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AIR FORCE

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MAGAZINE

СОВЕТСКИЙ АВИАЦИОННО-КОСМИЧЕСКИЙ АЛЬМАНАХ 1980*

*SOVIET AEROSPACE ALMANAC

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THE BEHOLDER'S EYE

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AIR FORCE MAGAZINE
PUBLISHED BY THE AIR FORCE ASSOCIATION

MARCH 1980
VOLUME 63, NUMBER 3

This Month

ABOUT THE COVER

The cover painting, "MiG-21s Over France," by Keith Ferris, introduces this sixth annual Soviet Aerospace Almanac. The painting, which depicts a 1971 visit to France by Soviet Marshal of Aviation P. S. Kutakhov, will also be included in AIR FORCE *Magazine's 1981 Military Aviation Calendar.*

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AN EDITORIAL

Cut-Rate Containment

EACH year, while we are putting together the Soviet Aerospace Almanac, the President delivers his State of the Union message and the Secretary of Defense goes to the Hill to explain the new Defense budget. The coincidence invites some observations on US foreign and defense policy, set against the background of information and analysis found in this Almanac.

US policy vis-à-vis the Soviet Union has waxed and waned in vigor for more than three decades. It generally has been aimed at containing Soviet expansion by various means—economic and military aid, alliances, or direct military assistance to threatened nations. Variations on that policy have been set forth in "doctrines" bearing the names of Presidents Truman, Eisenhower, and Nixon.

Confronting US containment is a permanent operating factor of Soviet policy. It got worldwide attention in 1968 when Soviet and other Warsaw Pact forces invaded Czechoslovakia to crush an attempted liberalization of Communist rule. In essence, the so-called Brezhnev Doctrine says the USSR has a duty to intervene in nations where Communist control is "imperiled." That doctrine is one means of reaching the ultimate Soviet goal: "Victory of the world socialist revolution."

There are powerful psychological and operational differences between Soviet and US doctrines. The former is aggressive and expansionist; the latter defensive and static.

America's containment policy originally rested on three pillars: US strategic nuclear superiority; confidence among other nations in US resolve and staying power; and the absence of Soviet ability to project power significantly beyond its borders.

The first two pillars of containment have been fractured by the US itself. During the drawn-out SALT negotiations, US strategic nuclear superiority was allowed to slip through parity to inferiority. At the same time, this country failed to expand and modernize its conventional and theater nuclear forces enough to offset at least partially the strategic decline.

The second pillar—confidence in the US as a reliable partner—has been seriously weakened, largely but not entirely by the Carter Administration. Among the actions and inactions that have bored into its structure are failure to oppose Soviet proxy aggression in Angola, Somalia, and Ethiopia; tacit acceptance of the 1978 Communist coup in Afghanistan; casting Taiwan adrift; a foreign military sales policy not keyed to US interests; and (in the eyes of important Persian Gulf potentates) abandonment of the Shah of Iran.

The Soviets have pulled down the third pillar by building a power projection capability described elsewhere in this issue. So, as the new decade began, the US policy of containment was a shambles.

President Carter has warned the Soviets that a move against the Persian Gulf area would be met with whatever means were necessary, including military force. The President has set about restoring some pieces of a containment policy, but his ability to rally support among potential allies has been compromised by a record of vacillation, naive idealism, and unfulfilled promises. Rebuilding confidence in US reliability will take more than words, and more than transient or halfhearted actions.

The Administration is already backing off from the President's strong stand, known, at least fleetingly, as the Carter Doctrine. Brezhnev has begun to coo again, which may stimulate Mr. Carter's natural instinct for trust and compromise. Even more telling, the FY '81 Defense budget does not support the President's tough talk. It is, in fact, essentially the same budget drawn up last fall and previewed by Secretary of Defense Harold Brown in mid-December, before the Soviet drive into Afghanistan.

Secretary Brown's report, presented to the Congress on January 29, did not minimize the seriousness of Soviet military investments that ". . . in 1979 alone, were probably greater by 85 percent" than ours. But the programs funded or initiated by a budget up only marginally over last year's in percentage of total federal outlays and GNP will take from six to nine years to close the so-called strategic threat window that will become critical in the next two years. Among many other shortcomings it will not buy enough air- and sealift to move rapid deployment forces to distant areas, nor will it provide war-readiness materiel and theater forces scaled to the Soviet threat for from five to seven years, if even then. (*For a detailed analysis, see p. 22.*)

Repairing the military pillar of containment—assuming the Administration is really resurrecting containment as national policy—is not likely to succeed at so slow a pace. Yet only by regaining at least parity in strategic and general-purpose forces can the third pillar of containment—Soviet inability to project power at a risk the Kremlin finds acceptable—also be put back in place.

We have fallen so far behind the military power curve that, under present defense programs, the US is foredoomed to a perilous state of strategic vulnerability, and inferiority in theater forces, for the better part of the '80s. Cur-rate containment won't arrest the erosive effects of more and further-flung Afghanistans. If containment is to work, we will need more money for defense, faster decision-making, tighter defense management, and a consistently realistic view of the world.

Also, to borrow a line from Alfred P. Doolittle of *My Fair Lady*, "just a little bit of bloomin' luck."

—JOHN L. FRISBEE, EDITOR

The New Collins AN/ARC-190/728U airborne HF. A strong defense against high costs.

You're looking at the next generation in airborne HF, the new Collins AN/ARC-190/728U. Selected by the U.S. Air Force for its HF modernization program, AN/ARC-190 follows in the tradition of such outstanding radios as the AN/ART-13, AN/ARC-58 and AN/ARC-94/102 (618T).

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The system offers a digitally tuned antenna coupler, and fully automatic tuning in one second or less. Peak envelope and average power output is 400 watts.

The hardware is flexible, too. Built-in microprocessors provide all the control, speed and flexibility you need for operation with functions like selective call scanning (SEL/SCAN) and remote frequency management.

After years of faithful service, many of today's airborne HF radio systems are due for retirement. Parts are scarce. Maintenance costs are spiraling. The solution? An/ARC-190/728U, the strongest defense yet against high costs. For details, contact Collins Telecommunications Products Division, Rockwell International, Cedar Rapids, Iowa 52406. Phone 319/395-3553 or 2909. TELEX 464-435.

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...where science gets down to business

"Vive la République," shouted Coutelle from aloft. As one revolution was saved, another was being born.

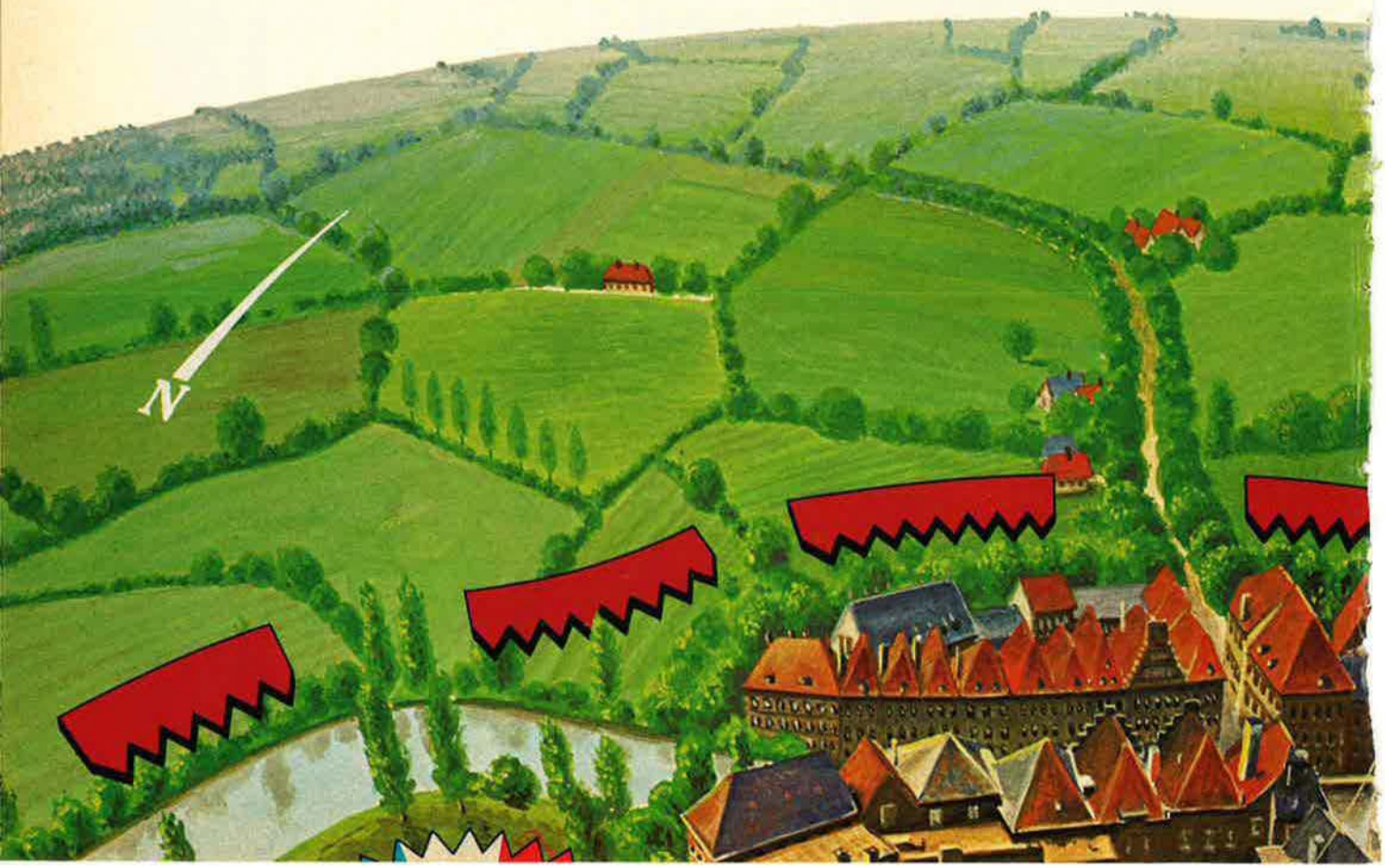
By holding Maubeuge, the French turned back a threat to their Revolution. Meanwhile a revolution in warfare began taking shape as Jean Marie-Joseph Coutelle's pioneering aerial reconnaissance mission opened up a whole new dimension in intelligence gathering. As it happened, this mission served only to boost French morale in the embattled town. The intelligence didn't reach battlefield headquarters where it was needed.

Just weeks later, however, the same balloon played a more direct tactical role. At the battle of Fleurus, the French adjutant general went up with Coutelle, observed Austrian movements, and dropped frequent dispatches. According to some who were present, these influenced the French general's tactical decisions – which produced a victory that led to French occupation of the Low Countries and the capture of Brussels.

These flights were the beginning of airborne command, control and communications. C^3 has come a long way since then. Today's Air Force E-3A Sentry aircraft, for example, carry sophisticated radar that can peer deep into hostile territory. And the on-board IBM data processor quickly translates these

1. May 1794. Reacting to French Revolution, pro-monarchy Allied forces, chiefly Austrians (shown as red bars), have pushed from Low Countries to Sambre River in campaign to capture Paris and crush new government. French government reinforces and consolidates its army (tricolor bars), succeeds in stopping Allied drive.

2. Newly formed French military balloon company, the world's first air corps, enters blockaded but still French-held Maubeuge despite bombardment by Allied force.



many inputs into information that is immediately useful to tactical commanders. Strategic commanders have similar advantages. In one program, SAC bases and missile sites are being linked to command posts by IBM terminals that embody state-of-the-art technology.

To meet the Navy's needs, IBM is providing processors and software for multiple communications systems for submarines.

All of these systems are components of the Worldwide Military Command and Control System (WWMCCS)—for which IBM developed the architecture. Each one posed unique problems. In areas such as integration, information handling, security, reliability. Problems IBM understands and has proven able to solve.

Complex projects like these benefit from IBM's special skill: our ability to marshal many specialized systems to a common purpose. We've applied this skill in avionics, antisubmarine warfare systems, sonar systems, and space systems.

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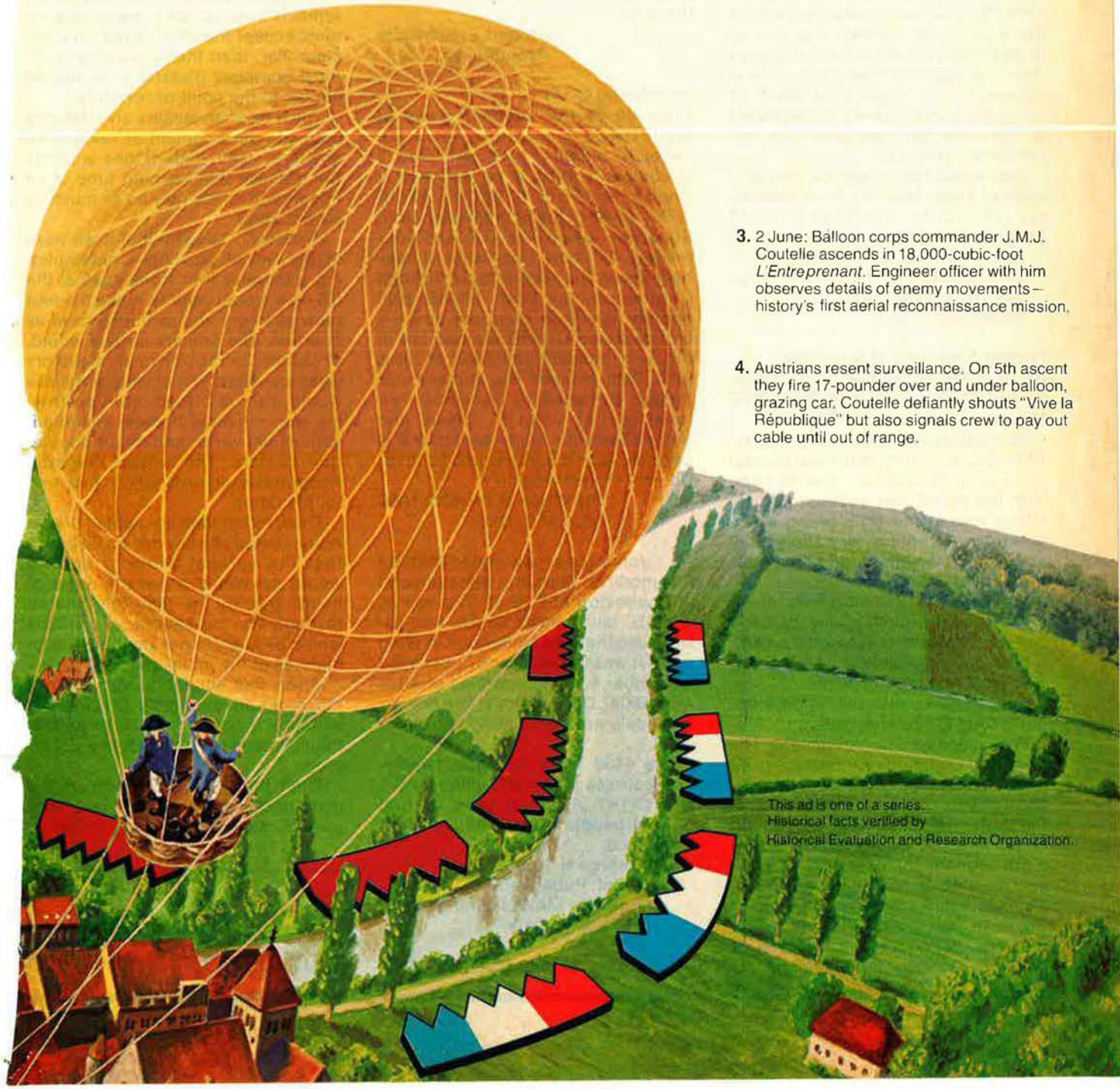

3. 2 June: Balloon corps commander J.M.J. Coutelle ascends in 18,000-cubic-foot *L'Entreprenant*. Engineer officer with him observes details of enemy movements—history's first aerial reconnaissance mission.

4. Austrians resent surveillance. On 5th ascent they fire 17-pounder over and under balloon, grazing car. Coutelle defiantly shouts "Vive la République" but also signals crew to pay out cable until out of range.

This ad is one of a series. Historical facts verified by Historical Evaluation and Research Organization.

Airmail

Well Done, MAC!
The article "MAC's Air Evac Mission to Japan," in the January 1980 issue of AIR FORCE Magazine by William Schlitz is a fine tribute to the many men and women of the Military Airlift Command who participated in this errand of mercy.

The quick response by MAC in evacuating and providing emergency medical care for the thirty-eight severely burned Marines was magnificent. The later successful recovery of many of those Marines was due in large measure to the superb efforts of the air and ground crews and medical teams. Please know that many of those Marines who were not expected to live have survived, and only two remain hospitalized.

I know that I can speak for the loved ones of these Marines in expressing our gratitude for the efforts of the US Air Force. Well done.

Gen. R. H. Barrow, USMC
Commandant of the Marine Corps
Hq. US Marine Corps
Washington, D. C.

Putting Them Out of Business
Re your article "In Focus . . . More Soviet Duplicity" in AIR FORCE Magazine, December 1979.

You quote Gen. Donn R. Starry, TRADOC, as saying that there are two schools of thought on how to cope with the Soviet rear echelon, *i.e.*, (1) killing tanks, and (2) slowing down tanks by disrupting formations, destroying C^3, logistics, and transportation.

I contend that there is a third tactic, a more cost-effective way to cope with the Soviet rear echelon than killing or delaying tanks. I call this approach a "damaging" tactic.

The Air Force program in developing WAAM (Wide Area Antiarmor Munitions discussed in "Armament: The Business End of the Air Force," p. 43 of the same issue) is primarily concerned with killing tanks. Because of the high cost of massive tank-killing capabilities, it would appear to be more economical for the Air Force to also develop damage-type munitions. Damaged tanks require long repair times in nearby or distant repair facilities, depending on the level of damage. The term "long repair times" is used in the context of a time-sensitive armored thrust. A tank being repaired can be considered killed if it is not available on a timely basis during an offensive. In this scenario, it is more cost-effective to damage tanks than kill them.

In regard to the delaying tactic mentioned in the article, there are many problems that would have to be resolved related to slowing down tanks, before it could become a feasible tactic.

Robert E. Schmaltz
Mendon, Vt.

Wandering C-141
Page 22 of the January issue of AIR FORCE Magazine shows the "stretch" model C-141B, delivered in December to MAC, to be stationed at Charleston AFB, S. C. Tsk, tsk, AFA!!!

The wives of the 57th Military Airlift Squadron would like you and your readers to know that, while it may have taken the scenic route through Charleston, the first C-141B (tail number 60176 as pictured) and the first qualified C-141B aircrew are at this very moment stationed at Altus AFB, Okla. Honest! The airplane was indeed delivered in December, piloted by Col. John P. O'Neill and Santa Claus. It's ours—we know it is because even if Santa would lie to us, Colonel O'Neill wouldn't!

The Wives of the 57th MAS
Altus AFB, Okla.

. . . you erroneously stated that the first modified StarLifter was stationed at Charleston AFB, S. C. The fact is, C-141B, tail number 60176, was assigned to the 443d Military Airlift Wing when it was turned over by Lockheed December 4, 1979. It arrived at Altus AFB, Okla., December 21. The first six B models are being assigned to the 443d.

The 443d MAW conducts twenty-nine courses of formal training for C-5 and C-141 aircrews, plus special ground people of the Military Airlift Command.

George H. Hobbs
Chief, Public Affairs
Hq. 443d MAW, Training (MAC)
Altus AFB, Okla.

• *According to Headquarters MAC, C-141 number 60176 was turned over to the Air Force by Lockheed-Georgia in early December and "was dedicated into the fleet" by MAC Commander Gen. Robert E. Huyser at Charleston AFB, S. C. Subsequently, the aircraft was transferred to the 443d MAW at Altus.*—THE EDITORS

First-Strike Catastrophe
William Olsen, Earl Conrad, and Robert Denington, coauthors of "A Civil Defense for Today" in the January issue's "Perspective" column, have focused attention on a much-neglected problem. Obviously, unless some constructive action is taken on a rather massive scale, a thermonuclear exchange involving the US will be inordinately costly. If national policy remains fixed on the premise that we must accept the "first strike" in a nuclear war, then the probability of almost complete disaster is increased almost to the point of certainty.

The idea of an austere civil defense plan and development of "expedient shelters" isn't bad—if one accepts the premise that warning time of an impending attack may be as much as several days.

However, I suggest that if we were in the Soviet position—contemplating a massive first strike against the US—we would want to make the first blow as heavy and as unexpected as possible. The primary targets would, of course, be the potential retaliatory weapons sites. But strong emphasis would also be placed upon destroying governmental bodies, communications networks, and major population centers. The largest megaton weapons would probably be reserved for the latter.

Thus, rather than a potential preparation period of a day or two, I'd guess that the earliest warning anyone would get would be on the order of hours and, by the time this filtered through the bureaucracy, civilians would be lucky to get anything within minutes of the initial attack.

Given this situation, civil defense measures are extremely difficult. The situation is not completely hopeless but solutions are obviously very complex.

Then there's the problem of the postattack period. Some have suggested that this promises to be so

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

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Joe Galian, Jr.,
Program Manager, Range Systems

General Dynamics Electronics Division's engineers combined advanced systems technology with high-speed, discrete-address, fast-pulsed leading-edge, range detection circuits. This hardware capability is interfaced with real-time computer hardware and software to yield the optimum Air Combat Maneuvering Instrumentation system.

This advanced ACMI uses an existing range measurement system (RMS-2) with high-speed, discrete digital addressing for multiple participants. The interrogate/transpond architecture allows up to 1023 microtransponder-carrying units to take part in highly realistic combat scenarios for air, land and sea. A small, lightweight 28 Vdc-powered microtransponder, carried in aircraft pods, aboard ships, on ground vehicles and personnel, and at fixed weapon sites, allows each participant to be addressed.

The system's leading-edge detection range circuits minimize multipath problems and discriminate against interfering signals by selecting the first or direct pulse from the multipath reflections.

General Dynamics' Program Manager, Joe Galian, Jr., says, "this program offers engineers the opportunity to achieve a technological balance by working on a large multi-disciplined system. It also provides opportunities to work in specialized areas such as antenna systems, micro-miniature hybrids, multi-layered circuit boards, stripline RF and SAW device technology, as well as computer hardware, software and display systems."

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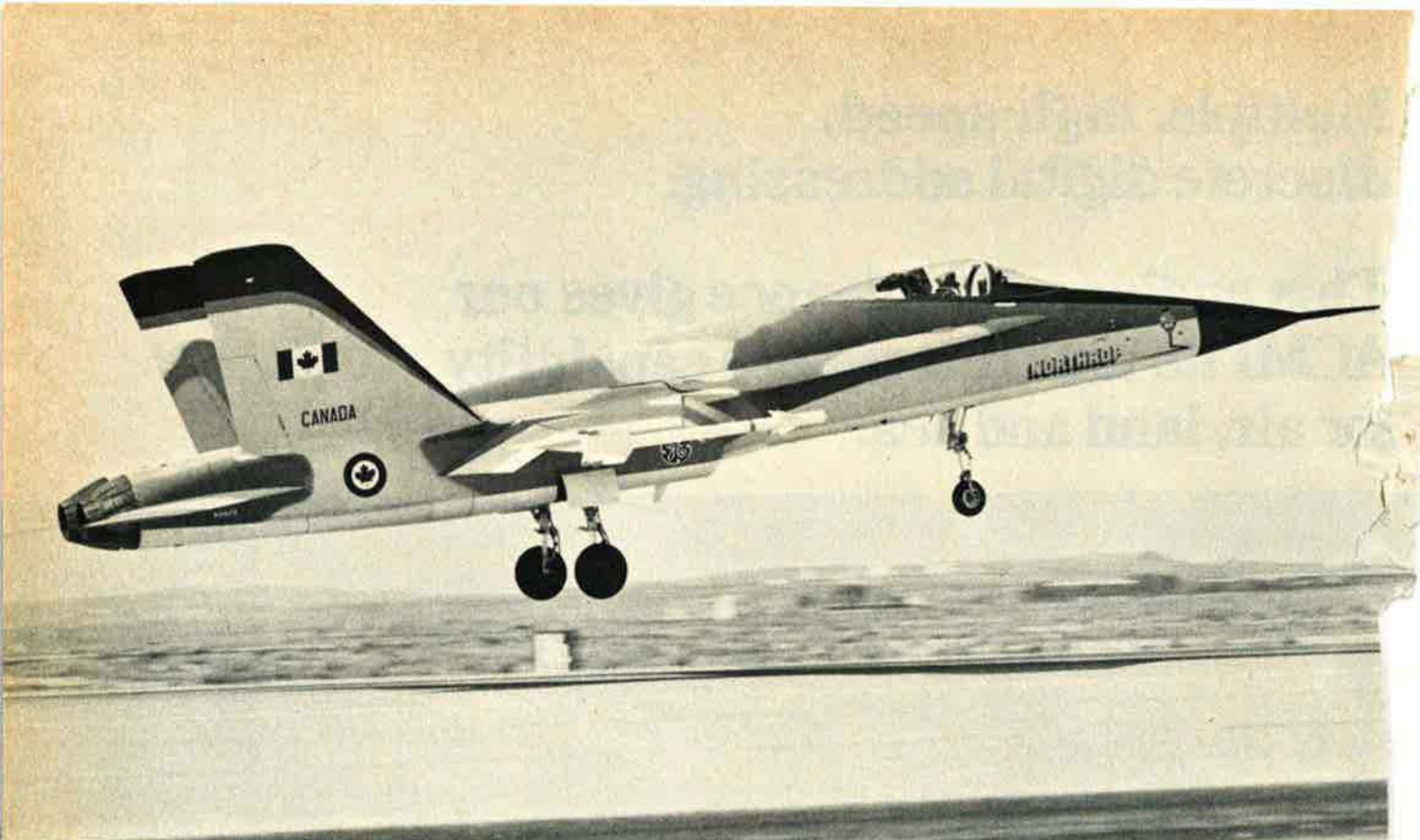

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Airmail

grim that, indeed, those who are wiped out in the initial exchange will be most fortunate. A situation is pictured wherein the bulk of the population is dead, communications are virtually nonexistent, supply lines are destroyed, uncontaminated foodstuffs are hard to find, most livestock is dead or dying, and the nation's productive capacity is wrecked. Add hordes of sick and dying civilians and various levels of fallout randomly scattered (probably undetected because of lack of equipment) and the bare outline of the disaster begins to emerge. It seems doubtful that the United States could survive such an attack.

On the other hand, the notion that we should accept the first strike never did make that much sense to me.

Hugh P. King
Dallas, Pa.

JDA at Work

I just finished reading the article on the Joint Deployment Agency ["Joint Deployment Agency Goes to Work," by Allan R. Scholin] in the January issue of AIR FORCE Magazine and enjoyed it immensely. It is always helpful for those of us no longer in Air Force blue to receive a succinct and lucid picture of what the newest buzz words are all about.

It is also interesting to read about activities at a familiar base and I do miss the good days at MacDill. . . .

Col. Dennis P. Sharon,
USAF (Ret.)
Washington, D. C.

Disservice to Those Who Served?

I take strong exception to the comment of Contributing Editor Ed Gates (AIR FORCE Magazine, January 1980) seeming to sanction CPI raises for retirees annually because "Social Security annuitants receive only one adjustment a year, so why shouldn't the military?"

Social Security annuitants, as a whole, did not engage in a "thirty-year camping trip," did not wade infested rivers in the jungles of Southeast Asia, did not suffer family separations, etc., *ad infinitum.*

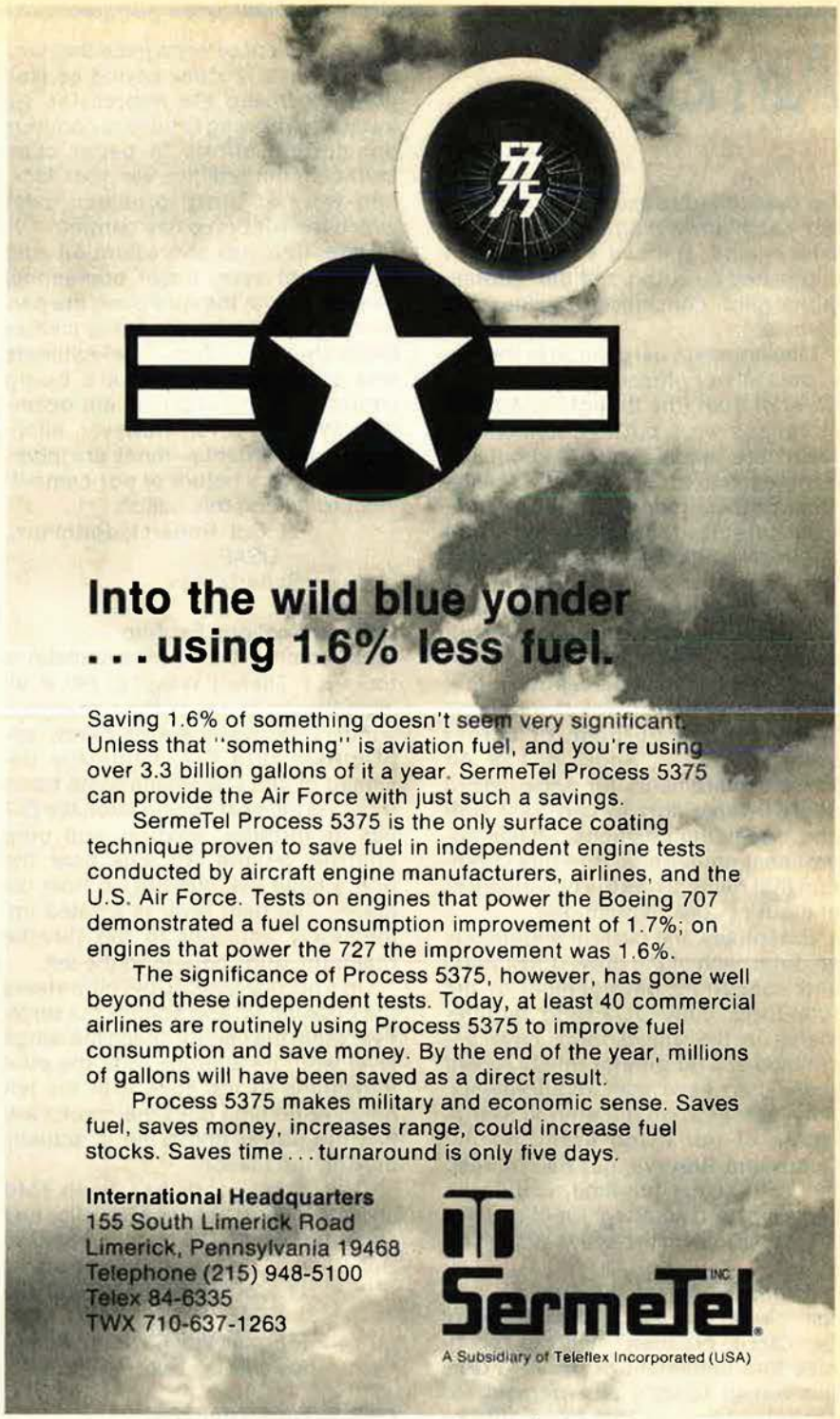
Any proposal that would lump the military retiree who served in the lean days of the late thirties, WW II, Korea, or Vietnam with Social Security annuitants or any other similar group, is a disservice to those who, for whatever reason, gave their most productive years to US military service.

Ralph D. Morrell
Dixon, Calif.

Let's Face the Realities

A number of opinions have been voiced publicly in recent months on the subject of pilot retention. One of the most-commonly expressed themes is that we ought to simply let pilots fly—and only fly—for their entire career. As a pilot who's been very much involved in the retention issue, I'm offering another perspective on that subject.

We have, over the past year, surveyed our people from every conceivable angle. . . . There is a very consistent pattern of dissatisfaction that forms the basis of efforts throughout the Air Force to work the problem. While there is little substan-



Airmail

tial data to indicate that a majority of our pilots are willing to restrict their talents and abilities to the extent suggested by authors of the "professional pilot" concept, it's obvious that some are. . . .

One common perception is that we expect all our officers to compete for Chief of Staff (the thought is worded in various ways but the concept remains the same). [That is] about 180 degrees out of phase with reality. Most officers recognize that promotion selection opportunity alone markedly limits the number of officers who can ever even approach that goal. Those who don't aspire need not fear being forced into competition for the Chief's job.

Another common perception is that we move pilots out of the cockpit solely for the purpose of career broadening. . . . About half of Air Force requirements for experienced pilots involve duty in mid-level staff and leadership positions outside operational squadrons. It is this condition that really drives the movement in and out of cockpit positions. . . .

Essentially, the current situation is an outgrowth of the draw-down years and concurrent development of the total-force concept. Flying requirements in the active force have decreased at a far greater rate in recent years than have staff requirements. Why? Because we transferred a large chunk of our flying assets to the Guard and Reserve, but had to keep the bulk of the full-time, worldwide planning and staffing functions for the total force on the active side of the house.

Those who just want to fly and decry what they see as a requirement to "career broaden" need to recognize that fulfillment of the Air Force mission in today's environment essentially demands that rated officers do something other than perform line cockpit duties for their entire career. . . . Our requirements are not driven by career broadening; they're driven by the need to maintain a viable, combat-capable Air Force, both at and beyond the line squadron. Career broadening is a coincidental, necessary, and—for most officers—popular by-product of all this. . . .

A perception has grown that concern for the individual is totally subordinated to the needs of the Air Force. Most of us recognize that simply isn't true, but my saying so isn't going to make the impression go away. We're going to have to continue our current efforts to better communicate the realities we must face, and work at those problems over which the Air Force has control.

Retention has the attention and concern of every major operational commander in the Air Force, the personnel community, Air Force civilian leadership, and others. The legitimate and sincere concerns are being addressed—and changes are occurring. We can never, however, eliminate all the irritants—many are inherent in the very nature of our commitment to defend this nation.

Lt. Col. Robert L. Rathburn, USAF
Schertz, Tex.

Communications Foul-up

Your comment on communications foul-up ["There I Was," p. 96] is always timely; however, the one in your January '80 issue seems hardly appropriate to a C-7. Originally designed by the Canadians to be flown from the left seat by one pilot, the C-7 has its throttles, mixture, and prop controls on the left side near the pilot's head and straight up from his elbow. The gear lever is located immediately adjacent to the throttle quadrant, and I believe to the left.

On a normal takeoff, the pilot steers the nose wheel and adjusts the throttles, while the copilot keeps the wings level with the ailerons until the pilot transitions to the yoke with his left hand. At no time does the copilot adjust the power unless he is actually making the takeoff.

That same story has been told about a foul-up between the pilot and engineer on a C-124 (in fact, I believe Bob Stevens drew that cartoon also).

Lt. Col. Christy D. McKenzie, USAF (Ret.)
(Former Viet Caribou Jock)
Iowa Park, Tex.

OER System Changes

I read with some misgivings an article in the January 7, 1980, issue of *Air Force Times*, which states that "a new OER system that will allow the rater to give his (her) assessment of his (her) own work will be tested on a small scale . . ." sometime in the near future. Maybe I am still a little shell-shocked from our most recent OER system changes, but even the thought of having to live and work through another change leaves me somewhat uneasy. I guess the fact that the article stated quite strongly that this was only a limited test and that any change to our current system is some years in the future has given me the will to suppress my feelings of anxiety. However, the fact still remains that a system of "self-assessment" is being considered.

Two things bother me most about such a system. First, it seems to imply that supervisors are unable to rate their subordinates accurately and fairly; and that unless subordinates are permitted to provide a personal assessment, the rating system cannot work. (Carried to an extreme, we might see the next step being a system where officers hire PR persons or agents to negotiate their OERs with their superiors.)

Second, I see the new system as a failure already since nowhere in the article does it mention that it rectifies one of the biggest problems I feel all OER systems have had to date—lack of feedback from supervisors and promotion boards. I personally could not care less about the rating system I am working under if my supervisors, on a recurring basis, would let me know where I stand, and if promotion boards would publish the criteria they used for selection.

Airmen have WAPS, a system that may not be perfect, but at least a system that lets them know where they stand relative to their promotability. What feedback do officers have? Nothing, except vague statistics about percent promoted by AFSC, level of assignment, MAJCOM, etc. And if an individual fails to pass a board, does he or she know why? No! All an individual can do in such instances is attempt to determine what block was not filled given no specific knowledge of what all the blocks are or what they really mean. Such an environment is frustrating; and until the feedback becomes a reality, I do not feel any rating system will be a success.

Capt. Leonard E. Kalinowski, Jr., USAF
Gunter AFS, Ala.

Lost Pickle Barrel

When the 3d Bomb Wing was active in Japan, there was great rivalry between its units—the 8th, 13th, and 90th Bomb Squadrons—to win the quarterly competition and be awarded the Pickle Barrel Trophy. This two-foot-high keg on a brass tripod base with an ornamental bomb mounted on its lid was kept in a place of honor by the winning squadron.

When the 8th and 13th Squadrons

SCIENCE/SCOPE

A new weapon delivery system using an advanced airborne radar will allow armed forces to defend against attack by tanks and other massed armor. Operating from an aircraft far from the battlefield, the radar tracks large numbers of moving and stationary targets and relays the information via data link to a ground station. The control center evaluates the threat, issues orders, and computes guidance commands for other aircraft or multiwarhead missiles. Once a missile has been launched from either air or ground, the airborne radar transmits signals that guide the weapon to its target. The system, called PAVE MOVER Target Acquisition Weapon Delivery System, is being developed by Hughes under contract to the U.S. Air Force and DARPA (Defense Advanced Research Projects Agency).

A gyroscope based on integrated optics technology promises to find important uses in missiles, aircraft, and the Space Shuttle. The new fiber-optic rotation sensor is less expensive, more compact, and longer lasting than conventional devices. It consists of a coil of fiber-optic cable and a one-inch-square chip containing a laser, beam splitters, a modulator, detectors, and data-processing circuits. The sensor detects motion by sensing changes in the path of light going in and out of the fiber-optic coil. Hughes is developing chips for NASA's Jet Propulsion Laboratory.

Modifications to a widely used sonar will improve the ability of U.S. Navy surface ships to detect and follow up on submarine threats. The AN/SQS-53 sonar, primary anti-submarine warfare sensor on more than 50 ships, is to be equipped with standard Navy AN/UYQ-21 displays and AN/UYK-20 computers. Hughes is developing equipment to interconnect existing analog units with the improved digital display subsystem. Software development, product support, and systems integration and test are part of the program. The contract was awarded by the Naval Sea Systems Command under direction of the Naval Undersea System Center.

Production of new long-life rocket launchers for helicopters has begun at Hughes after highly successful tests. The lightweight aluminum launchers are designed to fire 2.75-inch rockets from the U.S. Army's AH-1 Cobra helicopters and the new Advanced Attack Helicopter. More than 4500 rockets were fired from the ground and from helicopters through five 7-tube and five 19-tube launchers. Although the launcher tubes were designed to be fired 16 times, all withstood twice as many firings. One launcher was even fired 66 times. Hughes is adapting the launchers to fixed-wing aircraft and foreign helicopters.

The TOW antitank missile, of which 250,000 have now been delivered to the U.S. Army, has escaped inflation's pinch in the last decade. Designers and production experts at Hughes have used highly automated manufacturing equipment to cut the cost of today's missile by 25 percent compared with that of the first missile produced in August 1969. At the same time, the missile's range has been increased from 2000 meters to 3750 meters, or 2.3 miles. TOW (Tube-launched, Optically-tracked, Wire-guided) missiles have become the standard weapon for defense against tanks in 30 nations throughout the free world.

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Airmail

moved their B-57s to Southeast Asia in 1962, the Pickle Barrel went with them. This trophy's last-known location was at Ubon at the time the last of these squadrons, the 13th BS, was disbanded in April 1972 and their B-57Gs flown back to the US. The squadron commander turned this trophy and other details over to the squadron historian, who left the Air Force soon after.

Does anyone know what happened to the Pickle Barrel? This bit of information will be included in a book on the operational history of the B-57 to be published in 1980.

Robert C. Mikesh
5201 Oahu Court
Camp Springs, Md. 20031

And Still More Books

I am at it again with more book projects. I would like to hear from anyone who served in the Panama Canal Zone during World War II. I am starting a book based around the possibility of a Japanese attack on the Canal in 1945 and need to hear from pilots, commanders, personnel, and civilians who were there.

Also, I've signed a contract to write a history of the AT-6. Of all the aircraft to have had so much influence on World War II, this has been a much-neglected machine. The aircraft will be covered from its inception to the present, with emphasis on USAAF and USN use. How about some of those great training stories that make good reading? Bob Stevens's cartoons have certainly told some of them in the pages of this magazine and I would like to put them into print. I will need to borrow photos as well.

Jeffrey L. Ethell
2403 Sunnybrook Rd.
Richmond, Va. 23229

Missing Chapel Bell

We have been attempting to locate the bell presented to the Danang Chapel by the Coast Guard in tribute to Lt. Jack Rittichier, a Coast Guard pilot killed in the line of duty while attempting to rescue a downed Air Force pilot in the Khe Sahn area. Lieutenant Rittichier was an exchange pilot with the Air Force, assigned to the 37th Aerospace Rescue & Recovery Squadron at Danang. He was declared missing on June 9, 1968.

The bell was presented to the Air Force Chapel July 6, 1969, in memory of Lieutenant Rittichier, by Coast Guard Squadron One. We are trying to locate the bell now in response to a request from our Air Squadron at Detroit. We would like to provide a final resting place for the artifact.

Should any reader have information concerning this bell, please contact me.

J. R. Ward
US Coast Guard
G-APA-3/TP21
Washington, D. C. 20593
Phone: (202) 426-1900

***Tarfu*'s Pilot and Crew**

I am anxious to contact Henry A. Slayton, serial number 0-428770, pilot of B-24J *Tarfu* 2109933 of the 26th Bombardment Squadron (H), 11th Bombardment Group, Seventh Air Force (World War II). Also, I would like to contact any member of Slayton's crew. If anyone has information concerning "Hank" Slayton, or his crew members, please contact me.

Harry B. Girdler
(Navigator of Slayton's Crew)
3237 Arthur Terrace
Hollywood, Fla. 33021
Phone: (305) 983-8561

Photos of the F-80

I wish to contact any former members who served in the 16th Fighter-Interceptor Squadron, 25th FIS, and 26th FIS of the 51st Fighter-Interceptor Wing, between November 1949 and November 1951. Purpose is to buy, or borrow for copying, any photos, slides, or negatives taken during this time of any F-80 type aircraft assigned to these three squadrons. Any photos used in commercial or other publications will be credited to the persons who furnish them.

MSgt. Earl L. Otto, USAF (Ret.)
6638 South Wapato St.
Tacoma, Wash. 98409

Misplaced Classmates

The Randolph/Kelly Flying School Class 40-G (November 15, 1940) is missing addresses for the following members: Elmer C. Beach, Jr.; Hartzell R. Birch, Jr.; John P. Davis; Dr. Eugene R. Magruder; Jerome R. Sawyer; James F. Small; Roger Swain; Eugene A. Watson; and Wesley Werner. Anyone having knowledge of these individuals please contact me.

Col. H. H. "Gus" Wittrock, USAF (Ret.)
10229 Ridgewood
El Paso, Tex. 79925

UNIT REUNIONS

Association of Old Crows

Capitol Club, "Joint Concepts of Operations of Reconnaissance and Surveillance Symposium," in cooperation with the Combined Services Reconnaissance Force Steering Committee of DoD, May 13–15, 1980, at Institute for Defense Analysis, Arlington, Va. Security clearance required. Contact: N. John Hooper, 2300 S. 9th St., Suite 300A, Arlington, Va. 22204. Phone: (703) 979-6990.

Jolly Green Rescue Forces

April 25–26, 1980, Ramada Inn, Fort Walton Beach, Fla. **Contact:** Col. Ed Modica, 222 Sotir Ave., Fort Walton Beach, Fla 32548. Phone: (904) 863-1959.

3d Wing Association

June 6–8, 1980, Barksdale AFB, La. **Contact:** Tracy P. Little, 3011 Westover St., Shreveport, La. 71108. Phone: (318) 635-2426.

38th Bomb Group

June 13–15, 1980, Royal Orleans Hotel, Vieux Carre, New Orleans, La. 70130. For additional information send stamped, self-addressed envelope. **Contact:** Carlos E. Giron, 2727 Chestnut St., New Orleans, La. 70130.

40-E and 40-F Ryan

Primary Flying School Classes, get-together 40 years later, June 8–11, 1980, San Diego, Calif. **Contact:** 40-E "Benny" Ogas, 1447 San Pablo Dr., Lake San Marcos Calif. 92069, or 40-F "Willy" Willeford, 63 Half Moon Rd., Novato, Calif. 94947.

B-58 Hustlers

May 9–11, 1980, Green Oaks Inn, Fort Worth, Tex. **Contact:** Bill McGlohen or Bob Mumah, P. O. Box 26058, Fort Worth, Tex. 76116.

63d Station Complement Sqdn., 9th AF

June 6–8, 1980, Dunfey Hotel, Houston, Tex. **Contact:** Joe Isbell, 4504 Maple, Bellaire, Tex. 77401; or Lt. Col. Tom Gilmore, 24 Wedge Way, Littleton, Colo. 80123.

89th & 94th Troop Carrier Wings

Reserve units assigned to Hanscom AFB after WW II and Korean War, May 10, Hanscom AFB Officers Open Mess. **Contact:** Steve Lannan, 40 Winn St., Woburn, Mass. 01801.

483d Bomb Group (H)

July 11–13, Denver, Colo. **Contact:** Philip A. Luetke, 515 Madison Ave., Toledo, Ohio 43604. Phone: (419) 248-3100.

AFROTC Det. 720 Alumni

Hosting special reunion of all AFROTC Penn State grads and former detachment personnel. Will participate in annual Pennsylvania State Air Force Association Convention, June 6–8, Penn State Sheraton Inn, State College, Pa. Special seminars. **Contact:** Capt. David Ashton, AFROTC Det. 720, 109 Wagner Bldg., The Pennsylvania State University, University Park, Pa. 16802.

