Wing
Members of the 2d Bomb Group and 2d Bomb Wing will hold a reunion on October 10–13, 1985, in Sacramento, Calif. **Contact:** Al Anselmo, 1253 El Sur Way, Sacramento, Calif. 95825. Phone: (916) 489-5356.

4th Ferrying Group
The forty-third-anniversary reunion of the 4th Ferrying Group will be held on June 6–8, 1985, at the Hilton Airport Inn in Nashville, Tenn. **Contact:** T. L. Clark, 708 Lakeshore Dr., Lebanon, Tenn. 37087. Phone: (615) 444-7312.

7th Bomb Wing
Veterans of the 7th Bomb Wing (1948–58) will hold a reunion on April 26–28, 1985, in Fort Worth, Tex. **Contact:** Col. Richard S. George, USAF (Ret.), 7th Bomb Wing/B-36 Association, P. O. Box 10649, Fort Worth, Tex. 76114.

INTERCOM

7th Photo Group Ass'n
Members of the 7th Photo Group and all attached service organizations will return to Mount Farm, England, on May 23–30, 1985, for their seventh annual reunion. **Contact:** Claude Murray, 1933 E. Marshall, Phoenix, Ariz. 85016. Phone: (602) 274-5871.

15th Air Force Ass'n
The 15th Air Force Association (all groups) will hold a reunion on July 25–28, 1985, in Seattle, Wash. **Contact:** Lt. Col. C. E. Ben Franklin, USAF (Ret.), 15th Air Force Association, P. O. Box 6325, March AFB, Calif. 92518.

20th Air Force Ass'n
Former members of the 20th Air Force, their widows, and members of other services who were responsible for securing the Marianas and supporting 20th Air Force efforts during the closing months of World War II will hold a reunion on March 22–24, 1985, at the Miramar Hotel in Santa Barbara, Calif. **Contact:** Elbert B. Smith, 20th Air Force Association of Southern California, 7811 Compass Lake Dr., San Diego, Calif. 92119.

Class 45-D
Members of Pilot Class 45-D (Vance AFB, Okla.) will hold a reunion on May 17–19, 1985, in Gulf Breeze, Fla. **Contact:** Dick Pifer, 14446 N. 26th Ave., Phoenix, Ariz. 85023.

49th Fighter Squadron
The 49th Fighter Squadron, 14th Fighter Group, will hold a reunion on July 19–21, 1985, in Great Falls, Mont. **Contact:** Sheril Huff, 3200 Chetwood Dr., Del City, Okla. 73115. Phone: (405) 677-2683.

75th Air Depot Wing Ass'n
Veterans of the 75th Air Depot Wing who served in Texas, Korea, and Japan during 1952–56 will hold a reunion on August 8–11, 1985, in Dayton, Ohio. **Contact:** Kenneth M. Brunmeier, P. O. Box 181, Onida, S. D. 57564. Phone: (605) 258-2325.

82d Fighter Group Ass'n
The 82d Fighter Group will hold a reunion on September 19–22, 1985, in San Antonio, Tex. **Contact:** Tom Kelly, 132 Sharon Dr., San Antonio, Tex. 78216.

90th Bomb Group
The 90th Bomb Group "Jolly Rogers," which includes the 319th, 320th, 321st, and 400th Bomb Squadrons, will hold a mini-reunion on May 2–5, 1985, in Anaheim, Calif. **Contact:** William B. Stewart,

853 S. Winthrope St., Orange, Calif. 92669. Phone: (714) 633-4587.

311th Fighter Squadron
A reunion of the 311th Fighter Squadron will be held on May 24–27, 1985, in Louisville, Ky. **Contact:** A. J. Kupferer, 2025 Bono Rd., New Albany, Ind. 47150.

313th Fighter Squadron
The 313th Fighter Squadron will hold a reunion on October 24–26, 1985, at the Landmark Hotel in Myrtle Beach, S. C. **Contact:** H. M. Farr, 25 Chapel Creek Rd., Pawley's Island, S. C. 29585. Phone: (803) 237-4761.