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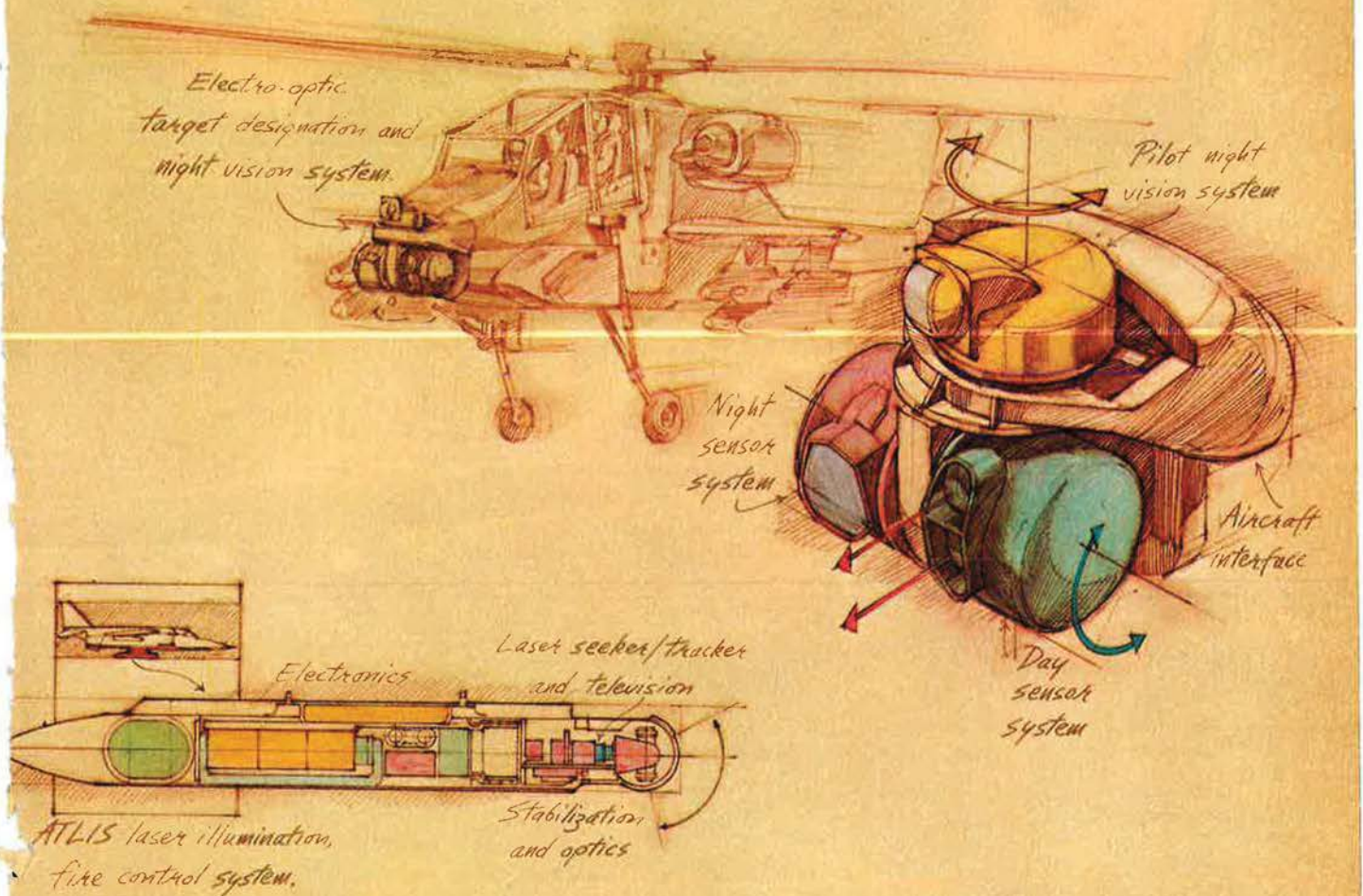

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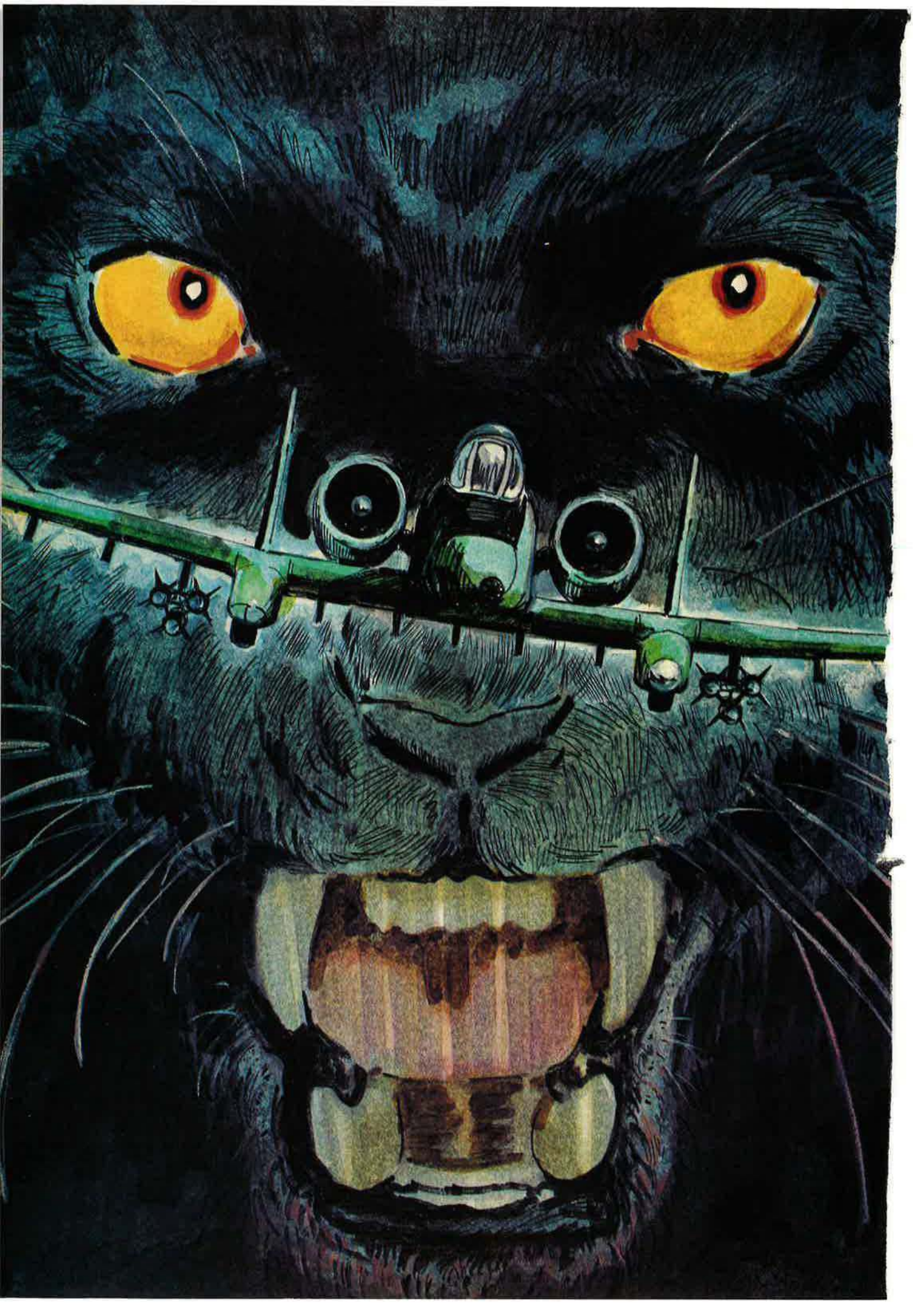

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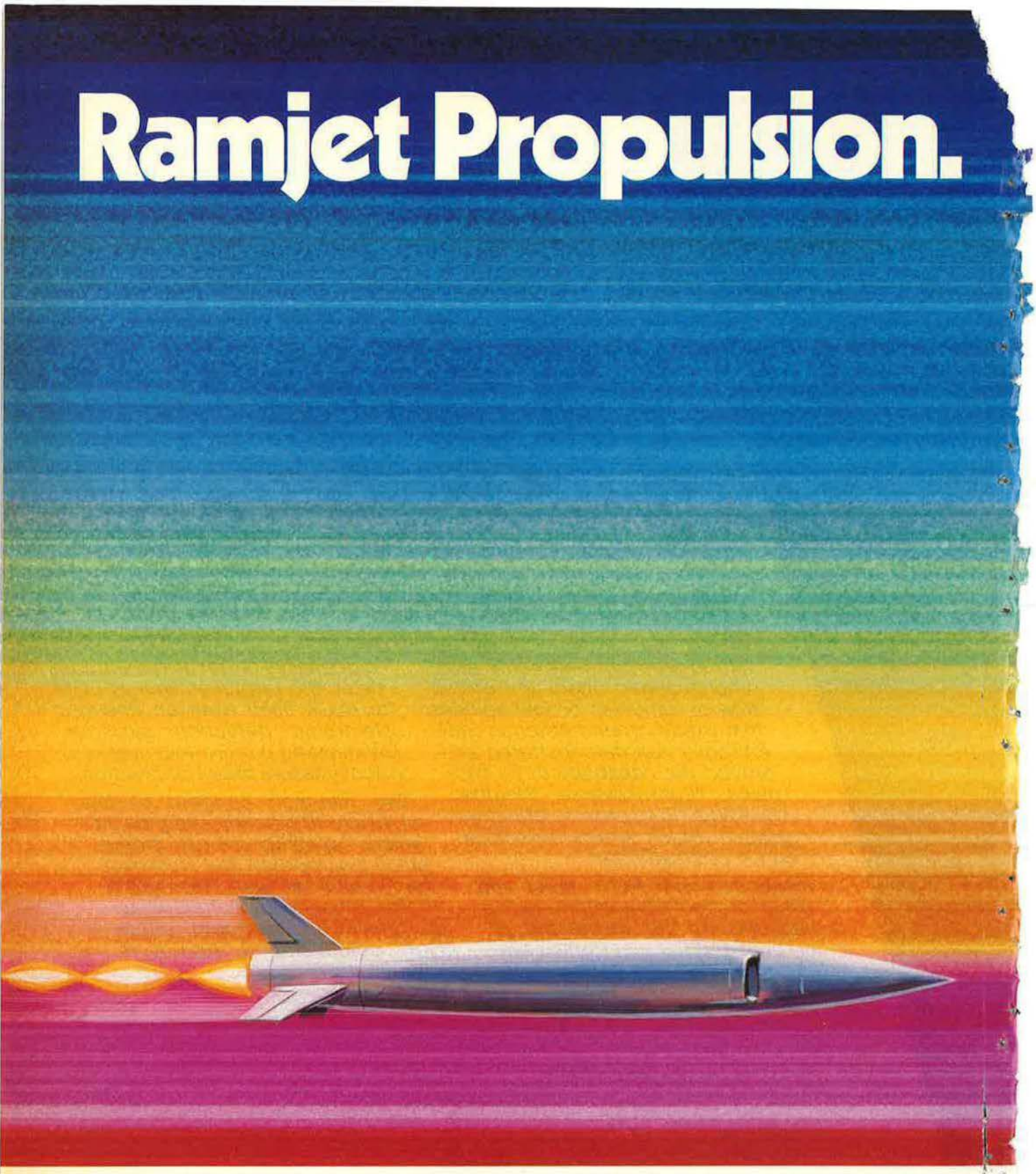

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In Focus...

BY EDGAR ULSAMER, SENIOR EDITOR

Washington, D. C., Jan. 31

The FY '81 Defense Budget

On January 28, the Administration submitted its FY '81 Defense budget request to a Congress deeply troubled by the USSR's invasion of Afghanistan, Soviet military maneuvers in Eastern Europe designed to intimidate Yugoslavia, and an alarming buildup of Soviet forces in the Transcaucasian region. Predictably, congressional reaction tended toward viewing the budget as a case of "too little, too late," and signaled the intention to vote additional funds in both the military investment and personnel accounts where the deficiencies of the Administration's budget request are perceived to be most pronounced.

The FY '81 request is for $158.7 billion Total Obligational Authority, an increase of $19.4 billion over the estimated FY '80 budget level. The Air Force budget for FY '81 (TOA) is $46.3 billion, a boost of $6.4 billion over the current year. After allowing for pay raises and price increases, the FY '81 Defense budget tops the FY '80 level by $8.1 billion; the corresponding figure for the Air Force is $3.2 billion.

In terms of percentages, the new, proposed budget provides for real growth of 5.4 percent over FY '80. Over the next five years, the funding levels proposed by the Administration provide for a constant growth rate of 4.6 percent, after accounting for inflation. The Air Force fares somewhat better, with a real growth rate for FY '81 over FY '80 of 7.5 percent and of 5.2 percent over the entire five-year period.

Measured in outlays, the Air Force also does better than DoD as a whole. Pegged at $40.9 billion in FY '81, USAF's outlays are up by 5.8 percent over the present figure. Defense-wide, the FY '81 outlays are estimated at $142.7 billion, a boost of 3.3 percent in real terms over FY '80.

The Administration formulated the FY '81 budget to assure four major objectives, according to Defense Secretary Harold Brown:

- That our strategic nuclear forces will be essentially equivalent to those of the Soviet Union.
- That the military balance between NATO and the Warsaw Pact will continue to deter the outbreak of war—conventional or nuclear—in Europe.
- That our ability to come quickly to the aid of friends and allies around the globe will be clear and impressive.
- That our Navy will continue to be the most powerful on the seas.

It is possible, if not irresistible, to question whether the new budget and the new Five-Year Defense Plan indeed meet some of these objectives.

In the strategic sector, there is no acceleration of the MX program, no provisions for either a new or interim manned strategic weapon system, no Trident II (D-5) SLBM development, no interceptor aircraft for air defense, no reliable warning system for Soviet strategic bombers launching sneak attacks on US bomber bases, and no comprehensive provision to upgrade strategic command control and communications. Especially conspicuous in the latter category is deferral of the E-4 Advanced Airborne Command Post program, a key element in survivable command and control. By delaying purchase of the last two aircraft—out of a total programmed buy of six—until FY '84 and FY '85 respectively, the cost of the program is increased and an essential capability impaired. Similarly, delays in the acquisition of survivable mobile ground stations for the Early Warning Satellite system, also referred to as DSP—and continued reliance on a central fixed ground terminal that is vulnerable to both sabotage and direct attack—provide no long-term cost savings but shortchange the strategic C^3 requirement in a major way.

Defense Secretary Harold Brown at the DoD Budget Briefing in January.

On the conventional side, congressional criticism of the FY '81 budget request centers on stretch-outs and deferrals in the acquisition of tactical aircraft, lack of initiatives to cope with retention and other military personnel problems, and inadequate funding of the Operations and Maintenance account, especially in the crucial areas of spares and war-readiness material such as air-to-air missiles—needed to support any prolonged conflict in Europe or elsewhere.

Additional criticism is being directed at the fact that Department of Energy outlays for atomic energy defense activities—set at $3.4 billion in FY '81 and carried on the books as a separate budget item—include no provision for producing enhanced radiation-reduced blast weapons, commonly referred to as neutron bombs.

It is ironic that in purely fiscal terms the Administration's budget request hikes almost all the areas under attack by its critics, and in most instances does so by substantial levels. Operations and Maintenance, for instance, is increased by 5.2 percent DoD-wide, or by 4.1 percent in the case of the Air Force, over the current levels. But congressional critics point to the fact that the existing backlogs require far greater catch-up investments than are requested.

In the military personnel sector, funding is increased in real terms by about $160 million DoD-wide, or by $55 million for the Air Force, to permit a rise in the active force end-strength by about 14,000 and in the Reserve strength by about 36,000. The budget assumes a 7.4 percent pay raise for military personnel and a 6.2 percent hike for civilian personnel on October 1, 1980.

The Air Force will continue to move toward equipping fully the twenty-six fighter/attack wings in the active force. New F-16s and A-10s, therefore, will be phased into the active force, and F-4Ds, A-7Ds, and F-105Gs correspondingly will be transferred to the Reserve components.

Air Force Reserve and Air National Guard fighter/attack aircraft force levels will be increased in the coming fiscal year by the equivalent of about

two and a half squadrons. Three F-105B/D/F squadrons will be retired, three A-37B squadrons will be converted to a forward air control support role, and one F-4C squadron will be reassigned to a strategic air defense role. Two Air Force Reserve squadrons will receive new A-10s in FY '81.

Strategic missile force levels will go down because of the mainly SALT II-related phasing out of the remaining ten Polaris SSBNs. (Five of the boats will be converted to attack submarines.) By the end of FY '81, the strategic-missile inventory will consist of 450 Minuteman IIs, 550 Minuteman IIIs, fifty-four Titan IIs, and 544 Poseidon/Trident I SLBMs. The latter category is down by more than 100 SLBMs from the current level.

The number of B-52 and FB-111 squadrons remains at twenty-five.

The Navy will have twelve deployable attack carriers with twelve active air wings throughout the next fiscal year. One additional—the thirteenth—aircraft carrier will be decommissioned to begin a two-and-a-half-year refurbishing and life-extension program. The Marine Corps remains stable, with three active and one Reserve air wings.

Twenty-four Army (sixteen active and eight Reserve) and four Marine (three active and one Reserve) divisions are continued in FY '81.

The FY '81 budget boosts the RDT&E account by 13.2 percent DoD-wide, and by a high 30.5 percent in the case of the Air Force, over the current level. The big-ticket item in the RDT&E sector is the MX program, funded at $1.5 billion.

Major RDT&E programs pertinent to air warfare are airfield attack and antiarmor munitions, the High-Speed Anti-Radiation Missile (HARM), the Advanced Medium-Range Air-to-Air missile, the GBU-15 TV data link glide bomb, and target acquisition/designation pods (ATLIS and LANTIRN).

Partisan claims about the size of new budget, not surprisingly, are on a collision course: The OMB's Associate Director for National Security and Foreign Affairs, Edward R. Jayne, told this column that the Administration's request for FY '81 is about $2 billion greater in real terms than the Ford Administration's FY '81 funding requirement, projected in its last Five-Year Defense Plan. For FY '82, the Carter Administration-proposed funding level tops that of the Ford Administration by more than $10 billion, according to the OMB executive. The Republican National Committee does not see things quite that way. Its contention is that cumulatively the Carter Administration will be spending $38 billion less in real terms in the intervening years than had been proposed by the Ford Administration four years ago.

The Need for a New Long-Range Combat Aircraft

Lt. Gen. Kelly H. Burke, Deputy Chief of Staff for Research, Development and Acquisition, recently spelled out why a long-range combat aircraft (LRCA) patterned after and eventually replacing the aging B-52 is needed and what it should be able to do: "It must be able to fly long distances, to carry large, diversified weapons loads, to provide self-contained capability for target acquisition and weapons delivery, to defend itself reasonably well against sophisticated air defenses, and, most importantly, to provide on-scene, human judgment throughout the mission."

Eschewing the term "penetrating bomber," General Burke stressed that the proposed LRCA should be an aircraft "that could perform many roles, including the very important and demanding role of the penetration of Soviet air defenses." He warned that the LRCA should not be confused with a new Cruise Missile Carrier Aircraft (CMCA). While the Air Force believes that the B-52s will serve as efficient and economical cruise missile carriers well into the 1990s, the importance of the air-launched cruise missile (ALCM) is such that "we need to allow for the possibility of unforeseen problems with the aging B-52s, as well as for the possibility that we might need a larger force of ALCMs than can be carried on those aircraft." For this reason, the Air Force advocates advanced development and flight demonstration of a new Cruise Missile Carrier Aircraft, separate and apart from the LRCA.

The case for the cruise missile itself, he said, is simple and compelling: "Large numbers of ALCMs will stress and dilute Soviet defenses, thus improving the overall penetration prospects of the mixed force." Also, the ALCM force can be expanded relatively quickly and economically if it becomes necessary to increase the nuclear-weapons arsenal. Modification of the B-52Gs to become the first cruise missile carriers is under way. The first squadron will become operational in December 1982.

Initially, General Burke explained, the ALCM-equipped B-52s will retain their penetration capability because they will be deployed "with only external cruise missile carriage, retaining the short-range attack missiles and gravity bombs now carried in the bomb bays. In the mid-'80s, we will complete the external modification of the 173 B-52Gs and will begin modifying them for internal cruise missile carriage as well. By 1990, the Gs will be completely converted, with each carrying twenty cruise missiles, eight internally and twelve externally, and will become an all-standoff force."

Additionally, modification of the ninety-six B-52Hs for cruise missile carriage is also under consideration to provide that option, beginning in 1984.

The case for the long-range combat aircraft, as outlined by General Burke, rests on a range of arms control as well as operational considerations. Assuming that SALT II definitions and limits prevail or are resurrected in one form or another in the future, a new LRCA would fill a void in terms of strategic weapons that are permissible under SALT II but don't count against the ceiling on MIRVed systems, meaning weapons that carry a number of warheads, such as certain ballistic missiles and cruise missile carrier aircraft. Under SALT II, General Burke explained, the US will reach the MIRV sublimit by 1985, but has no plans to reach the aggregate ceiling of 2,250 operational delivery vehicles that would be in effect from 1981 until 1986. "Within this limit of 2,250, both sides are restricted to a MIRV and ALCM carrier sublimit of 1,320. This leaves 930 'spaces' for non-MIRVed systems."

He added that by the mid-1980s the US will have only about 700 operational delivery vehicles to count against these 930 spaces, thus unduly lowering the total SALT-accountable inventory to about 2,000 strategic weapons. If the B-52Hs are converted to carry ALCMs, he explained, "our operational non-MIRVed delivery vehicle count would drop to about 600 and our overall operational delivery vehicle count to about 1,900."

The LRCA, General Burke asserted, appears to be the only new non-MIRVed delivery system that is consistent with arms-control objectives *and* cost-effective. Additionally, while an ALCM force—by itself—will continue to compel the Soviets to make massive investments in air defense, "the ALCM combined with an LRCA should extract much more," in General Burke's view.

Operational considerations that

F/A-18 Hornet aboard USS America (CV-66)

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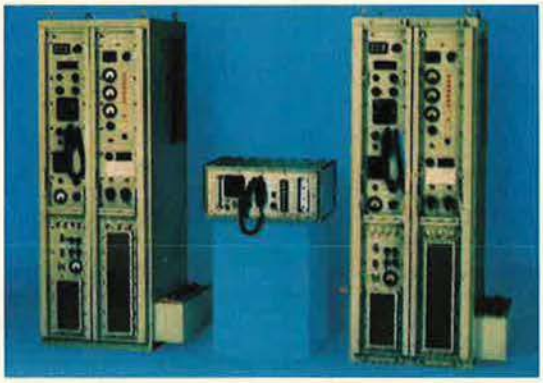

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make the case for the LRCA compelling include the system's unique capability to attack mobile or other targets whose location is not precisely known or to determine the need to restrike through on-the-scene target assessment.

The need for LRCA to meet diverse military requirements below the central strategic level is equally pronounced, according to General Burke: "For example, both ALCM and LRCA could be considered as a supplement to the theater nuclear forces. ALCM, however, would be useful only against fixed targets for which we already have reasonable coverage, whereas an LRCA would be effective against all objectives—particularly against the important mobile or imprecisely located targets that would be expected in theater conflict—targets for which we now have inadequate coverage."

Pointing out the LRCA's unsurpassed utility in conventional warfare, he said that in case of major conflict a force of this type "might provide our only means for adding mass firepower at the right spot and at the right time in Europe to blunt the massive armored spearhead attack, which is a key element of Soviet theater war-fighting doctrine. In addition, in a time when our interests are increasingly intertwined with the rest of the world [while simultaneously] our assured use of en route bases and ports is ever diminishing, an LRCA would provide the quickest, and, in some cases, the only means to mount a rapid show of force or, if required, to bring that force to bear—against any target, anywhere—within twenty-four hours and return to fight again."

SAC's Manned Penetrator Requirement

In testimony before the House Armed Services Committee in January, Gen. Richard H. Ellis, Commander in Chief of the Strategic Air Command and Director of Strategic Target Planning, JCS, asserted that "by today's measurements, an adverse strategic imbalance has developed and will continue for several years to come. This imbalance exists not only when our forces are in day-to-day alert posture (the worst case), but also when fully generated (the best case)."

General Ellis, in the unclassified portion of his testimony, implied that the ability of the nation's strategic forces to carry out the objectives set forth by the National Guidance was deficient. SAC, therefore, recommended a series of steps to improve the strategic posture after 1985:

"First, the MX, air-launched cruise missile, and Trident programs must not be allowed to slip further and, where possible and practical, they should be accelerated.

"Second, immediate steps are required to bring an improved or new manned strategic penetrator on line as soon as possible. . . . Such a bomber would not only help to correct the serious decline in US retaliatory capability between now and 1985, but also close the gap earlier than current programs in both the alert and generated case."

General Ellis listed two ways of approaching the latter challenge: stretching the FB-111 (designated the FB-111B/C model) or resurrecting the B-1. The most timely of these options, he told the committee, is modification of 155 FB-111As and F-111Ds with new engines, enlarged weapons capacity, and greatly increased range. Such a step, he said, would "allow us to recover our mid-1977 level of military damage expectancy in a generated condition by 1986."

The other alternative, start-up of the B-1 production program, could bring into the inventory by 1987 a force of 100 B-1s if go-ahead were given by October of this year, according to the CINC SAC's testimony. He explained that "because of the serious deficiencies we face in the early and mid-1980s, availability must be SAC's primary consideration in recommending a near-term solution; cost, of course, runs a close second. Based on a slightly earlier operational date and a favorable cost factor of approximately 2.5 to one for an equally capable force, SAC believes the better alternative is the FB-111B/C. The Air Force also recommends the stretched [FB-] 111 as the best near-term fix," General Ellis reported.

Air Force Secretary Hans Mark, in talking to a group of Pentagon reporters, also underscored the need for a new large combat aircraft that can bring human decision-making over the target in the strategic mission and double as a theater weapon. Three proposals are under consideration, he said. They are conversion of a wide-body commercial jetliner into a cruise missile carrier, a derivative of the B-1, and a stretched version of the FB-111. He expressed the hope that by the end of this year all relevant studies would be completed and backed up by "solid technical groundwork" to permit the next administration to make "some sort of commitment" to such a weapon system after the elections.

The B-1 derivative, he suggested, probably will involve a fixed, supercritical wing design to provide long ranges—about 8,000 miles without refueling—and high subsonic cruise speeds. Dr. Mark expressed doubt about the wisdom of providing this or any other large combat aircraft with the capability to penetrate supersonically on the deck. He suggested that the concept of low-level penetration may be outmoded because Soviet look-down-shoot-down technology might mature rapidly enough to rule out this penetration mode.

A possible solution to the penetration problem, according to Dr. Mark, is to return to high and fast penetration and to use high-energy laser weapons for self-defense. The laser system of the KC-135 ALL (Airborne Laser Laboratory) appears well suited for "shooting down" large numbers of SAMs or air-to-air missiles rapidly and reliably. Proof-testing of the ALL, he predicted, will take place late this year or early in 1981. It appears possible that such a laser will be able to shoot down twenty or thirty missiles fired against the carrier aircraft. A force of high-flying penetrators equipped with laser defense weapons, he suggested, thus would create an insoluble problem for the enemy's ground-based and airborne defenses. (Other sources warn, however, that such a carrier—in order to be effective—needs to operate at an altitude of 100,000 feet or higher. This requirement poses both technological and operational challenges, however.)

For the foreseeable future, Dr. Mark asserted, laser weapons, based on the ground or used by aircraft operating at medium and low altitudes, show little promise because of atmospheric interference with their beam propagation. Conversely, aircraft operating at extremely high altitudes are ideally suited to carry laser weapons. Because the laser directs its lethal energy with the speed of light, the problem of leading the target is eliminated, even if the target is a hypersonic missile. Dr. Mark said that laser self-defense weapons could be put on B-52s "for sure." The US enjoys a significant lead in laser-weapon technology over the Soviet Union, he reported. ■

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Aerospace World News, Views & Comments

By William P. Schlitz, ASSISTANT MANAGING EDITOR

Washington, D. C., Feb. 7

★ According to a recent analysis, West European nations are expected to appropriate $122.6 billion, or about $11.1 billion annually, during 1979–90 to fund military aircraft, missile, and space programs. A number of the programs are multinational cooperative ventures.

Funding first-line fighter aircraft is projected as the largest annual outlay, $4.3 billion, with tactical missiles next at $3.3 billion. The annual expenditure for jet trainer and light attack aircraft through the decade is forecast at $1.7 billion, and military helicopters $1 billion.

The report, prepared by international market researchers Frost & Sullivan, Inc., of New York and London, declares that "the European defense industry is seeking to expand its ability to develop and produce high-performance aircraft (jet fighters) through joint projects such as Panavia. This presents a potential market challenge to the US, particularly since Britain, West Germany, and Italy will seek an equitable arrangement in any transatlantic co-development of future fighter aircraft. . . .

"Major programs will be the Panavia Tornado, Mirage 2000 and 4000 and F.1/111, Dutch- and Belgian-assembled F-16, and the Swedish Viggen. The Harrier, Jaguar, and Super Etendard will be smaller production programs."

The British/German/Italian Tornado, a multirole fighter, has a projected production target of 800 for a total of $15.6 billion over nine years, according to the report. Great Britain is to receive 385 Tornadoes, West Germany 324, and Italy 100.

Current plans for the French-designed Mirage 2000 call for 588 aircraft costing $6.4 billion; the twin-engine Super Mirage 4000, 300 ($4.8 billion); the Dutch-Belgian-assembled F-16, 792 ($4.7 billion); the Viggen, 288 ($1.4 billion); and the Mirage F.1/111, 735 ($3.6 billion).

The prime tactical missiles expected to make up the second largest budgetary expenditure are Roland, MILAN, HOT, and Rapier.

The French/West German Roland is an all-weather, surface-to-air weapon designed for low-altitude defense (24,000 rounds at $1.2 billion). The portable antitank MILAN, also Franco/German, is scheduled for production of 216,000 rounds ($1.2 billion). Destined for use aboard German, French, and British helicopters and vehicles is the HOT antitank missile (at least 96,000 rounds; $960 million). Britain's Rapier, a low-level SAM with optically guided and blind-fire versions, is projected at 24,000 units ($1.2 billion). (USAF is contemplating the purchase of a limited number of Rapier for air base defense in the UK.)

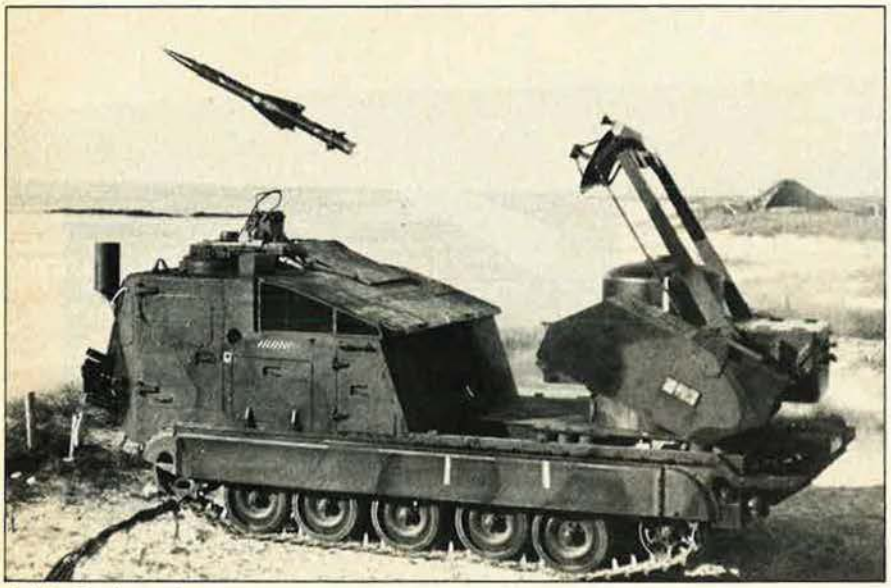
The major jet trainer and light attack aircraft will be the Alpha Jet, of which 1,980 ($10.8 billion) are to be built for France, Germany, Britain, and for export (the US is considering it). Other entries: British Hawk (792 aircraft worth $4.3 billion), including substantial exports; Italian Aermacchi MB-339 (600; $2.4 billion); French Magister and Spain's Casa C-101, each a total of 336 and estimated volume of $672 million.

Among military helicopters: the Aérospatiale Ecureiul, sold in the US as the Astar, 2,880 ($2.4 billion); the MBB-developed BO-105, 1,056 ($1.0 billion); Aérospatiale's Lynx and Puma (each $1.2 billion); and Britain's Westland WG-34 ($1.9 billion).

The European military/civil space program is forecast at about $7 billion funding for 1979–90. Major projects: the Ariane booster; a heavy three-stage launch vehicle; European Spacelab (receiving priority); and applications and communications satellites, among others.

★ Three European companies have formed a consortium "for the development, production, and marketing of guided weapons." Called Euromissile Dynamics Group (EMDG), the new firm represents the interests of British Aerospace, Aérospatiale of France, and Messerschmitt-Bölkow-Blohm of the German Federal Republic.

EMDG's statutes, subject to French law, were signed in Paris last December by M. Michel of Aérospatiale, Gunther Kuhlo of MBB, and G. R. Jefferson of British Aerospace Dynamics



British Rapier surface-to-air missile undergoes test firings in the Hebrides. According to a recent survey (see above), the UK plans to produce 24,000 of the low-level missiles at a cost of $1.2 billion over the next ten years.

Astronaut Anna Fisher, a mission specialist from NASA's Space Center in Houston, visited Eglin AFB, Fla., in January to check out the flight-control system of the F-15 Eagle. Dr. Fisher was taken aloft by Maj. Mart Bushnell of the 3246th Test Wing at the base.

Group. The three chief executives will form the supervisory board of the new company.

EMDG's first project will be research, development, production, and marketing of third generation antitank guided weapon systems, both medium and long range. Other weapon systems the three companies are working on jointly will also become the responsibility of EMDG, including the Antiship Euromissile (ASEM).

The British, French, and German governments are in the final stages of placing an initial feasibility study contract for medium and long-range antitank guided weapons.

★ The Administration has announced "that in certain cases the sale to foreign countries of intermediate fighter aircraft developed or modified for export (FX) would be in the national interest and would be consistent with the objectives of the US arms transfer policy."

An intermediate fighter is defined as one whose cost and performance characteristics would generally fall between the US's current export fighter, the F-5E built by Northrop Corp., and fighter aircraft now in production for US forces, such as the General Dynamics F-16.

In announcing the move, the State Department said: "The availability of FX aircraft will contribute to our national security objectives by permitting the US to respond positively to the security needs of our friends and allies when the F-5E is inadequate, and it will contribute to arms transfer restraint objectives by discouraging purchases of more sophisticated first-line aircraft from the US and other suppliers. . . . The FX, with its capabilities tailored largely toward a defensive role, is thus consistent [with the need] to provide countries with weapons best suited to their legitimate self-defense purposes."

The US government will not provide funding for development of an FX aircraft, and aircraft companies will assume all financial and market risks, the State Department added.

Previously, the Administration's

F-106 Pilot Tracks Doomed Cessna

"It was a sickening feeling to watch helplessly while a fellow aviator augered in," said Capt. Rick Zoerb, an F-106 pilot of the 48th Fighter Interceptor Squadron dispatched to track a wayward Cessna 441 early on January 11.

The Captain had scrambled from Langley AFB, Va., to relieve two F-4s from Seymour Johnson AFB, N. C., that had been tracking the ill-fated plane across much of North Carolina and Virginia.

The Cessna, bearing Louisiana State University head football coach Robert "Bo" Rein and pilot Lou Benscotter, had left Shreveport, La., for a short flight back to Baton Rouge. While en route, Benscotter radioed that he intended to deviate from the flight plan to escape hail and buffeting winds; that was the last voice contact with the plane.

Three hours later, Captain Zoerb witnessed the crash of the Cessna into dark Atlantic waters 150 nautical miles east of Norfolk, Va., more than 1,000 miles off course.

Captain Zoerb had made three passes within 300 feet of the plane and saw no signs of life, although the glow of instrument lights was evident. Numerous attempts to establish radio contact went unanswered. "The Cessna apparently was on automatic pilot, but if the people on board were conscious, they would have certainly made contact with me," he said emphatically. "They couldn't have missed my big, noisy jet with fire shooting from its tail." As he began his fourth pass, the twin-engine turboprop began to lose altitude.

The plane had been at about 40,500 feet, some 7,500 feet above its designed service ceiling. Safety officials suspect the two men became unconscious because of lack of oxygen or for some other reason. On automatic, the Cessna flew until it ran out of fuel. In its fall it leveled off briefly at about 26,000 feet before continuing its plunge into the Atlantic. Zoerb saw no explosion but in circling the area did spot what appeared to be a newly formed oil slick.

Low on fuel, Captain Zoerb was relieved by two Air National Guard F-106s from Atlantic City, N. J.

Later, the Coast Guard dispatched an HC-130 aircraft from Elizabeth City, N. C., to aid in the search being conducted by cutters USS *Tanney* from Norfolk and the USS *Cherokee* from Portsmouth, Va. The two-day search was unsuccessful and both Rein and Benscotter are presumed lost.

"It was the first time I had escorted a plane to its crash, and I hope it's the last," said Captain Zoerb.

—SrA. Joe Davis, 1st TFW/PA, Langley AFB, Va.

Aerospace World

policy related to arms sales abroad forbade the development of fighter aircraft solely for export.

★ Air Force recruiters are beating the bushes to sign up 76,000 enlistees in FY '80, including some 73,000 without prior military service and 2,800 prior-service men and women.

The total is 7,300 above FY '79's enlistment goal. To attract qualified people, a number of incentives are being offered.

For the first time, seventeen to twenty-seven-year-olds with forty-five semester or sixty-seven quarter hours of college credit may be enlisted as airmen first class (E-3) under the recently initiated "Stripes for College Experience" program. Twenty semester or thirty quarter hours would qualify for the rank of airman (E-2).

Prior-service enlistees are given a base of choice in their initial assignment, provided there is a slot available in the particular specialty. Additionally, qualified prior-service people are given the option of retraining into a needed Air Force skill.

Being offered to enlistees without prior service are such incentives as early promotion, guaranteed training, assignments abroad, and more. A composite list:

- Those who have completed a three-year JROTC program of any service while in high school or have received the Billy Mitchell Award (or higher) from CAP can enter as E-3s.
- Accelerated promotion to A1C (E-3): offered to six-year enlistees in authorized specialties following basic training.
- Accelerated promotion to Airman (E-2): offered to four-year enlistees in critical skills following basic (specialties under this option subject to short-notice change).
- Base of choice: open to enlistees in a variety of skills following technical training and guaranteed for a period of at least twelve months (list of bases in US also subject to change).
- Country of choice: open to enlistees in specific skills; the list of countries available changes monthly.
- Guaranteed retraining: Six-year enlistee security specialists (81130) and fuels specialists (63130) are eligible; guaranteed retraining after thirty-six months into any Air Force specialty for which qualified and Air Force need exists. If slot is not available at the time, enlistee may remain in current specialty, or may separate.

Dr. Edwin B. Stear, the Air Force's Chief Scientist, examines miniature electronic circuitry via microscope during a recent visit to Rome Air Development Center in New York.

★ With the successful conclusion of tests of a Fuel Savings Advisory System (FSAS) aboard an RC-135 reported on earlier, USAF has now expanded the program to include KC-135s, C-141s, and B-52s.

The computerized FSAS takes into account the environment, gross weight, and other aircraft characteristics, and projects optimal airspeeds, altitudes, and engine-pressure ratios to predict an optimum flight path for fuel savings. Studies indicate USAF could shave fuel use by three percent, representing savings of $40 million a year, if FSAS were in operation aboard the bomber and transport fleets.

Three variations of FSAS are being tested aboard KC-135s at Grissom AFB, Ind.; C-141s at Charleston AFB, S. C.; and B-52s at Ellsworth AFB, S. D., Grand Forks AFB, N. D., and K. I. Sawyer AFB, Mich. In the program, other aircraft not equipped with the devices will fly comparative missions to provide data to determine actual fuel savings.

Such systems have already been tried and proven by civil airlines in the

Tribute to Ed Mack Miller

A dinner honoring the late Ed Mack Miller, noted Denver pilot and author, will be held Friday, April 25, at the Fairmont Hotel in Denver. Cochairmen of the event are E. B. Jeppesen, board chairman of Jeppesen Sanderson, Inc., and Harry Combs, president of Gates Learjet, who said proceeds from the dinner will be applied toward the purchase of an airplane for Wings of Hope, Inc., in Miller's name.

The cochairmen said the gathering will feature a headline speaker and various forms of entertainment. Many local and nationally known persons in the fields of aviation and journalism are expected to attend, they said. Tickets will be priced at $100 per person and $1,000 per table of ten.

Ed Mack Miller, who died two years ago, was a retired United Airlines flight training instructor. During his career of some forty years in aviation, he trained more than 5,000 pilots as a military and commercial flight instructor. He was a member of the Colorado Air National Guard for many years.

Interspersed with his aviation duties, Miller authored five books and more than 1,800 articles and columns on a variety of subjects, mostly aviation. He won fourteen state and national writing awards and was an occasional contributor to AIR FORCE Magazine.

At the time of his death, Miller was deputy flight operations director for Wings of Hope, a St. Louis-based, nonprofit organization that provides air transportation and radio communication services to field medical personnel, missionaries, and others working in some of the world's most isolated areas.

For additional information concerning the dinner, contact Don Cannalte, 2155 First National Bank Bldg., 615 17th St., Denver, Colo. 80293; telephone: (303) 398-4535; or Dave Scherer, 3003 E. Third Ave., Suite 104, Denver, Colo. 80295; telephone: (303) 399-5322.

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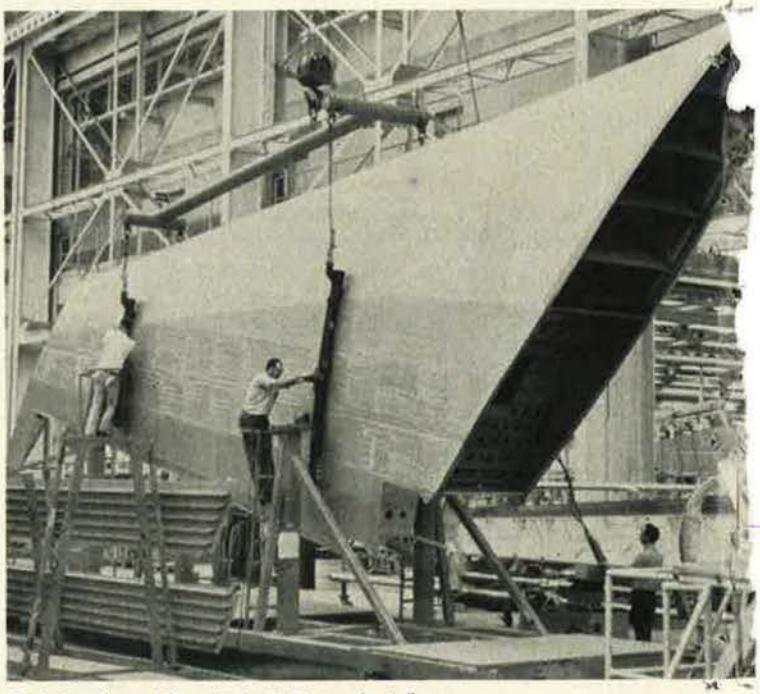

Fabrication of Boeing's 747 vertical fin.

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three configurations. The simplest allows the pilot to fly the aircraft according to parameters a computer has indicated on a cockpit screen. A more advanced system also has optimum speed and altitude registering on instruments for a closer tie-in. The most sophisticated system is directly linked to the aircraft's auto-throttle and autopilot and actually flys the aircraft.

The Air Force is tentatively planning to install 1,500 fuel advisory systems. The aircraft mentioned previously and the C-5 and C-130 transports altogether consume an average *1.7 billion* gallons annually.

★ Among the automotive options NASA is developing to economize on fuel use and align with environmental considerations are a combination electric/gasoline-powered car and an advanced gas turbine engine as an alternative to the internal-combustion engine in autos.

Under a thirty-month contract valued at about $7 million, GE of Schenectady, N. Y., will deliver two "hybrid" vehicles for test and evaluation. Visualized is a car equipped with both electric motor and gasoline engine that can operate separately or in parallel, with the electric motor primary at speeds under thirty mph (48.3 km) and in low-speed maneuvers as parking and reverse. The gasoline engine would be primary in highway driving. Batteries powering the electric motor would be recharged by the gasoline engine or overnight by ordinary house current. It is estimated that at 1,000-mile (1,609 km) monthly use, the vehicle could save forty-one percent of the gasoline and five percent of the total energy used by a comparable gas-powered car.

According to NASA, while the hybrid auto is experimental, it will be designed for mass production in the mid-1980s "at a consumer price of about $7,600 (1978 dollars)."

Under a $56 million contract, Garrett Corp.'s AiResearch Manufacturing Co., Phoenix, Ariz., will head up a team to develop the advanced gas turbine engine. The concept calls for a single-shaft gas turbine with a continuously variable transmission that can run on a variety of petroleum and nonpetroleum fuels. Built with new structural ceramic materials capable of withstanding high operating temperatures, it would be fuel efficient and low in pollution.

The turbine, to be developed and demonstrated by May of 1985, is aimed at having a fuel economy of thirty-six mpg when installed in a 1985 3,125-lb. production auto. Pollution emissions are to be below stringent federal standards being considered for the 1980s, NASA said.

NASA is overseeing the two programs for the US Department of Energy.

★ The Air Force has initiated full-scale engineering development of the High Altitude High Speed Target (HAHST), designed to simulate hostile aircraft and cruise missiles in tests of air-to-air and surface-to-air weapon systems.

HAHST, a subscale target, will have a controlled thrust rocket engine that can produce speeds over a range of Mach 1.2 to Mach 4 and altitudes up to 100,000 feet (30,480 m). Launched from an F-4 Phantom, highly maneuverable HAHST will be recoverable from air or a water landing and reused in subsequent flights.

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AAS/Angel Flight Conclave

At the recent Arnold Air Society/Angel Flight Area Conclave in Albany, N. Y., Air Force Secretary Dr. Hans Mark traced aerospace technology from the generation of the Wright brothers and Gen. H. H. Arnold to the second generation, of which the Secretary considers himself a part, and the third generation, represented by the AAS and Angel Flight members on today's campuses.

Participating in the conclave with the Secretary were Brig. Gen. H. J. Dalton, Air Force Director of Public Affairs; William G. Morley, Executive Administrator of Arnold Air Society and Angel Flight; Col. T. J. Philips, Air Force ROTC Commandant of the Northeast Area; and AFA Director Gerald V. Hasler.

The three-day conclave was hosted by the ASS Jack Newkirk Squadron at Rensselaer Polytechnic Institute. Members from more than twenty-one colleges and universities in Pennsylvania, New York, New Jersey, Connecticut, Massachusetts, New Hampshire, and Vermont attended.

Fourteen area conclaves are conducted by the society throughout the nation each year. The conclaves bring together Air Force ROTC members and their Angel Flight supporters and leaders in the Air Force and Department of Defense. Culminating the year's activity is a national conclave that will be held this year at Loew's Anatole Hotel, Dallas, Tex., April 6 to 10.

Air Force ROTC cadet and Arnold Air Society Maj. Warren E. Zelenski, the AAS Area A Conclave Chairman from Rensselaer Polytechnic Institute, is shown with guest of honor Secretary of the Air Force Hans M. Mark and AAS Col. Yvonne Pazdalski, Area A Commander from Pennsylvania State University.

Aerospace World

million-plus contract is Teledyne Ryan Aeronautical of San Diego, Calif. Subcontractors in the four-year development program are Brunswick Corp.'s Defense Division, Skokie, Ill., responsible for support equipment, testing, and recovery systems; and United Technologies Corp.'s Chemical Systems Division, Sunnyvale, Calif., for propulsion.

Teledyne will finalize the HAHST design to meet performance requirements and conduct and evaluate demonstration flights to assure that the target's configuration is ready for quantity production.

★ In January, USAF accepted delivery of the first of eighteen passive sensor systems that will allow tactical reconnaissance aircraft to quickly pinpoint such enemy electronic emitters as those located at AAA and SAM sites.

The other units of TEREC (for tactical electronic reconnaissance system and designated AN/ALQ-125) are to be produced during the year at Litton Industries' Amecom Division, College Park, Md.

The first TEREC unit will be used in a trial installation on an RF-4C aircraft, for which the system was specifically designed. Installation of the other units will take place at AFLC's Ogden Air Logistics Center, Hill AFB, Utah.

TEREC initial operational capability (IOC) is scheduled for the autumn of 1981.

★ Who says the one-man/one-aircraft spirit of Charles Lindbergh is dead?

In early January, Oregonian Alan Gerharter flew a single-prop Mooney 231 LR nonstop cross-country from San Francisco to Washington's National Airport in an astonishing eight hours, four minutes, and twenty-five seconds.

The record-shattering flight of 2,431 miles by the twenty-seven-year-old lightplane enthusiast was achieved following a careful evaluation of the nation's weather patterns and wind forecasts. The flight chopped three hours off the previous record.

A la Lindbergh, the flight was not a daredevil stunt, but a detailed operation including modification of the aircraft by Mr. Gerharter especially for the cross-country attempt. Unlike the Lone Eagle, the young pilot nibbled on granola bars and breathed oxygen from small tanks at 25,000 feet in the unpressurized aircraft. Midway in the flight, Mr. Gerharter lost his primary navigation radio and came the rest of the way using compass and clock, he said.

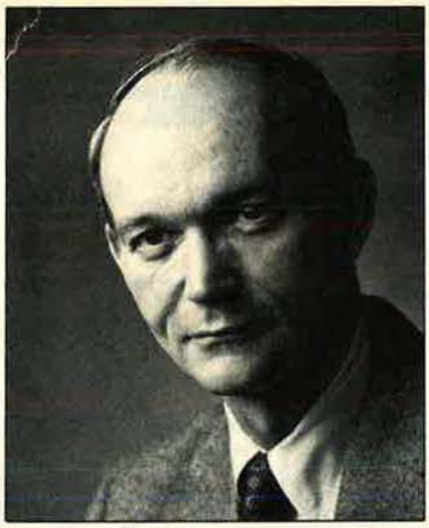
★ Sikorsky Aircraft has devised a new technique for the X-ray inspection of helicopter rotor blade spars that reduces inspection time while retaining quality control over the spars' manufacture. Sikorsky produces CH-53E helicopters for USAF as well as rotary-wing aircraft for the Army, Marines, and civil customers.

Called "in-motion radiographic inspection," the system moves an X-ray head along the weld seams of titanium rotor blade spars at speeds that Sikorsky says reduce nondestructive testing time by ninety-two percent. The spars are the backbone of helicopter rotor blades, the primary structural member. Each begins as a flat sheet of titanium that is rolled into a tube for welding. The new inspection technique is used to ensure integrity and then the spar is flattened into an elliptical shape to become part of a rotor blade.

The Sikorsky testing procedure threads X-ray film, a lead backing, and a pressure bladder into the hollow forty-foot-long spar tube. The pressure bladder is then inflated to hold the film and lead shield firmly against the spar wall while the in-motion X-ray system makes the exposure. The single-setup process eliminates the previous thirty-three setups necessary to radiograph a CH-53E spar, company officials said.

★ Women have made notable career progress in the aviation and space industry. Jobs that were once all male—jet and test pilots, astronauts, and air traffic controllers, for example—now are held by a growing number of women. Women are also firmly established as scientists, as engineers, as administrators, and as

Index to Advertisers



Michael Collins, Undersecretary of the Smithsonian Institution and a former Apollo-11 astronaut, has been named Vice President/Field Operations of Vought Corp., an LTV Corp. subsidiary.

technicians in the aerospace field.

At NASA's Johnson Space Center in Houston, Tex., on March 12 and 13 will be held a Women in Aerospace Symposium, featuring female representatives from the space, military, commercial, and general aviation fields assembled to examine their growing role in aerospace and what the future may hold.

The program is being sponsored jointly by the Aviation/Space Writers Association and the American Institute of Aeronautics and Astronautics with support from the Federal Women's Program at the Johnson Space Center.

★ **NEWS NOTES**—*Manoeuvre,* the **newest documentary by award-winning film-maker Frederick Wiseman,** focusing on a NATO military training exercise in West Germany, is to be televised nationally on Public Broadcasting Service stations the evening of Thursday, March 20. (Check local listings.)

USAF's **MSgt. Wayne L. Fisk,** a pararescueman currently stationed at Scott AFB, Ill., has been named by the US Jaycees as one of America's **Ten Outstanding Young Men for 1980.** Besides five combat tours in SEA that earned him two Silver Stars, Fisk was a member of the primary pararescue team for three Apollo missions. Cited for saving "dozens of lives," Fisk's expertise in combat rescue operations is sought by rescue specialists around the world (*see also p. 142*).

In missions ranging from **medevac of accident victims to locating downed aviators,** in 1979 USAF's Rescue Coordination Centers—at Scott AFB, Ill., and six abroad—**were credited with a total of 1,107 lives saved.** Active-duty Air Force units accounted for 486 saves; ANG, twenty-seven; AFRES, fifty-five; and CAP, fifty-three.

Died: Donald R. Jackson, a retired Deputy Assistant Secretary of the Air Force and an aerospace company consultant, of a heart ailment in Washington in January. The longtime AFA member was sixty-one.

Died: Brig. Gen. Martin F. "Mike" Scanlon, USAF (Ret.), in Washington, D. C., in January. A member of the Early Birds aviation pioneers and an AFA Charter Member, General Scanlon was ninety. ■

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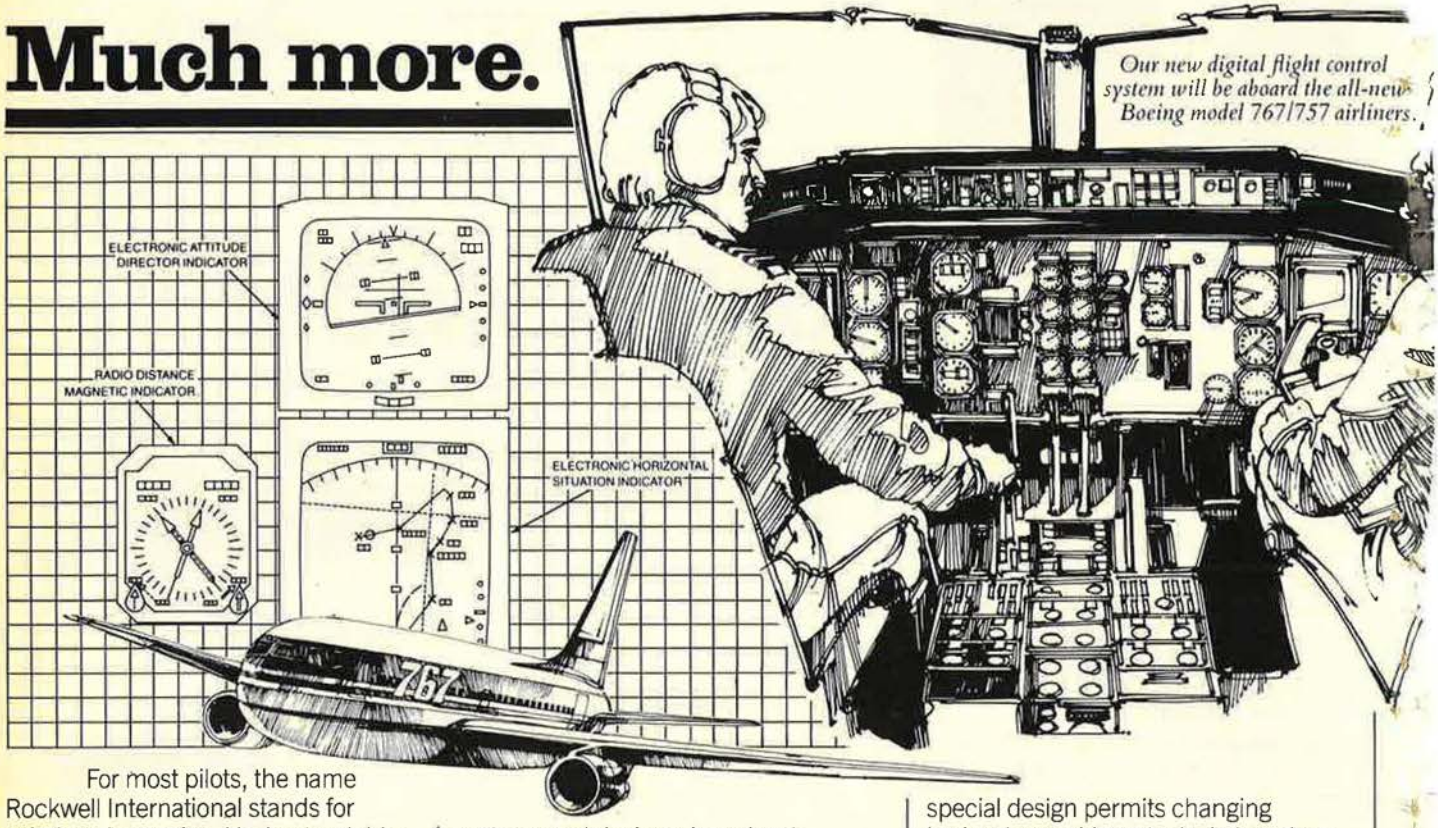


Our new digital flight control system will be aboard the all-new Boeing model 767/757 airliners.

For most pilots, the name Rockwell International stands for aviation electronics. Understandably so: Our Collins avionics systems are not only on board nearly every U.S.-built airliner, but on many general aviation and military aircraft as well. And our Collins Air Transport Division has a contract — scheduled to extend into the next century — to build avionics for all Boeing model 767/757 airliners. But avionics is only one of our strengths.

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

Electronics.

(Sales, fiscal 1979: $1.5 billion.)

Our position as one of the world's leading suppliers of avionics — communications, navigation and flight control equipment — reflects only one of our electronic businesses.

We also make microelectronic systems and devices, broadcast equipment, and missile guidance and control systems. And we manufacture and install telecommunications systems, including both digital and analog microwave systems, for businesses and governments worldwide.

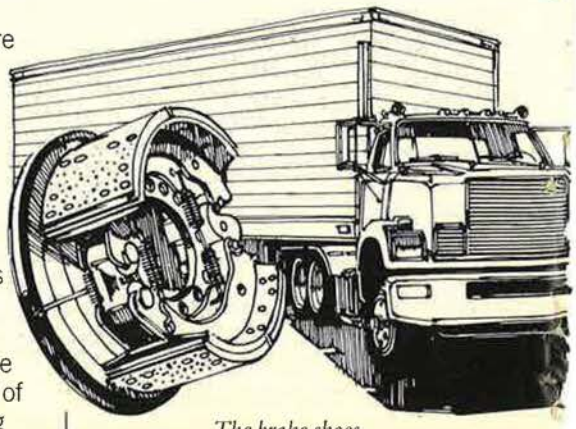
Automotive.

(Sales, fiscal 1979: $1.8 billion.)

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

Our Cam-Master® "Q"™ is the latest in the most widely used series of heavy-duty air brakes in the trucking industry. The "Q" is known as "the no-sweat, no-tools brake," because its special design permits changing brake shoes without tools, in less than two minutes.

Rockwell's extensive product line of mechanical, hydraulic, cam and wedge brakes is the result of over a half-century of design, engineering and manufacturing experience. Our most popular brake designs have been proved on and off the highway in literally billions of miles on the job.



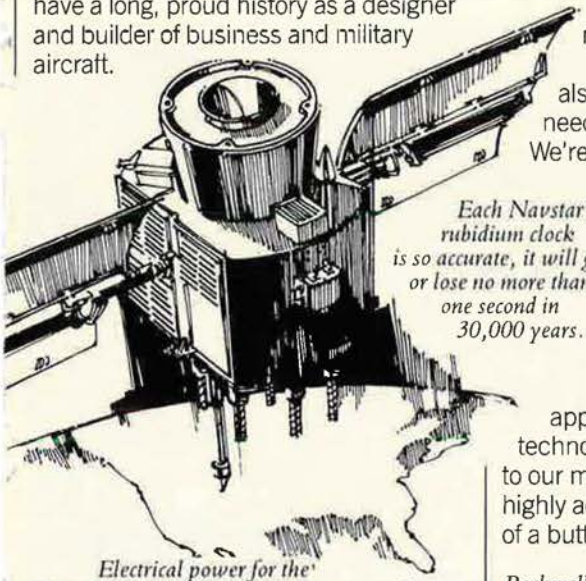
The brake shoes in this Cam-Master "Q" brake can be changed in less than two minutes – without using tools.

Also aboard is our new Electronic Flight Instrument System which displays attitude and navigation data.

Aerospace.

(Sales, fiscal 1979: $1.6 billion.)

We're prime contractor to NASA for its Space Shuttle orbiters and their main engines, and for integrating the entire Space Shuttle system including selected payloads. We build rocket engines for many other applications, too, and several types of Earth-orbiting satellites. We also have a long, proud history as a designer and builder of business and military aircraft.



Each Navstar's rubidium clock is so accurate, it will gain or lose no more than one second in 30,000 years.

Electrical power for the Navstar Global Positioning System satellites is provided by solar arrays which swivel to track and capture the sun's light.

Our current satellite projects include a new $86.1 million contract for "the brightest star in navigation history" — Navstar — designed and built by Rockwell for the U.S. Defense Department's Global Positioning System (GPS). When fully operational in the mid-1980s, GPS will utilize 24 Navstar satellites orbiting 11,000 miles above the Earth. Beaming a continuous stream of signals, the system will enable land, sea, air and space navigators to determine their positions to within 30 feet, their speed to within a fraction of a mile per hour — and the correct time to within a millionth of a second.

General Industries.

(Sales, fiscal 1979: $1.2 billion.)

Rockwell is one of the world's largest suppliers of high-technology valves for the energy market and for general industry. We also make printing presses, textile equipment, power tools, industrial sewing machines, and products for utilities, including over one-fourth of all the meters purchased by America's municipal water departments.

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

We also manufacture gas meters for industrial applications. And our new MPG Gas Flow Computer, an application of our microelectronics technology, can be connected directly to our meters to provide extensive, highly accurate flow data at the push of a button.

Rockwell's new digital gas flow computer.

Thousands of computations are performed in seconds — continuously calculated to ten places.

Over 15,500 scientists and engineers.

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

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

For more of the Rockwell story, please write us for a copy of our annual report. If you're an engineer interested in the kinds of challenges to be found in our company's areas of business, we would welcome the opportunity to consider your application to join us. Contact: Rockwell International, Dept. 815AF-24 600 Grant Street, Pittsburgh, PA 15219.

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Automotive/Aerospace Electronics/General Industries

Lifting off the runway, the U.S. Air Force F-16—one of the world's most advanced fighter aircraft. On its wingtips, the Sidewinder AIM-9L—the free world's most advanced short-range air-to-air missile. Together, they make up a first line airborne defense team. The AIM-9L is already operational on the F-15 and F-14 and is a firm requirement for the Navy/Marine Corps F-18.

As a prime industrial support contractor for Sidewinder AIM-9L, Raytheon is currently in full rate production on the missile's guidance and control section. We are also providing technical assistance to a European consortium—led by the Federal Republic of Germany—that will produce the AIM-9L for use by several NATO nations.

Designed by the Naval Weapons Center, this newest Sidewinder features substantial improvements in maneuverability, guidance, accuracy, and lethality. Its all-aspect IR capability provides for early acquisition and first-launch opportunity against targets in close air-to-air combat. Over 18,000 hours of MTBF and captive flight testing have demonstrated the system's design reliability.

Raytheon is working to insure that Sidewinder continues as the first line, short-range air-to-air missile well into the 1980's. Under U.S.

Sidewinder AIM-9L teams up with another

Navy and Air Force funding, we are helping to develop the next generation Sidewinder, the AIM-9M—a missile that will have further improved performance capabilities against targets operating in countermeasures and severe clutter environments.

For details on Sidewinder AIM-9L, please write on your letterhead to Raytheon Company, Government Marketing, 141 Spring Street, Lexington, Massachusetts 02173.

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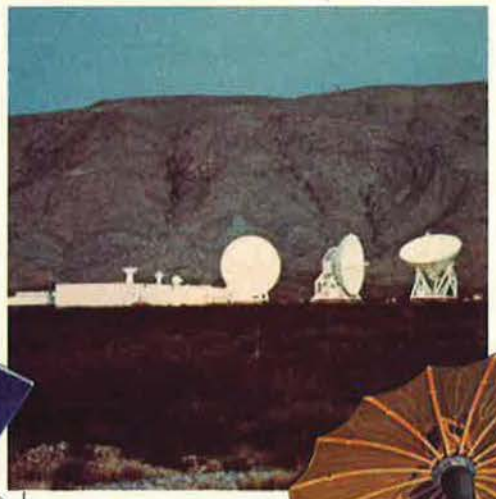

We're building it for Western Union to use for their own advanced Westar service and to lease to NASA for communication with other Earth-orbiting spacecraft and Shuttle. The NASA "bird-watching" role will eliminate the need for costly ground stations in politically risky areas.

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

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

TELECOMMUNICATIONS SATELLITE SYSTEMS FROM

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AIR FORCE MAGAZINE'S SIXTH ANNUAL

SOVIET AEROSPACE ALMANAC

This painting, "MIG-21s Over France," by Keith Ferris, shows three of six MiG-21MFs (Fishbed-Js) that accompanied the Commander in Chief of the Soviet Air Forces, Chief Marshal of Aviation Pavel S. Kutakhov, on his official visit to France in September 1971. The aircraft are on their approach for landing at Reims. The painting will be included in AIR FORCE Magazine's Keith Ferris Military Aviation Calendar for 1981.

© KEITH FERRIS 1980

SOVIET AEROSPACE ALMANAC

Measured by any standard, the Soviet military buildup proceeds at a rate and over a gamut that leaves no room to doubt that . . .

MOSCOW'S GOAL IS MILITARY SUPERIORITY

BY EDGAR ULSAMER, SENIOR EDITOR

IN TERMS of the "correlation of forces"—to borrow a Soviet euphemism employed to rationalize tilting the military balance in the USSR's favor—the dawning decade of the 1980s promises to become a period of unrelieved challenge for the West. As the Military Posture Statement of the Joint Chiefs of Staff so ominously put it: "Unmatched by Western efforts of similar magnitude, the continuing Soviet emphasis on military forces is gradually shifting the military balance against the United States and its allies in each of the major dimensions of capability: strategic, theater nuclear, and conventional. This sobering development tends to undermine the mutual confidence that supports the vitality and prosperity of the Free World and increases the prospect of overt political and military challenge to US and allied security."

In a statistical vein, Defense Secretary Harold Brown points out that "the amount that the United States is spending now on national defense is smaller in real terms than what we were spending in 1963. Real Soviet spending for defense, however, has nearly doubled in that time." In 1963, he said, the Soviets spent about sixty percent of what this country invested in defense; in 1980 the USSR allocated about half again as much to military matters as did this country.

Also, because of their political system, the Soviets are able to orient a disproportionately larger fraction of their expenditures to investments with direct payoff in terms of military capabilities, in the main research and development and acquisition of weapon systems, Dr. Brown recently told Congress. As a result, he warned, "not only has the military balance between us deteriorated, but the Soviets have now built a war machine far beyond any reasonable requirements for their defense and security, as we define defense and security." While Dr. Brown acknowledged that the Soviets may not subscribe to the US definition of these terms, he pointed out at the same time that "I don't consider that necessarily a reassuring fact."

That the Soviet leadership distorts the meaning of the term national security to make it compliant with Russian imperialism and hegemonism has been underscored by a series of aggressive acts undertaken by the Kremlin recently, of which the invasion of Afghanistan is the latest but hardly the last. The strident arrogance and studied brutality of these actions seem to have purged some of the West's most arrant disciples of détente and disarmament of their illusions about Moscow's benevolence and concern for human rights.

Whether this resurgence of Western apprehension over the nature of Soviet goals will suffice—and endure long enough—to impel the needed countermeasures—politically and militarily—remains to be seen. What is clear is that Soviet aggressiveness and brinkmanship are being backed and fostered by the emergence of Soviet military superiority, especially in the offensive strategic sector.

Last year in this space, this writer warned of impending Soviet testing of "open doors," from Afghanistan and Yemen to Iran. With the former well on the way to being "mongolized" into a Soviet dominion, and the latter two "finlandized" into a state of political impotence and subservience to Soviet hegemony, the stage now seems set for fresh rounds of Soviet interventionism.

This space last year also contained the warning that internal Soviet propaganda was inculcating the Russian people with the canon that in addition to defending the homeland they may be asked to go abroad to fight and die in furtherance of fraternal socialism. Soviet soldiers, by the numbers, seem to be doing both in Afghanistan at this time.

But the Kremlin's willingness to spill Russian blood for an offensive, interventionist cause should not be equated with the demise of its long-standing policy of using surrogate forces whenever and wherever possible. If anything, the Soviet variation on the US World War II maxim that it is more effective militarily to let the other fellow die for his country than to do so oneself—except that the US meant its enemies while the Soviet Union broadened the doctrine to include both its allies and foes—can be expected to be applied with increasing vigor and ferocity in the coming year.

As the 1980 Military Posture Statement points out, Soviet power projection into the Third World has been pursued, with mixed results, since the 1950s and involves military assistance as well as foreign military sales: "What is new to recent Soviet efforts are both the aggressiveness with which they have pursued these goals in the past few years and the expansion of the variety of means which they now use to further this aim. At the present time, Soviet advisors or military personnel can be found in thirty countries adhering formally to the Neutral and Non-Aligned (NNA) movement; Soviet arms are being sold to thirty-three NNA nations."

Not content with these means for subverting the Third World, the Soviets recently "have adopted more novel approaches to exercise influence. These include Soviet construction of local military facilities, long-term treaties of friendship and cooperation with NNA nations, and particularly the use of allies to act as surrogates for the Soviet Union. The leading example of this latter practice is Cuba, whose military forces and advisors, both military and civilian, now number in the thousands and are found in more than twenty countries," according to the Joint Chiefs of Staff.

Some US analysts see evidence that the USSR has drawn up a "rapid expansion" contingency plan in which Cuba, North Korea, Ethiopia, Aden, Yemen, Afghanistan, and especially Vietnam could play significant roles as Soviet surrogates. Focal points of Soviet interventionism, these experts predict, will be the Islamic nations as well as South and Central America. In the case of the Americas, the primary concern is a combination of long-festering socio-economic ills and a growing seepage of Marxism orchestrated by Cuba under Moscow's tutelage.

Western Pollyannas looking for silver linings in the gathering storm clouds are likely to be wrong on two counts. The comforting notion that the Soviet invasion of Afghanistan will turn into Moscow's Vietnam is neither logical nor factual, from geographic as well as politico-military viewpoints. Whether or not some pockets of resistance remain in the mountainous northern sphere of Afghanistan hardly is of moment to Soviet strategists. The fact that the more easily controllable southern portion of that country—because of mainly open terrain, inimical to guerrilla operations—is an ideal jumping-off point for overt or covert operations against Pakistan and Iran, no doubt is the only real criterion, from Moscow's point of view. Such an action, in the Soviet scheme of things, probably is merely a prelude for seizing control of the Persian Gulf and other oil-rich Islamic nations in the Middle East and along the Southern Mediterranean littoral.

A second theory that has currency among Western foreign policy students inclined to accord Moscow broad benefit of doubt posits that the Soviet Union stands on the threshold of major economic problems, a condition portrayed as the root cause for recent Soviet aggressiveness. A more critical examination of the facts suggests that this rationale won't wash and rather leads to the conclusion that the Soviet Union—among all industrialized nations in the world—is the most independent in the realm of natural, and especially energy, resources. Possibly even more decisive is the unquestionable ability of the Kremlin to "control" the internal political consequences of whatever shortages may prove unavoidable or simply acceptable. Hence the notion that current Soviet activities in the Middle East are germinated by a sense of "energy desperation" as well as the hope that Soviet bellicosity may be moderated by economic problems probably are as much of a chimera as the hope that the Soviet armed forces will—Vietnam-like—bog down in Afghanistan.

The trump card in the current phase of the Kremlin's drive toward world hegemony—and certainly in its sparring with the People's Republic of China—might well be Vietnam. Propped up by Soviet military and economic aid and motivated by the consuming compulsion to rule all of what was known once as Indochina, Vietnam is totally dependent on the USSR in a material sense and on perpetual aggression in a political, self-sustaining sense. In addition, the very real specter of the People's Republic of China just waiting to teach its fractious neighbor another "lesson," in the form of punitive expeditions, leaves Hanoi no option except docile adherence to Moscow's orders.

The explosive potential of the Southeast Asian situation, in the view of competent US analysts, is more ominous today than when this country was involved in

FIGURE 1: US AND SOVIET STRATEGIC FORCE LEVELS

	JANUARY 1, 1979		JANUARY 1, 1980	
	US	**USSR**	**US**	**USSR**
Offensive				
Operational ICBM Launchers[1,2]	1,054	1,398	1,054	1,398
Operational SLBM Launchers[1,3]	656	950	656	950
Long-Range Bombers (TAI)[4]				
Operational[5]	348	} 156	348	} 156
Others[6]	221		225	
Force Loadings[7] Weapons	9,200	5,000	9,200	6,000
Defensive[8]				
Air Defense				
Surveillance Radars	99	7,000	88	7,000
Interceptors (TAI)	327	2,500	327	2,500
SAM Launchers	0	10,000[9]	0	10,000[9]
ABM Defense Launchers	0	64	0	64

[1] Includes on-line missile launchers as well as those in construction, in overhaul, repair, conversion, and modernization.
[2] Does not include test and training launchers or 18 launchers of fractional orbital missiles at Tyuratam test range.
[3] Includes launchers on all nuclear-powered submarines and, for the Soviets, operational launchers for modern SLBMs on G-class diesel submarines.
[4] 1980 figures exclude, for the US: 66 FB-111s; for the USSR: more than 100 Backfires and less than 120 Bison tankers, Bear ASW aircraft, and Bear reconnaissance aircraft.
[5] Includes deployed, strike-configured aircraft only.
[6] Includes, for US: B-52s used for miscellaneous purposes and those in reserve, mothballs, or storage, and 4 B-1 prototypes; for the USSR: Bears and Bisons used for test, training, and R&D.
[7] Total force loadings reflect those independently targetable weapons associated with the total operational ICBMs, SLBMs, and long-range bombers.
[8] Excludes radars and launchers at test sites or outside North America.
[9] These launchers accommodate about 12,000 SAM interceptors. Some of the launchers have multiple rails.

(Source: Annual Defense Report, 1981)

Vietnam in the past decade. The momentum of Vietnam's conquest of Cambodia easily could spill over into Thailand—which is providing asylum to various Cambodian factions—and thus would almost automatically guarantee US reinvolvement in Southeast Asia on the larger scale of conflict between the Moscow-Hanoi axis and Peking. In a technical sense, under the Manila Pact, an attack on Thailand by the Soviet Union's Vietnamese surrogates would obligate this country to come to Bangkok's defense.

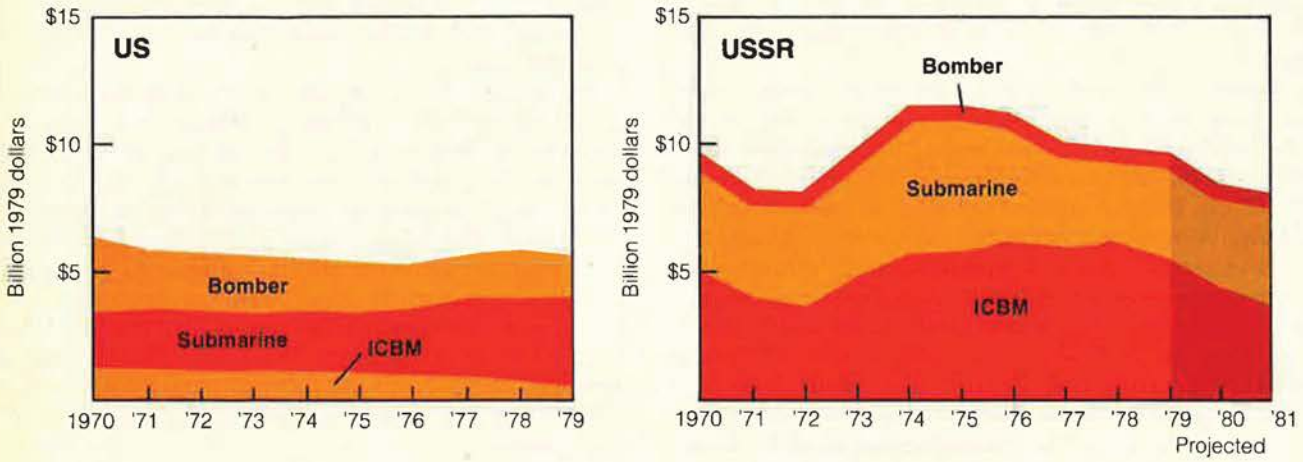
The Soviet presence in Vietnam, US defense experts point out with a sense of grave foreboding, is "substantial and growing." As the Military Posture Statement observes, "There has been unprecedented Soviet use of Vietnamese ports and airfields. Closer ties with Vietnam have allowed the Soviets to establish a presence in Southeast Asia, which enables them to exploit weaknesses and to diminish Chinese and Western influence."

The Changing Kremlin

If life expectancy statistics have any validity at all, over the next few years a massive turnover of Soviet Russia's superannuated leadership is bound to occur. Specific forecasts about who will succeed whom in the secretive, predatory world that is the Politburo probably

Figure 2: US and Soviet Forces for Intercontinental Attack

A comparison of US outlays with estimated dollar costs of Soviet activities if duplicated in the United States

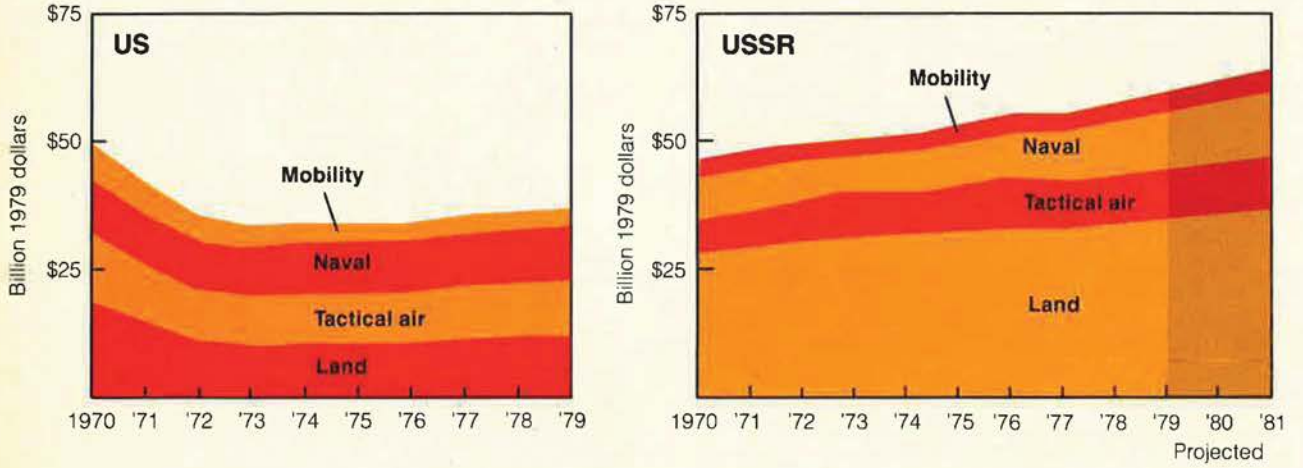


The intercontinental attack mission is defined according to the *US Defense Planning and Programming Categories* of November 1979, with minor adjustments made to attain comparability. Costs for pensions, nuclear materials for warheads, and RDT&E of both sides are excluded. The peripheral attack forces of the USSR are also excluded.

(Source: CIA)

Figure 3: US and Soviet General-Purpose Forces

A comparison of US outlays with estimated dollar costs of Soviet activities if duplicated in the United States



The general-purpose mission is defined according to the *US Defense Planning and Programming Categories* of November 1979, with minor adjustments made to attain comparability. Costs for pensions, nuclear materials for warheads, and RDT&E of both sides are excluded.

(Source: CIA)

are as perishable as they are risky. Many analysts, therefore, confine themselves to suggesting basic trends that are likely to emerge during the coming transition.

Two factors can be cited here. Future Soviet leaders—in order to gain sustained support within the infrastructure of the Communist Party—will have to win their spurs through new initiatives. The likelihood of these initiatives being in the category of politico-military aggression is far greater than conciliatory accommodation. Secondly, coming generations of Soviet leaders, in the view of some Sovietologists, will include people too young to have been traumatized by World War II in a personal sense, and unaware of the might of the US under full mobilization. The current leaders—almost without exception—had first-hand World War II experience and thus may be inclined to be chary of acts that deliberately provoke global war and thus could inflict on Russia the kind of agony that they remember so well. Lacking this restraining and sobering background, future leaders, according to this school of thought, are more likely to take risks and engage in politico-military gambles that could lead to nuclear war than did previous occupants of the Kremlin. The propensity for risk-taking probably will be compounded by the fact that for the first time in Soviet history, the USSR and its allies will be militarily superior to the rest of the world.

According to another theory that has currency among Sovietologists, an interim phase in the Soviet leadership transition may already be under way. The recent resumption of vintage Cold War behavior by the Soviets, according to this line of reasoning, is said to be the handiwork of Dmitriy F. Ustinov, Soviet Defense Minister and a voting member of the Politburo of the CPSU Central Committee. Although only two years younger than the ailing Brezhnev, the Defense Minister appears to be of robust health and eager to get in the lead position in the successorship race. There appears to be corroborating evidence to support the notion that Ustinov, to solidify his power base and enhance his reputation, is tightening his grip on the military and defense industry—that he directed prior to his appointment as defense minister—by rallying the nation behind such "patriotic defense efforts" as the invasion of Afghanistan. If this hypothesis indeed is correct, it would signal that Ustinov enjoys strong support among fellow members of the omnipotent Politburo and thus meets the fundamental prerequisite for eventual takeover from President Brezhnev.

At any rate, few Western analysts doubt that the execution of the Afghanistan operation—heavy-handed and devoid of political sophistication or even coordination—was the work of the Committee for State Security (KGB) and the military intelligence apparatus (GRU). Therefore, there is deep-rooted concern that a similarly crude power play may be in the offing in Yugoslavia at the time President Tito, for whatever reason, will leave office.

While the Western world had no excuse for overlooking the cynical blatancy of the invasion—and the even more egregious transparency of the ploy behind it—there is another, barely known aspect of the Afghanistan operation that illuminates the internal *modus operandi* of the Kremlin. A large number of Mongol troops, Pentagon sources report, were moved into the garrison towns of the troops assigned to carrying out the invasion. With the reputation of the Mongol troops being what it is among other Soviet ethnic groups there couldn't be any serious doubt that their presence "behind" the invading forces would assure among the latter a high degree of loyalty and a low desertion rate.

The Upward Tilt in Soviet Defense Spending

A CIA study entitled "Soviet and US Defense Activities 1970–1979: A Dollar Cost Comparison," released early this year, concludes that over the past decade the cumulative dollar costs of Soviet defense spending exceeded US outlays by nearly thirty percent and reflects an annual growth rate of about three percent when measured in dollars or between four and five percent when expressed in rubles. The Central Intelligence Agency further adduces, on the basis of weapon systems currently in production or development, continuing capital construction at major defense industry plants, and the increasing costs of modern weapons "that this long-term trend in Soviet defense activities will continue into the 1980s at about the same rate of growth." Last year, the CIA calculated, Soviet defense spending amounted to about $165 billion, or approximately fifty percent higher than the US total of $108 billion. *(For a differing analysis of Soviet defense spending see p. 100.)*

Soviet defense spending, measured in the 1970 buying power of the ruble and expressed as a function of GNP, averaged between eleven and twelve percent over the past decade, the report estimated. By comparison, US defense activities absorbed about eight percent of GNP in 1970, but dropped to five percent in 1979.

In the crucial area of investments, encompassing the procurement of weapons and equipment and the construction of facilities, the Soviets last year outspent this country by a staggering eighty percent, according to the CIA study.

The Soviets also outspent this country in terms of military operating costs. Soviet operating costs in 1979 "were thirty-five percent higher than comparable US outlays. Over the entire decade, they exceeded the US total by fifteen percent." The CIA study found similar trends in the equally crucial area of RDT&E (research, development, test, and evaluation) where Soviet expenditures were "both large and growing during the 1970–79 period. . . . The estimated dollar cost of Soviet RDT&E activities over the decade was approximately one and one half times the US outlays."

Soviet military manpower numbered about 4,300,000 in 1979, or more than twice the US total. This figure, the CIA explained, includes the five armed services of the Ministry of Defense and the Soviet Border Guards. Excluded are well over half a million men in the internal security forces of the Ministry of Internal Affairs and in railroad and construction units "because they do not fill what in the United States would be considered national security roles." Military manpower trends, according to the CIA, paralleled those for total costs in the two defense establishments. Estimated Soviet military manpower grew by more than 400,000 men between 1970 and 1979. The largest increase—200,000 men—occurred in the Ground Forces. In contrast, the level of US military manpower has fallen every year since the peak of the

Vietnam buildup—from 3,100,000 men in 1970 to 2,100,000 in 1979.

In comparing Soviet and US spending in specific mission areas, the CIA found that in the case of strategic forces—comprised of intercontinental attack, strategic defense, strategic control and surveillance, and Soviet peripheral attack forces (for which the US has no counterpart)—the "estimated dollar costs of the Soviet forces were three times the comparable US outlays" over the past decade.

Within the subcategory of intercontinental attack forces, the CIA report predicted that "as the Soviets complete deployment of their fourth-generation ICBMs [the SS-17, SS-18, and SS-19] the estimated dollar cost . . . will dip . . . before rising sharply in the mid-1980s, when the Soviets are expected to deploy the new ICBM [fifth-generation] systems now in development."

Estimated costs of Soviet forces for strategic defense accounted for roughly half of the dollar costs of the Soviet strategic mission during the decade covered by the report. US outlays for strategic defense, on the other hand, accounted for only fifteen percent of this country's spending on strategic forces. The dollar cost of Soviet strategic defense activities during the ten-year period increased from five times US outlays in 1970 to twenty-five times US outlays last year. The CIA forecast that "Soviet strategic defense activities will probably continue to grow in the early 1980s as the Soviets introduce a new generation of interceptor aircraft and surface-to-air missiles, in an attempt to further improve their air defenses."

In the field of general-purpose forces, which encompass all land, tactical air, naval, and mobility forces, the Soviets outspent the US by about fifty-five percent, according to the CIA.

US outlays for tactical air forces—including aircraft carriers and associated aircraft—fell from 1970 to 1974 but have grown since then. The dollar cost of the Soviet forces with a tactical air mission similarly showed a cyclical, but upward, growth pattern. By the end of the decade, US outlays exceeded estimated Soviet dollar costs for tactical air forces by twenty percent. The CIA study pointed out, however, that if the US carriers and their associated aircraft are not included, "estimated Soviet dollar costs would be thirty-five percent higher than US outlays in 1979 and forty-five percent higher for the period as a whole."

In the field of general-purpose naval forces, the Soviet level of effort exceeded that of the United States last year by about fifteen percent, if attack and multipurpose carriers and their associated aircraft are excluded. If these forces are counted, however, the picture changes, according to the CIA report, with US outlays then topping the Soviets' by about twenty percent last year, and by fifty percent over the past decade.

A marked turnaround occurred in support forces, which are defined as including training, maintenance, headquarters, most logistics functions, and military space programs. Over the decade, US outlays on support activities exceeded the estimated Soviet total by approximately twenty percent. While the US level was two-thirds higher than the estimated Soviet level in 1970, the two were equal at the end of the decade. The apparent reason for this growth in Soviet support costs is the need to match the size of the support forces to the growth in other mission areas.

In terms of geographic focus, the CIA found, the vast majority of Soviet defense spending is keyed to East-West confrontations but "between ten and fifteen percent of the estimated dollar cost of Soviet defense ac-

Figure 4: US/NATO and Soviet Land-Based Long-Range Theater Nuclear Forces[a]

	Missile Range/ Aircraft Radius (km)	Strike Inventory 1980		Strike Inventory Mid-1980s (Estimated)		Weapons per System[c]
		Total Worldwide	European Theater[b]	Total Worldwide	European Theater[b]	
Soviet						
SS-20 Launchers	4,400	100	60	250–300	[e]	3
Backfire Bombers[d]	4,200	60	40	100–150	[e]	4
Older Missile Launchers	1,900–4,100	450	450	50–?[f]	50–?[f]	1
Older Bombers[d]	2,800–3,100	450	350	350	300	2
NATO						
UK Vulcan Bombers	2,000	56	56	0	0	?
US F-111 DCA	1,800	365	170	254	166	2
US GLCM[g]	2,000	0	0	464	464	1
US Pershing II[g]	1,000	0	0	108	108	1

[a] Systems with missile ranges or unrefueled combat radii such that (a) Soviet systems can unambiguously hit targets in Western Europe from bases in the Soviet Union, and (b) NATO systems can hit the Soviet Union unambiguously from bases in Western Europe. Aircraft radii are illustrative for European missions.
[b] Inventory normally based in Europe or within striking range of Europe.
[c] Illustrative weapons load; actual load would vary according to mission and type of weapon (ASM or bombs).
[d] Strike-configured bombers and ASM carriers only. Does not include bombers or ASM-carriers assigned to Soviet Naval Aviation.
[e] Two-thirds of total worldwide inventory could be deployed against NATO.
[f] The decline in the forces shown is based upon current trends. It is possible, however, that the Soviets may wish to retain a larger portion of the current force, perhaps for use as a bargaining chip in future arms-control negotiations.
[g] Assumes completion of NATO-approved program.

(Source: Annual Defense Report, FY '81)

tivities (excluding RDT&E) is for units that we believe have primary missions against China. Some of these forces also could be used to meet other contingencies."

The Military Posture Statement amplifies the CIA's statistics by pointing out that "as a consequence of the extended period of greater relative expenditures for investment by the Soviet Union, the Soviets now possess an accumulated military capital stock some 25–50 percent greater than that of the United States. That differential is projected to increase to the 40–60 percent range in favor of the Soviets by the mid-1980s. . . . The Soviets have not only outspent the United States in the past decade, but, more significantly, they have outinvested the United States. . . . The momentum of the Soviet military programs resulting from the long period of high emphasis on military investment will insure the continuation of present trends in the military balance, at least in the intermediate future, regardless of the programmatic and budgetary decisions which the United States takes now. In other words, even a sharp reversal of the trend of declining American defense spending cannot be expected to close the gap in military capital for several years to come."

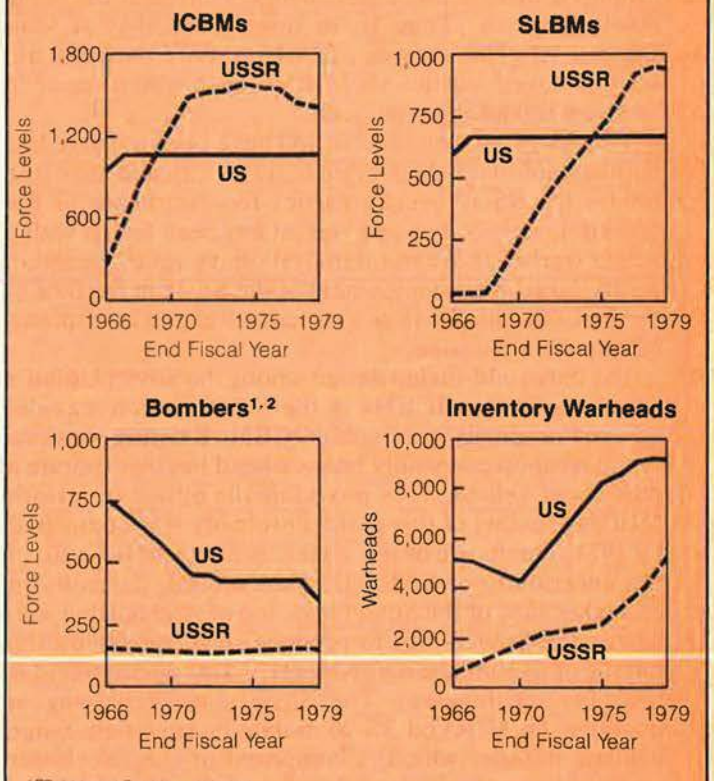
Soviet Strategic Forces

The high-minded notion held by Western analysts that one's offensive strategic forces should be designed to deter nuclear war rather than win it has no adherents in the Politburo and the Soviet General Staff. Moscow never subscribed to this concept, probably in part because deterrence decoupled from the will and ability to prevail in nuclear war denotes both poor reasoning and inadequate forces. Soviet strategy and force structure are anchored in the axiom that victory in nuclear war is as attainable and essential as in conventional war. The central requirement, therefore, is to be able to fight a protracted war in a manner that assures the Soviet Union will emerge as the strongest surviving force on earth and with sufficient residual capability to recover fully within a reasonable period.

The Soviet strategic forces, now in place or under development, are tailored to these criteria. The central element of the USSR's offensive strategic forces is a triad of ICBMs, SLBMs, and bombers, which at present can launch more than 5,000 independently targeted weapons against the United States. The bulk of this capability is provided by the ICBMs, numbering about 1,400 launchers, plus an uncertain but probably high number of spare missiles. This Soviet ICBM force has declined in terms of launchers since 1975, as 209 older SS-7 and SS-8 launchers were dismantled in accordance with the terms of SALT I. But the numerical decline was more than offset by modernization of this force. The vastly more capable fourth-generation of ICBMs, made up of the SS-16, SS-17, SS-18, and SS-19, is replacing the older family of weapons at the rate of about 150 launchers annually.

The new generation of Soviet ICBMs uses advanced guidance systems including digital computers, post-boost vehicles, and, except for the SS-16, multiple independently targetable reentry vehicles (MIRVs). Both silos and command and control facilities are hardened to a far greater extent than is the case with third-generation

Figure 5: Changes in US/USSR Strategic Levels



[1] FB-111 and Backfire excluded.
[2] Excludes approximately 220 B-52s in deep storage.

(Source: Annual Defense Report, FY '81)

weapons. Basic characteristics of the fourth-generation ICBMs are their high accuracy—in some instances better than the best existing US systems—their great throw-weight, their ability to accommodate a large number of MIRVed warheads, and a high quick reaction alert rate. Conversion from third- to fourth-generation ICBMs will net the Soviets an addition of some 5,500 warheads and accuracy gains that bring circular errors probable (CEPs) from the one-half nautical mile level to as low as 500 feet.

The largest ICBM in the world is the SS-18, with twice the throw-weight of Titan and six times that of Minuteman III. This weapon is a replacement for the 308 older SS-9s. More than 210 SS-18s in four different versions have been deployed so far. The newest version, known as the Mod 4, probably can carry fourteen warheads, some with a yield of about 600 kilotons and others with a yield of about one megaton. Two versions of this weapon, Mods one and three, have single warheads with yields in the eighteen to twenty-five megaton range. The SS-18 is a cold-launched ICBM; the missile lifts out of its silo with the help of a gas generator before the main booster engines ignite. This technique makes it possible to increase missile size in relation to available silo volume by reducing "rattle space" and thus increasing the lift capability of the missile. Further, the cold-launch technique does far less damage to the silo than hot launch, and, concomitantly, makes it possible to "reload" such a silo within a relatively short period. This reload feature is important also because US surveillance systems can accurately count launchers, but cannot

count concealed missiles used to reload the launch silos.

The SS-19, approximately the same size as USAF's proposed MX, is a hot-launched system with the same throw-weight as Titan II, or three times that of Minuteman III. This weapon, of which more than 200 are now deployed, carries six MIRVs, each with a warhead of about 600 kilotons in yield.

The SS-17, of which about 150 have been deployed, is another cold-launched system. Less capable than the SS-19, the SS-17 usually carries four warheads of the 600-kiloton class, but one variant has been tested with a single warhead. Western analysts have no explanation for the large-scale deployment of the SS-17 in the face of the fact that the SS-19 is a superior weapon of approximately the same size.

The only solid-fueled design among the Soviet Union's fourth-generation ICBMs is the SS-16, which was developed originally as a mobile ICBM. Existing versions of the weapon carry only one warhead but incorporate a post-boost vehicle, thus providing the option to retrofit MIRVs. Testing of this system probably was completed by 1974. The future of the system is not clear because of the uncertainty of SALT II. That accord, currently in limbo because of the Soviet invasion of Afghanistan, obligates the Soviets not to produce, test, or deploy the missile or its "unique components." This commitment is probably meaningless. The Soviets are deploying in quantity the MIRVed SS-20 mobile intermediate-range ballistic missile, which is composed of the two lower stages of the three-stage SS-16 and is not subject to SALT considerations. Because the cannisters in which both missiles are transported can be made to look alike, the US would not be able to distinguish between them, thus preventing verification.

In addition, the Soviets also are developing the SS-21 MRBM (medium-range ballistic missile), which uses the two upper stages of the SS-16. SALT II prohibition against producing, testing, or deploying either the fully assembled SS-16 or its unique components thus takes on a farcical character. The SS-16, therefore, provides the USSR with the option to deploy rapidly and clandestinely a survivable, mobile ICBM years ahead of the US. As the Joint Chiefs point out, the Soviets "probably will continue mobile ICBM testing" by means of the SS-16.

The prospects for overcoming the towering Soviet lead in ICBM capabilities, even over the longer term, are dim. As the Joint Chiefs concede in their Posture Statement, "with 308 modern large ballistic missile boosters of the SS-18 class and other relatively large SS-17 and SS-19 boosters, the Soviets are expected to maintain an advantage even after the planned MX deployment by the United States."

Submarine-Launched Ballistic Missiles

So far the Soviets have held their inventory of SLBMs that come under the purview of SALT I to 950 launchers. This figure is roughly half again as large as the US inventory. (These launchers are carried on sixty-two modern, SALT-accountable Yankee and Delta SSBN ballistic-missile-equipped submarines). There are, however, seventy-five additional launchers on twenty-five nuclear- and diesel-powered (SSB) ballistic missile submarines of the Hotel and Golf class which, as theater nuclear weapons, are not counted under SALT. (It is the latter type, stationed occasionally at Cienfuegos in Cuba, that could be a major threat to the US Navy's SSBNs homeported at Charleston, S. C.)

In addition to the sixty-two modern SSBNs currently in the operational order of battle, according to the Joint Chiefs, more Delta III units are believed to be under construction. The Soviets also are thought to be building the lead units of a new class of SSBN, the Typhoon, that is larger than the Delta III. The missile for this new SSBN is expected to be larger than the newest operational Soviet SLBM, the 4,050-nautical-mile-range MIRVed SS-N-18. The new missile for the Typhoon SSBN is expected to be MIRVed but will use solid rather than liquid propellants.