359th Fighter Group
The 359th Fighter Group will return to East Wretham, England, for a memorial dedication on August 1–8, 1985. **Contact:** Tamarac Travel, Inc., 5100 W. Commercial Blvd., Tamarac, Fla. 33319. Phone: (305) 484-4500 (in Florida) or (1-800) 228-9690.

452d Bomb Group Ass'n
Members of the 452d Bomb Group who served in England during World War II will hold a reunion on July 24–28, 1985, in Seattle, Wash. **Contact:** Rom Blaylock, P. O. Box 2526, New Bern, N. C. 28561.

454th Bomb Group
Veterans who served in Italy during World War II with the 454th Bomb Group will hold a reunion in September or October 1985 in San Antonio, Tex. **Contact:** Ralph Branstetter, 3765 Holland St., Wheat Ridge, Colo. 80033.

461st Bomb Group
The 461st Bomb Group will hold a reunion on September 12–14, 1985, in the Colorado Springs, Colo., area. **Contact:** Bill Harrison, 6681 N. W. 6th Ct., Margate, Fla. 33063.

462d Fighter Squadron
Veterans of the 462d Fighter Squadron, 506th Fighter Group, will hold a reunion on May 17–19, 1985, in Dayton, Ohio. **Contact:** E. F. Bahlhorn, 7485 Center Parkway, Sacramento, Calif. 95823. Phone: (916) 428-8469.

474th Fighter Group Ass'n
The 474th Fighter Group will hold a reunion on May 16–19, 1985, at the Holiday Inn Hotel and Casino in Las Vegas, Nev. **Contact:** Robert D. Hanson, Suite 226, 7515 Wayzata Blvd., Minneapolis, Minn. 55426. Phone: (612) 544-4122.

Reunion notices should be sent to the attention of the "Unit Reunions" Editor, AIR FORCE Magazine, 1501 Lee Highway, Arlington, Va. 22209-1198. Notices must be received at least four months before the scheduled date of the event, should be typewritten, and should give the unit designation, the location and date of the reunion, and the name and address of the contact.

487th Bomb Group
Members of the 487th Bomb Group, 8th Air Force, will hold a reunion on July 25–28, 1985, in Seattle, Wash. **Contact:** Norbert H. Riegel, 409 N. Third St., Lompoc, Calif. 93436.

530th Fighter Squadron
A reunion for the 530th Fighter Squadron will be held on September 5–7, 1985, at the Mission Inn in Howey-in-the-Hills, Fla. **Contact:** J. J. England, 9603 Petite Cove, #2, Austin, Tex. 76750. Phone: (512) 258-4922.

50th Troop Carrier Wing
I am searching for former members of the 50th Troop Carrier Wing to inform them of our next reunion.

Former 50th TCW members who are interested in attending should contact the address below.

Frank Ehrman
829 N. Bauman St.
Indianapolis, Ind. 46224

92d Troop Carrier Squadron
I am attempting to locate men of the 92d Troop Carrier Squadron, 439th Troop Carrier Group, 50th Troop Carrier Wing, Ninth Air Force, for the purpose of holding a reunion.

Please contact the address below.

John Jay Ginter, Jr.
74 Nichols Ave.
Stamford, Conn. 06905

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(See chart at right)

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Inpatient military hospital care	The only charge normally made is a $6.55 per day subsistence fee, not covered by CHAMPUS.	CHAMPLUS® pays the $6.55 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 $6.55 per day, whichever is greater.	CHAMPLUS® pays the greater of $6.55 per day or $25 of the reasonable hospital charges not covered by CHAMPUS.
Inpatient military hospital care	The only charge normally made is a $6.55 per day fee, not covered by CHAMPUS.	CHAMPLUS® pays the $6.55 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.