The bulk of currently deployed SLBMs—SS-N-18s and the 4,800-nautical-mile-range SS-N-8s—have sufficient range to be launched from Soviet homeports against US targets. That capability is important because Soviet submarines have to pass through "chokepoints," such as the Greenland-Iceland-UK (GIUK) gap, the Baltic Sea, the Black Sea, and the Seas of Japan—all patrolled by US and NATO ASW forces—once they leave their homeports of Murmansk and Vladivostok. Subs stationed at the Siberian port of Petropavlovsk do have direct access to the ocean but must transit areas monitored by US Navy acoustic arrays and thus easily could fall prey to antisubmarine warfare weapons. The new

Figure 6: Soviet Fourth-Generation ICBMs

Missile	SS-16	SS-17		SS-18			SS-19	
Missiles Deployed	*	About 150		More than 200			More than 200	
		Mod		Mod			Mod	
		1	2	1	2	3	1	2
Warheads	1	4	1	1	8/10	1	6	1
Maximum Range (km)**	9,200	10,000	11,000	12,000	11,000	16,000	9,600	10,100
Launch Mode	Hot	Cold	Cold	Cold	Cold	Cold	Hot	Hot
Fuel	Solid	Liquid	Liquid	Liquid	Liquid	Liquid	Liquid	Liquid

* None deployed.
**Exclusive of range imparted by post-boost vehicle.

(Source: Military Posture Statement, FY 81)

Backfire, the only Soviet Long-Range Aviation aircraft in production, has intercontinental strike capabilities with gravity bombs or AS-4 Kitchen air-to-surface missiles.

Soviet SLBMs have advantages in range and payload over the US Trident (C-4) missile that is about to enter the inventory. Thus, the Soviet SLBM threat to the US will continue to increase, according to the Joint Chiefs of Staff.

Yet another dimension of the Soviet submarine threat is the fact that a number of Soviet technologies that are being tested in operational exercises are so advanced that US analysts do not understand the fundamentals involved. Also, the latest version of the Soviet Alpha submarine, thought to be a prototype for ASW attack boats but perhaps also SSBNs, uses an advanced titanium hull and sophisticated hydrodynamics and controls that enable it to travel much faster and dive deeper than any existing or proposed US submarine. US intelligence experts, therefore, fear that the Soviets may be on the threshold of overtaking the US lead in ASW and SSBN technology.

Soviet Long-Range Aviation (LRA)

Long-Range Aviation's inventory is comprised of more than 800 aircraft assigned to three major strike commands based throughout the Soviet Union, according to the Military Posture Statement. About seventy-five percent of the force is arrayed against NATO while the remainder is positioned along the Sino-Soviet border.

About 600 long- and intermediate-range bomber and/or missile carriers make up this strike force. The long-range force includes some 100 Bear turboprop bombers and fifty-six Bison turbojet bombers. The SALT-accountable total is 156 aircraft. In addition, there are more than fifty variable-wing Backfire bombers assigned to LRA, and an equal number deployed with Naval Aviation. Backfire production continues at the rate of about two and a half aircraft per month. Even though exempted from SALT II considerations, Backfire's range is comparable to that of Bison. While estimates of maximum range differ, Backfire clearly is capable of reaching targets in the US and recovering in other countries without refueling. With refueling, the aircraft could cover virtually the entire US on two-way, high-altitude, subsonic missions from Soviet Arctic bases. According to the best USAF estimates, the unrefueled combat radius of Backfire is about 2,950 nm while the refueled range is estimated at 5,600 nm. Further, most Backfire models observed by Western intelligence include a refueling probe. When operating in conjunction with aerial tankers, such as the some fifty Bisons available for tanker use or a new tanker derivative of the Il-76 Candid jet transport, considerable range extension is available for Backfire.

The intermediate-range force of the LRA includes about 400 Badger and Blinder aircraft that are supported by reconnaissance, ECM/ELINT Badger, and tanker aircraft.

The primary air threat to the continental US is from the Bear/Bison force. The Bear, a four-engine turboprop, forms the largest element of the long-range bomber force. More than half of the Bears, according to the 1980 Posture Statement, are equipped with the AS-3 Kangaroo air-to-surface missile. This missile carries a warhead of about five megatons to a range of about 650 kilometers. Backfire, at the same time, is equipped with the AS-4 Kitchen, which carries a three- to four-megaton warhead to a distance of about 270 nm. In addition, there is some evidence that a cruise missile capable of being launched at supersonic speeds and with a range of up to 1,000 nm has been developed for eventual use by Backfire.

Over the past few years, the Soviets have alluded to the development of a new long-range bomber with characteristics similar to the B-1. There is circumstantial evidence that several prototypes are being developed and that one or more of them could be derivatives of the Tu-144 Soviet SST. Since flight testing of these aircraft has not begun, US intelligence has no specific knowledge of the performance or operating mode of the aircraft. The Military Posture Statement predicts that deployment of the new strategic bomber is likely by 1988 as is entry into the Soviet strategic arsenal of "a wide-body cruise missile carrier."

Assuming that the Soviets will abide by the terms of the SALT II accord—even though ratification of the accord is in question—the inventory of Soviet offensive strategic weapons by 1985 probably will consist of 2,250 strategic delivery vehicles of roughly this mix:

- 308 SS-18 type "heavy MIRVed" missiles.
- 512 SS-17 or SS-19 type MIRVed ICBMs.

Soviet Airpower Nearing Indian Ocean

By moving to air bases in Afghanistan, the USSR has brought its airpower about 400 nautical miles closer to the Indian Ocean and some 200 nautical miles closer to the Strait of Hormuz, through which most of the West's oil from the Middle East must pass. MiG-23 Floggers stationed in Afghanistan can fly counterair and ground-support missions over all of Pakistan and Kashmir and the eastern half of Iran. Su-17 Fitter ground-attack aircraft can deliver several tons of ordnance against targets with similar radii. Il-28 Beagle light bombers of the Afghan Air Force can attack targets up to 1,400 nm from their bases, thus reaching deep into the Indian Ocean area. There is widespread expectation that the thirteen Su-15, Su-17, and sixty to seventy-five MiG-21 aircraft now in Afghanistan will be augmented by additional forces from the Soviet Union.

• Fewer than 580 single RV ICBMs, probably of a new type.
• 380 SS-N-18 type MIRVed SLBMs.
• A combination of more than 470 single RV SLBMs and bombers.

Strategic Defensive Forces

The historic Soviet-Russian penchant for a strong defensive posture is evident in the realm of strategic defense, in which the USSR enjoys an undisputed lead. The air defense forces of the Soviet Union consist of some 12,500 surface-to-air missiles, 7,000 surveillance radars, and 2,700 interceptor aircraft. Augmenting these forces in wartime would be portions of the tactical air defense forces consisting of some 4,500 fighters and some 4,200 SAMs.

The primary Soviet interceptor force provides a comprehensive capability against targets at high and medium altitudes. The MiG-23 Flogger and MiG-25 Foxbat probably will become the most widely deployed interceptors over the next few years. A version of Flogger with upgraded radar and enhanced low-altitude intercept capability—known as the "B" model—has been entering the inventory.

The Su-15 Flagon continues to provide a significant portion of the air defense capability and older aircraft, such as the Su-9 Fishpot, Yak-28 Firebar, Tu-128 Fiddler, MiG-19 Farmer, and MiG-17 Fresco, make up about thirty percent of the homeland air defense force. According to the Joint Chiefs, the trend toward more flexible tactics is continuing: "The traditionally tight control of interceptors by ground controllers during their final search and attack phase has apparently been loosened."

Fifteen years after entering the inventory, Foxbat is still the fastest and highest flying weapons carrier in the world. The Soviets are working on a modified model incorporating a "look-down-shoot-down" capability. Another Foxbat modification centers on increasing the weapon system's range, presumably to improve its ability to cope with the standoff capabilities of future US cruise missile carrier aircraft.

At the moment, Soviet air defense capabilities are hamstrung by the absence of an airborne early warning aircraft with a sophisticated look-down radar capability. But there is evidence of an improved airborne warning and control aircraft—similar in capability to USAF's E-3A AWACS—being readied for entry into the operational inventory.

The Soviet homeland surface-to-air missile defense force includes the SA-5 Gammon system for long-range, high-altitude defense, the SA-3 Goa for low-altitude point defense, and the SA-2 Guideline system, which has medium range and altitude capabilities. A limited number of older SA-1 Guild missiles remain in the inventory to provide air defense around Moscow.

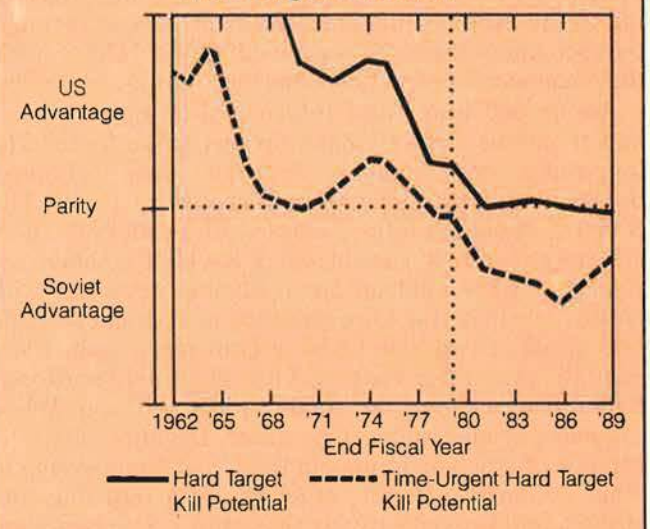
The Soviet SAM force is being modernized through the deployment of additional SA-5s and the introduction of improved versions of the SA-3. Further, a highly advanced strategic surface-to-air missile, the SA-X-10, which has been tested on fixed sites as well as aboard ships, appears ready for full operational deployment. This weapon seems to be optimized for cruise missile defense.

In the area of ballistic missile defense (BMD), the Soviets also are clearly ahead of the US. The Russian BMD consists of the Hen House early warning radars, Dog House and Cat House battle-management radars, and the Try Add engagement radars. The Galosh-Ib interceptor system deployed around Moscow consists of four complexes with sixteen launchers each. Each complex has two Try Add engagement radar sites with two large tracking radars and four smaller interceptor tracking and guidance radars per site. The Galosh apparently has a range of several hundred miles and carries a nuclear warhead with a yield of between one and two megatons. While there is no evidence that the Soviets plan to increase their interceptor launchers beyond the currently deployed sixty-four systems, they nevertheless continue to upgrade the existing early warning and battle-management radars and to expand the Hen House early warning network. Also, the Soviets are pressing research and development on improved phased-array radars and a new interceptor missile. Four so-called X3 BMD battle-management radars are deployed on the periphery of the Soviet Union and appear to incorporate advanced radar and computational capabilities. These new radars will provide better target handling and more accurate impact prediction than is possible with the older systems.

Burgeoning Civil Defense Capabilities

The Soviet Union treats civil defense as an integral part of its overall military strategy. If war should occur, a recently released CIA study suggests, "the Soviets seek through civil defense—along with other means—to assure survival of the homeland and to leave the USSR in a stronger postwar position than its adversaries. Civil defense is meant to contribute to the maintenance of a functioning logistic base for continuing military operations,

Figure 7: Comparative US and USSR Hard Target Potential



NOTE: The strategic forces represented in this chart include the total active inventory without Backfire, as SAL constrained, and with current programs on schedule (MX, Trident, ALCM).

(Source: Military Posture Statement, FY '81)

to help limit human and material losses, and to . . . enable the Soviets to speed recovery from the effects of nuclear war."

Civil defense activities are directed by a nationwide civil defense organization consisting of more than 100,000 full-time personnel located at all levels of the Soviet government and economic structure.

One key objective of the Soviet civil defense program is to assure that the Soviet leadership will survive a nuclear war. Superhardened bunkers for at least 110,000 members of the Soviet leadership are known to exist. In addition, between twelve and twenty-four percent of the total civilian work force is given a high level of protection. Overall, the CIA study concludes that even in case of an attack involving only a few hours of warning, a "large percentage of the leadership would probably survive." The Agency predicted that under worst-case conditions, Soviet casualties from an unconstrained nuclear war would be in the order of 100,000,000, while under best-case conditions civil defense could reduce that total to "the low tens of millions."

The effectiveness of the Soviet civil defense program with regard to assuring the survival of the sources of economic productivity—mainly industry—is marginal, in the view of the CIA.

The Growing Soviet TNFs

Soviet military doctrine remains wedded to the tenet that any major military conflict in Europe is likely to escalate to nuclear warfare. The prolific growth of Soviet theater nuclear forces (TNF) appears to be the result of this doctrine. Destruction of NATO's TNFs in rapid and preemptive fashion is clearly one of the important tasks assigned to the Soviet theater nuclear forces, but the development and massive deployment of the mobile MIRVed SS-20, an IRBM with a range of more than 3,000 miles, demonstrate that the basic orientation of these forces is offensive.

About 1,200 SS-20 missiles, each carrying three warheads in the 500-kiloton range, apparently are planned, with close to 300 in operational deployment at this time. About half of the presently deployed missiles are capable of striking NATO targets while the remainder of the force is positioned to cover targets in the Middle East, China, and Japan. Augmenting the SS-20 are the nearly twenty-year-old SS-4 Sandal and SS-5 Skean medium-range ballistic missiles.

The SS-20, a dramatically new weapon that provides the Soviet Union with the ability to threaten all of Western Europe from sites well within sovereign Soviet Russian territory is being deployed in thirty-five launch complexes, each one containing nine launch tubes. In turn, each launcher is reloadable with three missiles plus a reserve contingent, thus bringing the inventory to about 1,200 missiles. The SS-20 is rated by US intelligence as a "highly mobile" system that can move freely and quickly over unimproved roads and defies reliable monitoring and counting by the US. The missile can be launched from any presurveyed site and is rated as highly survivable.

TNFs assigned to Soviet ground forces include the unguided Frog tactical rockets, the up to 160-nautical-mile-range Scud, and the 500-nautical-mile-range Scaleboard. Two new systems, the SS-21 and SS-22, are entering the inventory and, over time, can be expected to replace the Frog and Scaleboard. In addition, heavy artillery brigades of nuclear-capable towed and self-propelled howitzers are available to frontal units.

The Soviets also have increased sharply their ability to deliver nuclear weapons with modern dual-capable fighter bombers. The latest Fencer, Flogger, and Fitter aircraft, with increased ranges and payloads as well as better survivability, multiply the nuclear threat to targets deep within NATO's rear echelons. Further, the Soviets also have the option of employing Backfire as well as some 500 Badger and Blinder Long-Range Aviation bombers for theater nuclear warfare missions.

The Soviet Navy can augment TNFs with nuclear armed ballistic missiles capable of striking targets throughout Europe. Other naval air, surface, and subsurface platforms can deliver a variety of nuclear weapons via cruise missiles, SAMs, ASW depth bombs and rockets, torpedoes, and naval guns. Training by Soviet and other Warsaw Pact forces for operating in a radiological environment is intense.

Soviet Ground Forces

Soviet Ground Forces, numbering some 1,800,000 troops excluding paramilitary organizations, are organized into sixteen military districts in the Soviet Union, four groups of forces in Eastern Europe, and a force in Mongolia. According to the 1980 Posture Statement, major tactical units of this force include twenty-four armies, ten corps, and more than 170 divisions. About two-thirds of the Soviet divisions are motorized rifle divisions each with a full strength of about 12,000 troops; the remainder consists of mainly tank divisions as well as some airborne divisions. The Soviet Ground Forces structure also includes a number of "artillery divisions" that provide general support of frontal units.

Soviet Ground Forces grew significantly over the past decade through the addition of some 200,000 troops and twenty-two divisions. Concurrently, new armored systems came into the inventory and were assigned in larger numbers to individual units. Conventional war-fighting capabilities were enhanced also through the addition of arrays of new artillery, antitank guided missile systems, armored fighting vehicles, air defense weapons, river-crossing equipment, small arms, and equipment transporters.

The Warsaw Pact forces alone have about 45,000 light, medium, and heavy tanks dedicated to the NATO area. A major portion of that armored force is equipped with T-62 tanks, comparable to the best deployed US tank, the M-60. Two newer and more advanced weapons, the T-64 and T-72, also are being deployed in large numbers.

Frontal Aviation

Over the past few years, a massive infusion of new, modern aircraft has boosted the combat potential of Frontal Aviation manifold. These aircraft carry modern ordnance, such as IR guided missiles and other "smart weapons." Frontal Aviation is equipped with more than 4,700 fixed-wing tactical aircraft, excluding 430 combat trainers.

The new generations of Soviet counterair fighters have a maximum speed at sea level of at least 700 knots and carry air-to-air missiles with a range of almost fifteen nautical miles. Combat radius of these air-superiority fighters exceeds 500 nautical miles. Soviet ground attack fighters can carry payloads of about 4,000 pounds over distances greater than 300 nautical miles. Over shorter ranges, the new Soviet ground attack fighters can deliver more than 10,000 pounds of bombs, rockets, and guided missiles. These aircraft incorporate upgraded avionics and can deliver ordnance very accurately over long distances.

Complementing this boost in weapon systems performance are comprehensive upgrading in crew training and changes in command and control. The dependence on ground control is being relaxed.

The FA's combat effectiveness is being enhanced through a massive modernization program. The entire counterair and about seventy-five percent of the ground-attack force are comprised of aircraft introduced during the past decade.

Growth and modernization are the watchwords also with regard to the Soviet helicopter force which now numbers more than 5,000 units. In the latter category, special emphasis is on ground-attack helicopters deployed against NATO. Several new, high-performance designs are entering the inventory and can fire launch-and-leave weapons from standoff position.

A new trend is emphasis on more sophisticated multimission aircraft apparently aimed at shoring up Frontal Aviation's ground-attack capabilities.

Military Transport Aviation

The cargo-carrying capability of Soviet Military Transport Aviation (VTA), one of three commands subordinate to the Soviet Air Force, is provided by more than 700 medium and heavy aircraft, the vast majority of which are An-12 Cubs, four-engine, medium-range turboprops with a lift capacity of about twenty metric tons. The largest transport in the inventory is the An-22 Cock, a long-range turboprop aircraft capable of carrying an eighty-metric-ton payload, including such outsize cargo as tanks.

The newest operational VTA aircraft is the Il-76 Candid, of which about 120 are in service. Aeroflot, the USSR's only commercial airline, augments military airlift in times of war or crisis. Flight crews hold mobilization assignments and have military-related experience. Since most of Aeroflot's 1,300 medium- and long-range aircraft don't have rear-loading features, they cannot carry large military vehicles and thus are confined to transporting troops and small items of equipment. *(See also the article starting on p. 80.)*

Naval Forces

The relatively rapid evolution of the Soviet Navy from a coastal defense force to one of the world's largest blue-water navies, visible in nearly every part of the globe, was achieved through a shift from a large number of small, simple ships to fewer but larger and more capable units.

Soviet surface forces consist of two *Kiev*-class aircraft carriers (a third was launched recently), two *Moskva*-class guided-missile aviation cruisers, twenty-five missile cruisers, ten gun cruisers, thirty-six guided-missile equipped destroyers, thirty-five conventional destroyers and 163 frigates, for a total of 271 active major combatants. The Soviet Navy also boasts 270 general-purpose submarines and about ninety amphibious warships.

Soviet ships in general are more heavily armed than their Western counterparts and carry far more guns and conventional ASW ordnance. Soviet ships appear to be optimized for short, intense engagements rather than for staying power.

Soviet naval aviation consists of about 1,320 aircraft capable of performing diverse missions. Some 300 Badgers and Blinders, most of them equipped with antiship missiles, provide the principal antiship strike capability. Some fifty Backfire bombers configured for antiship missions have entered the inventory recently. A number of Fitter land-based fighters as well as carrier-based Forger V/STOL aircraft also are assigned to the naval strike role.

The Soviet naval aviation forces are supported by about 130 reconnaissance aircraft and about eighty Badger tankers. Supplementing the naval strike and reconnaissance forces are another 370 aircraft and helicopters assigned to ASW missions and 290 amphibian, transport, and training aircraft.

What are the omens spawned by the Soviet lunge toward decisive and comprehensive military superiority? The Military Posture Statement for 1980 provides a trenchant, analytical answer that is likely to set the theme for the new decade:

> It does not seem likely that the attainment of strategic parity or even an overall advantage by the Soviet Union foretells a realistic possibility of a Soviet "bolt-out-of-the-blue" strategic attack on the United States. To be sure, an irrational act is always possible, but the ability of US strategic forces to absorb a Soviet first strike and inflict major destruction on the Soviet Union in retaliation continues to constitute an effective deterrent. A far more likely consequence is that it will affect the Soviets' perception of the military balance in a way which might embolden them to act with less restraint in international affairs. It is thus the political consequences of the shifting strategic balance which are of greatest immediate concern. Soviet achievement of strategic parity, or even an edge in some areas, increases the possibility that the Soviet Union will take military action to exploit instability in the Third World when it occurs.

If the Joint Chiefs' assessment is correct, the invasion of Afghanistan probably was the opening bell for round one in the bout for Soviet global hegemony. ■

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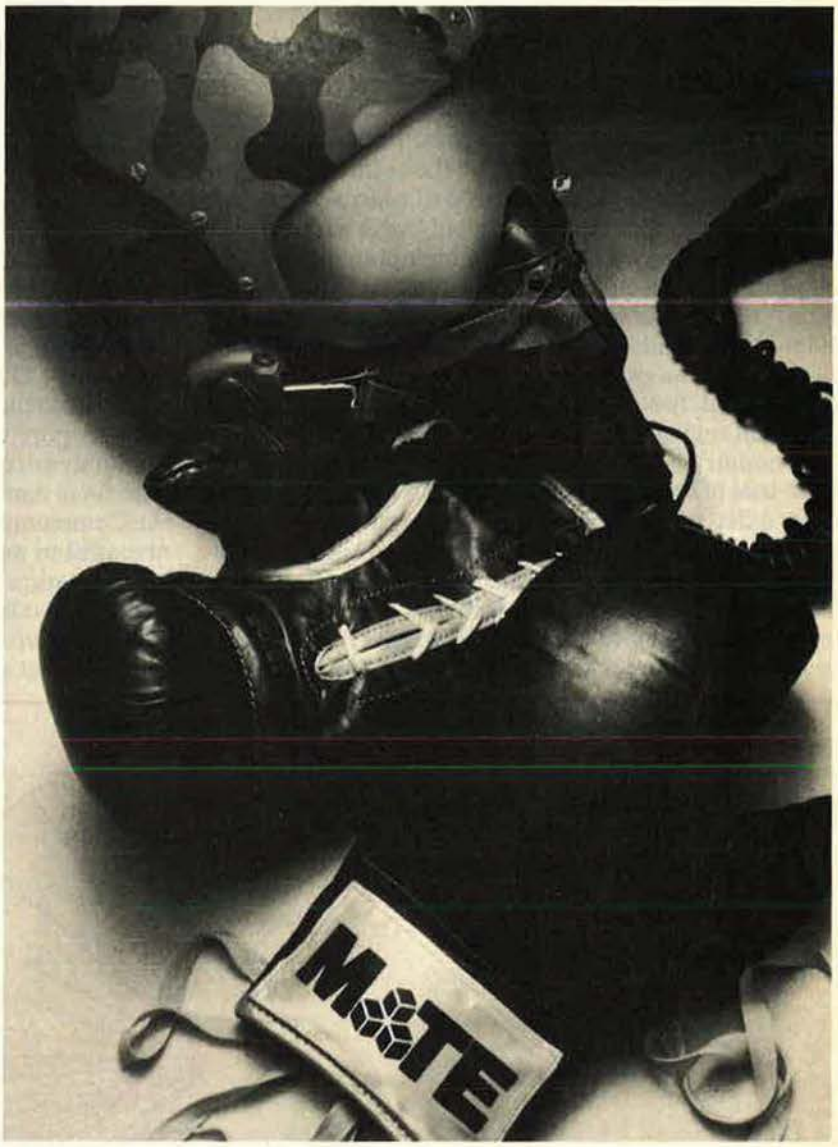

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SOVIET AEROSPACE ALMANAC

Although the Soviet leadership is aging, and problems of succession may be expected in this decade, the reality of the situation is that firm, centralized control will still be exercised by interlocking Communist Party and State hierarchies as it has been done since the Revolution.

HOW THE SOVIET UNION IS RULED

BY CMDR. STEVE F. KIME, USN

It is impossible to control totally a society of a quarter of a billion people. There are bound to be areas of thought and action that are beyond the ability of even the most totalitarian-minded leadership to control. There are also realms where no leadership would wish to interfere.

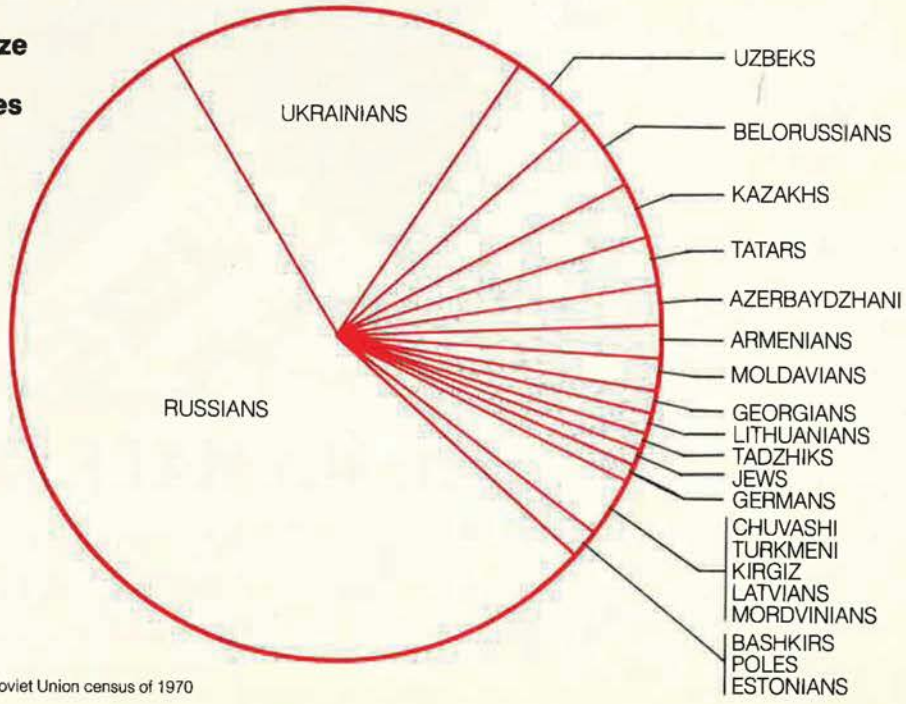
Still, the Soviet Union places a high premium on central planning and control. Academics can argue over which "model" of society best fits the contemporary Soviet Union, and most can reject totalitarianism as inapplicable, given current technological and social complexities, but few would dispute the fact that an authoritarian regime is solidly entrenched in the USSR.

The country is organized for firm, centralized control. This is true in spite of the natural divisive tendencies that would exist in any country of such vast population, enormous geographic expanse, and varied national composition. Leninism would call for a tightly knit, centralized, controlling elite wherever a Communist Party came to power, but "democratic centralism" is an absolute necessity in order for a regime like that of the Communist Party of the Soviet Union to maintain power in the multinational, multilingual USSR.

Geopolitical Realities

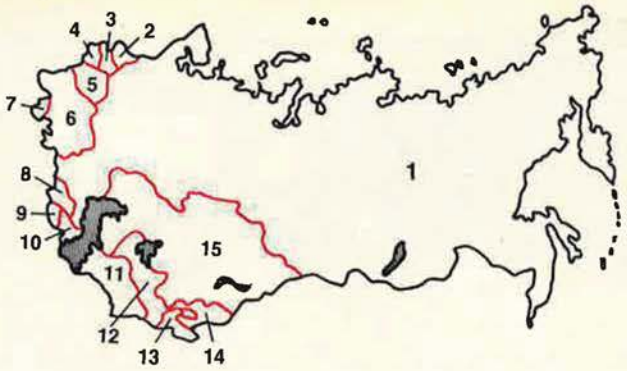
In order to understand how the Soviet Union is organized, it is necessary to look first at the geopolitical realities. Figure 1 shows the relative sizes of the twenty-two largest nationalities among the more than 100 that exist in the USSR. Soviet leaderships have always been sensitive to the problems inherent in dominating so many diverse populations and, in fact, they have been remarkably successful in doing so. By combining Russians with local natives in positions of visibility and authority, the Communist Party leadership in Moscow has carefully managed to monitor and defuse any effective dissidence among nationalities. In addition to absorbing and manipulating the leaders of national groups, the central leadership has wisely chosen to invest sufficiently in the various national areas to help quell potential complaints.

Figure 1: Relative Size of Soviet Nationalities



Source: Based on Soviet Union census of 1970

Figure 2: Geopolitical Subdivision of the USSR



1. Russian Fed. SSR
2. Estonian SSR
3. Latvian SSR
4. Lithuanian SSR
5. Belorussian SSR
6. Ukrainian SSR
7. Moldavian SSR
8. Georgian SSR
9. Armenian SSR
10. Azerbaydzhan SSR
11. Turkmen SSR
12. Uzbek SSR
13. Tadzhik SSR
14. Kirgiz SSR
15. Kazakh SSR

The Russian Soviet Federated Socialist Republic (No. 1) includes 16 Autonomous Republics, 5 Autonomous Regions, and 10 national Areas. Georgia (No. 8) includes 2 Autonomous Republics and 1 Autonomous Region. Azerbaydzhan (no. 10) includes 1 Autonomous Republic and 1 Autonomous Republic, and Tadzhik (no. 13) includes 1 Autonomous Region.

But the problem of managing nationalities has not yet reached its most serious dimensions. Already Russians are probably a minority in the Soviet Union, though Slavic peoples together (including Ukrainians, White Russians, etc.) predominate. It is clear that the higher birthrates among Central Asian peoples will make a difference by the end of the century. In terms of organizing and ruling the USSR, the shifting demographic balance might have important impact. The currently successful practice of "managing" the various nationalities might have to give way to a greater substantive role in management for their leaders. But there seems to be little danger that the regime will be forced to change the fundamental structure of the country.

The political subdivisions of the USSR reflect a basic geopolitical asymmetry. As Figure 2 shows, one of the fifteen Union republics is far larger than all the rest. In fact, the other fourteen republics are peripheral satellites of the huge Russian Soviet Federated Socialist Republic (RSFSR). The political subdivisions directly subordinated to the RSFSR, which is in turn thoroughly dominated by Russians, include many nationalities. The RSFSR includes within its borders sixteen so-called "autonomous republics," five "autonomous regions," and ten "national areas."

Three of the fifteen Union republics—the RSFSR, the Ukrainian Soviet Socialist Republic, and the Belorussian Soviet Socialist Republic—comprise about eighty percent of total USSR territory and more than seventy percent of total population. This geopolitical dominance by peoples with a common Slavic heritage is one of the basic facts of life in contemporary Soviet politics.

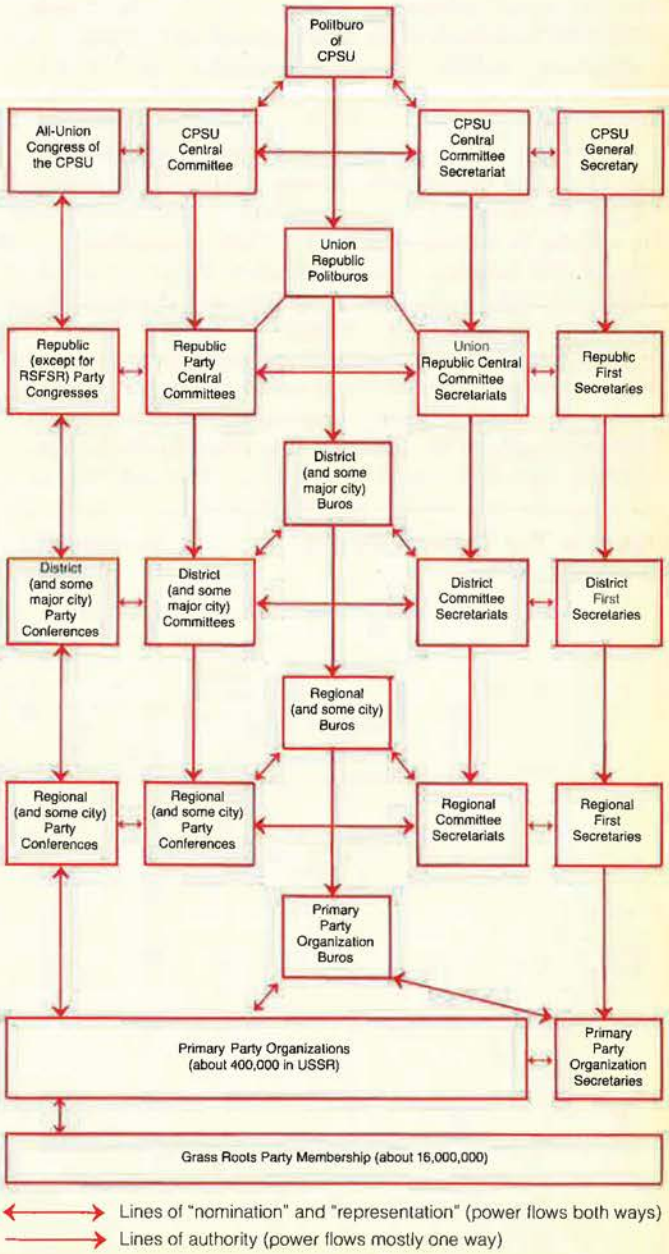
It is interesting to compare the three Slavic republics with other regional groups of republics that might have some reasons for similar outlooks. The three Caucasian republics—Armenia, Azerbaydzhan, and Georgia—comprise only a little more than one percent of total USSR territory and about five percent of total population. The three Baltic republics—Latvia, Lithuania, and Estonia—comprise only a negligible percentage of USSR territory and less than three percent of its population. The five Asian republics—Uzbekistan, Turkmenistan, Tadzhikistan, Kirgizia, and Kazakhstan—are more important geopolitically. They account for about eighteen percent of Soviet territory and fourteen percent of the population.

These geopolitical realities are both reflected and institutionalized by the Soviet political structure. The Party and the State hierarchies parallel the geographic and national subdivisions and, importantly, the Party and State hierarchies parallel each other.

Power, Politics, and Administration

The Party is in command. The Party rules and the State

Figure 3: Power Flow in the CPSU Organization



"represents" the populace. Figures 3 and 4 show the Party and State hierarchies, respectively. Each town, region, district, and republic has both a Party and a State element. Most important, anyone with power and influence in the State hierarchy is also a Party member.

In fact, at each geographic level there is a kind of "interlocking directorate" that wields political and social power. The administration of the State, and the planning of the economy down to the grass-roots level, is accomplished by Party functionaries steeped in the political religion that is Marxism-Leninism. The official Party hierarchy monitors and supervises the workings of those who actually operate the governmental and economic apparatus. Obtaining a position and holding it depends upon orthodoxy and loyalty as well as performance and achievement.

The Communist Party of the Soviet Union is the only elite organization that cuts across all other elites. Not only is the governmental apparatus thoroughly infused and dominated by the Party: Every other elite that might effectively compete for influence and power in other societies is permeated by Party loyalists. The roughly 16,000,000 members of the Party, about six percent of the population, include the decision-makers and opinion leaders in Soviet scientific, economic, artistic, and military circles.

Of course, this is a two-sided coin. The Communist Party has very thoroughly permeated the officer ranks in the Soviet military, for example, but this also means that the military is well represented in Party councils and decisions. The military, which comprises about 1.5 percent of the population, occupies more than eight percent of the seats on the CPSU Central Committee. Generally speaking, it is accurate to say that there is a symbiotic relationship between the Party and *each* of the other important elites in the society's economy and polity. Speaking specifically of the military, the relationship is a particularly tight-knit one. Those who assume that there are basic disagreements between political and military leaders in the USSR do not understand this aspect of the Soviet system. The military is very well represented in a political leadership that is quite sympathetic to the military point of view.

Figure 4: The State Hierarchy of the USSR

Dushanbe, capital of Tadzhik SSR. Population of that central Asian SSR has increased 150 percent since 1940, compared to from six to twenty-five percent for the three Slavic SSRs.

The quarter of a billion people living in the USSR do not determine the membership of the CPSU, which dominates Soviet life. But even within the six percent of the population that comprises CPSU membership, there is little room for representation of the opinions of those at the bottom of the pyramid. Though there are various organs of theoretical power at each level of society where Party organizations are formed, actual decision-making authority flows downward through the CPSU hierarchy. The operative principle is that decisions made at a higher level in the Party apparatus are binding on all lower levels. Critical local decisions are made and implemented by the Party Secretaries at each level, the full-time functionaries who are responsible for the daily administrative chores of the organization. Party Secretaries at any level in the hierarchy are, in fact, selected not by the constituent body at that level but by the next higher level in the system. Thus, their loyalty is toward the top, where their ambitions lie and where their orders originate.

Power within the Party rests at the top. At all levels of Party activity from grass-roots Primary Party Organizations up to the central CPSU organs in Moscow there are constituent bodies, representative "committees" that act for the total membership; "Bureaus," which in turn act for the representative committees; "Secretariats," with permanent Secretaries and staffs to conduct the business of the apparatus at that level; and "Auditing Commissions" to keep an eye on the overall workings of the organization. But ultimate power rests at the All-Union level. The "constituent body" at this level is the Party Congress. The Central Committee of the CPSU is the representative organ of the Congress. The Secretariat of the Central Committee wields much of the day-to-day power in overseeing and administering the business of the Party and the entire country, and the Central Auditing Commission watches over the operation of the Party organization itself. The Politburo sits atop the central apparatus and makes all important decisions.

The Party is paralleled at each level by a system of "Soviets," or councils. The Soviets comprise the State

hierarchy that, in theory, is elected at each level and is supposed to represent the choice of the population at large. Actually, candidates for the Soviets at all levels are put forward by the Party and almost always run unopposed. There is a tremendous effort to get the population to "vote" for "their" deputies to the Soviets, and absurdly high numbers of ballots are cast, but the process is more one of endorsing the Party's will than of exercising an independent will of the masses. As a result, Soviets are impotent organs comprised of economic, political, scientific, military, and cultural leaders at the level of society involved. These people, mostly active members of the Party organization as well as "elected representatives of the people," are unlikely to challenge Party dictates.

At the apex of the State system is the Supreme Soviet of the USSR, and its Presidium. The Supreme Soviet is made up of two chambers, one elected (approved) directly by the population and one chosen to reflect national and geographic entities. There is the appearance of genuine democracy. In theory, this "highest organ of State power" has awesome power. It makes the laws and appoints the Council of Ministers. In fact, the Supreme Soviet is not a deliberative or decision-making body. It rubberstamps the decisions of its Presidium and the actions of the Council of Ministers.

The Council of Ministers is charged with making the Soviet polity and economy work. The Party decides, monitors, and controls. The State (Soviets) approves and provides a democratic facade. The Government (Council of Ministers) implements policy and administers the country under the watchful eye of the Communist Party. The Council of Ministers presides over a complex array of ministries with USSR-wide jurisdiction, subordinate councils of ministers at the Union Republic level, each of which has its own republic-level ministries, and a number of State committees, agencies, and commissions as shown in Figure 5.

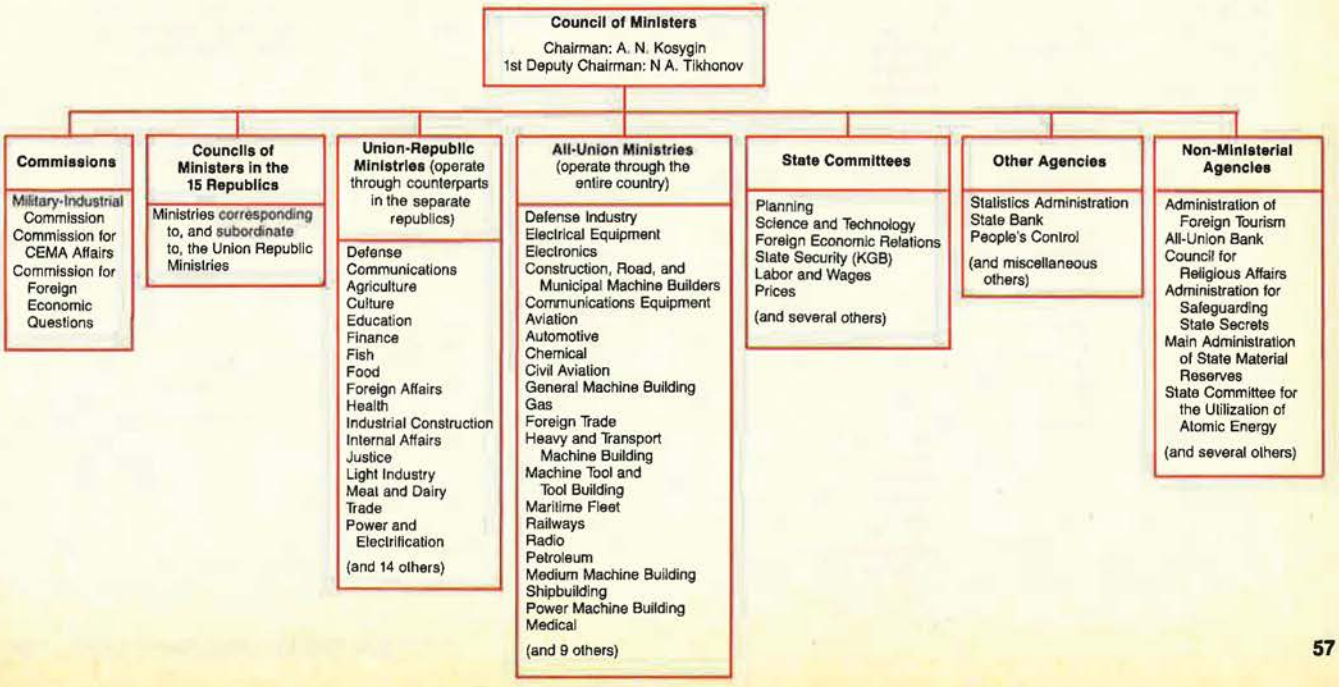
Though the Council of Ministers, on paper, must answer to the Supreme Soviet, membership of the Council of Ministers actually overlaps that of the CPSU Central Committee and Politburo. Four ministers are full Politburo members, and three ministers are candidate members of the Politburo. Five members of the Supreme Soviet are full Politburo members, and three are candidate members. Again, power is vested in, and emanates from, the Party.

Who Rules?

We have seen that the Soviet Union is organized for the effective, centralized exercise of power. A minority of Great Russians dominates a majority of Slavs. A handful of Slavic nationalities comprises a majority of the population and of the area and dominates a vast multinational, multiracial empire. Within the Party-State-Government triumvirate, the Party clearly reigns supreme. The system is carefully organized to ensure the impotency of the State, the administrative effectiveness of the Government, and the supremacy of the Party. Even if one chooses to look at the USSR as a society of competing elites, an erroneous perspective in the author's opinion, it is obvious that one elite, the CPSU, and especially its senior leadership, dominates all the rest.

This kind of system values power more than progress. True, Marxism was based on notions of modernization and development, but Leninism was preoccupied with political power. Soviet leaderships, while mindful of the requirements for improving the life of the Soviet citizen, have been reluctant to yield any of the power that has accrued to the Communist Party of the Soviet Union. For an entrenched, aging elite, stability and security are valuable commodities. Down through the Soviet system the Party apparatchik is more interested in protecting his position, and the power and access that come with it, than he is in promoting any revolution. Innovation and imagination are not engendered in such an atmosphere. Thus it is that the USSR is not well organized to promote, for example, a vibrant, effective economy. Central planning and firm control are simply more highly prized than

Figure 5: The USSR Council of Ministers



progress.

At the top of the Soviet system one can see the kind of interlocking and overlapping leadership that exists at all levels. Figure 6 shows the top leadership of the USSR. Their ages are shown in parentheses. These twenty-seven men are, at a minimum, either full or candidate members of the CPSU Politburo, or members of the Secretariat of the Central Committee of the CPSU. Only four men are both full members of the Politburo and members of the Secretariat. Two candidate members of the Politburo are Party Secretaries.

It is dual and overlapping authority that defines a leader's power at the top. By studying Figure 6 one can discern three echelons of power at the senior levels of the Party, State, and Government. Interestingly, one can also see that within these levels distinctions can be made.

Full Politburo members clearly constitute the top level of power. In addition to the four who are Party Secretaries, five others are members of the USSR Council of Ministers, and five sit on the Presidium of the Supreme Soviet. Brezhnev, Kirilenko, Suslov, and Chernenko might be considered the first echelon of the Politburo and, among these four powerful Politburo members, only Brezhnev is a Party Secretary and on the Presidium of the Supreme Soviet. Since he is the General Secretary and the Chairman of the Presidium of the Supreme Soviet, he is obviously "first among equals." He is also a Marshal of the Soviet Union and Chairman of the USSR Council of Defense.

Kosygin, Andropov, Gromyko, Ustinov, and

Figure 6: The Top Leadership in the USSR

Full (voting) Members of the Politburo	Candidate Members of the Politburo	Members of the Central Committee Secretariat	Members of the USSR Council of Ministers	Members of the Presidium of the Supreme Soviet	Year Assumed Most Important Position	Other Responsibilities
L. I. Brezhnev (73)	—	Brezhnev (Gen. Secy.)	—	(Chairman) Brezhnev	1957 (full Politburo mbr.), 1964 (Gen. Secy.), 1966 (Chmn. of Presidium)	Chairman of the USSR Council of Defense (Rank of Marshal of the Soviet Union)
A. P. Kirilenko (73)	—	Kirilenko	—	—	1962	Central Committee Secy., responsible for Party Organization, Industrial Mgmt., and the economics of other Communist nations
M. A. Suslov (77)	—	Suslov	—	—	1955 (and 1952, 53)	CPSU Central Committee Secy., responsible for ideological matters
K. Yu Chernenko (68)	—	Chernenko (Chief, Gen. Dept. of the Central Committee)	—	—	1978	—
A. N. Kosygin (76)	—	—	(Chairman) Kosygin	—	1960 (and 1948, 1952)	—
Yu. V. Andropov (65)	—	—	(KGB) Andropov	—	1973	Chairman of the Committee for State Security (KGB) (Rank of Army General)
A. A. Gromyko (70)	—	—	(Foreign Affairs) Gromyko	—	1973	—
D. F. Ustinov (71)	—	—	(Defense) Ustinov	—	1976	(Rank of Marshal of the Soviet Union)
N. A. Tikhonov (74)	—	—	(First Deputy Chairman) Tikhonov	—	1979	—
D. A. Kunaev (68)	—	—	—	Kunaev	1971	First Secy. of the Kazakhstan Communist Party Central Committee
V. V. Grishin (65)	—	—	—	Grishin	1971	First Secy. of the Moscow City Party Central Committee
G. V. Romanov (57)	—	—	—	Romanov	1976	First Secy. of the Central Committee of the Leningrad District
V. V. Scherbitskiy (62)	—	—	—	Scherbitskiy	1971	First Secy. of the Central Committee of the Ukraine
A. Ya. Pel'she (81)	—	—	—	—	1966	Chairman of the CPSU Central Committee's Party Control Committee
	B. N. Ponormarev (75)	Chief, International Dept. Ponormarev	—	—	1972	Responsible for relations with nonruling Communist Parties
	M. S. Gorbachev (49)	(Agriculture) Gorbachev	—	—	1979	—
	P. N. Demichev (62)	—	(Culture) Demichev	—	1964	—
	M. S. Solomentsev (66)	—	Solomentsev	—	1971	Chairman of the Russian Republic's (RSFSR) Council of Ministers
					1978	—
	S. R. Rashidov (62)	—	—	Rashidov	1961	First Secy. of the Central Committee of Uzbekistan
	P. M. Masherov (62)	—	—	Masherov	1966	First Secy. of the Central Committee of Belorussia
	V. V. Kuznetsov (78)	—	—	(First Deputy Chairman) Kuznetsov	1977 (and 1952, 53)	—
	G. A. Aliev (56)	—	—	—	1975	First Secy. of the Central Committee of Azerbaydzhan
	E. A. Shevarnadze (56)	—	—	—	1978	First Secy. of the Central Committee of Georgia
		(Chief, Heavy Industry Dept.) V. I. Dolgikh (56)	—	—	1972	—
		(Propaganda, Ideology, Culture) N. V. Zimyanin (65)	—	—	1976	—
		(Party Organizational Work) I. V. Kapitonov (65)	—	—	1965	—
		(Relations w/Ruling Communist Parties) K. V. Rusakov (70)	—	—	1965	—

Tikhonov are full Politburo members who also occupy key positions on the USSR Council of Ministers. If they are the second echelon in the top level of power, they are certainly a close second. Kosygin, the Chairman of the Council of Ministers, has long been a powerful figure. But, like the other four, he has no strong base in the Party, to which government is always subordinate.

The five remaining full Politburo members are clearly not as influential as the rest, at least for the present. Kunaev, Grishin, Romanov, and Scherbitskiy are all First Secretaries of significant Republic Party Central Committees. The latter two are bosses of the potent Party apparatuses in the Leningrad District and the Ukraine, respectively. Since these two are the youngest full members of the Politburo, they are forces to be reckoned with in the future. Arvid Pel'she is eighty-one years old and the token "old Bolshevik" in the Party's top body.

One can also judge the relative power of those at the second level—the nine candidate (nonvoting) members of the Politburo. Ponormarëv and Gorbachëv are the only ones who are also Party Secretaries. Demichev and Solomentsev are also members of the Council of Ministers. Rashidov, Masherov, and Kuznetsov are members of the Presidium of the Supreme Soviet. Kuznetsov is Brezhnev's deputy on the Presidium. Rashidov and Masherov are First Secretaries in Uzbekistan and Belorussia, respectively. Aliev and Shevarnadze are token members in the top body from Azerbaydzhan and Georgia.

Architecture of the Weeping Maiden's Tower at Baku in the Azerbaydzhan SSR illustrates the historic and cultural diversity that exists within the USSR.

At still a lower level of relative power, but nonetheless very influential men, are the four Party Secretaries not on the Politburo. These men may well be candidates for promotion in the future as their political superiors, who are generally older, fade from the scene. Gorbachëv, who is only forty-nine years old, was recently elevated to candidate membership in the Politburo.

While dual and overlapping authority define a leader's relative power among his peers, the interlocking positions and personalities atop the Soviet power structure tell us how the Soviet system as a whole currently works. It is not merely the dictatorial rule of one man. Neither is it the rule of an elected, collective leadership. It is not a simple collection of the elites of various interest groups. Instead, it is the leadership of one institution, the CPSU, which rules by distributing its membership as it sees fit throughout the top positions of other, subordinate, governing institutions. The power of individuals can wax and wane within the interlocking directorate that dominates the governing institutions of the USSR, but there is generally stability at the top. The Soviet Union is organized for the exercise of centralized power, and for the stability and security of an entrenched, aging leadership.

Because the USSR is organized the way it is, there seems little likelihood of dramatic change even after Brezhnev falls from power or dies. The average age of full Politburo members is more than sixty-nine, and Western observers are often tempted to think in terms of wholesale change in the near future. What seems more likely, given the nature of the Soviet system, is a change of personalities without systemic change or different approaches to social, political, and economic issues.

In a succession period, the jockeying for the combination of positions that will determine those who make the most important decisions will be between men already in the top leadership. Some personalities will be elevated in the next decade as age and circumstances take their toll on the current "gerontocracy," but this will hardly be "new blood." Those taken into the top leadership will have served long years in similar crucibles at the next lower levels of power. Their outlook toward preserving the power of the Party and the stability of the leadership, even if it means a stultified economy and limited freedom for the peoples of the Soviet Union, is likely to be little different from that of the current regime. ■

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Americans who follow Soviet affairs know of the USSR's Institute of the United States of America and Canada and its director, Georgiy Arbatov. What influence do this institute and others that are part of the Soviet Academy of Sciences have on the formulation and Western perceptions of Soviet policy?

THE SOCIAL SCIENCES INSTITUTES OF THE SOVIET ACADEMY OF SCIENCES

BY WILLIAM F. AND HARRIET FAST SCOTT

THE Academy of Sciences, USSR, has no exact counterpart in the United States. It is a lineal descendent of the Russian Academy of Science, founded by Peter the Great in St. Petersburg in 1724. The Presidium of the Academy and some of its institutes were moved to Moscow in 1933, where the Academy is under the direct control of the Council of Ministers. *(See box, p. 64.)* Its function, as is true of all institutions in the USSR, is to serve the interests of the state, which are synonymous with the interests of the Communist Party of the Soviet Union.

The more than 45,000 scientists and scholars of the Academy of Sciences are organized in four Sections, dealing respectively with physics and mathematical sciences, chemistry and biological sciences, earth sciences, and the social sciences. Within each Section are Departments concerned with specific disciplines, and under many of the Departments are still more specialized institutes.

Of particular interest to Americans who are concerned with political relations between the US and the USSR—especially the defense aspects of those relations—are two institutes that fall under the Department of Economics of the Academy's Social Sciences Section. They are the Institute of World Economy and International Relations (IMEMO), founded in 1956; and the Institute of the United States of America, founded in 1967 and redesignated the Institute of the United States of America and Canada (IUSA&C) in 1974. Members of those two institutes, particularly the latter, have had frequent contacts with US officials and other dignitaries associated with political/defense relationships. Institute members frequently visit and lecture in the US, and their articles appear not infrequently in prestigious US journals.

There is nothing sinister about these, and other, institutes of the Soviet Academy of Sciences when one understands what they are and what they are not. They are not associations of independent scholars and scientists comparable to, for example, the Council on Foreign Relations in the US. They are instrumentalities of the Communist Party, dedicated to the service of the USSR.

Many Americans who have had personal contacts with officials of IMEMO and IUSA&C, either in the USSR or at home, regard them as reasonable men pursuing goals that are not identical to those of the US but that lead to the same ultimate objective—a stable and peaceful world. These Soviet intellectuals are sometimes characterized as "doves" who are thought to be a counterweight to Soviet "hawks," particularly to the Soviet military. In fact, some of the most influential members of the institutes are military officers who are leading Soviet strategists and theoreticians; other members occupy high-level positions within the Party structure. The institutes are an illustration of the fusion of Party and state and of the Party's control and domination of elites, described by Cmdr. Steve Kime, USN, in the article beginning on page 54 of this issue. Their function is to play a major role in "the struggle for the victory of world

Georgiy Arbatov, Director of the Institute of the USA and Canada.

N. N. Inozemtsev, Director of IMEMO and head of a new disarmament council.

socialist revolution." A primary means for achieving that victory, explained in a book published by IMEMO in 1965, is "to force the imperialists to general and complete disarmament."

The Rise of the Social Science Institutes

In 1966, Marshal V. D. Sokolovskiy and his frequent collaborator, General Major M. I. Cherednichenko, in a carefully timed article entitled "On Contemporary Military Strategy," wrote of the attention being given to military strategy in the United States. The Rand Corp. was described as an "original factor of military thought where engineers, mathematicians, physicists, philosophers, economists, astronomers, and so forth work. The mission of the corporation—the scientific working out of plans for thermonuclear war." They also cited the Hudson Institute and the International Institute for Strategic Studies in London as centers for strategic analysis.

To counter "the aggressive strategy of imperialism" the authors stressed the need for the Soviet Union "to work out the contemporary problems of strategy, both on the theoretical and on the practical plane. . . ." They wrote that "the working out of the theory of military strategy, in essence, represents specific social research." These two Soviet military strategists were advocating that something new be added to the Soviet Party-military structure.

Rarely does anything appear in the Soviet press without a purpose. Party Secretary Brezhnev in his address to the XXIII Party Congress in March 1966 criticized the work of the Soviet social sciences, and demanded improvement. The Sokolovskiy-Cherednichenko article obviously had been coordinated at the highest Party levels to ensure it would coincide with the Party Secretary's criticism. Their article had said:

> As in other social sciences, the theory of military strategy is called on to expose pressing problems and tasks and to indicate the valid path of their solution, to serve as a scientific basis of Party policy in questions of protecting the country. It is fully understood that *the deficiencies of social sciences, being printed in our periodical press, are inherent in military strategy as well.* (emphasis added)

The Party's Central Committee took remedial action the following year, described in a resolution "On Measures for Further Developing the Social Sciences and Heightening Their Role in Communist Construction." It was noted that "in the era of transition from capitalism to socialism," both Marxist-Leninist theory and the role of the social sciences have become increasingly important. To this end:

> . . . intensification of creative work in the sphere of theory is imperative to strengthen the political, economic, and cultural cooperation of the socialist countries and to determine the most effective ways and means *to secure the victory of socialism over capitalism.* (emphasis added)

In 1972, just after SALT I was signed, Vadim Zagladin, deputy head of the International Department of the Central Committee, wrote of actions that had been taken to improve the work of the social sciences. He listed the following research institutes as among those whose tasks had been broadened and clarified. The dates they were established are in brackets:

- Institute of World Economy and International Relations (IMEMO) [1956].
- Institute of Economy of the World Socialist Systems (IEMSS) [1960].
- Institute of the Far East (IDV) [1966].
- Institute of Oriental Studies (IVAN) [1930].
- Institute of Africa (IA) [1959].
- Institute of Latin America (ILA) [1961].

New institutes had been formed, also, including the Institute of the International Workers' Movement (IMRD) in 1968, the Institute of Scientific Information for the Social Sciences (INION) in 1969, and the Institute of the United States of America (IUSA) in 1967. As mentioned earlier, IUSA was redesignated the Institute of the United States of America and Canada (IUSA&C) in 1974.

The formation and growth of these Soviet research institutes has coincided with the buildup of the Soviet Armed Forces, and Soviet ability and willingness to project its military power and presence. The actual relationship between the institutes and the Soviet General Staff is a closely guarded secret. However, leading Soviet military strategists have held, and continue to hold, key assignments in the institutes.

The Institutes' Influence on Soviet Policy

There is considerable speculation in the US about the role of the institutes in developing or influencing Soviet policy, but no general agreement on the degree or the nature of their influence. One index of their actual or potential importance lies in the linkage between senior officials of the institutes and the Kremlin power structure.

In June 1979, to take an example, a Scientific Council for Research on Problems of Peace and Disarmament was formed under the auspices of the Soviet Academy of Sciences and the State Committee for Science and Technology. The new council is headed by N. N. Inozemtsev, director of IMEMO. Members include Georgiy Arbatov, head of IUSA&C; Yevgeniy Primakov, head of the Institute of Oriental Studies; and Dzerman Gvishiani, Deputy Chairman of the State Committee for Science and Technology. The Council is to coordinate research in the USSR on peace and disarmament and *promote cooperation with foreign scientists.* (emphasis added)

The men named above have been working together for years, and have both direct and indirect ties with the top Kremlin leadership. With a few other key individuals, they form an "old-boy" network that appears to have a significant influence on Soviet foreign and defense policies.

Anatoliy Dobrynin, the Soviet Ambassador to the United States since 1962 and now dean of the Washington diplomatic corps, is a major figure in the Soviet power structure. He started as an aeronautical engineer, soon shifted to foreign affairs, and graduated from the Higher Diplomatic School in 1946. Until 1952 he worked

in the Ministry of Foreign Affairs and taught at the prestigious Institute of International Relations (MGIMO). Since 1966 he has been a member of the Party's Central Committee.

One of Dobrynin's students at MGIMO was Nikolay Inozemtsev, who graduated in 1949. In 1966, as a result of the shakeup in the social science institutes, Inozemtsev was designated head of IMEMO. He is an Academician of the Academy of Sciences and since 1971 has been a Candidate Member of the Communist Party's Central Committee.

Georgiy Arbatov was another member of the MGIMO class of 1949. In 1964 he was cited as one of the primary authors of the Soviet textbook, *Fundamentals of Marxism-Leninism*. In 1967 he was named head of the newly formed Institute of the USA and in 1976 became a Candidate Member of the Central Committee. Arbatov accompanied Brezhnev to Camp David during the Party General Secretary's visit to the United States. His articles have appeared in many Western publications, and he has been on network television programs in this country.

A third member of the MGIMO class of 1949 was Vadim Zagladin, now first deputy head of the International Department of the Central Committee. This department operates under the direction of Politburo Candidate Member and Party Secretary Boris Ponomarev. Zagladin has served on the editorial board of *USA*, Arbatov's monthly journal.

Dzerman Gvishiani, son-in-law of Premier Aleksey Kosygin, is a 1951 graduate of MGIMO. Since 1955 Gvishiani has worked in the influential State Committee on Science and Technology, and since 1965 has been its deputy chairman. He also heads a research laboratory in the Institute of Sociological Research, and recently was elected an Academician. Gvishiani chairs the Scientific Council of the Academy of Sciences on Social, Economic, and Ideological Problems of the Scientific-Technical Revolution, formed in 1972. He works closely with Inozemtsev and Arbatov.

A relative newcomer to the power scene is Yegeniy Primakov, who specializes in oriental studies. In the 1960s he was assigned as the deputy director of IMEMO. In the mid-1970s he was made director of the Academy of Sciences' Institute of Oriental Studies.

The power base of the "old-boy" network has many forms. As the OSS and its offspring, the CIA, attracted younger members of the United States "establishment" in the 1940s and 1950s, so have the Soviet social science institutes attracted many offspring of the Communist Party elite. Sons and daughters of Kosygin, Gromyko, and Mikoyan have served on the staffs of either IUSA&C or IMEMO. Currently, Mikoyan's son is editor of the Institute of Latin America's journal, and Gromyko's son heads the Institute of Africa. According to reliable sources, sons and daughters of top military leaders, such as Marshal Zakharov, also have been on the staffs of these institutes.

Between 1965 and 1971, men and women from at least thirty different agencies had done graduate work at IMEMO, the largest of the social science institutes. Among them were rising individuals from the Ministry of Foreign Affairs, the Academy of Foreign Trade, Tass, *Pravda*, the International Department of the Central Committee, Brest University, and the Institute of Oriental Studies. Advanced degrees mean considerably more to an individual's career in the Soviet Union than in the United States. The power of institute faculty members to advance the careers of students who already are well-placed in Party and government positions enhances the status both of the institutes and the faculty members.

The Soviet Foreign Ministry cooperates with the institutes in placing and in training institute staff members. While on leave of absence from their institutes, faculty members may serve as employees of the United Nations or in the Soviet Embassy in Washington. At the completion of their assignments, they may return to their institutions. The Soviet Embassy in Washington has a full-time position for a representative of Dr. Arbatov's IUSA&C.

It is likely that within this "old-boy" network there are jealousies, conflicting personal ambitions, and even divergent views on some issues. But all get instructions from the same Politburo, and speak with one voice on Soviet policy matters. There are no "hawks" or "doves" among them. All represent the voice of the Kremlin leadership.

Another indicator of the importance attached to the social science institutes, and of the probable nature of their influence on Soviet policy, may be found in the number and quality of military theoreticians assigned to the institute staffs. Here it should be pointed out that the military profession in the USSR devotes far more time and energy to the study and formulation of strategy and doctrine than does its counterpart in the US. Some Soviet officers become career theoreticians and the more outstanding attain great prominence within the profession. Among those who either have been or now are associated with the institutes are:

V. V. Larionov, who was the composing editor of all three editions of Marshal Sokolovskiy's *Military Strategy*. In 1966, he was a Frunze Prize winner and in the early 1970s he headed the Political-Military section of IUSA&C. In 1974, Larionov was assigned to the Academy of the General Staff, the USSR's highest military college, and promoted to general major. His latest of many books, scheduled for publication this year, is entitled *Local Wars*.

Col. V. M. Kulish was assigned to IMEMO in the early 1970s. In 1972 he edited perhaps the most significant military book of that year, *Military Forces and International Relations*, which examined the questions associated

Gen. Lt. M. A. Milshtein heads IUSA&C's Political-Military Section.

Gen. Maj. V. V. Larionov, now assigned to the General Staff Academy.

William F. and Harriet Fast Scott are consultants on Soviet defense affairs and have been frequent contributors to AIR FORCE *Magazine. The Scotts lived in the USSR for four years during Colonel Scott's two tours as US air attaché in Moscow. Since his retirement in 1972, they have traveled extensively in the Soviet Union, their most recent visit in late 1979 following meetings in the People's Republic of China with scholars of that country. They have met many times with members of the Soviet social sciences institutes. Both Dr. Scott and Mrs. Scott have published books on Soviet military affairs and both have written extensively for defense and foreign policy journals. They collaborated on* The Armed Forces of the USSR, *published last year by Westview Press.*

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with projecting Soviet military power beyond the boundaries of the Warsaw Pact. In the mid-1970s, Kulish transferred to the Institute for the Economy of the World Socialist System, where he continued in the same area of research.

General Colonel N. A. Lomov, for many years head of the Department of Strategy at the Academy of the General Staff, has been a consultant to IUSA&C. Daniil Proketor, a former faculty member of the Frunze Military Academy's Department of History of War and Military Art, is a staff member of IMEMO.

Col. Lev Semieko, one of the most prolific of the Soviet defense intellectuals, is serving on the staff of IUSA&C. He has been among the primary Soviet writers on SALT and in recent months has attacked every effort to modernize NATO forces. He is, incidentally, vice chairman of the Disarmament Committee of the Soviet Peace Council.

General Lieutenant M. A. Milshtein, of whom we will say more later, is head of the Political-Military Section of IUSA&C. In the mid-1950s he headed a new department at the Academy of the General Staff, formed to study the military strategy of the capitalist nations.

In recent years, members of the Soviet research institutes have been the Kremlin's primary spokesmen against the B-1, the neutron bomb, cruise missiles, and currently the "Eurostrategic" missile. Their propaganda campaign is clever, taking full advantage of the free and open discussion of arms-control matters permitted in the West. For their own weapon systems, they claim the Backfire bomber "has no strategic significance," and the SS-20 "is for defensive purposes" only.

IUSA&C publishes a monthly journal, *USA: Economics, Politics, Ideology*. Journal articles indicate the basic purpose of the institute. In 1979, eleven dealt with SALT II, and thirty on the United States economy. Fifty articles were about United States domestic problems, particularly vulnerabilities. More than one hundred articles about United States military strategy and foreign policy have been published in this journal in the last three years.

Members of the institutes frequently have articles printed in *Red Star,* the daily newspaper of the Ministry of Defense, or in one of the service journals such as *Herald of PVO* (Air Defense). What is written for internal consumption in these Soviet publications is much different from the moderate and restrained articles by IUSA&C staff members that may appear in the New York *Times*, for example.

The social science institutes also prepare advisory reports (*Spravka*) on policy issues for departments under the Secretariat of the Party's Central Committee and special monthly internal bulletins (*Spets Bulletins*) with a very restricted circulation.

The Institutes' External Influence

Besides their primary mission of supporting the top echelons of the Party and the government in the formulation of Soviet policy, the social science institutes serve a second purpose—that of persuading influential officials and private citizens of non-Communist countries of the USSR's peaceful intent, as a step toward the broader objective of disarming the West.

Specialists in the Soviet Union concerned with the United States and Canada call themselves "Amerikanisti." The best known and most influential are found in the social science institutes of the Academy of Sciences, principally in IUSA&C and IMEMO. Their considerable persuasive powers—at least so far as foreigners who have only a superficial knowledge of the USSR are concerned—are exercised both on distinguished visitors to the USSR and in meeting with influential foreigners abroad. But, first, how do IUSA&C and IMEMO—principally the former—handle their important foreign guests in the USSR?

Despite the belief that members of the Soviet research institutes may try to foster, there has been no general opening up of Soviet society during the so-called détente period. Foreigners today have as much or more difficulty in meeting with Soviet citizens as during the Khrushchev period. There are now specific Soviet groups authorized to deal with foreigners, the members of which are carefully screened and trained for this purpose. Among them are selected members of the social science institutes.

In the Soviet Union approximately 325 of the 400 largest Soviet cities are closed to foreigners, and probably more than ninety-five percent of the land area as well. Foreigners are permitted to stay only in special hotels, and to travel only on selected air routes and railroads. Travel by automobile or bus is restricted to approximately 5,000 miles of highways in the entire Soviet Union.

United States citizens can visit the Soviet Union in a very limited number of ways. If considered influential, they may be invited to Moscow by the Soviet Academy of Sciences. A standard program has been worked up. Many of those invited do not know the Russian language, nor are they familiar with the USSR. They are met at the airport by an English-speaking guide and a senior institute member to take them to a convenient hotel. A full and pleasant schedule is arranged: the Bolshoi Theater, a tour of the Kremlin treasures, a visit to Leningrad for a tour of the Hermitage, or perhaps a side trip to Kiev or Tbilisi. Discussions are arranged with selected English-speaking members of the research institutes. Guests are shown a Potemkin Village, as carefully staged as any performance in the Bolshoi Theater.

The greatest cause for concern is that so few who visit the Soviet Union know enough about that country to even realize how they are controlled. Too many return home believing that their hosts are educated, urbane people (which they are), who sincerely want to cooperate

with the non-Communist world but who feel threatened by the "encircling" NATO alliance and by the People's Republic of China. But the visitors have, in fact, seen only what their hosts wanted them to see, heard only what their hosts wanted them to hear, and met only those Soviet citizens whom their hosts wanted them to meet.

A few Western "Sovietologists" are accepted by the Soviets under various exchange programs, but only to do research on subjects approved by the Soviet authorities, such as the early works of some obscure Russian poet. Many come as part of a group to attend a symposium or conference. The KGB regularly harasses and attempts to intimidate those who move outside of the regular group pattern.

For the Soviet Amerikanisti, a visit to the United States has been an entirely different story—at least until the Soviet invasion of Afghanistan. In the early 1970s, as détente was coming into full bloom, leading Americans in government, education, science, and business visited Moscow in increasing numbers. English-speaking members of the research institutes, after being cleared by the KGB to talk to foreigners, found themselves swamped with requests to meet the many guests. It was only natural that invitations would be extended to the Soviet hosts to travel in the United States. When they visit the United States, they have ready access to influential organizations and leaders in every field of activity. They can travel almost as freely around the country as can any American.

In their studies and travels in the "capitalist" world, Soviet scholars are acquiring political, military, economic, scientific, and technical data defined by Marshal Sokolovskiy in *Military Strategy* as strategic intelligence. It would be difficult to find a better method of obtaining information on another nation than that used by the Soviet institutes. They have put intellect into the intelligence process.

The meetings with Americans have offered a platform to justify Soviet foreign actions and to sell Soviet policies. As Dr. Arbatov once remarked, his job is not simply to study the United States, but also to explain the Soviet Union to Washington. When selling "peace-loving and progressive" Soviet policies, it should be expected that the institute members give out a great deal of "disinformation." In private conversations and small discussions, the "Amerikanisti" have argued persuasively that "the Soviet Union does not threaten anyone" and that the deployment of new United States weapon systems, such as the "Eurostrategic" mobile missile in NATO, might bring the "hardliners" to power in the Soviet Union.

The head of the Political-Military section of IUSA&C, General Milshtein, who was mentioned earlier, is a good example of how the Amerikanisti operates abroad. He has visited this country and Canada many times and met with the heads of research organizations, US senators and senior congressional staff members, and Americans prominent in many fields. During these trips, he has lectured at several leading US universities where he impressed his audiences with his detailed knowledge of the US armed forces. In his last visit, during the fall of 1979, General Milshtein attended defense hearings on Capitol Hill, and in California addressed several groups on arms control, urging the rapid approval of the SALT II Treaty.

THE ACADEMY OF SCIENCES, USSR

Peter the Great's Academy of Sciences, founded in St. Petersburg in 1724, survived the storms of the Russian Revolution of 1917. The Academy did, however, undergo many upheavals, especially during the industrialization of the Soviet Union, which began in 1929. In order to increase control over the Academy by the Communist Party and Soviet government, in 1933 it was put directly under the control of the Council of Commissars (now called the Council of Ministers). The Presidium of the Academy was moved from Leningrad to Moscow at that time. It required 250 railroad boxcars to carry materials belonging to the institutes that were transferred to the capital.

After the Revolution, the social sciences chiefly were studied at the Communist Academy. But, in 1936, the social science institutes of the Communist Academy were transferred to the Academy of Sciences, and the Communist Academy was abolished.

The Academy of Sciences has been overhauled periodically, gaining and losing institutes and other facilities. A major addition was made in 1957 when the Siberian Branch of the Academy was formed in Akademgorodok (Science City) near Novosibirsk. In 1975, the Academy had some 250 scientific establishments, including its own floating research laboratory. There are 400 additional scientific institutions in the academies of science of the fifteen union republics.

The plan for scientific research in the Soviet Union has two parts: The first, concerning the technical sciences, is under direction of the powerful State Committee on Science

Summary

There is no way of knowing to what extent the social science institutes of the Soviet Academy of Sciences influence Soviet policy. If there were no institutes, the Kremlin's foreign and defense policies probably would be much the same as they are now, but perhaps articulated and implemented with less sophistication. In any event, there is no reason to fault the USSR for setting its best brains to work on its problems and objectives as seen from the Kremlin.

There is plenty of reason to criticize the way the social science research institutes have carried out their second function of influencing public and official opinion outside the USSR. For very little cost, trained Soviets are able to meet with Western leaders, both in Moscow and in the West, to gather information first-hand, and to spread disinformation.

The criticism should be directed as much at ourselves as at the Soviets. The West has meekly accepted rules laid down by the Kremlin that have made these potentially valuable contacts—including contacts between Western Sovietologists and Amerikanisti—a one-way street. This should have been expected, but it need not have happened. An informal association of US scholars, for example, could have demanded reciprocity.

Whenever the West agrees to play by Soviet rules, it will always come out a loser. That message apparently is now understood in Washington and elsewhere, but dangerously late in the game. ■

and Technology, or GNKT, often called "the State Committee." The second part of the plan, drawn up by the Academy of Sciences, deals with problems of the natural and social sciences for which it has more than 200 scientific councils. Technical problems are examined in scientific councils attached to the State Committee.

In the postwar period, the Academy of Sciences broadened its international ties. By 1976, it had developed ties with 108 countries, the most important with socialist countries. In 1975, 4,500 Soviet scientists were sent to socialist countries and some 4,900 came to the USSR. The Academy also developed relations with the US, France, West Germany, Great Britain, Italy, Sweden, Japan, and other non-Communist states. In 1970 it had formal relations with only forty-nine countries; by 1975 this number had doubled. Agreements on international cooperation increased from thirteen in 1971 to thirty in 1975. More than 12,000 scientists from the Soviet Union visited capitalist and Third-World countries from 1970 to 1975, with a large share of them visiting the US. At the same time, 22,000 from the US, Western Europe, and Japan visited the USSR.

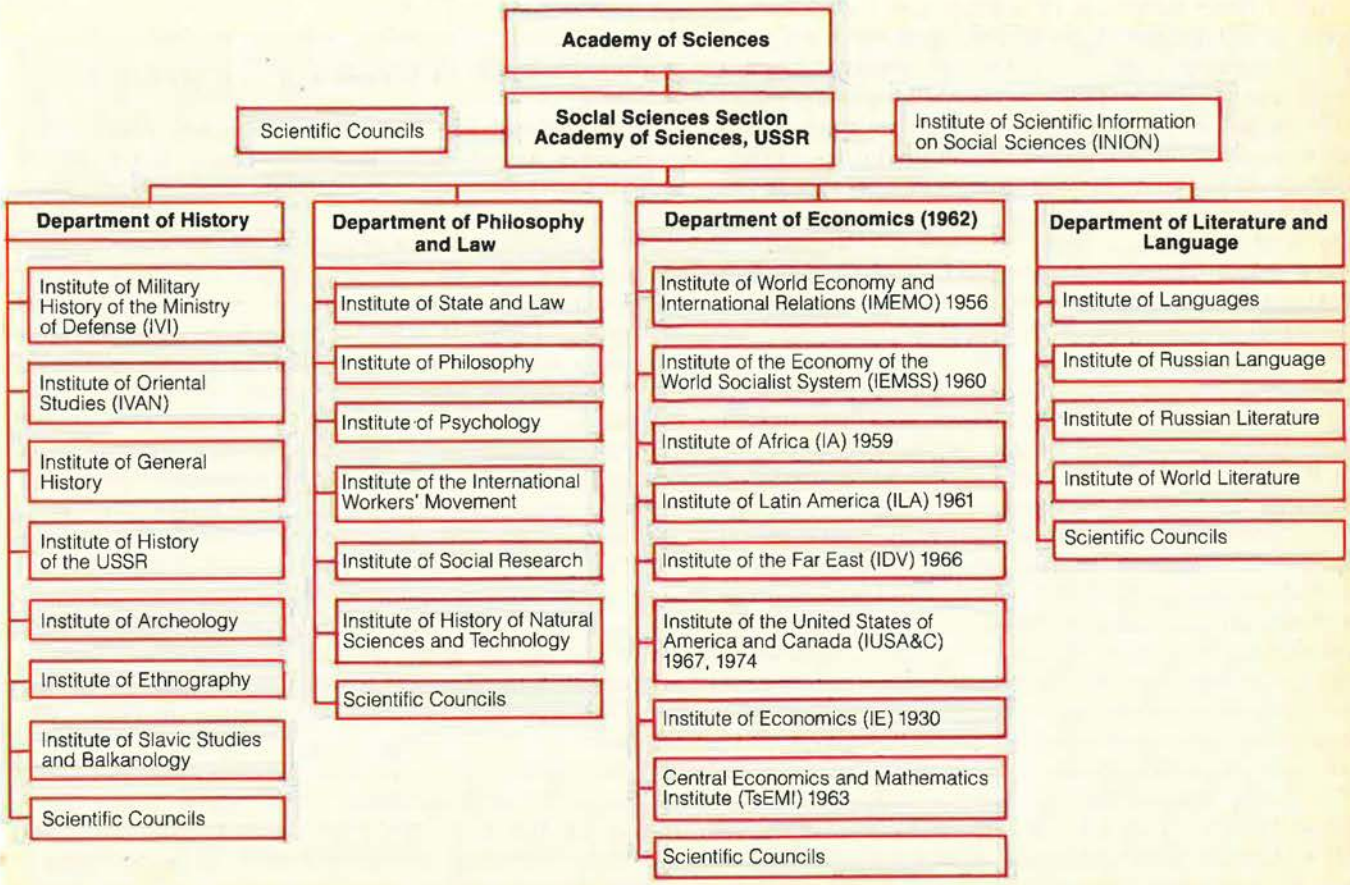
The Soviet Academy of Sciences has been especially active in joining nongovernmental international organizations. In 1950, it belonged to three, in 1965 to eighty-nine, and in 1976 to 155. Soviet scientists are very active in organizations like the UN and UNESCO. They also have increased the number of Soviet scientists holding posts in international organizations from twenty-seven in 1965 to 139 in 1975. In this way they can attend international meetings. As one Soviet social scientist told us, books take years to write, articles months, but at meetings you can find out what they are thinking right now.

A more traditional form of international cooperation is the election of foreign scientists to membership in the Academy of Sciences. The first one was elected in 1725. Voltaire, Darwin, Kant, Laplace, Pasteur, and Faraday in their day were members of the Russian Academy of Sciences. Niels Bohr, Lord Rutherford, and Albert Einstein have been among the honorary members of the Soviet Academy of Sciences. Some 1,250 foreign scientists have been elected to membership in the 250 years the Academy has existed. Nearly 400 Soviet scientists are members of foreign academies. In 1978, there were 235 Academicians, 477 Corresponding Members, and eighty-seven foreign members of the Academy of Sciences, USSR.

The Academy of Sciences has maintained a certain amount of autonomy. Election is by secret ballot; thus they were able to resist pressure to elect a certain politician at a recent meeting. They also have kept dissident Academician Andrey Sakharov, a prominent nuclear physicist active in the civil-rights movement in the Soviet Union, on the roster. (Since this article was written, Sakharov has been stripped of his honors and, without trial, exiled to Gorkiy, a city closed to foreigners. V. A. Kirillin was ousted from his position as the head of the powerful State Committee of Science and Technology on the same day.)

In 1978, the Academy of Sciences had more than 45,000 scientists of all types working in its laboratories and institutes. Some 4,273 were doctors of science and 20,474 were candidates of science. Of all Academicians, Corresponding Members, and professors in the USSR in 1975, 20,500 were men and only 2,400 were women.

The Social Sciences Section of the Academy of Sciences is organized as shown in the accompanying chart.



Soviet arms-control policy is an integral part of Soviet grand strategy. Because the long-term objectives of the US and the USSR are diametrically opposed, the Superpowers, as now governed, cannot agree on worthwhile arms-control measures that bear directly on their security.

ARMS CONTROL IN SOVIET POLICY

BY COLIN S. GRAY

From Lenin to Brezhnev, Soviet leaders have had a consistent and intelligent view of the political-instrumental value of a positive declaratory stance vis-à-vis questions of disarmament and, more recently, of arms control. If some Western officials and politicians are disappointed by the negligible results of protracted East-West arms-control negotiating processes, they have only themselves to blame for unrealistic expectations. Soviet arms-control behavior in SALT and MBFR faithfully reflects a Soviet political culture that is not, never has been, and probably never will be friendly to familiar Western visions of a more stable international order. Soviet arms-control policy is an integral part of Soviet grand strategy, and that grand strategy has the twin objectives of defending and enhancing Soviet security interests.

Unlike some American Presidents and Secretaries of State, Soviet leaders (*any* Soviet leaders) understand that international politics is a story of continual struggle for relative advantage; that the other Superpower, objectively, is their enemy; and that they have no choice other than to seek, patiently, global hegemony for the USSR. Whether or not one chooses to believe that the Soviet Union has been more sinned against than sinner, or that superficially aggressive-looking behavior really reflects a deep insecurity, xenophobia, and paranoia, the fact remains that Soviet foreign and military policy means harm to all power centers that it does not currently control.

This conveniently simple world view provides useful general guidance for military policy. The firm, indeed unalterable, commitment to the long-term struggle for global hegemony inoculates Soviet officials against any temptation to relax military competitive effort, save for tactical prudential reasons, and virtually guarantees a measure of realism in Soviet defense planning that is generally absent in the West. The Soviet Union desires the fruits of successful war, but does not want war. Nonetheless, the slow transition of the international order to a condition where Soviet influence is preeminent may—in Soviet estimation, reasonably enough, given the premises—be challenged by desperate adversaries. War could come at any time.

The Soviet approach to problems (and opportunities) of security owes more to Russian geopolitical experience than it does to Soviet ideology. However, the fact remains that the West has to attempt to cope with a malign combination of Russian imperialism and Soviet ideology. The two have proved, in practice, to be wholly compatible. The ideology provides a universalistic doctrinal rationale for the grosser manifestations of Russian imperial ambition.

The undeniably black portrait of Soviet intentions briefly sketched above should be beyond reasonable challenge in 1980. The overwhelming evidence for this portrait is provided by the open record of Russian and Soviet history. Close students of Russian history and culture can help us understand the predatory character of Soviet policy, but better understanding on our part does not render the Soviet Union much less dangerous. (By way of analogy, our society physically constrains many deeply disturbed people: They may be ill rather than criminal, but the danger that they pose to the rest of society is none the less for that.)

The USSR: A Case for Treatment?

Some Western scholars, and even a few senior officials, have approached the Soviet Union as though it were either backward or disturbed. Arms-control processes were identified as a useful instrument for effecting Soviet education or "treatment." Neither Superpower chose to pursue, say, the SALT process, for a single clear purpose. Nonetheless, one can argue that sufficient historical evidence is in for the claim to be made that the United States and the Soviet Union have been pursuing almost diametrically opposed goals in *major* arms-control forums (*i.e.*, in SALT and MBFR). This claim does not contradict the fact that the Superpowers can concert, and have concerted, their diplomatic energies, both on arms-control projects of only symbolic significance (the Antarctica Treaty of 1959, or the Seabed Treaty of 1971, where they tend to find it relatively easy to agree not to commit acts that they discern no incentive to commit), and on arms-control regimes that bear down heavily on the freedom of possibly embarrassing (to the Superpowers) policy choice of third parties (the Nuclear Non-Proliferation Treaty of 1968, for example).

Paradoxically, given the enormous quantity of information available concerning arms-control policy discussions in the West, it is much easier to offer succinct and fairly confident characterizations of Soviet arms-control objectives than it is the objectives of the United

States and its close allies. Because the Soviet Union has a steady strategic doctrine that clearly outlines the dangers in the world; because it has a military science of war developed by responsible military officers, instead of a highly academic strategic theory; and because it enjoys an effective fusion of political authority and military advice at the highest level, Soviet arms-control policy is an effective, yet clearly subordinate, instrument of Soviet strategic planning.

Probably the most dramatic elementary way to demonstrate the contrast between the successful Soviet, and unsuccessful American, attempt to coordinate military and arms-control policies is to point to the career outcomes of the leading military figures on the two sides' SALT delegations. On the American side, Lt. Gen. Edward Rowny, for more than six years the JCS representative on the SALT delegation, retired from the Army in 1979 in order to testify honestly against the SALT II Treaty. On the Soviet side, then Colonel General N. V. Ogarkov was the senior Soviet military figure on their SALT I delegation (1969–71). He went on to become, in January 1977, First Deputy Minister of Defense and Chief of the General Staff, a position he still holds.

The details of Soviet SALT policymaking remain obscure, but the best recent analysis available in the West (Thomas Wolfe, *The SALT Experience*, Ballinger Publishing Co., Cambridge, Mass., 1979) has confirmed what long has been strongly suspected: Most of the detailed analytic work, and probably even identification of the tolerable military framework within which negotiations should be conducted, has been the responsibility of the Main Operations Directorate of the Soviet General Staff.

Negotiations

Partly for reasons of its democratic political character, and partly because of genuine intellectual confusion, the United States has never enjoyed a settled understanding of what arms-control policy could, or should, seek to accomplish. Above all else, the US government has never directly confronted the question of whether or not defense problems could be solved or greatly alleviated through timely arms-control agreements. Two pervasive underlying beliefs have been fundamentally erosive of good arms-control negotiating habits by Western officials:

First, there has been belief in the myth of progress, the belief that Soviet-American, and East-West, relations are evolving, or could evolve—to mutual benefit—through ever more cooperative stages, toward a political condition that would be less than *entente*, but more than *détente*. In short, there is an international order toward which East and West grope their way, in which risks of armed conflict, and particularly of armed conflict involving intercontinental strategic weapons, would be very much reduced.

Arms control, and above all strategic arms control, was seen as the jewel in the crown of détente. The control, by mutual agreement, of strategic nuclear arms would be both massively symbolic of the joint Superpower commitment to a safer world and to improved relations, and should—in and of itself—contribute to a more secure international environment.

Through the entire duration of the SALT process, American officials have been unable to decide whether SALT was about détente symbolism (meaning that virtually any agreement, with or without substance, that appeared to be tolerably equitable could be proclaimed as a negotiating success), or about the improvement of strategic stability in a somewhat technical sense (in which case neither SALT I nor SALT II was defensible).

More by historical accident than conscious design, SALT became synonymous with the Soviet-American détente of the 1970s. A number of misguided if well-meaning Western arms-control and defense analysts be-

—White House photo

Vienna, June 18, 1979, when SALT II hopes were high for the Administration. Presidents Carter and Brezhnev sign, as Secretary of Defense Harold Brown and National Security Advisor Zbigniew Brzezinski smile.

lieved that East-West relations could be influenced benignly by the evidence of progress in arms-control forums. In fact, as the events of 1979–80 have illustrated all too clearly, progress in arms-control negotiations is almost wholly dependent on a permissive political climate—internationally and domestically. SALT I was not the engine of Soviet-American détente in the early 1970s; rather, it was the beneficiary of a unique and transitory political era. Those Western politicians, officials, and opinion leaders who believed that SALT I would phase into a permanent SALT II, or who (by 1974) anticipated early consummation of a temporary SALT II, which would phase into a SALT III, were guilty of a fundamental misreading of international political reality. SALT I was not the beginning of a process wherein the Superpowers could gradually tame their strategic weapon competition; instead, it was the high (*and probably only*) point of "arms-control theory as practice," whereafter the political fragility of SALT accords (in Western perspective) increasingly would be recognized.

Second, for the better part of two decades the American defense community has been guided by people who, fundamentally, were (and are) quite indifferent to matters of military operational detail. The reason for this was doctrinal. From the Johnson to the Carter Administrations, strategic policy has tended to be controlled by officials who believed that nuclear war is unthinkable; that nuclear war can occur only in the very large, nonsurvivable variety; and that the United States has an "overkill" potential vis-à-vis any interesting set of Soviet-located civilian-economic targets.

Some deviation from these beliefs might be deduced from the apparent evidence of the strategic targeting reviews conducted under Presidents Nixon and Carter, but such deviation, in net effect, is of only trivial significance. In practice, the United States has entered SALT (and MBFR) negotiations, over a ten-year period, with the dominant official assumption that a central nuclear war would mean "the end of history." Strategic stability, in this view—and contrary to the opinion of the Soviets and many Western professional defense analysts—is virtually a bequest of technology. With very few exceptions, and those of no great significance, the American ends of the SALT I and SALT II bargaining processes were manned by people who disbelieved profoundly in the vitality of the concept of strategic superiority; who were antipathetic to the idea of a politically intelligent strategic targeting policy; and who, therefore, did not really care about the fine detail (or even some of the gross detail) of a SALT treaty save insofar as that fine detail, if obviously unbalanced to the US disadvantage, might provide lethal ammunition for domestic critics of the negotiated agreement.

In his testimony on SALT II before the Senate Committee on Foreign Relations in July 1979, Henry Kissinger recanted his much-quoted 1974 statement that was implicitly dismissive of the value of strategic superiority. Nonetheless, the spirit of 1974-vintage Kissinger was alive throughout the SALT process of the 1970s. The United States, therefore, believed that through SALT: (a) it was contributing to the enmeshing of the USSR in a network of linked détente processes that would gradually encourage Soviet leaders to play a more constructive role in international affairs as their "stake" in the existing order increased; (b) it could ratify a technological fact of life at lower cost than otherwise might be the case; specifically, that through SALT agreements the Superpowers could agree to forgo bids for arms competitive advantage that must prove futile.

Our Own Worst Enemy

Soviet officials must have been suspicious and incredulous as, from the mid-1960s through to the end of the 1970s, their principal adversary put into defense policy practice a strategic doctrine that was bereft of political or strategic sense. The United States persuaded itself that its erstwhile condition of strategic "superiority" was of little (or even negative) value, and would inevitably prove to be insupportable in the face of a determined technological challenge. In its place, Soviet defense officials observed the United States adopt, what, in their eyes, was an absurd and irresponsible concept of strategic stability. The forward momentum of the Soviet defense effort was rewarded in the specific terms negotiated in SALTs I and II, but the American defense condition that rendered those agreements negotiable was solely the product of domestic American convictions. The United States thought that the Superpowers were registering those convictions through SALT. Instead, the United States was providing the USSR with a unique historical opportunity to achieve a meaningful strategic advantage.

The arms-control connection between East-West, as institutionalized in the 1970s, cannot endure. The reason for this judgment, simply, is that the gulf between the political and strategic philosophies of the two sides is too great. As more and more evidence comes in on the details and trends of the Soviet military buildup, and on the character of Soviet political intentions as evidenced by their foreign policy behavior, it becomes clearer and clearer that the arms-control process per se (let alone any particular treaty or understanding) has been working to the West's disadvantage.

Arms control is not a monstrous plot hatched and di-

"Arms control is not a monstrous plot hatched and directed from Moscow. On the contrary, it is Westerners who have been guilty of self-deception."

rected from Moscow. On the contrary, it is Westerners who have been guilty of self-deception. Soviet purposes and style of behavior are enduring factors. They cannot be altered by an arms-control process, however businesslike its conduct. It is an incontestable fact (and those are rare!) that not merely are the Soviets not "on board" for Western concepts of stability, strategic and political; they have worked energetically in the SALT period to undermine what Western governments understand by stability.

In principle, and not infrequently in practice, a negotiating process and an agreement can be of general benefit, even if the high contracting parties have individual reasons for wanting an agreement. With respect to SALT, this reasoning has little if any validity beyond the date of the signing of SALT I. It makes no sense to negotiate a very permissive agreement on strategic offensive arms with an adversary who shares no significant fraction of your deterrence philosophy—and who has very warm production lines. Moreover, as Henry Kissinger often maintained, SALT was an integral part of overall Soviet-American and East-West relations. It was not intended to stand on its own inherent merit. Indeed, it has no inherent merit. SALT agreements, for example, should reflect (they cannot create) a different, and improved Soviet-American political relationship. Arms-control processes, and weapon balances, have meaning only in political terms. War is a political event. Great states cannot cooperate in negotiating arms reduction if one or both of them harbors the gravest suspicions concerning the foreign policy ambitions of the other.

Much of the official Western approach to arms control with the Soviet Union continues to be dominated by the discredited notion that the principal danger of war stems from the process of arms competition itself (in strategic weaponry, in theater weapons for Europe, in naval deployment in the Indian Ocean, in conventional arms transfers to local clients, and so forth), rather than from the political rivalry that licenses the competition. Arms control, generically, has long been seen as a technical end-run around a political rivalry that cannot be alleviated directly.

There is some small truth to the claim that the process of competitive armament itself fuels political anxieties, but that truth is dwarfed by the fact of political control over competitive arming. A state arms itself in a competitive context because it believes that it may have to fight. But, when a state arms itself, all the while disbelieving in the likelihood of war and in the possibility of surviving a war, it is unlikely to arm itself effectively. This is the American (and NATO) condition today.

Understanding the Soviet Union

In Soviet perspective, an on-going arms-control process offers a golden opportunity for securing unilateral advantage. So long as a major arms-control process either is alive, or is alive in prospect, Soviet leaders can hope to:

- Convince Western leaders and publics that they are responsible and willing to be cooperative.
- Manipulate Western public fears of nuclear holocaust, through the fueling of "peace-loving" or "realistic" forces in the West with ammunition appropriate for thwarting the evil intentions of defense-minded, peace-through-strength circles.
- Encourage the popular Western fallacy that there is a "happy ending" to East-West rivalry. "If only your leaders would be reasonable . . ." etc. There is nearly always a vocal and politically significant constituency for "peace through self-restraint" in Western countries.
- Persuade Western politicians and publics that restraint and reasonableness today will be rewarded tomorrow. The history of SALT is, in good part, the history of Western security problems that will be alleviated "in the next round."
- Exploit the Western emotional investment in the process itself, so as to influence Western behavior in other policy areas.
- Perpetuate the Western belief that arms control can be a panacea for security concerns.

The "experts" who have dominated policymaking and the major organs that inform public opinion "have . . . rendered possible the prospect of a military defeat for the West in the 1980s."

It is only fair to observe that Soviet behavior in, and related to, the arms-control process of the 1970s has been exactly the kind of behavior that any careful student of Russian/Soviet history, culture, and geopolitics would have anticipated. Lest this be thought to be retrospective wisdom, readers are advised of the fact that such scholars as Richard Pipes, Adam B. Ulam, and William R. Van Cleave all wrote very early 1970s-vintage analyses of Soviet intentions and behavior that have stood the test of time. Not to mince words, many (though not all) of the proponents of SALT I, and later of SALT II, up to and including Henry Kissinger (who, strangely, seems to acquire wisdom only when he is out of office), are guilty of gross, and for Western interests as a whole, potentially fatal, incompetence in comprehension of the Soviet negotiating adversary. These are strong words, but they are probably not strong enough to characterize the sins of a body of supposed "experts" who, through their dominance of official policymaking and the major organs that inform public opinion, have—quite literally—rendered possible the prospect of a military *defeat* for the West in the 1980s.

At the very least one should consider Soviet arms-control policy as being two-tiered. At the higher, political, tier, the Soviets have seen arms-control institutions (SALT, MBFR) as means for encouraging the Western hope that the détente of the very early 1970s is still, if barely, alive. The very existence of the SALT and MBFR negotiating processes bears the promise of hopeful times returning. This consideration is particularly potent in the domestic policies of some NATO-European countries (*see below*). The lower, defense-program-related tier of Soviet arms-control policy should be seen, simply, as a sensible endeavor to enhance the prospective war-fighting effectiveness of Soviet forces. The Soviet defense community is assisted greatly in its dedication to success in war by the lingering remnants of Western stability doctrine. Regardless of what a SALT regime does, or does not, cover, the United States government continues to believe that the American homeland cannot, and should not, be defended. In addition, any US offensive program that has considerable counterforce potential against Soviet offensive forces promotes a bitter domestic debate over its allegedly destabilizing consequences. Witness the contemporary MX ICBM debate.

Ongoing or imminent SALT (*et al.*) negotiations facilitate the task of Soviet officials attempting to interdict the American defense policymaking process. For example, they can hint that US restraint today will promote the cause of productive arms-control negotiations tomorrow; or, rather more crassly, they can follow Mr. Brezhnev's (*et al.*) line in the fall of 1979 and state that a NATO decision to deploy particular weapons (572 Pershing IIs and GLCMs) will foreclose upon the possibility of arms-control negotiations in the near future.