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AFA's CHAMPLUS®

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.

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	$19.03	$23.30	$14.85
50–54	$26.16	$32.01	$14.85
55–59	$36.16	$44.28	$14.85
60–64	$43.62	$53.41	$14.85

Inpatient and Outpatient Benefits

Under 50	$26.80	$31.05	$37.13
50–54	$36.83	$42.68	$37.13
55–59	$50.92	$59.02	$37.13
60–64	$61.41	$71.20	$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 $15 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

3/85

NOTE: Application must be accompanied by check or money order.
Send remittance to:
Insurance Division, AFA, 1750 Pennsylvania Ave., NW, Washington, D.C. 20006.

Form 6173GH App.

Bob Stevens'

"There I was..."

WE HEARD THIS STORY AFTER WW II "AS GOSPEL" FROM SEVERAL SOURCES. WE'LL ADMIT IT SURE SOUNDS FAR OUT, BUT EVEN IF FABRICATED, IT STILL MAKES QUITE A TALE.

NEAR WAR'S END, B-29s OF THE 21ST BOMBER COMMAND ARE ATTACKING THE MITSUBISHI AIRCRAFT PLANT ON THE OUTSKIRTS OF TOKYO-

ONE BIRD IN THE REAR RANK HAS A BIT OF A PROBLEM...

THE ROUTE OUT WENT RIGHT OVER DOWNTOWN TOKYO. AT THIS POINT, THE HUNG 1,000 POUNDER LET GO-

KABLOOIE

NEXT DAY-

FIELDING STATE-OF-THE-ART SYSTEMS

AT 1/5 THE COST... IN 1/10 THE TIME

How do you meet a state-of-the-art information system requirement when the "art" is evolving faster than the requirement?

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Are they universally applicable to new information systems requirements? Of course not. But they may meet your requirement. If you're receptive to new ideas and innovative approaches to dynamic issues and demands, call on us. You may well find "evolutionary development" a better, faster solution. Contact BDM International, Inc., 7915 Jones Branch Drive, McLean, Virginia 22102. Phone (703) 821-5000. Telex 901103.

MANAGING THE COURSE OF CHANGE

BDM

CHANGING THE COURSE OF MANAGEMENT

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

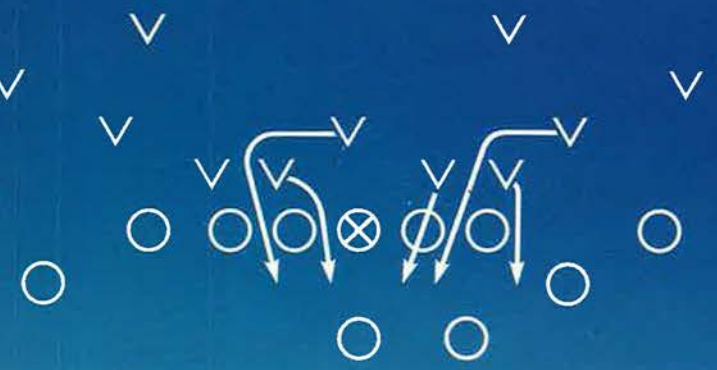
THE MISSION: RAPID DEPLOYMENT. GET U.S. AIR FORCE AIRPOWER TO ANY TROUBLE SPOT IN THE WORLD. FAST. Rapid deployment is a crucial USAF mission required to meet our global commitments. Why? Because situations that require USAF support can occur anywhere in the world with little warning.

Rapid deployment requires versatile and reliable fighters that can travel great distances to get to the fight.

The USAF chose the F-15 Eagle for the rapid deployment mission. The Eagle has the range and speed to reach any area in the world quickly and safely. Its conformal fuel tanks allow it to travel between continents without refueling. It's the only U.S. fighter ready to meet and beat any airborne threat in the world from now through the 1990s. Its combat readiness and safety record are excellent.

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

BLITZ.



MCDONNELL DOUGLAS