It is a fact that in some NATO-European countries arms control has become a near-essential indicator of détente. Unfortunately, those countries have come to believe that détente, mid-1970s style, is—in and of itself (whatever it is—and this is somewhat vague)—a highly desirable political component of their security. By threatening to withhold the détente benefits that NATO-Europeans believe flow from arms control, the Soviet Union can hope to induce cooperative (*i.e.*, appeasing) behavior.

Soviet Skill, or Western Folly?

The record of the 1970s leaves open the question of whether the Soviet Union has successfully exploited the opportunities that ongoing arms-control processes allowed it, or whether the Soviet Union has been the undeserving beneficiary of Western wishful thinking. One thing, at least, is certain: An arms-control process is neutral as to which side it benefits most. "The SALT process" did not bring forth SALTs I and II, or the accelerating slide in relative US strategic nuclear prowess; a succession of senior American policymakers is responsible. It is true that there has been a "mad momentum" to arms control, meaning that politicians and officials have persisted in their arms-control crusade even though the implications of arms-control policy for Western security have been less than vaguely comprehended. However, the pace of arms-control negotiations has been so dilatory that the Ford and Carter Administrations had ample opportunity to reconsider what they were about.

Arms control has everything to recommend it, in Soviet perspective. The adversary has an enormous potential for strategic superiority in its high-technology in-

". . . the Soviets have neither advanced nor agreed to any strategic nuclear arms-control proposal that would have a negative impact on their war-fighting capability."

dustry: What could be better than to encourage that adversary in the belief that "the parity principle" is the basis of SALT, and that SALT is crucially symbolic of, and is a vital contributor to, improved political relations? (It is axiomatic today in Western arms-control circles that SALT agreements can be negotiated only on the basis of parity or essential equivalence. That axiom may be true. What is not true, or at least axiomatic, is that the United States should not and could not reestablish an enduring relative condition of strategic superiority.)

The Soviets can hardly fail to have noticed that the United States and its NATO allies have enormous difficulty coordinating their defense planning and arms-control policy activities. As noted already, the Soviets do not have this problem because they assign the lion's share of defense and arms-control planning to military professionals on the General Staff. To date, the Soviets have neither advanced nor agreed to any strategic nuclear arms-control proposal that would have a negative impact on their war-fighting capability. Soviet commitment to the idea of *victory* in war (at any level) is nonnegotiable—as have been any American/NATO proposals that might, in their net effect, impair the likelihood of achievement of that goal.

Whether or not one judges defense planning in the United States and NATO to have been affected adversely by arms-control considerations depends critically upon one's doctrinal preference. If, in common with the US government, one is basically uninterested in the conduct (as opposed to the deterrence), let alone the outcome (which one presumes to be mutual annihilation), of war, then the defense planning complications imposed by SALTs I and II have to be assessed as irrelevant to Western security. For example, the ABM Treaty of 1972 foreclosed upon the effective point defense of ICBM silos—a capability that would have a stabilizing effect by any strand of Western strategic reasoning. Also, "arms-control considerations" have had a major impact on the design of MX ICBM basing (the "racetrack," or "closed-loop," arrangement) even to the point where the strategic case for the system might be jeopardized as a consequence.

As in political matters, so in strategic, the Soviet Union has no interest in promoting what moderate Western observers would term stable balances. Soviet political leaders, though attentive to the positive "psychological disarmament" spinoff that can accrue as a consequence of arms-control process, tend to be more interested in the advantageous military programmatic results of arms-control politics. Stated simply, though without distortion, the Soviets employ, in good part, the existence or the promise of arms-control negotiations in order to inhibit prospective Western war-fighting—hence deterrence—effectiveness.

Virtually a self-parody of Soviet manipulation of arms-control prospects was offered by Mr. Brezhnev in October 1979. In return for a NATO decision to not modernize its deep-strike theater-nuclear assets, he offered the enticing promise of arms-control negotiations on the subject of deep theater-strike systems. It was unclear just what he was promising, in detail, but he—and subsequent Soviet spokesmen—were very forceful on the subject of the very negative consequences that would flow from a NATO dismissal of this demarche. In its lack of subtlety, this Brezhnevian offer/threat was unusual, even by Soviet standards.

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The Soviet leadership knows that the fact or prospect of arms-control negotiations tends to fuel the politically fissionable material in the NATO Alliance. Norway, Denmark, Holland, Belgium, and West Germany all have politically significant opinion groups that value arms control for its own sake. Moreover, none of the governments of these NATO members is likely to be impressed with the kind of military arguments for new nuclear-capable weapon systems that are popular in Washington. NATO-Europeans, living on the prospective battlefield, prefer to take comfort in the prospect of effecting the successful prewar deterrence of Soviet military power, rather than in the hope that Soviet military power actually could be defeated. For this and related reasons, NATO has never been able to agree on genuine military requirements for nuclear-capable weapon systems.

For fear of doing needless damage both to intra-alliance relations, and to the prospect of NATO-Warsaw Pact arms-control negotiations, NATO will deploy (if ever) as few deep-strike theater-nuclear weapon systems as the political traffic will permit. Both in the NATO-European theater, and with respect to central strategic forces, arms-control negotiations act as a major impediment to militarily rational defense planning.

The Problem Is Us

Notwithstanding its title, this article has had no choice other than to consider Soviet arms-control policy in the light of Western approaches to arms control. Soviet arms-control policy, crude though it has often been, could draw undeserved strength from the flabbiness of Western performance in this area. The reasons why the United States and NATO should not engage in SALT and MBFR are not because the Soviet Union is untrustworthy, or is diabolically clever in negotiations. Rather, it is because Western politicians and officials know, and understand, so little history.

The Soviet Union is paranoid, geopolitically unsatisfied, and ideologically irrevocably committed to hostility to all political systems not controlled by Moscow. For arms control to accomplish its more expansive Western goals—that is, to contribute noticeably to a change in the extant conflict orientation of the official Soviet world view, or to cut painfully and in balanced ways into real military muscle—the Soviet Union would have to change its very character. Worthwhile measures of arms control, which bear directly on their security, cannot be negotiated between the Superpowers as currently governed. ■

Soviet exports of military aircraft are tied explicitly to USSR foreign policy goals. They also provide a means of entrée into target countries, as well as prepositioning aircraft and equipment for use worldwide. However, the exports do not always work out as planned, with ultimate reverses for the Soviet Union and opportunities for the West.

MILITARY AIRCRAFT EXPORTS: SOVIET FOREIGN POLICY TOOL

BY F. CLIFTON BERRY, JR., SENIOR EDITOR

THE Soviet Union has exported more aircraft of just one type, the MiG-21 Fishbed, than all the tactical aircraft the NATO allies presently have in operational service in Northern and Central Europe. The latter figure is about 2,400 planes of all types. But in less than seventeen years, the Russians have exported between 2,600 and 2,900 MiG-21s to more than thirty countries. (The most-exported US military plane is the Northrop F-5; 2,200 of them have gone to twenty-seven countries.)

Since the USSR began exporting military aircraft outside the Warsaw Pact in 1955, one or more models have gone to at least forty-one nations around the world. The air forces of such countries as Afghanistan and Cuba are totally equipped with aircraft of Soviet origin, just as the Warsaw Pact satellites are. In such other nations as Iraq, Libya, and Syria, Soviet aircraft predominate, although a few strays from other nations are present. In still other countries, there is heavy Soviet stockage of their air forces, but not to the exclusion of Western planes. An example in this category is India. Its fighter force is dominated by Russian- and India-built MiG-21s (more than 450), but also includes 150 Hawker Siddeley Gnats and 125 H. S. Hunters.

Still other countries have only one or two types of Soviet aircraft, but are possible future markets. Peru is an example. Russia gave Peru three Mi-8 Hip helicopters in 1970, and three more in 1973. Peru then purchased more than thirty Su-22 Fitter fighters in the mid-seventies. Between those deals, Peru bought Mirage 5 fighters from France, Bell 212 helicopters and Cessna A-37 light attack planes from the US, refurbished Canberra bombers from the RAF, and Nomad light transports from Australia.

Estimates of the total number of Soviet military aircraft exported outside the Warsaw Pact range upwards from 6,000 to near 10,000. (Numbers are necessarily estimates, and must be drawn from a variety of open sources, with the attendant possibility for error in any direction.) The geographic spread of their military aircraft exports and the large numbers dispatched demon-

MiG-21 Fishbed-D fighter aircraft. MiG-21 variants (of which twenty-three are listed in Jane's) have been exported in greater numbers to more countries than any other aircraft.

The Mi-8 Hip helicopter is a standard utility helicopter that has evolved into a gunship as well. It has been exported to at least nineteen countries outside the Soviet Union. This version has three stores pods on each side of the fuselage. An Mi-8 commercial version is in use by Aeroflot.

strate that the Soviet Union takes second place to no nation in selling or giving away aerial hardware worldwide. A recent example in the Middle East illustrates the point.

The North Yemen Case

In late February 1979, the US government announced an airlift of military equipment to North Yemen. The country borders Saudi Arabia and South Yemen at the southern tip of the Arabian Peninsula, and has a coastline along the Red Sea. Purpose of the urgent airlift was to bolster the military forces of North Yemen, which had been routed by the Soviet-backed army of South Yemen, and additionally to demonstrate US resolve to the Saudis. Part of the consignment included twelve Northrop F-5E fighter planes to be delivered through Saudi Arabia. The Saudis were already training North Yemeni pilots in the F-5B. Additional US equipment, such as thirty-two M-60 tanks, seventy-two Vulcan air defense guns, and military vehicles, was shipped to North Yemen via sealift.

With the equipment went small teams of US military and civilian experts. Most were in mobile training teams. They went to North Yemen, gave training, and departed. The number never exceeded sixty. Saudi Arabia and Jordan also dispatched small teams of military people to the capital of North Yemen, fewer than three dozen in all. By February 1980, the US presence associated with the military equipment was down to sixteen—ten military and six civilians.

The situation between the two Yemens simmered through the summer without erupting into warfare. The F-5Es were readied for delivery in Saudi Arabia, and by September 26 all were operational and had been flown into the North Yemeni capital.

About that time, such publications as the *Foreign Report* of the *Economist* of London reported deliveries to North Yemen of fifteen Soviet MiG-21 aircraft, fifty T-62 tanks, and assorted missiles, howitzers, and infantry weapons through its Red Sea port of Hodeida. According to *Foreign Report*, with the weapons came a contingent of more than 600 Russian officers, technicians, and intelligence operatives. Other sources suggest that the 600 figure is too high; that "a few hundred" is nearer reality.

As 1980 began, North and South Yemen no longer appeared on the brink of war. And, although the US F-5Es were flying, authoritative sources said the Soviet MiG-21s remained in crates. But a massive Soviet military and intelligence contingent had been planted in the country, settling in for a long stay. They joined a large group of 2,000 already in neighboring South Yemen, which in 1979 received additional MiG-21 and MiG-23 fighters to add to its inventory of MiG-17, MiG-21, and Su-20/22 aircraft.

Different US and Soviet Methods

The North Yemen exercise points up differences between the US and Russian methods of exporting military aircraft, reflecting essential differences in the national security and foreign policy execution of the two countries.

The point to remember about Soviet exports of military aircraft is this: They are an integral and extremely important part of Soviet activities to further their expansionist goals. Aircraft exports provide a stepping-stone, a method of entry into a target country. Accompanying the aircraft are large numbers of people. These technicians, trainers, advisors, and operators carry out the terms of the deals, and then some. Their numbers provide cover for members of the KGB and GRU intelligence apparatus, or for individuals assigned to gain access to—and influence over—the recipient country's military people.

The next steps include gaining such concessions as overflight rights, servicing agreements for Russian aircraft and ships, and base rights. These lead eventually through the entire spectrum of actions needed to bring a country into the Soviet orbit or to exercise effective control over it, if the campaign is successful.

An additional Soviet objective is to preposition modern military equipment in strategic locations, available

MiG-21 Operators Outside The Warsaw Pact

Latin America	Europe	Mideast & Africa		Asia & Australasia
Cuba	Albania*	Algeria	Somalia	Afghanistan
Peru	Finland	Angola	Sudan	Bangladesh
	Yugoslavia	Egypt	Syria	China*
		Ethiopia	Tanzania*	India
		Iraq	Uganda	N. Korea
		Mozambique	N. Yemen	Laos
		Nigeria	S. Yemen	Vietnam

*China-built

The MiG-23 Flogger is replacing the MiG-21 as the standard air combat fighter in the Soviet Air Force. The export version, with downgraded equipment and capabilities, has gone to favored clients, including Algeria, Cuba, Ethiopia, Iraq, Libya, Syria, and South Yemen, as well as Egypt.

for use by regular Russian troops if the need arises. This is typified by the introduction of advanced types of aircraft into Libya, whose forces lack the capability to operate and maintain them to useful standards. In addition to the aircraft and requisite technicians, the infrastructure in Libya includes air-conditioned, climate-controlled warehouses for stockage of end items, spare parts, and major components. Thus, if the Russian presence needs to be increased, or a surge of Russian power produced, it can be done simply by sending in the people to use equipment already on hand.

US objectives in military aircraft exports, while in some respects similar to those of the USSR, are aimed primarily at helping the recipient retain its independence. Also, US foreign military sales are attended by a web of Administration and congressional restraints, are wide open to public scrutiny and discussion, and usually are entered into rather gingerly. The Soviets, by contrast, operate within a closed society and infuse massive numbers of people into a target country when ready.

Seasoned observers of the Soviet Union point out that military aircraft exports in recent years have clearly supported these three major goals:

- Gaining control of oil-rich countries;
- Gaining access to the Mediterranean and a direct link to the Indian Ocean; and
- Ensuring that the Eastern bloc countries plus Afghanistan and India serve as buffer zones along Russia's borders.

These observers say that the USSR tries to build a reputation with its clients as a reliable supplier. They cite its massive airlift of replacement equipment to Egypt and Syria during the 1973 war as an example. They also point to Russian assistance to India in building the Hindustan Aeronautics plant at Nasik, which began producing MiG-21s in 1966.

The client states do not always agree that the Russians are reliable suppliers. After twenty years, Egypt evicted the thousands of Russian advisors in its country. Now nearly 200 MiG-21s of its air force are being converted, with British Rolls-Royce engines and French electronics replacing the original Russian components. Nigeria in mid-1979 expelled most of the Russians supporting its MiG-17 and MiG-21 fighters, after becoming fed up with poor spares support and the heavy-handed tactics of the Russians. It is one of the OPEC members that for the moment has rejected Soviet military aircraft support.

Three other important OPEC members—the oil-producing states of Algeria, Iraq, and Libya—are equipped with a predominance of Soviet military aircraft, and they seem to enjoy the highest priority for technical and training support needed to keep the planes operational. In addition, the Russians have been willing

The "Top Ten"

Soviet military aircraft types exported to the greatest number of countries

Designation	Type	Number of Countries
MiG-21 Fishbed	Fighter	30-plus
MiG-17 Fresco	Fighter	27
MiG-15	Fighter	24
Mi-4	Helicopter	24
Il-14	Transport	22
Mi-8	Helicopter	19
Il-28	Bomber	18
MiG-19	Fighter	17
Su-7	Fighter/Ground Atk	16
An-2	Transport	13

Sources: Jane's All the World's Aircraft (various editions); FLIGHT International World Military Aircraft Census, 29 September 1979; The Military Balance, 1979–80; Stockholm International Peace Research Institute (SIPRI) Arms Trade Registers, 1975; INTERAVIA 1/1980, World Air Forces Survey; others.

Up to 360 of the Mi-24 Hind-D assault helicopter are being produced each year for Soviet aviation units. This is its predecessor, the Hind-A, somewhat more lightly armed, but still a more formidable gunship than in service anywhere else in the world. Hind-A gunships have been exported to East Germany, Libya, and Afghanistan.

to supply the later-model aircraft to those countries. All three have received the MiG-23/27 Flogger fighters, and both Algeria and Libya have the MiG-25 Foxbats equipped for reconnaissance and electronic countermeasures roles.

Regarding the buffer states, all countries bordering the Soviet Union are equipped with aircraft of Russian origin, except for Norway, Turkey, and Iran. (In the case of the People's Republic of China, this fact does not offer much comfort to the Soviet leadership any longer.) All the Warsaw Pact countries are equipped with exclusively Soviet operational aircraft. Also in Europe, Finland's front-line fighters are mainly MiG-21s. In Asia, the air forces of Afghanistan, North Korea, and Mongolia are equipped exclusively with Russian aircraft. Elsewhere in Asia, the air forces of Bangladesh, Laos, and Vietnam are all heavily of Soviet origin. The Russians can thus exert pressure on those countries by providing or withdrawing spare parts, technical assistance, and training.

Elsewhere in the world, Soviet export aircraft are employed by such surrogates as Cuba and East Germany to further Soviet goals, as in Angola and Ethiopia. The surrogates provide "force multipliers" of skilled personnel, reducing the Russian requirement.

Why Buy From the USSR?

Why would a country not already under Soviet dominance buy its aircraft, when those from the US or other Western countries are just as suitable? Why should Peru, for instance, opt for MiG-21 and Su-22 fighters? The answers lie in two fields, foreign policy and economics. Peru was frustrated by restrictive US policies in its attempts to buy modern US jet fighters. The Soviets were not only willing to supply the aircraft as a matter of policy; they also offered very attractive terms to Peru. They offered bargain-basement prices, no-interest financing with a long grace period and up to forty years to repay, and a willingness to consider taking some of the price in commodities such as fish meal. American and foreign experts always cite this Soviet willingness to grant virtual giveaway terms to prospective customers as a major reason for the USSR's export success. When it's in their interest, the Soviets give away the aircraft, as they did MiG-21s and MiG-23s to South Yemen in 1979. The same observers also note that the customer pays eventually, just as Dr. Faust had to pay Mephistopheles; it may get modern aircraft cheaply or even free, but also takes on the risk of Soviet penetration and possibly eventual dominance.

When the Soviets become too overbearing or obnoxious, some remarkable flip-flops occur among the pieces on the world chessboard. Take the Horn of Africa, for example. Ethiopia was for years a US client. Neighboring Somalia was under Soviet influence, and the "beneficiary" of Russian-constructed base facilities. Now the situation is reversed. The Russians are pouring equipment into Ethiopia (MiG-17, -21, and -23 fighters); and Somalia, having ousted the Russians, is expressing willingness to grant access to USAF and Navy planes

The obsolescent MiG-17 has been exported to more than twenty-seven countries. This one was flown by a Cuban defector under US radar coverage to land at Homestead AFB, Fla., in 1969. Air forces phasing out the MiG-17 are upgrading into the MiG-21.

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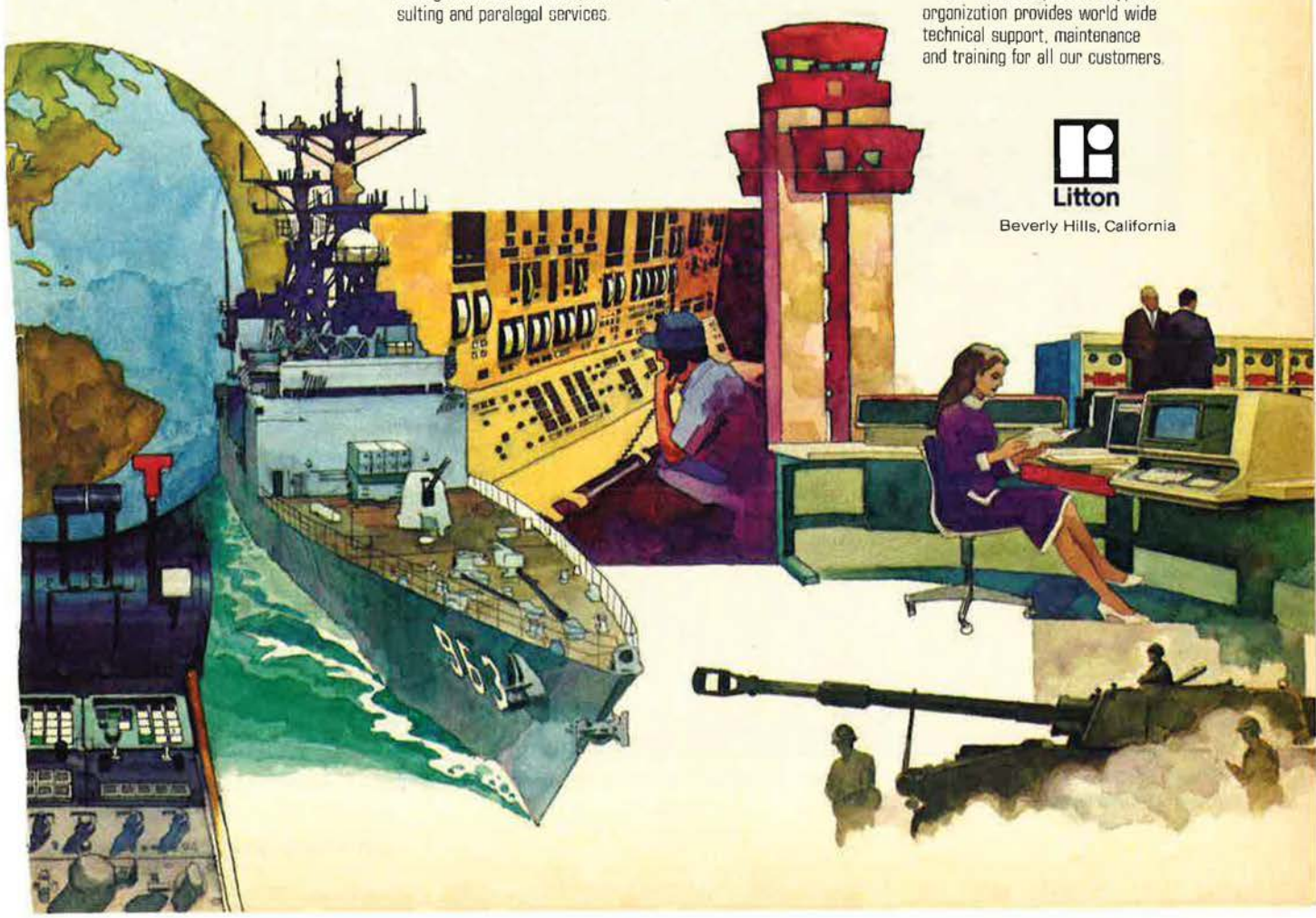

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and ships. Egypt and China are more massive examples of policy reversals where the Russians have lost, with apparent gains for the West and the United States.

Restrictions Imposed by USSR

As noted above, the US has been restrictive in its aircraft exports, domestic critics notwithstanding. This was true even before the Carter restrictions announced in May 1977. Now, however, President Carter has reversed his stand on one aspect of his arms-transfer policy. He is now willing for US aircraft manufacturers to develop a fighter aircraft specifically for export—the FX. Its capabilities are expected to be somewhere between the F-5E and F-16. Other restrictions of law and policy still apply.

Although the Russian leaders do not have a recalcitrant Congress to impose legislative restrictions on their aircraft exports, they do impose their own in practice. They do not export their latest aircraft, for example. And when a late-model airplane is exported, it may for a time be operated solely by Soviet pilots in the recipient country. The Russians tend to downgrade the engines' thrust or fuel capacity, say experts, or substitute older equipment for high technology items such as navigational and guidance systems or armament on export models.

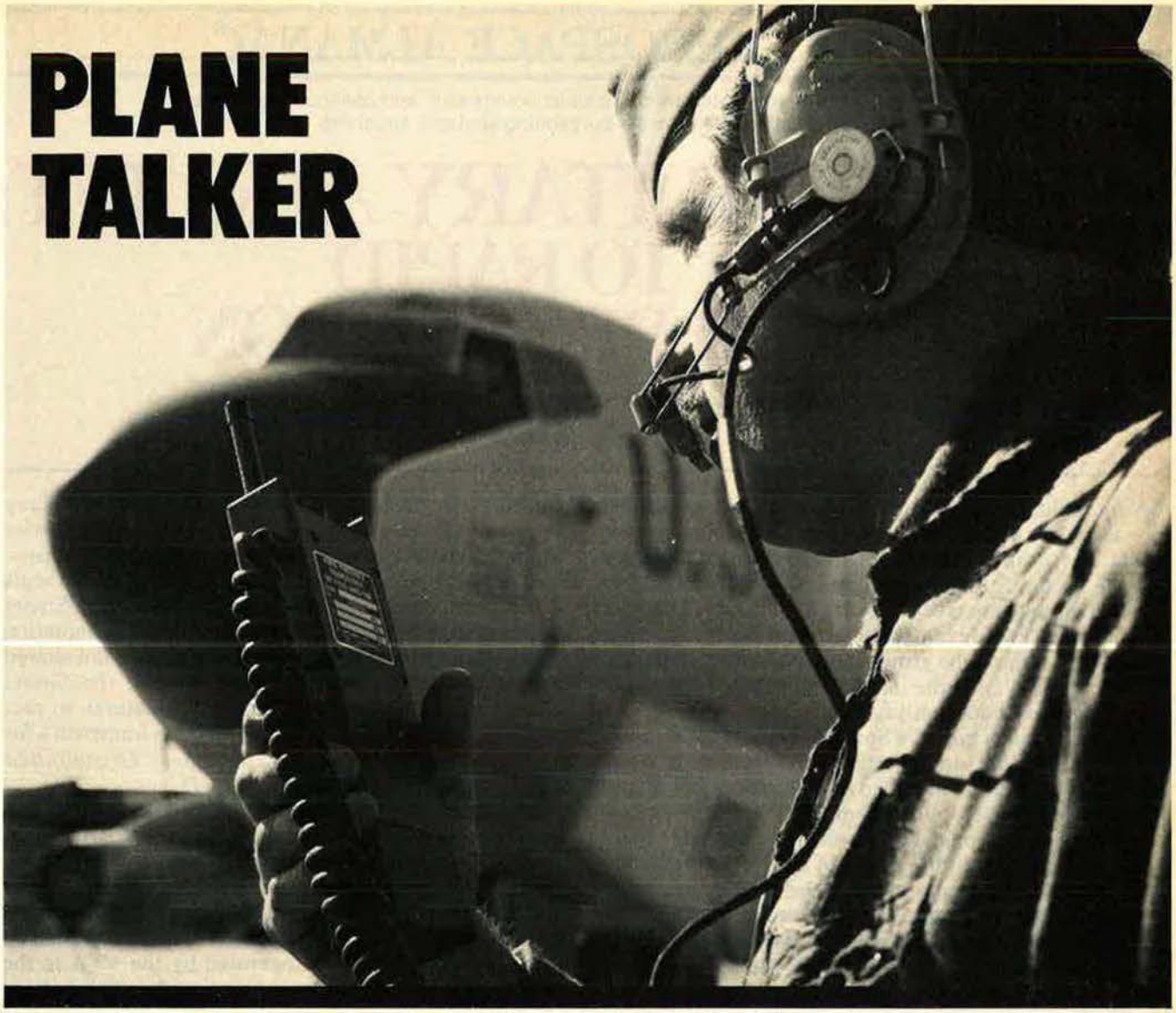
The USSR does not export such long-range aircraft as the Antonov An-22 heavy transport or the Tupolev Tu-95 strategic bomber/long-range reconnaissance aircraft. They restrict the customer list for such sophisticated aircraft as the Tupolev Tu-22 supersonic twinjet bomber; it has gone only to Iraq and Libya, two very-high priority customers. On the other hand, the older, less-capable Ilyushin Il-28 Beagle bomber has gone to fourteen countries. It is the same with helicopters; the older Mi-4 and Mi-8 have gone to twenty-four and nineteen countries respectively. But the Mi-24 Hind assault helicopter has been transferred only sparingly, most notably to Libya and Afghanistan in 1979. Their receipt of the Hind gunship before it is in Warsaw Pact inventories (except East Germany) is a gauge of the priority the Soviet Union attaches to those two countries.

The Future

Future trends in Soviet military aircraft exports can be summarized very simply: "More of the same." It will be a continuation of the policy of using aircraft exports to gain or consolidate influence over target countries. The exports will be aimed at serving Soviet expansionist goals, and to frustrate or displace Western influence. At the same time, the exports extend production runs, reducing unit costs to the Russians and the Pact. The concessionary terms and giveaway prices will continue. As for specific models, the MiG-21 will probably continue to lead the world in exports, because nations now operating the MiG-17 and MiG-19 will want it to upgrade their forces. In helicopters, the Mi-24 Hind gunship will be introduced into the Pact countries, but will be exported outside the Pact only sparingly. However, the Mi-8 Hip helicopter, already in use by a score of countries, will be sold or given to even more clients, as will the Ka-25 Hormone helicopter. Finally, Soviet losses and reverses can be expected, as clients tire of Soviet methods or refuse to pay the price for apparent bargains. ■

A US Navy SH-3A Sea King helicopter swoops down on a Soviet Kamov Ka-25 Hormone antisubmarine helicopter. Exports of the Ka-25 have been limited to India, Syria, and Yugoslavia.

PLANE TALKER



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SOVIET MILITARY AIRLIFT: KEY TO RAPID POWER PROJECTION

BY WILLIAM SCHNEIDER, JR.

THE ability of a nation to project power on a global scale has become the *sine qua non* of superpower status. Yet, despite the Soviet Union's dominant military posture on the Eurasian landmass, its ability to project power to remote areas of the world has been modest until recent years. Two developments appear likely to reverse this state of affairs: the growth and qualitative change in the Soviet Navy, and the incipient appearance of a substantial Soviet military airlift capability.

The evolution of both the Soviet Navy and military airlift capability differs in important ways from their Western, and particularly American, counterparts, but is congruent with Soviet political-military objectives and "style" of operations. During the past decade, there have been changes in the scope of Soviet political-military interests, especially in the Third World, that have been reflected in changes in Soviet military airlift. The nature of these changes has substantially augmented the Soviet potential for worldwide as well as regional strategic airlift operations that will be capable of challenging American interests in most areas of the world during the coming decade.

Organization

The Soviet Air Force (*Voyenno-Vozdushnyve Sily,* or V-VS) is unique among the world's air forces in its organization. The V-VS is one of the five major elements in the Soviet armed forces and ranks fourth in the Soviet order of precedence. (The other four are the Strategic Rocket Forces [*Raketnyye Voiska Strategicheskogo Nazacheniya*], the Ground Forces [*Sukhoputnyye Voiska*], National Air Defense Forces [*Voiska Protivovozdushnoi Oborony Strany,* or PVO Strany], and the Navy.) There are five branches of the Soviet Air Force, but only three are under the administrative command of the Air Force Commander in Chief—Frontal Aviation (*Frontovaya Aviatsiya*—FA), Long-Range Aviation (*Dal'nyaya Aviatsiya*—DA), and Air Transport Aviation (*Voyenno-Transportnaya Aviatsiya*—VTA). Operational command of the remaining two elements—the Air Defense Fighter Command (*Istrebitel'naya Aviatsiya im Protivovoz-dushnoi Oborony Strany* or IA-PVO Strany), and Naval Aviation (*Aviatsiya Voyenno-Morskoy Flota*—AVMF)—are vested in the commander of the National Air Defense Forces and the Soviet Navy (*Voyenno-Morskoy Flot*—VMF) respectively. Soviet Frontal Aviation Air Armies (*Vozdushnaya Armiya*—VA), the largest tactical formation, come under the aegis of the front commander of the local group of Soviet Forces in time of war. The organizational fragmentation of airpower by the Soviet Union is a practice not shared by any Western air force. Nevertheless, the Soviet scheme of organization has numerous features to recommend it, and appears to be an effective framework for managing a very large organization. (*See "Organization of Soviet Armed Forces," pp. 112–115.*)

An organization element that cannot be omitted in a discussion of the VTA is the Soviet's Civil Air Fleet (*Grozhdanskogo Vozdushnogo Flota*—GVF), commonly known as Aeroflot, with which the VTA is closely linked. Unlike their Western counterparts, there are no important military transports that are not also used in civilian service. All aircraft operated by the VTA in the transport role are also operated by Aeroflot. This pattern

of procurement has numerous operational as well as production-related advantages, discussed below. Aeroflot aircraft can be readily transferred to VTA service when required. With more than 500,000 employees, Aeroflot provides a logistics infrastructure that can support the lower manning ratios of the VTA. Aeroflot is under the command of a senior Air Force officer, Chief Marshal of Aviation B. P. Bugaev, and the links with the VTA are well established. Aeroflot has an unequaled route distance in excess of 500,000 miles, of which forty percent is beyond Soviet borders. With the substantial integration of personnel and aircraft between the two services, the potential for the international expansion of VTA activities is significant.

The VTA itself is composed of more than 1,800 fixed-wing aircraft in three broad categories: strategic airlift (of the Il-76 Candid and An-22 Cock variety), "operational-tactical transports" such as the An-12 Cub and the An-72 Coaler, and tactical transports, including both fixed-wing aircraft and more than 6,000 transport helicopters divided equally between the VTA and Aeroflot. Some 3,000 helicopters also are assigned to FA.

The VTA is organized in the traditional triangular hierarchical structure. It is divided into air divisions composed of three regiments, each in turn composed of three squadrons (*eskadril'ya*) with each squadron containing three "links" or flights (*zveno*). The number of aircraft assigned to each level of organization varies substantially among aircraft types. The commander of the VTA is operationally subordinate to the Soviet General Staff, and is charged with furnishing airlift support to all branches of the Soviet armed forces.

The Coincidence of Soviet Civil-Military Requirements

Air transportation is an essential ingredient in both Soviet military and civilian activities. The vast Soviet territory is, with the exception of developed areas in the Western part of the USSR, almost entirely devoid of adequate overland transportation.

Moreover, the inhospitable climate and lack of modern airports has made military airlift requirements very similar to those imposed on the civil sector. Hence, the Soviets have designed and operated military aircraft in large numbers, capable of meeting both civil and military requirements. Economies of scale associated with single production runs make large-scale procurements possible.

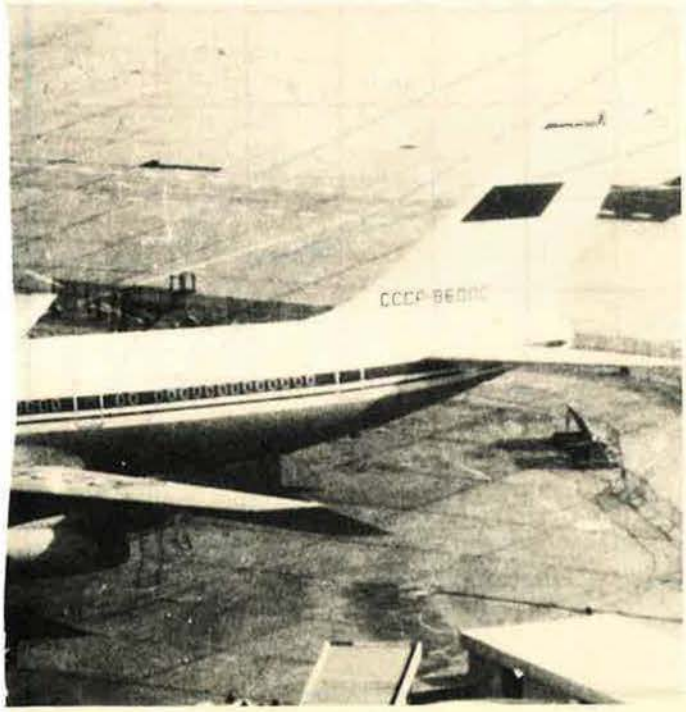
The ability of both the VTA and Aeroflot to use identical aircraft types provides a built-in "reserve" of nearly 400 transports for military operations under emergency conditions. Hence, the Soviet military airlift potential can be swiftly augmented by the civil sector without requiring special ground-handling equipment, unique fuels, special training programs, etc. By contrast, the US Civil Reserve Air Fleet (CRAF) program contemplates integrating only about one-quarter of the total US commercial airline fleet to meet military strategic airlift requirements in an emergency. Most of the civil aircraft allocated to CRAF are passenger carriers; of the 462 total, only 124 are long-range international cargo planes. If Congress provides the funds and the air carriers agree, the CRAF Enhancement Program could produce by 1987 a total of sixty-five additional wide-body passenger aircraft of the 747, DC-10, L-1011 types, convertible from passenger to freight hauling in a mobilization.

Characteristics of Soviet Military Transport Aircraft

The accident of geography and persistent underinvestment in surface transportation has combined to levy rather rigorous requirements on Soviet transport aircraft to meet both military and civil needs. Soviet transport aircraft have six important properties that distinguish them from their Western counterparts: short takeoff and landing capability (STOL), commercial signatures, the ability to operate from unprepared airfields, autonomous operation, simple and easily maintained equipment, and high range/payload performance.

STOL Capability

Soviet aircraft have a substantially higher power-to-weight ratio than their Western counterparts, owing to the requirement for short-field operation. For example, the US C-141B has a thrust-to-weight ratio of .57; the somewhat comparable Soviet Il-76 a ratio of .62. To augment the Soviet aerodynamic design which favors STOL, Soviet transports are normally fitted with hard points for a RATO (rocket-assisted takeoff) unit. The RATO units are widely dispersed at Soviet civil and military air bases, and are frequently carried on board transport aircraft. Some aircraft, such as the An-24 and An-26, are equipped with an auxiliary turbine built into the starboard engine nacelle as an auxiliary power unit. The availability of STOL provides the Soviets with an important capability in both tactical and strategic airlift



An Ilyushin Il-86 wide-body long-range transport aircraft of Aeroflot, on the ramp at the Paris Air Show, alongside the Tu-144 supersonic transport. Aeroflot's aircraft are identical to their counterparts in the military Air Transport Force, and there is substantial integration of personnel as well.

operations where 3,000- to 4,000-meter runways that might be required for heavily laden strategic aircraft are not available.

Commercial Signatures

An important advantage of Soviet military aircraft results from their parallel employment by Aeroflot. Soviet VTA aircraft (with suitable repainting) are indistinguishable from commercial transports. This can be extremely important for achieving tactical surprise. For example, the Soviets could covertly deploy substantial numbers of military personnel outside the USSR without revealing the military nature of their operation (as was done in Czechoslovakia in 1968), by using aircraft with civil aviation markings. By comparison, US military transport aircraft are almost exclusively of a military-unique signature, thereby compromising tactical surprise if a covert airlift operation should be required. As Aeroflot has a very extensive international route structure, the prospects for clandestine movement of military forces and equipment, especially in the Third World, is substantially greater for the Soviet Union than is the case for the United States.

Operation From Unprepared Airfields

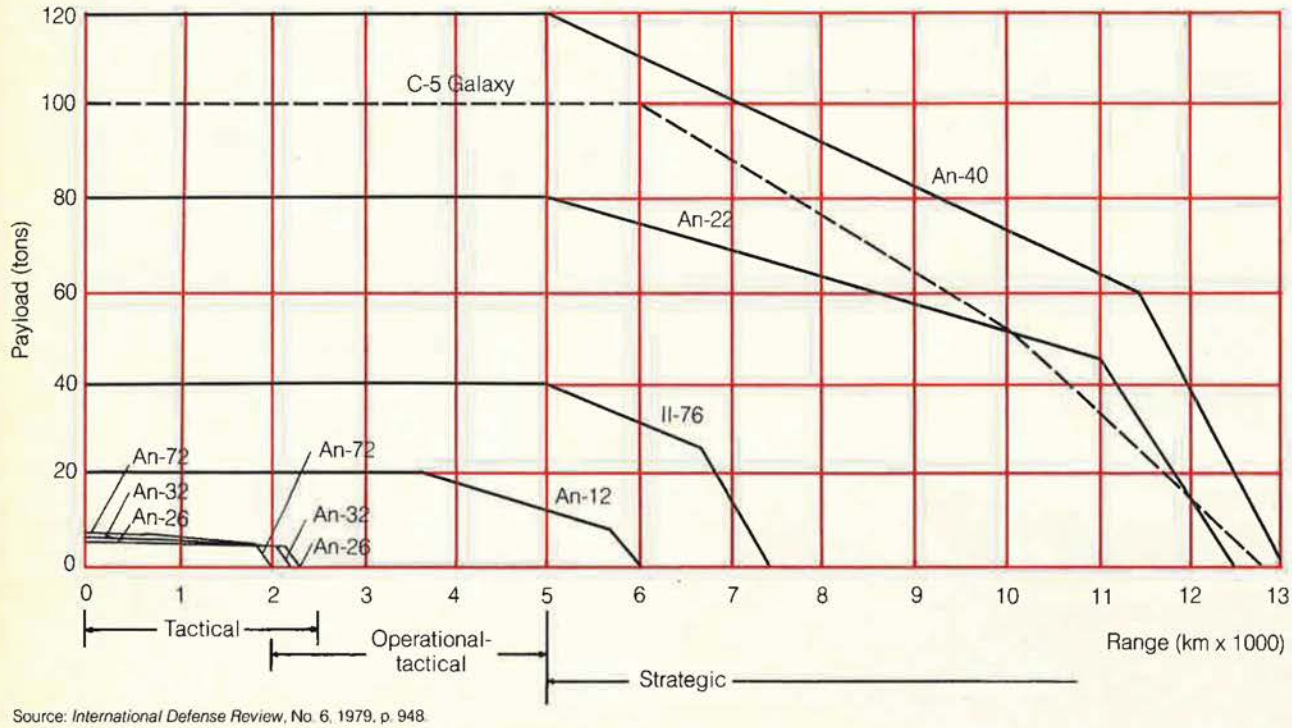
The lack of a substantial number of prepared runways has led to a requirement for all Soviet aircraft, both military and civil, to be capable of using low-quality airfields. Soviet transport aircraft are designed with extremely rugged undercarriage, having multiple low or variable pressure tires and short landing-gear legs mounted in pods. Like Soviet fighter aircraft, most modern Soviet transports are equipped with a variable tire pressure system to enable them to adjust tire pressure to meet local conditions. Tire pressure can typically be varied between 5.0 bar and 2.5 bar when going from a concrete runway to a runway of uncompacted sand or sandy soil.

Autonomous Operation

As the Soviets frequently have to use their military and civil aircraft under austere circumstances, they must be equipped to operate with a minimum of ground-handling equipment. As a consequence, Soviet air transport design has embodied a number of features generally not found in Western aircraft because of the more widely available ground-handling equipment characteristic of Western airfields. Soviet transports generally operate with on-board cargo-handling equipment (for both fixed-wing and helicopter aircraft). Rather than relying on ground-based auxiliary power units (APU) to start engines, they have on-board APUs that also supply power for testing electrical and hydraulic systems. The availability of gravity refueling makes it possible to refuel Soviet transport aircraft under primitive conditions—a fact that increases the utility of these aircraft.

Soviet fixed-wing aircraft and helicopters also have on-board cargo-handling equipment built into the load-bearing structure of the airframe. Overhead trolley hoists and chain conveyors facilitate rapid unloading, particularly of nonself-propelled equipment, and built-in winches are used to extract cargo from the interior bays. The Soviets have also developed several unique air-dropping systems, including the use of braking retro-rockets to drop heavy or fragile equipment. The air-dropped pallet is equipped with sensors mounted on the pallet which, upon touching the ground, fire the retro-

PAYLOAD/RANGE PERFORMANCE OF SOVIET TRANSPORTS



Source: *International Defense Review*, No. 6, 1979, p. 948.

NOTE: The C-5 (dotted line) is shown for comparison. An-40 data is theoretical.

The Ilyushin Il-76 is the Soviet counterpart to the USAF C-141. It has a payload similar to the C-141's, but is capable of operating from more austere airfields. Current production is three per month, with several hundred contemplated for purchase by the Soviet Air Transport Force and an additional one hundred for Aeroflot.

rocket, enabling the equipment to achieve a zero descent speed at the moment of impact. The West in general, and the US in particular, have placed declining emphasis on parachute delivery of personnel and equipment to combat areas, while this emphasis has increased in the Soviet Union. The Soviets now have eight airborne division-equivalents deployed, with numerous special operations brigades attached to them, equipped with unique airportable equipment.

Simple Design With Low Maintenance Requirements

According to Peter Bogart, an analyst of Soviet military aviation, while "Soviet transport aircraft can hardly be said to represent the epitome of aerospace technology, they are certainly capable of fulfilling their roles. . . ." This summarizes the general approach of Soviet designers to meeting military requirements. The modest air base infrastructure in the Soviet Union has led to a requirement for simple maintenance procedures. Some Soviet aircraft, such as the Il-76, carry two or three additional persons to perform maintenance, enabling the aircraft to remain out of maintenance depots for up to ninety days. An illustration of relatively simple equipment is a landing aid for helicopters operating in heavy fog—a frequent occurrence in Arctic regions. Two searchlights are built into the helicopter's undercarriage. When their beams intersect, the helicopter is one meter off the ground. Such a "crude" device may be more dependable and easier to maintain than advanced electronic devices.

In some areas, however, the Soviets have imposed more rigorous requirements on their aircraft than have their Western counterparts. This is particularly true in the requirement for night/all-weather helicopter capability, which has existed since the 1950s, but only recently has been installed in some US and Western helicopters. This requirement relates to the Soviet doctrinal emphasis on providing Soviet ground forces logistic support for round-the-clock offensive operations, as well as the civilian requirement to operate at northerly latitudes where the period of daylight is brief during most of the year.

Range/Payload Capability

Soviet transport aircraft are divided into three mission categories; tactical (with a range of up to 2,500 kilometers), operational-tactical (with a range of between 2,000 and 5,000 kilometers), and strategic (with a range in excess of 5,000 kilometers). The Soviets have not placed the premium on developing a small number of aircraft with optimized range/payload characteristics that has dominated Western thinking. Rather, they have proliferated types of aircraft unique to, or at least overlapping, the three mission areas as suggested in the accompanying graph. The range/payload relationship of Soviet helicopters is related to their civilian requirements of relatively long ferry ranges between remote areas of the northern and northeastern part of the USSR. At two-thirds of maximum payload, Soviet helicopters have a range of at least 400 kilometers, and the larger helicopters have a range of 500 kilometers. Moreover, most Soviet helicopters are equipped with external fuel tanks.

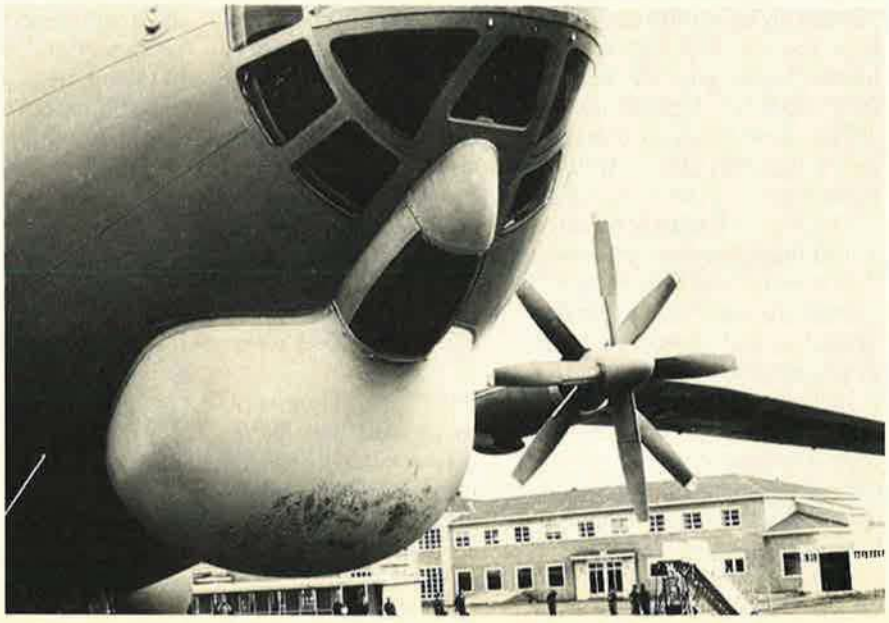
An Ilyushin Il-62 of Aeroflot during flyby at Domodedovo Airport, Moscow. The Il-62 was teamed with the Antonov An-22 in an airlift to Angola, 1974–75.

Current and Prospective VTA Aircraft

The VTA operates a substantial fleet of approximately 1,800 aircraft serviced by a modest force of perhaps 50,000, but supported by the additional 372 aircraft and a staff of 500,000 in Aeroflot. The Soviets meet their military airlift needs through a large number of aircraft types, a factor that reduces the advantages that may otherwise accrue to a design philosophy of simplicity and low maintenance costs. A similar multiplicity of types is characteristic of the Soviet transport helicopter fleet.

Soviet transport aircraft are developed primarily by three Soviet design bureaus; Ilyushin, Antonov, and Yakovlev. Helicopters are developed by two Soviet design bureaus, Mil and Kamov. These bureaus provide the designs for both the Soviet civil and military aircraft that are produced by a network of nearly 400 factories under the Ministry of Aviation Industry (MAP). The aircraft performing the tactical and operational-tactical missions have many similar characteristics so they will be discussed only briefly here. The general characteristics of these aircraft are well described in standard reference texts on international aircraft. The principal aircraft of the VTA/Aeroflot are: I1-14 (Crate), I1-18 (Coot), An-8

Above: The Antonov An-22 turboprop-powered long-range cargo aircraft is fitted with dual counterrotating propellers for each of its four engines. It is the largest Soviet strategic airlifter, and has been used extensively in flights to the Western Hemisphere and Africa, as well as the December 1979 invasion of Afghanistan. At right: Close-up of navigator's station on the Antonov An-22 cargo transport. The aircraft's unique dual counterrotating propellers can be seen to right of the nose.



(Camp), An-12 (Cub), An-24 (Coke), An-26 (Curl), An-32 (Cline), An-72 (Coaler), Yak-40 (Codling), and Yak-42 (Clobber).

As is common Soviet practice, obsolescent aircraft are rarely phased out, but instead shifted to lower-priority missions. Hence, such aircraft as the An-8, Il-14, and I1-18 are still in wide use, although seen less frequently in first-line service.

One operational-tactical aircraft that deserves particular mention is the An-72 (Coaler). This aircraft closely resembles the Boeing YC-14, the experimental advanced medium STOL (AMST) aircraft that involved innovative blown wing technology providing substantial aerodynamic lift without the need for additional thrust. This aircraft was not procured by the US Air Force, but its Soviet counterpart is now in serial production for Aeroflot and VTA. If deployed in large numbers, the An-72 would substantially improve Soviet tactical transport, as it has efficient on-board cargo-handling equipment that will enable it to service the airlift needs of a fast-moving mechanized ground force, such as is now deployed in Afghanistan.

The An-12 was widely used in the December Soviet airlift to bases in Kabul and Bagran, Afghanistan, from Soviet air bases in the western USSR, including Vitebsk (probably the 103d Guards Motorized Rifle Division, long thought to have a special role in the event of Soviet intervention in the region, is stationed there), Smolensk, Pochinok, and Seshcha. These bases are well beyond the range of the An-12, and would consequently require intermediate stops, an interesting illustration of the Soviet concept of "operational-tactical" aircraft suggesting that the traditional Western distinction between "tactical" and "strategic" airlift is not shared by the Soviets. They would be likely to exploit their tactical airlift in a strategic role through the use of intermediate bases, a practice that is facilitated by employing military aircraft with commercial signatures, enabling them to more easily use foreign commercial facilities for refueling.

There are four principal strategic airlifters with an operational range in excess of 5,000 kilometers. The largest, the An-22 (Cock), has been used extensively in airlifts to the Western Hemisphere and Africa, as well as the recent operation in Afghanistan. Eighty-five of these aircraft have been built, with forty assigned to the VTA. However, at least three have crashed outside of the Soviet Union and perhaps others within the USSR, unreported to international aviation authorities. Hence, it is believed that the Soviets are developing a new aircraft which has been designated the An-40. It will have range-payload characteristics similar to or exceeding the US Air Force C-5 Galaxy. The Soviets have tried to buy high bypass turbofan engines suitable for a large strategic transport, but were rebuffed by US and British authorities. Thus, there may be a considerable delay in deploying the An-40, until a suitable engine can be developed by the Soviet Union.

A recently produced aircraft, the Il-86 (Camber), is the first major Soviet wide-body aircraft. It is powered by four Kuznetsov NK-86 turbofan engines, but this engine may be replaced by a more advanced design, the NK-8-2U, nearly fifty percent of which is made of titanium. The I1-86 is appropriate for tanker and early warning roles, as well as freight and troop-transport missions. The Soviet Union normally rotates 100,000 to 125,000 troops from the Group of Soviet Forces in Germany (GSFG) to the USSR each summer using Aeroflot aircraft, a mission well-suited to the I1-86. The Camber is designed with both upper and lower decks pressurized, giving it a maximum troop-carrying capacity of 420. The design of the lower cargo doors enables the aircraft to accommodate 200–300 fully equipped paratroops. The I1-86 is produced jointly by the Soviet Union and Poland, although final assembly is carried out entirely at the Voronesh facility in the USSR. Because the aircraft is expected to be widely used in commercial service, it poses a potential problem where NATO is most concerned about rapid reinforcement, *i.e.*, in eastern Europe.

The Soviet counterpart to the US C-141 is the I1-yushin Il-76 (Candid) aircraft. The Il-76 has a payload similar to the C-141B, but is capable of operating from far more austere airfields. The Candid was a principal component of the Soviet airlift to Angola in 1975 and Ethiopia in late 1977 and early 1978. Current production of the I1-76 is approximately three aircraft per month. Several hundred of these aircraft are expected to be procured by the VTA with an additional 100 for Aeroflot, providing the Soviets with a very substantial long-range airlift capability that can exploit the limited air base infrastructure in the developing world with considerably greater effect than can its Western counterparts.

The I1-62 (Classic) is now widely used in Aeroflot service, and was teamed with the An-22 in the Angolan airlift of 1974–75. From air bases in the southern USSR, the I1-62 was deployed to Angola via Libya or Algiers, Guinea-Bissau and Brazzaville, to Luanda, Angola, in one of the first large-scale Soviet strategic airlift operations.

Although the US had an early lead in the large-scale deployment of transport and attack helicopters, the Soviet Union has undertaken a vigorous program to produce helicopters that now are widely deployed in several branches of the Soviet armed forces, including VTA, FA, the Navy, and Aeroflot. As is the case with fixed-wing aircraft, obsolescent types normally are retained in service although used primarily in low-priority missions and training. The most important currently deployed types include Mi-2 (Hoplite), Mi-4 (Hound), Mi-6 (Hook), Mi-8 (Hip), Mi-10 (Harke), Mi-12 (Homer), Mi-24A-D (Hind), Ka-25K (Hormone), and Ka-26 (Hoodlum).

Although most Soviet transport helicopters contain some form of on-board armament, only the Mi-24 series is explicitly employed in the dual transport/attack role. Armament on Soviet transport helicopters typically includes multiple rocket launchers and machine guns, and in some cases, bombs. Coincident with the Soviet view of warfare involving the rapid movement of mechanized forces on the offensive, Soviet helicopter transport aug-

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ments fixed-wing as well as ground-based transport to deploy materiel to division, regiment, and battalion depots as needed.

Recent Soviet Airlift Operations

The support of Soviet diplomacy in the Third World increasingly has involved the employment of airlift. It was not until the 1970s, however, that the convergence of trends affecting the scope of Soviet Third World interests, the worldwide "basing" structure available to the Soviets (acquired through a combination of bilateral agreements, *e.g.*, the "Friendship Treaty" with Afghanistan, and the growth of Aeroflot's international route structure), and the qualitative improvement of Soviet transport aircraft have fully matured.

There have been four major Soviet airlift operations that had a decisive effect on the outcome of a local conflict: Egypt and Syria in 1973, Angola in 1975, Ethiopia in 1977–78, and Afghanistan in 1979–80. These operations reflected the increasing capability of the VTA/Aeroflot to conduct logistic activities at long ranges with substantial payloads, exploiting, where necessary, its commercial access to Third World airport facilities. A detailed discussion of each of these airlift operations would be beyond the scope of this article, but several general observations contribute to understanding trends in Soviet military airlift operations.

Aeroflot-VTA Integration

To a considerable degree, recent Soviet airlift operations have shown that the Soviets have been able to exploit both their civil and military airlift potential in a flexible manner. In October 1973, 934 An-12 and An-22 missions were flown delivering 15,000 tons of materiel to Egypt and Syria. Approximately 225 aircraft were used, departing from several Soviet civil and military airfields at intervals of twenty to twenty-five minutes. A similar number of aircraft was employed in the Ethiopian airlift, although the aggregate tonnage delivered is believed to have been considerably larger, based on the fact that Soviet Army stores from depots in Alma Ata and Tashkent had to be drawn upon to meet requirements in Ethiopia. Little disruption in Aeroflot operations was noted.

High Sortie Rates With Minimum Prior Preparation

Soviet transport aircraft do not require elaborate ground-support equipment, making possible rapid turnaround, even from areas where the cargo-handling infrastructure is virtually absent, as was the case in Ethiopia and Afghanistan. The Soviet practice of developing equipment unique to or compatible with airborne operations, including artillery (the ASU-57 and ASU-84 assault guns, 122-mm howitzer, 120-mm mortars, the sixteen-tube 140-mm multiple rocket launcher, and the nuclear-capable FROG missile), antitank weapons (Sagger, Swatter, and RPG), air defense weapons (ZSU-23/2 and ZSU-23/4 23-mm guns and the SA-4 SAM), and ground-based transport and tanks (BRDM and BMD armored personnel carriers, and the PT-76 light tank) gives the Soviets the ability to swiftly place a powerful airborne force in a troubled region with a modest transport force. By way of illustration, in the *Dvina* exercise in 1971, a Soviet airborne division with 160 vehicles was landed in only twenty-two minutes.

Civil Sector Requirements Overlap Military Requirements

The limited air transport infrastructure in the Soviet Union parallels the situation facing Soviet military airlift in many areas of the Third World. Thus, the Soviets have a ready capability to surge their airlift potential by including civilian aircraft without time-consuming modifications or by being restricted to developed airfields.

Military Airlift May Be the Preferred Soviet Mode of Intervention

The growing capability of the USSR's military airlift meshes well with Soviet capabilities. Soviet naval power appears to be designed to thwart the preferred US mode of intervention (*i.e.*, naval power), but does not (yet) appear directed toward the development of a US-style amphibious assault capability. The offensive land-warfare support role, at least for the present, appears to lie in the Soviet potential for military airlift.

The Future of Soviet Airlift

The success that the VTA has enjoyed during the past decade will almost certainly spur a greater emphasis on airlift in the future. Soviet airlift has already made most of the Indian Ocean littoral "closer" in a strategic sense to the Soviet Union than it is to the United States—primarily through growing capability of the VTA. This fact is underscored by a concrete example: The Soviet Union could deliver ten airborne/motorized rifle division-equivalents to the Persian Gulf in the same two-week period that the US would need to deliver a single fully equipped mechanized infantry division, a disparity of decisive significance in many potential conflict situations. The disparity in airlift capability amounts to a major reversal for the United States in power-projection terms, and substantiates the extent of the decline of American military power since the 1960s.

The pacing needs of Siberian development will inevitably require larger transport aircraft of the projected An-40 size, but retaining the features of other Soviet transport aircraft such as STOL and autonomous operation capability. The vast civil requirements facing the Soviet Union suggest that a large increase in strategic transport aircraft will be needed in the 1980s—an investment program that will accrue to the benefit of the VTA. This further implies that the Soviet Union will be able to move main battle tanks (typically weighing about forty tons or two-thirds that of their Western counterparts) and heavy self-propelled artillery (up to 203 mm) with the next generation of transport aircraft, bringing virtually the entire ground force complement of the Soviet Army into the air-transportable realm.

To successfully deploy its forces overseas by transport aircraft, the Soviets will be obliged to make very considerable improvements in their command and control systems. The Afghanistan operation suggests that many of these problems have been mitigated, at least as far as nations contiguous to the Soviet Union are concerned, putting the Soviets on the road to a worldwide power projection capability of significant proportions. ■

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A continued high level of manned and unmanned spaceflights characterized Soviet activities in 1979. The program is massive, rather conservative, but with major emphasis on military programs.

THE SOVIET SPACE PROGRAM IN 1979

BY CHARLES S. SHELDON II

THE year 1979 continued a high level of activity in the Soviet space program. Eighty-seven launches orbited 124 payloads, compared with sixteen and eighteen respectively for the United States. Another comparison between the two countries shows that the year's civilian and nonsensitive military launches in the Soviet Union totaled twenty-eight, compared with eleven in the United States. Sensitive Soviet military launches were fifty-nine, compared with five in the US.

A simple comparison of numbers is not sufficient in drawing conclusions about the two nations' space programs, because there could be differences in the effectiveness of particular kinds of flight hardware. The disparity in numbers, however, is so great that one must feel strong concern.

The United States has not had a manned spaceflight since 1975, and is still working to ready the Shuttle for future use, struggling to overcome its development difficulties. The Soviet manned station effort has continued to demonstrate versatility. In 1979, six more successful rendezvous flights were made to Salyut-6 for a total of sixteen successes in eighteen attempts. By the end of the year, the cumulative Soviet man-hours in orbit reached 35,778:05, compared with 22,503:49 for the United States.

Ground Support and Launch Vehicles

Plesetsk, the Arctic site north of Moscow, remains the busiest in the world, with a cumulative launch total of 686, including sixty-six in 1979. Tyuratam, the site in Kazakhstan, now has a cumulative total of 491, with nineteen in 1979. The third Soviet site, Kapustin Yar on the lower Volga, has had sixty-nine, including two in 1979. These numbers contrast with Vandenberg at 422 and six, Canaveral at 303 and eight, and Wallops Island at eighteen and two respectively.

Seven large, modern Soviet ships are fully equipped floating control centers for spaceflight. They also serve as relay stations (via Molniya satellites) between the main control centers near Moscow and Yevpatoriya in the Crimea and orbiting spacecraft. Additional Soviet space monitoring ships are strategically placed in all the oceans and selected seas in further support of missions.

The standard "A" Soviet launch vehicle, able to orbit as much as 7,500 kilograms, has been used successfully 767 times, including sixty in 1979. The "C" class launch vehicle has now been used 210 times, including eighteen in 1979. This vehicle may be able to lift 1,000 kilograms, but generally carries less to a variety of often circularized intermediate altitude orbits. The small "B" class launch vehicle, which has been used 144 times, now may be retired, as it has not been used since 1977. The "F" class vehicle, which can lift about 4,500 kilograms, has flown sixty-eight times, including three flights in 1979. The large "D" class launcher, able to lift 20,000 kilograms, has flown sixty-one times, including six in 1979.

These numbers compare with the US leading launch vehicles: Thor at 352 and four in 1979; Atlas at 170 and four in 1979; Titan at 122 and five in 1979; and Scout at seventy-one, including three in 1979.

Activity Levels by Program

Since the majority of Soviet launches, though announced promptly with their orbital elements, are not accompanied by any official explanation of specific purpose, Western analysts still must depend upon their own skills and on analogies to past flights in assigning suspected launch vehicles and missions to each flight. There is reasonable confidence that such classification is accurate, but especially toward the end of each year as new types of flights appear, there is not enough time to test all the hypotheses and to be absolutely certain. Tables have to be revised slightly from time to time as better answers become available. That caution applies to the USSR's space activities during 1979, which are summarized here by type of mission.

Military Observation

These thirty-six flights still make up the largest single element of the Soviet program. Most of the payloads are in about the 5,000-kilogram class in low orbit and are recovered on earth in about fourteen days. The improved version, which stays up thirty days, was used five times during 1979. This extended-stay flight may use a modified Soyuz shell with solar panels, contrasted with the shorter life version, which may use a Vostok shell and chemical batteries alone. In 1979, ten of the flights were labeled as earth resources missions, but to Western observers were indistinguishable from other military photographic missions.

Store-Dump Communications

During 1979, there was a regular replacement of payloads used for such purposes. Two launches of eight

satellites each plus three other single launches of a larger version were made for a total of nineteen payloads. These may be used to pick up messages in one part of the world, record them, and play back on command later; or they may serve tactical real-time communications purposes in particular theaters.

Regular Communications

Ten flights included three Molniya-1 payloads, probably for military use, and two Molniya-3 payloads, which support general domestic communications, ties of the Intersputnik Soviet bloc network, and the hot line to the United States. All the Molniyas fly twelve-hour eccentric orbits inclined at sixty-three degrees to the equator so that any four can be spaced in a way to give virtually continuous coverage over the entire expanse of the USSR. They station-keep to repeat a ground trace each day over the Soviet Union and over North America, lingering in the northern hemisphere, and sweeping fast and low over the southern hemisphere. Also during 1979, Raduga-5 was placed in a geostationary orbit over the equator at eighty degrees longitude east. Gorizont-2 was placed at fourteen degrees west, and Gorizont-3 at fifty-eight degrees east, both geostationary over the equator. Ekran-3 and Ekran-4 were placed at ninety-nine degrees east, geostationary over the equator. Raduga, Gorizont, and Ekran make up different parts of the Soviet Statsionar system, with Raduga supplying domestic television, telephone, and computer links without the necessity for tracking and switchover as with Molniya, while Gorizont will support international links during the Olympic Games, and Ekran is used to distribute television to about a thousand small antennas in Siberia not served by the eighty or so expensive Orbita ground stations that can provide two-way service.

Soviet launch vehicle for the Soyuz spacecraft on launch pad. It lifted off on July 15, 1975, to join the US vehicle in space on the Apollo-Soyuz project.

Navigation and Geodesy

Six flights in 1979 probably belong in this category, although one was apparently mislabeled as a natural resources flight. The name Kosmos is used to describe these flights, the ubiquitous label used for most military flights, but the Paris Air Show included a model on display that was labeled Tsikada. These satellites broadcast the same 150- and 400-megacycle stable signals as used by US Navy Transit flights. Currently, there are two distinct networks in service, identified by Geoffrey Perry and Christopher Wood in England who have interpreted virtually all the coded signals that come from them, including accurate time and orbital data that indicate their exact place in the sky. One network is probably purely military, while the newer network, with one flight specifically identified by the Russians, serves the merchant marine and fishing fleets.

Earth Orbital Science

Unmanned scientific flights were relatively few in number. Interkosmos-19 and -20 carried experiments from Soviet bloc countries. Kosmos-1,112, because it was launched at Kapustin Yar, may have been scientific, but it could as easily have been a minor military mission. There were perhaps ten unidentified piggybacks carried on military recoverable missions that could be scientific missions. This will not be known until years later when published scientific articles happen to reveal such information. Principal scientific work during 1979 was conducted on manned missions.

Natural Resources Studies

This class of activity can be identified as increasingly important, but it cuts across other categories of flights. As mentioned, ten military recoverable payloads were identified as serving natural resources purposes. One navigation satellite was mislabeled for natural resources purposes. Soviet weather satellites produce such high resolution pictures that they are also used for natural resources work. The Salyut space station during 1979 carried on considerable natural resources work. Three other specialized flights were specifically tagged as doing similar work. These were: Kosmos-1,076, a fairly large and ambitious ocean resources data mission; Interkosmos-20, also related to ocean resources for the bloc countries, but on a fairly modest scale; and finally Bhaskar, an Indian satellite whose television camera system apparently failed at the outset of the mission, thwarting an ambitious program of resources work.

Weather Satellites

Since the Soviet program began, the Russians have put up forty-nine weather satellites. Today, such flights are either of the Meteor-1 or Meteor-2 class. Meteor-1 now flies a retrograde sun-synchronous path as do most US

weather flights. Meteor-2 is still classed as partially experimental with advanced sensors, but is not sun-synchronous. During 1979 there were three flights, one of the first type and two of the second.

Earth Orbital Man-Related Flights

During 1979, the Russians flew a third mysterious paired flight of two payloads on a single "D" class launch vehicle, with a recovery so soon that no orbital period was announced. There were similar flights in 1976 and 1978, and they suggest reentry tests, which one is tempted to link to development of a Soviet recoverable shuttle, but no available evidence confirms this.

Another long, drawn-out development program that was never acknowledged or explained included, during 1979, a flight labeled Kosmos-1,074, whose orbit and telemetry seemed to link it with the Soyuz manned program. Late in the year, this mystery was cleared up. Soyuz-T was launched unmanned, with similar characteristics, and it was described as a new-generation ferry craft extensively redesigned, in contrast to the gradual improvements normally added to the old Soyuz series. Soyuz-T, flown unmanned, and docked with Salyut-6 after a three-day approach, had a new unified propulsion and orientation system, a much more versatile on-board computer and autonomous control system, a new life-support system, and solar panels, which in recent years had disappeared from other Soyuz ferry craft.

Progress-5 through -7 during 1979 served as unmanned resupply ships to the Salyut-6 station, carrying fuel, food, air, and replacement parts or new experiments. Because they are not recovered at the end of their flights, they have added carrying capacity compared with Soyuz, which they resemble superficially. These supplies total about 1,300 kilograms of packaged goods and 1,000 kilograms of fuel and oxidizer in spherical tanks. Their transfer can be done automatically, but is done with close cosmonaut monitoring as any intermixing of the hypergolic propellants could be fatal. Loaded, Progress weighs 7,020 kilograms.

Kosmos-1,129 was one of a series of biological experiment satellites in the Vostok class, carrying Soviet bloc, US, and French experiments for a nineteen-day flight. While many experiments were carried, principal attention focused on white rats divided into two groups in centrifuges and a third group left "weightless," to be compared with analog groups in a laboratory on earth.

Manned Flights

The successes of 1978 were continued through 1979, when the third long-duration crew set a world record for staytime in orbit—175 days. Lyakhov and Ryumin were launched on February 25, in Soyuz-32. A resupply mission by Progress-5 was launched on March 12. When preparations were made to transfer fuel from the Progress into Salyut, an opening was discovered within the Salyut tank in the bellows membrane that separates the fuel from the nitrogen gas used to pressurize the system. The entire station was spun to separate as much fuel from nitrogen as possible, and then the salvaged fuel was transferred to another tank, with the remaining mixed fuel and nitrogen pumped to an empty container in Progress, followed by a week of careful purging to the vacuum of space, finally sealing off the damaged tank. Then normal transfers of fuel and oxidizer were carried out.

On April 10, Rukavishnikov and Ivanov (a Bulgarian) were launched in Soyuz-33 to join the earlier crew. For the first time in the Soyuz program, a serious anomaly developed in the approach engine, and the new crew was returned to earth without docking. Salyut-6 was then resupplied by Progress-6, launched May 13, and carrying the Bulgarian experiments that were to have been delivered by the aborted mission.

The Russians do not like to leave a station crew dependent on a Soyuz ferry that has been shut down for more than ninety days, a limit that was passed by Soyuz-32. Soyuz-34 was launched unmanned on June 6, reaching the station less than four hours after Progress-6 was undocked. On June 13, Soyuz-32 was returned to earth unmanned carrying experimental results and films. Because Soyuz-34 had docked at the after end of the station, the only place where propellants can be transferred, the crew entered the ferry on June 14, undocked, and watched the station rotate 180 degrees, then redocked at the forward end and reentered the station.

Progress-7 was launched on June 29 for another resupply mission, in lieu of sending the expected Soyuz-35 with a crew including the promised Hungarian. Finally, the crew returned to earth on August 19, having mothballed the Salyut-6 to keep open the option of further visits by future crews.

Soyuz-T, mentioned above, was launched on December 16 and docked with Salyut-6 three days later. Late in the year, in a familiar pattern, the new ferry was used to raise Salyut-6 to an orbit only a little short of 400 kilometers high.

The 1979 crew during their 175 days had a very full program that can be grouped under several headings.

DISTRIBUTION OF SOVIET SPACE PAYLOADS BY PUTATIVE PROGRAM 1957–79

Possible Mission	*1979*	*(1957–79) Cumulative*
Military Recoverable Observation	36	466
Communications	29	312
Earth Orbital Science	14	154
Minor Military Mission (which could include some environmental monitoring, radar calibration, or electronic ferreting)	2	112
Navigation and Geodesy	6	78
Electronic Ferreting	6	68
Earth Orbital, Man- or Biology-Related	9	55
Weather Reporting	3	49
Earth Orbital, Manned	2	44
Unmanned Lunar Related	0	34
Venus Related	0	27
Ocean Surveillance	3	24
Fractional Orbital Bombardment	0	18
Mars Related	0	16
Inspector/Destructor	0	16
Early Warning	2	15
Targets for Inspection	0	14
Engineering Test	0	9
Lunar, Man- or Biology-Related	0	8
Orbital Launch Platform	12	186
TOTALS	124	1,703

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The well-being of the crew itself carried a high priority, including more than two hours a day of exercises on a treadmill and fixed bicycle, many hours each day of wearing a tension suit against which human muscles had to work, periods in a negative pressure lower body suit, and extensive use of sensors and blood-analyzing equipment. Station well-being also received considerable attention, with a program of preventive maintenance and replacement and upgrading of existing systems and components. Resonance experiments were conducted repeatedly to discover what stresses came from human movements and equipment operation as two or three ships were coupled together. For example, it was found one particular speed in the exercise treadmill set up harmonic vibrations that were potentially destructive.

There were many biological experiments for measuring the growth of plants, single-celled life, tissue cultures, fruit flies, and fish. Two separate electric furnaces, Splav and Kristall, were used repeatedly to create new alloys impossible to create on earth, to create perfect spheres, and to develop solid-state crystals for infrared devices and electronic purposes.

Earth resources investigations studied tectonics, topography, agriculture, forestry, water resources, ocean currents, fisheries, pollution, and the atmosphere, using an impressive array of instruments. Some of these devices were also used for astrophysical, lunar, and planetary research. The German Democratic Republic MKF-6M multispectral camera with a resolution of ten to twenty meters was used repeatedly, with each film cassette recording ten million square kilometers. The KATE-140 topographic camera with a resolution of sixty to seventy meters took highly controlled stereo pair pictures for topographical mapping. The BST-1M submillimeter camera with a 1.5-meter reflector was cooled with liquid helium prepared in an efficient compressor, and made measures of both earth and stars in the infrared and ultraviolet ranges. The Yelena gamma ray telescope made solar and stellar observations. The final surprise came in the closing weeks of the mission: The KRT-10 radio telescope was brought to the station by Progress-7 to be assembled by the cosmonauts. As Progress-7 backed off from the station, but hovered close enough to observe by television, the crew pushed controls that unfurled a ten-meter dish at the after end of the station. The dish was used both to study the earth and as an interferometer with a ground-based seventy-meter dish in the Crimea for deep space observations of high resolution. At the close of the experiments, it was discovered when the crew tried to separate the KRT-10 from the station that it had become caught on a projection. On August 15, the crew did an EVA (extravehicular activity), and with special tools cut free the radio telescope, which was large enough to be visible to ground observers the world around.

Communications with the station were better than ever, as the radio links and on-board teletype were supplemented with more on-board color cameras and a television receiver so that diagrams, pictures, and even families could be seen by the cosmonauts, supplementing their recreational reading, music tapes, and videotapes.

Electronic Ferret

There were six payloads put up in regular orbital patterns by either the "A" or "C" vehicles, serving as replacements in systems established in earlier years as probable ferrets, gathering intelligence.

Early Warning

Two more Kosmos flights were probable replacements in the existing Soviet missile launch warning system. These flights follow a path like those of the Molniya communications system already described. During each twelve-hour orbit, they linger at the high northern latitudes, where they overlook most of the potential launch sites for attacking missiles.

Minor Military Missions

By now the number of undefined military missions under the Kosmos label sent to orbit on "B" or "C" class launch vehicles has risen to 112, with two such flights in 1979. Both flew at the same inclination as the targets used by the Soviet ASAT system; yet flights of this nature have not themselves been used as targets. This strengthens the case for their being either diagnostic or calibration in nature, perhaps to exercise either the radars or the control systems of the Soviet defenses.

Ocean Surveillance

Ever since Kosmos-954 went out of control and in time decayed over northern Canada, the Soviet Union has suspended flights of ocean surveillance satellite pairs, each equipped with a nuclear reactor to power the active radars used for ocean search. It will be recalled that at the end of its mission, Kosmos-954 should have responded dutifully to ground signals and split into three parts, with the radioactive portion lifting from 225 kilometers to 1,000 kilometers, where there would be a 600-year stay until the radiation dropped to safe levels; this it failed to do.

In 1979, the only military flights apparently related to ocean surveillance were Kosmos-1,094 and -1,096. They flew at close to 450 kilometers circular altitude and in the kind of orbit that strongly suggested the same "F" class vehicle used by the active radar craft. The higher altitude and the failure to move a portion of the satellite to higher orbit suggests they do ocean electronic ferreting, with a solar panel class of power supply. Like the radar craft, they flew in close parallel planes to ensure that inspection bands on the ocean surface would overlap slightly, and ship movements in many cases could be estimated. These ferrets are able to station-keep because measurements of their orbital elements show that in their early months they do not begin decay or make upward steps periodically as might result from firing a chemical rocket. They probably use electric propulsion, speculates Geoffrey Perry.

Brief mention was made earlier of Kosmos-1,076, identified by the Russians as an ocean resources satellite.

The nature of its orbit suggests it was flown on an improved "F" launch vehicle, and it could represent the first nonmilitary use of the "F" class vehicle since its introduction in 1966. On the other hand, its scientific functions might be only part of its repertoire, with unannounced naval functions as well.

Inspection/Destruction Program

While the United States continues to be concerned about the Soviet threat to its satellites posed by the existing Soviet ASAT (antisatellite) system, the two countries have had a series of meetings to consider a treaty to limit this threat. Strangely, after a vigorous renewal of their ASAT testing program in 1976, the Soviets conducted only one interception in 1978 and none in 1979. One can only speculate on several alternative answers as to their reasons. To date, no Soviet ASAT has flown much higher than 2,000 kilometers, restricting proven capability to going after photographic missions, electronic ferrets, and existing navigation satellites of the Transit type. Soviet ASATs have not yet reached the much higher US global positioning system or the even higher early warning and communications satellites.

Orbital Launch Platforms

To overcome the northern latitude of their launch sites, the preferred Soviet method for reaching geostationary orbits and escape missions to the moon and planets is first to put a heavy sputnik and its separated carrier rocket in a low earth orbit, and then to fire a probe rocket from that orbiting platform. The same technique is used for the Molniya-type orbits and the Prognoz scientific satellites even though neither of these types requires a plane change. In 1979, twelve of these orbital platforms were used to launch major payloads to higher orbits, with five of them launched by the large "D" class and seven by the standard "A" class vehicle.

New Developments and Trends

Of the three mystery elements somehow related to the manned program, two remain unanswered, despite the passage of time. Soyuz-T now explains the Kosmos series that was carried on over several years, up through Kosmos-1,074. The large and maneuverable Kosmos-929, which seemed to be either a new class of space station or space tug of broad capabilities, has been called down from orbit, and no related successor has provided additional clues. The paired payloads, recalled perhaps as soon as the end of a single orbit, have come several times, but cannot be explained with certainty from existing public evidence.

Those most excited by the prospect of an early Soviet reusable shuttle thought it might appear in identified orbital flight as early as 1978; it did not appear then or in 1979. If it exists, the Russians have extra months with an opportunity still to beat the US Shuttle, which has suffered repeated delays. More than a year ago, the nonattributed *Aviation Week* story on the subject predicted a reusable orbiter between "now" and 1985, with the fully reusable winged booster to appear in the 1985–90 period. Events to date are not inconsistent with that forecast. Even the Soviet official press gives some credence to there being a Soviet shuttle in the making.

The other big controversy relates to the possibility of Soviet beam weapons, as retired US Air Force Maj. Gen. George Keegan has warned, based upon his interpretation of circumstantial evidence. The year 1979 does not seem to have produced much fresh evidence of Soviet progress toward such a capability, but interest in sup-

Soviet Vostok launch vehicle at Paris Air Show. A workhorse of the Soviet space program since 1957, the Vostok Standard "A" launched sixty payloads in 1979.

porting similar US research on the possibilities has heightened.

While there is keen interest in following the kinds of new developments mentioned above, trends in flight activity show no significant increases in the already high levels. There are some interesting absences in activity during 1979. As mentioned earlier, there was no overt ASAT activity. The fractional orbital bombardment system (FOBS) has been quiet since 1971. And despite the heavy past commitment to deep spaceflights, none came in 1979. A lunar payload has shown up in the background of a recent photograph taken inside an assembly building. The windows for launches to Venus and Mars were allowed to pass without activity despite rumors from unofficial Soviet sources that there might be such flights.

Outlook for the Future

Despite the current lack of activity, there is an official Soviet commitment to further deep spaceflights. A lunar polar orbiter is to make a much more detailed reconnaissance of the entire lunar surface for its topography, composition, and special properties. The Soviets also plan an unmanned mission to return samples from the far side of the moon. In 1981, they are expected to repeat the 1978 Venus missions, whose surface camera systems did not return pictures as had been done so successfully by the pair of Venus landers the time before. In 1984, the Soviet Venera payloads will carry ambitious French sounding balloons, expected to float in the cool upper levels of the Venus atmosphere, to return direct readings to earth for a longer period than past probes and landers.

Salyut-6 has already exceeded its nominal two-year life, and during 1980 may receive another long-duration Soviet crew and shorter visits from mixed crews, including a Hungarian, a Cuban, a Mongolian, and a Romanian, all of whom have completed training. At an earlier state of training are Vietnamese, and, during this year, French flight candidates may be named, including a woman.

Based upon previous patterns, Salyut-7 may be a specialized military space station like Salyut-3 and -5. If so, it may show some of the same growth in capabilities that Salyut-6 has shown over Salyut-4 in the civilian program.

The Russians continue to predict they soon will be ready for permanent occupancy of space and will increase station capacity to ten or twenty cosmonauts. The present Salyuts would seem pretty crowded if more than four people were on board, so the assembly of a larger station from separate components can be expected. Conventional docking works well, and welding under space conditions has been tested successfully again as recently as in Salyut-6. The Russians are more vague about a timetable for constructing future colonies in space, expanding space manufacturing, and building solar power stations in orbit. Science officials have put emphasis on a future manned station in lunar orbit with only brief sorties to the surface of the moon, rather than the lunar colonies they used to talk about. The Soviets have always claimed that a manned orbital facility would be used in the future to assemble the parts of manned expeditions to the planets. Within the past year and a half several senior officials have renewed predictions of Soviet manned flights to Mars as a logical product of their growing experience with manned flight.

At some point, whether competitive with the United States or not, there will be a Soviet reusable manned shuttle. Leading engineers and cosmonauts have been claiming for years that expendable rockets are "obsolete."

While the Russians rarely give advance notice of their flight timetables or reveal hardware before it flies, the requirements of the International Telecommunications Union for allocation of frequencies and for the positioning of geostationary satellites give us an unusual specific glimpse of plans. As early as this year, we may see the launch of the four Gals military communications satellites to fixed positions over the equator. A fixed-position weather satellite called GOMS is also expected in 1980. As many as seven Volna fixed-position satellites may be launched in 1980 for mobile communications with ships, aircraft, and ground units. A whole new generation of high-capacity communications satellites may also be launched in 1980 and 1981. There are eight planned Loutch satellites to operate in the 14/11 gigacycle range, contrasted with the 6/4 gigacycle range of the existing Raduga and Gorizont satellites.

As has been noted in other years, the Soviet program is massive, rather conservative in many respects, but continues to build a solid base of experience with major emphasis on military applications and support of the Soviet national economy. So far, mutual self-interests of the major powers, formalized by treaties and agreements, has kept space a sanctuary from military interference with the payloads that are in orbit. This is always subject to change as military planners know only too well, and relationships will become more complicated as Chinese, French, Japanese, Indian, and space payloads of other nationalities become more common and more ambitious in scope. ■

HISTORICAL TABLE OF SUCCESSFUL LAUNCHES TO EARTH ORBIT OR ESCAPE

Year	United States	Soviet Union
1957	0	2
1958	5	1
1959	10	3
1960	16	3
1961	29	6
1962	52	20
1963	38	17
1964	57	30
1965	63	48
1966	73	44
1967	57	66
1968	45	74
1969	40	70
1970	29	81
1971	31	83
1972	31	74
1973	23	86
1974	22	81
1975	28	89
1976	26	99
1977	24	98
1978	32	88
1979	16	87
TOTALS	*747	1,250

*US launches include four by Italy for the United States.

The USSR has sought a degree of flexibility in theater warfare that could achieve victory with either conventional weapons or weapons of mass destruction, including chemical munitions. They may be moving toward reestablishing an "aviation of the Ground Forces."

FLEXIBILITY: A DRIVING FORCE IN SOVIET STRATEGY

BY PHILLIP A. PETERSEN

THE advent of jet aircraft and nuclear weapons, and subsequently ballistic missiles, created divergent views within the Soviet Union concerning military strategy and force structure. No longer able to find security in the physical size of the Soviet state, the establishment had to forge a military strategy and force structure able to advance Soviet interests while protecting the Soviet people. This had to be done within an international environment outpacing the ability of a single state, or a group of states, to control.

Khrushchev as Military Reformer

Although it can be argued that the Soviet establishment did not articulate a specific concept of "hostage Europe," that notion was implicit in the Soviet approach to defending its interests and deterring the United States during the late 1940s and the '50s. This approach grew out of an inability to match US nuclear strength. Partly out of necessity, therefore, the USSR emphasized preparation of its armed forces for an invasion and occupation of Western Europe. Both Stalin's public depreciation of the military and political significance of nuclear weapons and his vaunting of large conventional forces must be understood in the context of his need to make the Soviet strategy credible, at least until the Soviet nuclear-weapons program produced a nuclear deterrent. Thus, the struggle between 1953 and 1960 to free Soviet military thinking from "Stalinist doctrine" and to adjust to the military-technological revolution was grounded in the rising state of Soviet weapons technology, for which credit, in no small way, is due Stalin.

The evolving state of Soviet weapons technology, together with economic considerations, made a military reformer out of Khrushchev, who attempted to drag a traditionally conservative military establishment into the nuclear-missile age. It was apparently his hope that by substituting the firepower of nuclear-armed missiles for manpower, the Soviet Union could gain military equality with the United States, while at the same time reducing the economic burden of maintaining a large standing army. Khrushchev stressed that these weapons would be the principal element in any future war and that the nation's defensive capability no longer was determined merely by numbers of soldiers under arms.

By bluff and bluster, Khrushchev attempted to make his newborn Strategic Rocket Forces (SRF) seem an equitable counter to the fast-growing intercontinental ballistic missile (ICBM) force being built by the United States. SRF missiles were displayed in Red Square, and progressively larger and more powerful warheads for them were tested. At the same time, Khrushchev proposed nuclear disarmament, clearly hoping thereby to obtain US assistance in reaching nuclear parity.

While Khrushchev was pushing reliance on nuclear-missile forces, the newly elected President Kennedy was institutionalizing a strategy calling for a "flexible-response" capability. The result of programs initiated as part of the flexible-response strategy was to widen the missile gap in favor of the United States, as well as to give the United States a far greater capability to press a conflict at any level short of an intercontinental exchange. Only in Europe did the Soviet Union have any potential for winning a confrontation with the United States. The Soviet Union had failed to take the lead in nuclear forces at the same time the United States was becoming more competitive in nonnuclear forces.

If he were to save his defense program, Khrushchev needed to find a quick fix for the imbalance in nuclear-missile forces. He thought he had found the immediate answer when in 1962 he attempted to overcome American nuclear-missile superiority by placing medium-range ballistic missiles (MRBMs) and intermediate-range ballistic missiles (IRBMs) in Cuba. That attempt could have been viewed as a *quid pro quo* for American missiles then based in Turkey and Italy. Furthermore, the success of his move also would have been consistent with the goal of reducing defense spending in favor of other sectors of the economy; it would have involved substituting less expensive MRBMs and IRBMs for ICBMs and submarine-launched ballistic missiles (SLBMs).

Khrushchev took the gamble that his Cuba ploy would be a demoralizing *fait accompli* for the United States. The stiff American reaction, however, left Khrushchev with the difficult decision of how to handle the extended Soviet position in the Caribbean. There was little proba-

bility that a Soviet conventional defense of Cuba could be successful. The confrontation clearly put Khrushchev in the position of choosing between a nuclear catastrophe, a conventional "hostage Europe" gamble, or backing off as gracefully as possible in order to minimize his losses.

As a result of the Soviet post-Cuban reappraisal of its military posture, professional criticism of Khrushchev's emphasis on nuclear missiles, present since 1960, began to gain momentum. In May 1963, a Major Kazakov suggested that Soviet armed forces needed to be able to fight without using nuclear munitions. Before the end of the year, the commander of the Soviet Ground Forces, Marshal V. I. Chuikov, was calling public attention to the fact that the West had recognized the danger involved in "one-sided" military theories and was complementing strategic nuclear power by steadily developing its ground forces. By the spring of 1964, no less a Soviet military authority than Chief Marshal of Tank Troops P. A. Rotmistrov was suggesting that excessive emphasis on missiles threatened to cripple other forces, and the development of military theory in general.

The Post-Khrushchev Military Expansion

After Khrushchev was removed from the political scene in October 1964, the debate over strategy and force structure subsided. By the spring of 1965, however, the military launched a dialogue with the new leadership aimed at getting political approval of an increase in military capabilities. As the debate about strategy and force structure moved from the agreed-upon concept that war is possible, reliance on a deterrence in which both sides are vulnerable failed to provide any insurance that the social order could survive if war should occur. The debate, therefore, revolved around the strength needed for the system to survive if deterrence failed.

In order to meet the increasing weapon-system requirements identified in the debate over strategy and force structure, a military expansion began in 1965 and became undeniably evident by mid-1966. A large investment of effort and resources gave the Soviets nuclear equivalence with the United States by the turn of the decade. The new leaders also began to prepare Soviet military forces to fight from a nuclear posture without using nuclear weapons. Additional reach and force mobility also were sought as part of the drive to improve flexibility. But geographic and technical realities have remained obstacles to the Soviet development of "reach" in their drive for a full range of military options. Thus, although the Soviets view themselves as a global power with legitimate international interests and commitments, their nonnuclear military strategy remains predominantly continental. The increase in options, however, has meant, among other things, the development of a capa-

In an attack against NATO, the Soviets would hope to advance rapidly to the Atlantic before any nuclear use by NATO could escalate out of control. Their armored forces are accompanied by the ZSU 23-4 antiaircraft system, shown here. It can be aimed and fired on the move.

bility to engage in nonnuclear as well as nuclear operations in Europe.

Having recognized the difficulty of preventing a theater nuclear conflict from escalating to an intercontinental exchange, the Soviets have attempted to tailor their forces and tactics so they can fight without nuclear weapons. That capability has been sought in the hope of being able to advance rapidly to the Atlantic, thereby evicting US forces from Central Europe before any nuclear use by NATO could escalate out of control. In essence, the Soviets would hope to be able to present the United States with a *fait accompli* by attacking the defense before it could use its nuclear means to redress the situation. Such a nonnuclear option, however, still required a force posture able to neutralize NATO's air and nuclear resources within a European Theater of War. Thus, targeting and force posture remain the same, whether conducting nuclear or nonnuclear operations.

Utilization Planning as a Driving Force in Weapons Acquisition

The Soviets recognize that, despite their effort to destroy NATO air and missile assets, any conflict would be conducted under the constant threat of nuclear use. They would hope, therefore, that the quantity and depth of ground-force penetrations, the interposition and close proximity of attacking and defending forces, and the fact that attacking forces would already be dispersed would make it difficult for NATO to use what remained of its nuclear weapons to stabilize the situation. In order to neutralize NATO's aviation and tactical nuclear capabilities without nuclear munitions, the Soviets would have to substitute the massed use of aviation carrying either conventional or chemical weapons. Once NATO air and nuclear targets were neutralized, air activities could shift to the direct support of ground operations.

The Air Operation

Until Soviet Frontal Aviation began to receive its current generation aircraft, any Soviet air operation against NATO air and nuclear capabilities would probably have been ineffective. Soviet tactical aircraft in the 1960s were characterized by light bomb loads and short range. But over the last ten years, the Soviets have produced increasingly capable and sophisticated aircraft for their own forces, and for the non-Soviet members of the Warsaw Pact. New fighters like the MiG-23 Flogger-B and new fighter-bombers like the MiG-27 Flogger-D have narrowed the technological gap that NATO traditionally had sought in order to offset Warsaw Pact superiority in numbers. NATO moves to regain a significant technological advantage, such as buying the F-15 and F-16 in significant numbers, may be offset by new Soviet aircraft that are under development. Replacing the old Yak-28 Brewer tactical bomber with the swingwing Sukhoi-designed Fencer gives Frontal Aviation the ability to strike targets throughout the Federal Republic of Germany from airfields in the Soviet Union.

An air operation also would involve those Long-Range Aviation (LRA) bombers not dedicated to intercontinental strikes or withheld for nuclear employment in continental theaters of military operations (TVDs). While the Soviets have long had the Tu-16 Badger and the Tu-22 Blinder bombers, the Backfire has contributed immeasurably to the effectiveness of any air operations against NATO. The Backfire and Fencer would be an extremely effective combination for deep penetration operations against the better-defended NATO installations.

Direct Air Support of the Ground Forces

Helicopters undoubtedly would have to assume much of the responsibility for aerial fire support of the ground forces, at least during the first hours of nonnuclear conflict, while fixed-wing aircraft were neutralizing NATO air and nuclear resources. This important role for rotary-wing aircraft, in addition to the fact that modern combat helicopters like the heavily armed Mi-24 and the versatile Mi-8 exist, may well help explain an extremely thought-provoking term used in a recent issue of *Red Star*.

In a front-page editorial on August 2, 1979, this central Soviet military newspaper mentioned the existence of an "aviation of the Ground Forces." The editorial discussed the high intensity of summer training for the Air Forces, an aviation of the Ground Forces, National Air Defense, and Navy. Interestingly enough, the same phrase appears in a 1978 Soviet publication that lists the historical constituents of "aviation of the Ground Forces" as frontal, army, and organic aviation. The use of this historical phrase to discuss current aviation elements is interesting. Frontal Aviation is one of the elements of the Soviet Air Forces (VVS) and certain types of noncombatant aircraft have long been organic to Ground Forces units. Thus, if both Frontal and organic aviation already exist, the only "new" element could be the recreation of army aviation.

Prior to World War II, army aviation had the same type of combat aviation regiments as Frontal Aviation. In effect, army aviation provided the combined-arms commander with his own combat aviation—his own little air force, if you will. The Soviets withdrew combat aircraft from the direct control of combined-arms army com-

"The ever-growing number of combat helicopters . . . may be considered a measure of the viability of [army aviation]."

manders in 1942–43. They concluded that it was difficult to maneuver scattered aviation resources and to make concentrated (massed) strikes to attain operational-strategic objectives. The resurrection of the term "army aviation" could suggest that the Soviets have found a solution to the contradictions involved in conducting massed strikes in support of TVD objectives while at the same time providing direct air support to the Ground Forces. Since destruction of NATO nuclear and aviation resources is the principal objective of Frontal Aviation, an army-level aviation force could provide the direct air support required for the nonstop advance of tanks and motorized infantry.

High-performance aircraft that have entered the Soviet Air Forces inventory over the last decade are not particularly suited to provide the direct fire support required by the operational-tactical Ground Forces commander. The only aviation system that has appeared—and that might not be expected to participate in an air operation—is the helicopter. Creating an aviation force of combat helicopters dedicated to supporting the combined-arms or tank army commander would appear to be a natural extension in the evolution of concepts for the flexible employment of Soviet air and missile power.

The ever-growing number of combat helicopters found in the Soviet forces may be considered a measure of the viability of such a concept. That the helicopter has already been recognized as a critical element in the air mobility of Soviet Ground Forces is indicated by the increasing number of Mi-8 Hip helicopters. In addition, the gunship variants of the Hip and the newer Mi-24 Hind are a rather formidable means of providing flexible fire support. Furthermore, such a pattern can be seen in Poland, where there is a Ground Forces Aviation consisting of helicopters that have been subordinated either permanently or temporarily to ground units. This is not to suggest that helicopters are organic to Ground Forces units in the Soviet Union. However, recreating an army aviation force would tend to suggest that the Soviets may be moving toward a doctrine that at least extends some wartime operational control over combat helicopters within the *Front* organization to the combined-arms or tank army commander.

SRF Theater of War Operations

The Soviets would like to minimize the risk of nuclear strikes against the Soviet homeland. If they failed to adequately neutralize NATO tactical nuclear capabilities and found NATO preparing to conduct a mass nuclear strike, it should be expected that the Soviets would try to preempt with a mass nuclear strike of their own. This does not, however, exclude the possibility that the Soviets would be willing to accept some limited battlefield use of nuclear weapons by NATO if that were not perceived as preventing a Soviet victory.

In examining Soviet attitudes concerning the use of nuclear munitions within a Theater of War (TV), it is important to note that the Soviets have, in the past, recognized the need to apply the appropriate military means to varying requirements of the several theaters of military operations (TVDs) within a TV. Thus, the Soviets have concluded that " . . . there will be essential differences in the strategic mission, the forces, and the material brought into action in the various theaters, and in the ways in which they are used." If the Soviet military organization in World War II remains applicable, the Soviets would probably see the European TV divided into three main TVDs. Nuclear munitions might well be used, or not used, in any combination of TVDs that would ensure victory within the TV at the lowest possible cost.

As part of their sophisticated approach to using nuclear munitions within a European Theater of War, the Soviets have begun to deploy a new family of nuclear weapons. In July 1978, Gen. Alexander M. Haig, Jr., then Supreme Allied Commander Europe, disclosed that the Soviets were replacing the whole range of their theater nuclear missiles, from the Frog rocket through the Scud to the Scaleboard. One of the new missiles, the SS-21, has a reported range of about seventy-five miles and is described as a more potent successor to the Frog battlefield rocket.

Even though the Soviets have long had "Euro-specific" nuclear weapons in the sense that the ranges of these "strategic" systems were not intercontinental, deploying the mobile SS-20 dramatically enhances the Soviets' ability to strike specific targets, because of its increased accuracy. The SS-20 also contributes to the strategic security of the Soviet Union as a potent means of suppressing the French *force de frappe*. This is of particular importance to the Soviets because of the independence from American control of any French decision to conduct a nuclear strike against the USSR. Furthermore, deploying the SS-20 allows the Soviets to replace the less accurate SS-4 Sandal and SS-5 Skean. Because the SS-20 is a mobile missile, it has a high degree of security against a NATO strike. It could be withheld from use without undue risk of loss, thus effectively preserving the Soviets' ability to go nuclear only when doing so is the sole means of achieving victory.

Along with Soviet attainment of essential nuclear parity with the US at the close of the 1960s, the recognition that the correlation of military forces determines actual capability to exert influence accelerated the post-Khrushchev military expansion. It did so, not only because expansion affected the probability of success in assuring enemy destruction and Soviet survival, but also because it reduced risk by promoting the development of flexibility in the selection of scales, forms, and methods of conducting combat operations. While those changes in the correlation of military forces that occurred subsequently can be traced to the debate over Khrushchev's proposals for the alteration of Soviet strategy and force structure, Western inaction also influenced these developments. No longer having nuclear superiority, NATO finds itself, as noted by Gen. John W. Woodman-

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see in testimony before the Congress, " . . . outnumbered and qualitatively inferior relatively to the Soviets in the major instruments of land warfare, such as the tank, the BMP infantry fighting vehicle, and artillery."

NATO is also fast losing its ability to offset the Soviet numerical advantage in the air with technologically superior aircraft. Thus, the dramatic shift that has occurred over the last decade in the Soviet-American military balance is not caused primarily by an evolution in strategy. It is more a reflection of the combined effect of Soviet weapon systems that improve their ability to implement earlier strategic concepts, and the unwillingness of the West to invest in its own security.

Weapons of Mass Destruction

Should the Soviets at some point conclude that war is inevitable, their long-standing recognition of the importance of surprise will undoubtedly prompt them to strike first. If tensions leading up to this decision are protracted, and have resulted in NATO preparations to use nuclear weapons, the Soviets would probably hope to deter an American intercontinental strike while attempting to deliver a decisive mass nuclear strike against European targets. However, if the Soviet decision to strike is not preceded by NATO nuclear preparations, the Soviets could be expected to attempt to preempt such preparations with a nonnuclear air operation. Even if the conflict escalates to a series of nuclear exchanges, the Soviets might well have significantly reduced NATO nuclear capabilities and, more importantly, suppressed such capabilities precisely when their utility was greatest. Without doubt, if the Soviets fail to neutralize NATO air and nuclear resources by conventional means, they could be expected to try preempting any NATO mass use of nuclear weapons with either chemical or nuclear weapons, both of which they classify as "weapons of mass destruction."

Although the Soviets may reserve chemical munitions until they believe their objectives could not be achieved with conventional weapons, chemical agents could be used against selected targets from the outset. The possibility that they would initiate the use of chemical weapons in a nonnuclear conflict cannot be ruled out. The Soviets have an impressive ground and air chemical capability and are aware of the potential advantages that chemical weapons offer in satisfying multiple objectives. Airfields and nuclear storage facilities are especially attractive targets for chemical attack. Such an attack could gain time for the Soviets by neutralizing NATO operations without the need for pinpoint strikes on the target. If surprise were to be achieved or NATO personnel did not have adequate protective clothing, equipment, and decontamination facilities, the Soviets could expect to halt effective operations at the targeted facilities.

Understanding that the use of "weapons of mass destruction" on the battlefield would lead to staggering loss rates, the Soviets have concluded they require a large, highly mobile ground force, precisely the type of force they also need for nonnuclear operations. Such a force is, then, capable of engaging the enemy at whatever level is required to ensure victory. In this way, Soviet military thought traversed the distance between deterrence and "war-fighting" capability via a route that left them prepared to seek victory at the lowest possible cost. Besides making military power more usable, this option-building process can only enhance the credibility of the Soviet deterrent, while at the same time ensuring the military power that would be required to reconstitute the Soviet social order after a nuclear conflict.

Projections

Modernization of the Soviet air and rocket forces since the mid-1960s has resulted in a dramatic shift in the correlation of military forces. Present Soviet programs can be interpreted as an attempt to make this shift irreversible. To the Soviets, East-West negotiations are a means by which to consolidate their gains while creating the opportunity to stretch out military programs so as to relieve the heavy burden borne by the civilian sector.

At least three general trends can be identified for the aviation forces. First, the Soviets can be expected to continue expanding the helicopter force. The role of helicopters in airmobile operations, cargo delivery, and as combat vehicles outfitted with rockets, machine guns, bombs, and guided missiles has made them an undeniably important element of Soviet ground operations. As part of the expansion of the helicopter force, the Soviets may well shift from the production of general-purpose helicopters to a program of differentiated development of combat helicopters. A program producing attack helicopters for fire support of land forces, helicopters specially designed for engaging tanks and armored vehicles, and fighter helicopters for destroying enemy combat helicopters and fixed-wing aircraft would improve the capability to perform such missions.

Second, the Soviets can be expected to continue their attempts to close the technological gap between NATO and Warsaw Pact fixed-wing aircraft. They obviously believe that they have enough fixed-wing aircraft. By closing the technological gap, they can take advantage of their long-standing numerical superiority.

Finally, the Soviets can be expected to modernize their LRA forces that threaten the United States. A new LRA intercontinental system could be either a long-range bomber and/or a standoff platform for cruise missiles.

Military programs involving the missile forces are likely to emphasize two areas: an increase in accuracy and in multiple warhead capabilities. Soviet research and development activities in both areas will continue to enhance the capability to actually "fight" a war, which in turn will increase the deterrent value of the missile forces. The continued deployment of SLBMs with extended ranges will also make an important contribution to Soviet flexibility and, therefore, to security.

Clearly, the post-Khrushchev military expansion, and the lack of a matching Western response until recently, has contributed to the development of a significantly different international environment. The growth in Soviet general-purpose forces, as well as Soviet nuclear strength, has created a situation in which nonnuclear superiority in Europe assumes greater importance. As the Soviets expand their technological capability to project their combat forces, an international environment of growing complexity may well lead the United States into an increasing number of confrontations with the USSR that would require a broad range of military options. ■


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SOVIET AEROSPACE ALMANAC

Based on his analysis of Soviet military budgets and weapons procurement during the past fifteen years, the author, a former CIA specialist in Soviet defense affairs, presents a detailed outline of Soviet strategy, doctrine, and hardware for the next decade.

THE SOVIET DEFENSE ESTABLISHMENT IN THE '80s

BY WILLIAM T. LEE

WHAT kind of Soviet defense establishment will the US and its allies face in the mid- to late 1980s? There are likely to be some significant innovations and shifts in emphasis that the US is not prepared—or preparing—to counter. These changes will take place within the context of those dominant trends that, in two decades, have brought the USSR from a position of military inferiority to at least qualified superiority.

Having now achieved some degree of military superiority in most areas, the USSR probably will try to increase its margin over the US and NATO forces. The Soviets will continue to develop the military capabilities needed to fight and win a nuclear war with the US and its partners, but in the decade ahead this will mean more emphasis on strategic defense. Concurrently, naval and air forces capable of projecting Soviet power outside Russia's borders probably will have a much higher priority than in the past.

The MiG-21 multirole fighter first flew in 1955. It has gone through continuous modifications and now is gradually being replaced by tactical aircraft developed in the 1970s.

According to conventional wisdom, the massive Soviet buildup in all forms of weaponry from ICBMs to antitank grenade launchers was not expected to continue in the political conditions of the 1970s—SALT, the Helsinki accords, the US-USSR "Basic Principles of Relations," MBFR negotiations, vastly expanded trade accompanied by billions in loans and credits extended to the USSR by the US and its allies. According to the conventional wisdom, "détente" was supposed to be accompanied by restraint in Soviet weapons procurement and in Soviet intervention beyond the borders of the USSR and its allies.

In fact, Soviet procurement policies during a decade of détente have been more in accord with scenarios of ruptured diplomatic relations, with both sides busily ripping out the Hot Line. As the Soviets bluntly said so often "détente" did not reduce their obligation to aid revolutionary movements whose objectives met Soviet political standards and purposes, and they have passed up few opportunities to extend such aid, even to the use of Soviet troops in Afghanistan.

As the Soviet military buildup proceeded, Western perceptions generally lagged behind realities. Many observers told us that the Soviets have been engaged only in minimum maintenance and replacement programs. Until 1976, the CIA said that Soviet procurement outlays had been a *constant* five billion rubles each year from 1960 to 1975. In fact, Soviet procurement outlays grew at the rate of about seventeen percent a year during that period and reached thirty-seven to forty-two billion rubles in 1975. Since tripling its procurement estimates in 1976, the CIA has been telling us that Soviet procurement outlays have grown at the rate of three to four percent a year when in fact the average annual rate of growth has been about fourteen percent since 1970. In 1980, Soviet procurement will be from sixty-six to seventy-four billion rubles, or about three times the CIA's revised estimate, and well above the Agency's estimate for *total* Soviet military outlays.

In the 1970s, the Soviet military buildup has been greatly facilitated by trade, credits, and loans from the US and its allies. Domestic profits from foreign trade have become essential to cover the gap between what the Soviet economy has produced and what the Soviet leaders have allocated to investment, consumption, and defense. In 1978, Soviet imports of machinery were 4.6 times the 1968 level, much of it coming from the West. In 1978, the increase in machinery imports of at least three billion rubles made it possible to allocate most of the 1978 *increment* from Soviet domestic machinery production to weaponry.

US policymakers' reluctance to understand the factors driving the Soviet buildup passeth all comprehension. One of the favorite theses of the conventional wisdom is that the Soviets do not know what else to do with the weapons design bureaus and factories so they let them grind out more weaponry to avoid unemployment. In other words, as the labor supply has gotten tighter and tighter, the Soviet leaders have had to increase employment in the defense industries to avoid unemployment! For the same reason, the Soviet leaders have increased the share of GNP devoted to defense from nine percent in 1958 to twelve percent in 1970 and to about eighteen percent in 1980! To avoid unemployment, the Soviets will roughly double their imports of machinery in 1980 as compared to 1975 in order also to double the value of weapons output in Soviet factories without crippling capital investment programs!

As in the case of the relationship between "détente" and Soviet aid to approved revolutionary movements, the Soviets make no bones about the factors that drive their military buildup: requirements derived from military doctrine and strategy; their estimate of the military threat; assessments and forecasts of political conditions abroad; service missions and effectiveness of existing weapons relative to mission requirements; technological opportunities and constraints; economic capabilities and constraints; military research findings on the effectiveness of various types of military organization, operations, and weapons; and manpower resources. No doubt such factors as bureaucratic parochialism, inertia, and personal politics are present, but there is no evidence that these factors, or the simplistic "action-reaction" theory, dominate the Soviet weapons-acquisition process at the expense of the above rational factors described in the Soviet General Staff journal, *Military Thought*.

Moreover, Soviet sources tell us that the Party makes the policy on weapons acquisition. In conjunction with each Five-Year Plan, and sometimes in between, the Party issues directives on "military-technical policy" that specify the principal types of new weapons to be developed and procured, relative priorities, general funding levels, and other goals and objectives to be pursued by the military establishment and its supporting industries. Although Brezhnev has been denying it of late, Party documents indicate that the directives specify quantitative and qualitative "superiority" as the general goal of the Party's military-technical policy.

Despite the reluctance of Washington officialdom to recognize that what looks, waddles, and quacks like a duck may indeed be a duck, the US has begun to take notice and respond. Secretary of Defense Harold Brown's preview of the FY '81 budget and highlights of the five-year defense program presented to the Senate Armed Services Committee on December 13, 1979, represent a major shift in US perceptions and procurement policies, skepticism voiced by some critics notwithstanding. Viewed historically, however, Dr. Brown's list of proposed procurement programs is ironic: Allowing for interim technological progress, it is virtually the same list of weaponry that the US considered and rejected twelve to fifteen years ago, in part because the conventional wisdom argued that US restraint would be matched by Soviet constraint, and in part because the US decided to get fully involved in Vietnam.

About the only things missing from Dr. Brown's 1979 list are modernization of US air defenses—now virtually nonexistent—ballistic missile defense, and civil defense. Most ironically, air and ballistic missile defenses were the areas of greatest US comparative military advantage

The Soviet Union apparently plans to build a relatively large number of carriers such as the Kiev, *shown here, or a larger and more advanced class. They certainly will be used for antisubmarine warfare, and probably for power projection.*

in the mid-1960s. Had these defensive forces been combined, at a far smaller budget cost (to say nothing of lives) than Vietnam, with the MX system of the day and a serious civil defense program, the Soviets just might have been forced out of the arms competition. That is not merely the wisdom of hindsight; a few foresaw these possibilities at the time. At the very least, US strategic superiority could have been ensured into the early 1980s.

Soviet Weapon Procurement in the 1980s

To forecast some of the specific weapons the Soviets may procure in the 1980s, three things are helpful: the missions of the Soviet forces, which are derived from Soviet military doctrine and strategy; past and current procurement patterns; and available indicators of future procurement and trends in capabilities related to mission requirements. Some of the constraints on future Soviet programs will be noted in closing.

The mission of Soviet strategic offensive forces is to limit damage to the USSR by destroying: enemy nuclear delivery systems, weapons stocks, and associated command-control authorities and facilities; other military forces; selected essential industry; and transport and logistics facilities. The damage-limiting mission of Soviet strategic defensive forces is to defend the USSR from air, missile, and space attacks while civil defense forces protect the Party-government elite, the general population, and conduct repair-rehabilitation work that will permit the USSR to continue functioning after the initial exchange and facilitate subsequent recovery.

The combined arms, or "operational-strategic," forces are to defeat and disarm enemy forces after the initial nuclear exchange and occupy a Europe kept as intact as possible so its assets may be used to aid Soviet economic recovery. These various forces are to perform their missions in a highly integrated fashion, *e.g.*, fire support by strategic missiles and aircraft for the ground, air, and naval offensive, following a common operational plan under the centralized direction of the top political and military leaders—the Stavka, a smaller wartime version of the Main Military Council, operating through the General Staff.

In terms of weapons inventories (TO&E) credited to active military units, the quantitative trends in the 1970s were mixed, some decreasing or remaining more or less level, but most increasing—some slowly, some rapidly. The number of attack submarines declined rather steadily as older diesel models were retired, and the number of strategic defensive interceptors declined until the mid-1970s when it leveled off. Unit inventories of most other major weapon systems for which data are available increased. In at least two cases, SLBM launchers and MIRVed ICBMs and IRBMs, the unit inventory growth has been dramatic.

No data are available on the trends in total weapons stocks. We know something about when and to what degree the Soviets reequip units with new weapons or improved models. We know precious little (in most cases) about what happens to the weapons that have been "retired." One thing is certain: By no means all of the "retired" weapons are scrapped. On balance, therefore, changes in Soviet weapons stocks during the 1970s might well look more fearsome than the growth in active unit inventories.

In general, however, the most important trend in Soviet weapons procurement during the 1970s was the general advance in technology. At the beginning of the 1960s, Soviet missiles had accuracies (CEPs) on the order of one nautical mile or more; by the end of the 1970s, CEPs on some Soviet missiles were reported as low as 0.1 nm. In recent months, the speed of the Alpha-class nuclear-powered submarine (SSN) has been reported at more than forty knots and its operating depth at more than 600 meters. While such dramatic examples are not the rule, the trend toward greater technological sophistication is unmistakable and impressive. The Soviets have narrowed the technological gap between their weaponry and ours to the point where many observers are questioning whether the remaining US technological advantages have much military significance, particularly given the Soviet numerical advantages in most types of weapons.

During the period 1962–72, Soviet data indicate that Soviet procurement outlays increased between six and seven percent per annum, solely because of the increased complexity and higher technology of the weapons. That is very similar to US experience. This trend may have been accentuated in the 1970s and will continue into the 1980s.

In light of Soviet requirements, past trends and current indicators of Soviet weapons development, Table 1 presents a quantitative forecast of Soviet procurement of major weapon systems in the 1980s, grouped according to Soviet missions and operational concepts.

In general, because the Soviet objectives remain superiority and opportunistic expansion in peacetime, and victory in the event of war with the US and its allies, and because the Soviets are continuing to advance military technology to satisfy their demanding requirements, we can expect the Soviets to develop and produce at least as many new weapon systems in the 1980s as in the 1970s. Note that about 100 systems were procured in both the 1960s and 1970s. Procurement of more than fifty current systems will continue into the 1980s. Probably an equal number are in advanced stages of development and will begin series production by 1985.

Now let us look at these quantitative forecasts in some detail.

Strategic Offensive System Procurement in the 1980s

During the 1980s, we can expect the Soviets to develop and procure at least four new ICBMs; one or two SLBMs, and the same number of IRBMs; two to four bombers (medium and heavy); and one to three antisubmarine warfare (ASW) missiles, or about the same number as the missile design bureaus engineered in the 1970s. For the bombers, however, it will be a considerably larger effort, even if much of the development already has been done. Reports indicate at least two new heavy bomber projects are well under way, one of them a cruise missile carrier. The Tupolev design bureau has been responsible for all Soviet strategic bombers fielded since the mid-1950s. These reports suggest that the Antonov and Ilyushin bureaus may be back in the bomber business.

Soviet strategic missiles introduced in the 1980s probably will be improved in three respects: qualitative accuracy, targeting flexibility, and survivability. Reports of Soviet strategic missile accuracy as low as 200 meters probably are premature, but there is general agreement that the Soviets are down to 300 to 400 meters, and the trend is toward 200 meters and less. Sometime during the decade the Soviets will probably introduce terminal guidance because there are limits to what can be done with inertial systems. In the early 1980s, Soviet ICBMs will be able to destroy any undefended hard target with two warheads. By the mid-1980s, only one warhead will be needed, although each target probably will be struck twice to make sure.

Incorporating improved accuracies in all Soviet ICBMs will make it possible to attack the entire hard and soft target array in the US with any mix of Soviet systems, whereas previously specific Soviet missiles had to be matched against specific target sets. Contrary to widespread impressions, Soviet targeting strategy has specified minimum yields compatible with target vulnerability and the missile accuracy. (The SS-9 needed a twenty-megaton warhead to destroy a Minuteman launch-control center.) As accuracy improves, the new missiles will continue to improve the match of yields to targets, with a consequent reduction in collateral damage.

Better silo design and construction can still contribute to Soviet ICBM survivability until toward the end of the decade. Meanwhile, MIRVing several hundred SLBMs will offset increased Soviet ICBM vulnerability. By the end of the 1980s, however, the Soviets will have to do something about their ICBM vulnerability if the US deploys MX.

While the Soviet preference for missiles over bombers for attacks on fixed targets is likely to persist, development of new heavy bombers/cruise missile carriers will add flexibility and versatility to Soviet strategic offensive forces. In the next decade the Soviet design bureaus (probably Tupolev) also should turn out a follow-on to the Tu-22M Backfire. Because long-range aircraft are needed to combat US carriers, any new Soviet "medium" bomber will probably have enough range to cause endless arguments in the US about its intercontinental capabilities and how it should be counted in any strategic arms agreement.

According to much conventional wisdom, the Soviets would keep on building new ICBM launchers if it were

Table 1: Quantitative Trends in Soviet Weapons System Procurement—1960–90

Number of Weapon Systems Procured by Major Mission per Decade

	DECADE			
	1960s	1970s	1980s	
			Carried over from 1970s	Introduced in 1980s
MAJOR MISSION				
Strategic Offensive				
ICBMs, IR/MRBMs, SLBMs, SSBNs, Bombers, ASMs	20	17	7–9	8–16
Strategic Defensive				
Air Defense—SAMs, Interceptors, AAMs, EW&GCI Radars	18–19	14–15	4–7	5–14
Missile and Space Defense, Early Warning—Interceptors (missiles) and Radars	5	2–4	1–3	0–8
Antisubmarine Warfare (ASW)—Surface Ships, SSNs, Aircraft, Missiles	8	15–16	12–13	7–16
Anticarrier—SSNs, SLCMs, Aircraft, ASMs	4 (11)	5 (7)	3 (4)	3–4
Operational-Strategic				
Ground Forces—Tanks, APCs, SP Artillery, Towed Artillery and Mortars, SAMs, AA guns, ATGMs	23–24 (25)	17–22	12–15	9–15
Frontal Aviation and Military Transport Aviation—Interceptors, Fighter-Bombers, Helicopters, Transports	8	17–19	9–10	6–13
Navy—Missile Patrol Boats, Frigates, Amphibious Landing, Force Projection	9	8	6	6–12
TOTAL SYSTEMS PROCURED	95–97	95–106	54–66	44–98

NOTES: 1. Numbers in parentheses indicate systems common to more than one mission, e.g., Backfire bomber is procured for both strategic offensive and strategic defensive—anticarrier—operations.

2. Not counted in subtotals and totals: nuclear and chemical weapons; communications, countermeasures and surveillance equipment; space systems (except antisatellite); infantry weapons; munitions and most rockets; engineering equipment; chemical warfare equipment; trucks and logistics support equipment; naval auxiliaries and most minor naval combatants.

not for SALT. This is not likely. SALT allows the Soviets enough ICBMs, at least until 1985. Through that year, at the earliest, additional offensive missiles or warheads would add little or nothing to Soviet damage-limiting capabilities. Table 2 summarizes Soviet ICBM and SLBM missile and warhead inventories from 1960 to 1980 and extrapolates the inventories to 1985. Figure 1 shows the number of warheads the Soviets could deliver on hard and soft targets located in the US in a preemptive strike, and Figure 2 shows the likely Soviet strategic offensive missile reserves after an initial exchange, even without going into the uncertain and controversial issues of refire missiles. (From 200 to 300 ICBMs are allocated to targets not in the US, and fifteen percent of the inventory is considered unreliable.)

Unless and until MX is deployed, the US has little or no counterforce capability against Soviet silos. Nevertheless, the Soviets probably credit the US with some such capabilities. Hence, from the Soviet point of view, they probably had little assured second-strike capabilities prior to about 1970 and did not have adequate survivable reserve forces until the late 1970s. Consequently, the Soviets adopted launch on (tactical) warning in the mid-1960s. For the first time in twenty years, the Soviets soon will have forces sufficient to destroy all US hard and soft targets, and still retain a large survivable reserve, even in a second-strike scenario. But deployment of MX would put the Soviets back a decade. The Soviets probably would expect a US MX strike to destroy about ninety percent of their silos, thus eliminating their counterforce capabilities and depleting their survivable reserve, because all the soft targets would have to be covered by Soviet SLBMs. The Soviets can be expected to use any and every diplomatic and negotiating means to forestall US MX deployments. If they cannot do so, they are not likely to live with the SALT II Treaty constraints (if those constraints become effective either by treaty or informal agreement) beyond 1985.

While application of the Brezhnev doctrine to Afghanistan probably will make all of this academic, US policymakers appear to have deluded themselves in believing that they could have MX and the SALT II numerical constraints on Soviet ICBMs and SLBMs, to say nothing of expecting to negotiate lower limits in SALT III. Let us keep the historical record straight: SALT II contained its own self-destruct mechanism in MX. Afghanistan may hasten the process, but did not start it.

Strategic Defensive Weaponry in the 1970s

Few things better illustrate the asymmetry between US and Soviet views of nuclear strategy, the objectives and feasible outcomes of a nuclear war, how military budgets should be apportioned, and what SALT is all about than the contrasts between what the Superpowers have done about strategic defensive forces in the 1970s and plan to do in the 1980s.

Following the Antiballistic Missile (ABM) Treaty, the US virtually dissolved its air defenses, restricted R&D to tactical air defense, and cut ABM R&D to a small fraction of outlays during the 1960s. In contrast, Soviet air defense priorities rose about the time the ABM Treaty was signed. Certainly R&D funds increased, particularly for ballistic missile defense where Soviet spending in the 1970s may have exceeded the previous decade by about the same magnitude as US spending on ABM R&D declined. Moreover, the Soviets have a much broader con-

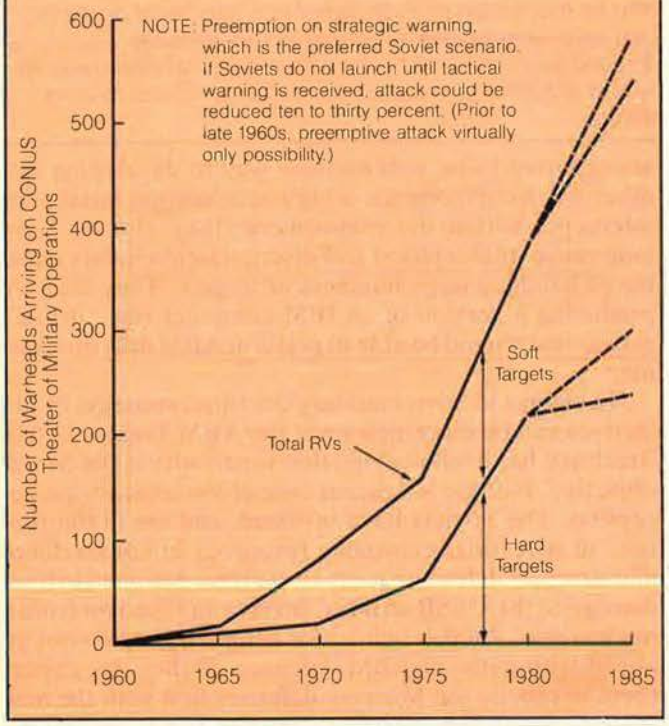
Table 2: Trends in Soviet ICBM and SLBM Inventories Under SALT Constraints

(LNCHs = Launches; WHs = Warheads)

	1960		1965		1970		1975		1980		1985	
ICBMs	LNCHs	WHs	LNCHs	WHs	LNCHs	WHs	LNCHs	WHs	LNCHs	WHs	LNCHs	WHs
SS-6	5–10	5–10	5–10	5–10								
SS-7			200	200	200	200	190	190				
SS-8			19	19	19	19	19	19				
SS-9					228	228	288	288	38	38		
SS-11 and SS-13					920	920	1,030	1,630	590	1,190		
SS-11 and Non-MIRVed Follow-on											340	940
SS-17 and Follow-on							10	40	150	600*	150	600
SS-18 and Follow-on							20	200	270	2,700*	308	3,080
SS-19 and Follow-on							50	300	350	1,900*	360	1,960
ICBM TOTALS	5–10	5–10	≈225	≈225	1,367	1,367	1,607	2,667	1,398	6,428*	1,158	6,580
SLBMs												
SS-N-4/5	≈70	≈70	96	96	90	90	84	84	72	72		
SS-N-6					256	256	544	1,088	512	1,056	432–352	976–896
SS-N-9							188	186	276	276	276	276
SS-N-18									160	1,120	160	1,120
"Typhoon"											80–168	1,120–2,352
SLBM TOTALS	≈70	≈70	96	96	346	346	816	1,358	1,020	2,524	948–956	3,492–4,644

*All MIRV accountable missiles are assumed to be MIRVed. This is not likely, but no information is available on how many SS-17, SS-18, and SS-19 missiles have been deployed with only one reentry vehicle. Likely 1980 warhead inventory is about 6,000 ± 500. Compilation does not allow for refire missiles, which may or may not exist in large numbers.

Figure 1: Illustrative Soviet Strategic Missile Attacks on CONUS 1960-85, Net of Allocations to Order Theaters, Designated Reserve Forces, and Reliability Factors.



cept of strategic defenses, which include strategic ASW (against US SLBMs) and anticarrier operations. As Dr. Jack Vorona of the Defense Intelligence Agency said, in testimony to Sen. Harry Byrd's subcommittee on procurement: "We estimate that the Soviets give the highest naval priority to ASW against ballistic missile submarines." Last but not least, the USSR has a vigorous civil defense program that includes large-scale construction of hardened shelters for a significant portion of the population, a program that the US intelligence community has discovered once each decade since the 1950s.

Because the Soviets entered the 1970s lacking much of the technology needed to meet the air, missile, and space threat, they concentrated on closing the technological gap, rather than on buying new weaponry. National Air Defense (PVO Strany) received two new interceptors, but no new surface-to-air missiles (SAMs). Deployment of SA-3 and SA-5 continued at a modest rate while active SA-2 launchers were reduced. They constructed several large radars that may be the long leadtime components of national ABM defenses, and tested and apparently deployed an antisatellite system, but again, most of the emphasis was on R&D. A number of new ASW platforms were added along with systems to destroy enemy nuclear-powered ballistic missile submarines (SSBNs), but they still lacked the sensors to locate and trail US SSBNs. Anticarrier forces were modernized with new cruise missiles, submarines, and aircraft. In the next decade, however, procurement of strategic defensive systems will be more in balance with the R&D effort, which also will continue to expand. The principal thrust of Soviet air defense weapons procurement in the 1980s, therefore, will be to buy all the weapons, and more, that the US refused to buy in the 1960s.

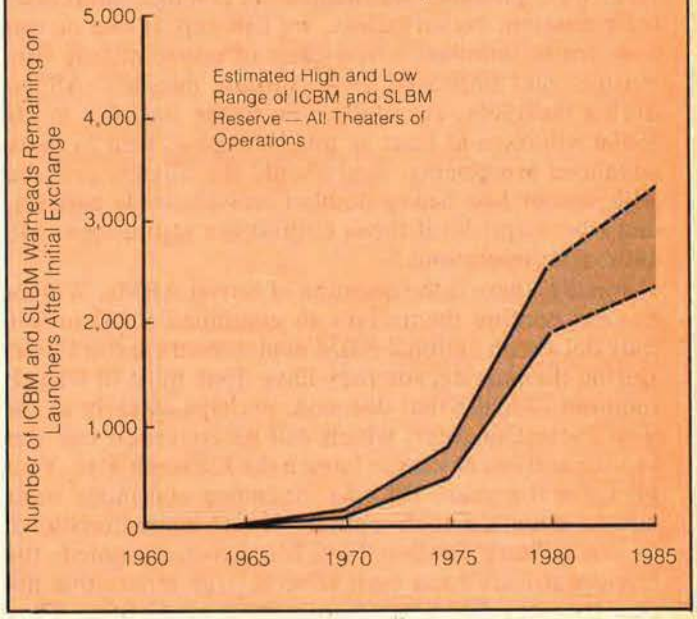
Several very large Soviet air defense deployments are in the offing: the SA-10, MiG-25 Foxbat with look-down/shoot-down radar and missiles, an improved airborne warning and control aircraft (AWACS) with similar capabilities, and various ground environment systems. With these weapons, PVO Strany will be able to challenge SAC for the first time in fifteen years. How effective the new SAMs and interceptors will be is uncertain to both sides, a lucrative source of study money to Western analysts, and a source of controversy beyond the decade of the 1980s.

Deployment of the SA-10 has been reported prematurely, suggesting some development problems late in the R&D cycle. But deployment of this system should begin soon and probably will continue through most of the '80s. By the end of the decade, PVO Strany probably will receive another new SAM, possibly a mobile system related to those developed for air defense of the Ground Forces (PVO Voisk) so that bombers and cruise missiles will not be able to avoid the SAMs.

In the early 1980s, PVO Strany probably will receive new versions of Foxbat and the MiG-23 Flogger, at least one of which will have the new radar and missiles for low-altitude intercepts, and a number of AWACS aircraft. By the mid- to late 1980s, the Mikoyan and Sukhoi design bureaus should turn out at least one and probably two new interceptors to further improve Soviet air defenses against bombers and cruise missiles. In addition, a new family of ground-based radars may be expected, inasmuch as most of the radars deployed during the 1970s were based on much earlier designs. R&D on new radars probably proceeded during the past decade in parallel with the SA-10 and interceptor programs, and the results can be expected to appear soon. Meanwhile, Soviet literature indicates a trend toward more flexible tactics that will allow much more initiative to interceptor pilots instead of tying them so rigidly to the ground-control environment.

To perform its strategic ASW mission in the 1980s the

Figure 2: Illustrative Trends in Soviet ICBM and SLBM Reserve Forces, 1960-85



Red Navy will receive many new ships, submarines, aircraft, weapons, and sensors. Several major shipbuilding programs have recently been identified: a nuclear-powered aircraft carrier, up to four classes of new cruisers, and series production of the Alpha-class nuclear-powered submarine (SSN). Some of the new surface ships may be designed for, or shared with, the power projection mission, but ASW will benefit. Since about 1960, all of the Red Navy's major surface combatants have been designated as ASW ships, and this priority may persist.

In many ways the Alpha-class submarine is the most spectacular of Soviet strategic ASW efforts. It has a titanium hull that apparently permits it to dive to more than 2,000 feet, or twice the depth achieved by an American submarine, and it is reported to steam at forty-two knots, faster than any American vessel. The US does not know how to build such vessels, so one can imagine how costly they are to the USSR. The USSR now has six of these boats. Design of the Alpha evidently goes back to the late 1950s; the system obviously has experienced developmental problems because it was described in Soviet literature in 1967, the first unit was launched in 1970, but series construction did not begin until the late 1970s. Meanwhile the Alpha design team probably has been working on a more advanced model that may appear in the mid- to late 1980s.

Along with new ASW ships and submarines, the Soviets will procure aircraft, helicopters, missiles, torpedoes, and a variety of sensors to detect, track, and kill US, UK, and French SSBNs. Such sensors are the critical Soviet problem in the 1980s (and beyond) if the platforms and other weapons are to be effective. Aside from the inherent limits of acoustics, Soviet platforms, particularly SSNs, are relatively noisy and hence at a great disadvantage in locating and tracking US SSBNs. Whether the Soviets will find the answer in nonacoustic sensors is a moot question. Meanwhile, the Soviets are acting as if they expect to have the necessary sensors one of these days.

Modernization of anticarrier forces probably will proceed, but will require less effort than ASW because the former's capabilities are much more commensurate with their mission. Nevertheless, we can expect one or two new cruise missiles, a new class of cruise missile submarine, and improved air-to-surface missiles (ASMs) during the 1980s. Any follow-on to the Backfire in the 1980s will have at least as much range as well as more advanced armaments. And should the Soviets proceed with one or two heavy bomber/cruise missile carriers, don't be surprised if these aircraft are also assigned to anticarrier operations.

Finally, there is the question of Soviet ABMs. Will the Soviets confine themselves to continued R&D or will they decide on national ABM deployments in the 1980s? During the past decade they have done most of what is required to make that decision, perhaps as early as the next Party Congress, which will be convened late this year or early next year to launch the Eleventh Five-Year Plan, for the years 1981–85. Spending enormous sums just to maintain their options is not characteristic of Soviet military R&D policy. Moreover, as noted, the Soviets already have built several large radars that appear to have ABM battle management capabilities. They are reported to be well on their way to developing two other basic components: a high-acceleration missile for intercepts within the atmosphere (they already have long-range interceptors) and discrimination radars capable of handling large numbers of targets. They also are producing a version of an IBM computer (the "Ryad" series) that should be able to perform ABM data processing.

No change in Soviet military doctrine, strategy, or objectives can be discerned since the ABM Treaty. Lately Brezhnev has been denying that superiority is the Soviet objective, but this is a patent case of Soviet strategic deception. The Soviets have invested, and are in the process of investing, enormous resources in counterforce and strategic defensive weapon systems designed to limit damage to the USSR so it can survive and recover from a nuclear war. All this will be for naught if they do not go ahead with national ABM defenses. If they do, expect them to rebuild the Moscow defenses first with the new system, which they can do within the Treaty provisions and which would get the production lines rolling and provide operational experience for the all but inevitable breakout in the mid-1980s.

Soviet Operational-Strategic (General-Purpose) Forces

During the 1970s, the Soviets modernized all types of equipment for the operational-strategic forces—Ground Forces (GF), Frontal Aviation (FA), and Military Transport Aviation (VTA). Active inventories showed substantial increases for many weapon systems, the result of "up-gunning" GF units so that they are probably the most equipment intensive military organizations in the world. Whereas in the 1960s Soviet GF and FA were only prepared to fight a nuclear war, they are now prepared to fight both nuclear (chemical) and conventional war. As Western observers have belatedly recognized, the buildup in these forces has gone far beyond what is required to defend Soviet/Pact territory.

Table 1 shows that some thirty-one to thirty-four major weapon systems were procured for the operational-strategic forces in the 1970s. Most of the identified weapons entered series production in the 1970s. Modernization will continue in the 1980s although active inventories may not grow as much as in the past decade, which in part was making up for relative neglect during the 1960s. Two or three new surface-to-surface missiles (SSMs) apparently already are in series production and one or two more may be expected to appear by the mid- to late '80s. Production of the T-80 tank should begin soon, while the T-72 is expected to continue in production until the mid-1980s. At least one new armored personnel carrier (APC) can be expected by the late 1980s,

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and one or two new model self-propelled guns (SPs) would be no surprise. On the basis of past performance, several new antitank guided missiles (ATGMs) can be expected. Much other new equipment also will appear for communications, countermeasures, and engineer support as well as advanced munitions.

During the 1970s, Frontal Aviation for the first time received aircraft specifically designed for ground support and reconnaissance operations. These new aircraft, principally Flogger and the Su-19 Fencer, carry much larger loads of munitions farther than their predecessors, which were designed as interceptors and then converted to ground-support missions. Most importantly, the aircraft delivered in the 1970s began to carry the avionics and other gear designed to deliver nonnuclear ordnance accurately enough to be effective, and to operate in poor weather. Transfer of US avionics and munitions technology from Vietnam evidently was very effective. Reports indicate the Soviets are working on air-superiority fighters designed to counter the F-15 and F-16. Between them, the Mikoyan and Sukhoi design bureaus should develop one or two such aircraft plus the same number of new fighter-bombers in the 1970s, while the Yakovlev bureau may contribute a V/STOL model. Besides advanced avionics and "smart" munitions, these aircraft may be expected to be equipped with several new missiles for air combat and ground attack.

Stimulated by US demonstrations in Vietnam, the Soviets developed the Mi-24 (Hind) helicopter gunship during the 1970s and modified the Mi-8 (Hip) for much heavier armaments. These "flying tanks" are helping to crush resistance in Afghanistan. At least one new model gunship and one or two new transport helicopters can be expected to enter FA inventories in the 1980s.

Transport Aviation (VTA) received about fifty large An-22 turboprop and about 100 Il-76 turbofan transports during the 1970s and the latter is still in production. The Antonov design bureau has a medium assault transport ready for production. It appears overdue as a successor to the An-22, and will be a large turbofan model comparable to the USAF C-5.

While PVO Strany weapons designers spent most of the 1970s catching up in technology needed to meet the air and missile threat, Ground Force air defenses (PVO Voisk) received four new SAMs during the 1970s. SA-11, the latest in the series, has just been introduced and presumably will be produced for much of this decade. One or two new SAMs for PVO Voisk should appear by the mid- to late 1980s. According to press reports, the Soviets have been developing a second high-acceleration missile in addition to the ABM model. Consequently, a Soviet antitactical ballistic missile (ATBM) may be deployed by about 1983–85. Recently announced NATO nuclear modernization programs will add impetus, if any

Production of the T-72 main battle tank, which generally is considered superior to Western tanks now operational, is expected to continue into the mid-'80s, when about 30,000 will have been built. A still more advanced T-80 is expected soon.

is needed, to PVO Voisk SAM and ATBM programs.

As was noted earlier, some five new classes of major surface combatants reportedly are under construction for the Red Navy. One class of large logistic support ship already has appeared. Soviet shipyards, hitherto underutilized, reportedly are being equipped for new construction programs. The 1980s evidently will see considerable expansion in the tonnage, and probably the number, of Red Navy ocean-going combatants and support ships. The degree to which these vessels will be designed for ASW or power projection, or for both missions, will not be known until the ships and their weapon systems are observed and training patterns established. Clearly, however, the 1980s will see a major expansion of Soviet surface naval power.

Advanced Technology Systems

Thus far the discussion has been confined to procurement of weapon systems whose technologies, the Alpha SSN excepted, are well understood. What about possible Soviet technological "breakthroughs" in the '80s? Such advances do not occur overnight; any "breakthrough" the Soviets may achieve in this decade will be the result of intensive and expensive efforts that have been under way for the last twenty years. At least four such high-technology areas in which the Soviets have been working for some time are: lasers, electromagnetic pulse weapons using very high peak power microwave generators, nonacoustic ASW, and particle beam weapons. Considerable controversy over Soviet progress in the latter area has surfaced during the past few years. To this observer, however, laser applications are the most likely candidates for spectacular Soviet progress in the 1980s.

Assuming the Soviets are not far behind the US in laser technology, they should be able to field at least one, possibly two, laser air defense systems in the 1980s and possibly have a space-based laser ABM defense system by the end of the decade or in the early 1990s. Such laser air defense applications are likely to be short-range systems, hence most suitable for defense of Ground Force units in the field or possibly for point defense of important targets by PVO Strany. Both orbital laser ABM systems and laser radars may be feasible in this decade. Such systems would greatly enhance the effectiveness of conventional ABM defenses already discussed.

Although the Soviets just might achieve some spectacular advances in directed energy and/or particle beam technology in the 1980s, weaponized versions of these technologies for strategic applications do not seem likely before the 1990s. Some authorities would argue not even then. Because the Soviets continue to invest so heavily in noisy ASW ships and submarines, deployment of some type of nonacoustic sensors may be planned for the 1980s.

Feasibility

Can the Soviets afford all this? Probably, but much depends on whether the US and its allies continue to support the Soviet military buildup with trade, credits, and loans. We have been doing this for more than a decade, mindlessly and largely unwittingly, despite the evidence, which our intelligence community has largely ignored. During the last decade, the profits from foreign trade have enabled the Soviets to balance their books on domestic accounts while they increased the share of their GNP devoted to military programs from about twelve to about eighteen percent. (One component of the CIA has Soviet military expenditures down to six to eight percent of GNP in 1978.) Rapidly rising machinery imports have enabled the Soviets to devote more and more of their domestic capacity to producing weaponry so that currently more than fifty percent of Soviet machinery output goes to the military as compared to about one-third in 1970. (Another component of CIA has military procurement down to about one-sixth of Soviet machinery output.)

In addition to allocating about eighteen percent of their GNP to the military, the Soviets have plenty of other economic problems: the rising cost of domestic raw materials, declining growth in petroleum production, a growing labor shortage combined with generally inefficient use of labor in the Soviet economy—due in no small part to the military burden that preempts the lion's share of machinery output—the perennial disaster called collectivized agriculture, the high cost of technological innovation, a cumbersome and oppressive bureaucracy, and so on. Yet, all these problems may not preclude at least another decade of rapid growth in Soviet weapons procurement.

Keep in mind that measured in dollars, Soviet GNP is about seventy percent of US GNP, despite the conventional prattle that it is only fifty percent. Measured in rubles, it may be closer to the latter relationship, but that is primarily due to the relatively low level of personal consumption in the USSR compared with the US. Soviet heavy industry output is not far behind the US, whether measured in rubles or in dollars. For some time now, the Soviets have been procuring more of almost every type of weapon system than the US—aircraft carriers and some avionics excepted. Considering all its other problems and the fact that the share of Soviet GNP devoted to the military has roughly doubled from nine to eighteen percent in the last twenty-two years, Soviet economic growth has held up remarkably well. Something over four percent per annum since 1975 is not bad; three percent per annum over the next decade appears possible. The US would be happy to do as well. Moreover, about sixty percent of the Soviet military budget goes for weapons procurement as compared to less than thirty percent in the US. Measured in constant 1970 rubles, the Soviets will spend nearly four times as much in 1980 as in 1970. Measured in current dollars, Soviet procurement in 1980 will be much larger than the US, perhaps twice as much.

If not only the US but also all our allies cut off machinery and grain exports to the USSR and stopped extending loans and credits, then the Soviet leaders might have to back off or extract much greater sacrifices from their people. Weapons modernization alone, with little or no inventory growth, probably will increase Soviet procurement outlays by at least six to seven percent per annum in the 1980s. If the West continues to support the military buildup, expect the Soviets to procure at least 100 weapon systems in the 1980s with procurement outlays increasing at ten to twelve percent per annum. They may be able to do it even without our help. ■

TOP LEADERS OF THE SOVIET ARMED FORCES

Marshal of the Soviet Union Leonid Il'ich Brezhnev. Born 1906. Russian. General Secretary of the Central Committee CPSU, Chairman of the Presidium of the Supreme Soviet USSR, Chairman of the Council of Defense USSR, Supreme Commander in Chief. Brezhnev was in political work in the Armed Forces during World War II, and took part in the defense of Novorossiysk. In 1957, he was given the task of expediting production of missiles and developing a space program. General Secretary of the CPSU since October 1964. He has been awarded a third Gold Star of "Hero of the Soviet Union." He also is a "Hero of Socialist Labor."

Marshal of the Soviet Union Dmitriy Fedorovich Ustinov. Born 1908. Russian. Naval artillery engineer who became wartime armaments production chief. From 1946 to 1957 he was Minister of Armaments, then Minister of Defense Industry. He worked with Brezhnev expediting missile production and the space program (1957) as Deputy Chairman of Council of Ministers. First Deputy Chairman to 1965, then Secretary of Central Committee, CPSU (1965–76), Candidate Member of Politburo (1965 to March 1976), then Member of Politburo since March 1976. Minister of Defense (April 1976). Twice "Hero of Socialist Labor." Also a "Hero of the Soviet Union."

Marshal of the Soviet Union Nikolai Vasilyevich Ogarkov. Born 1917. Russian. Became 1st Deputy Minister of Defense and Chief of the General Staff in January 1977. Candidate (1966–71), then Member of the Central Committee CPSU since 1971. Deputy of the Supreme Soviet 7th through 10th sessions. With engineer troops during World War II. First Deputy Chief of the General Staff (1968–74), Deputy Minister of Defense (1974–77). Military Engineering Academy (1941), Academy of the General Staff (1959).

Marshal of the Soviet Union Viktor Georgiyevich Kulikov. Born 1921. Russian. In January 1977, appointed Commander in Chief of the United Armed Forces of the Warsaw Pact. First Deputy Minister of Defense since 1971. Member of the Central Committee CPSU since 1971. Commander of the Kiev Military District (1967–69), then Commander in Chief, Soviet Forces Germany (1969–71). From September 1971 to 1977, Kulikov was Chief of the General Staff. Frunze Military Academy (1953). Academy of the General Staff (1959).

General of the Army Aleksey Alekseyevich Yepishev. Born 1908. Russian. Chief of the Main Political Directorate since May 1962. Yepishev was in political work in the Armed Forces during World War II. Deputy Minister of State Security (MGB) (1951–53). Ambassador to Romania (1955), then to Yugoslavia (1961). Candidate (1952–64), then Member of Central Committee CPSU since 1964. Deputy of the Supreme Soviet 1st, 3d, 4th, and 6th through 10th sessions. Military Academy of Mechanization and Motorization (1938).

Marshal of the Soviet Union Sergey Leonidovich Sokolov. Born 1911. Russian. First Deputy Minister of Defense for General Affairs since 1967. Served on the Western and Karelian Fronts during World War II. First Deputy Commander (1964–65), then Commander of the Leningrad Military District to 1967. Candidate (1966), then Member (since 1968) of the Central Committee CPSU. Deputy of the Supreme Soviet 7th through 10th sessions. Military Academy of Armored and Mechanized Troops (1947). Academy of the General Staff (1951).

General of the Army Vladimir Fedorovich Tolubko. Born 1914. Ukrainian. Commander in Chief of Strategic Rocket Forces and Deputy Minister of Defense since 1972. 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 10th 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).

General of the Army Ivan Grigor'yevich Pavlovskiy. Born 1909. Ukrainian. Commander in Chief of Ground Forces. Commanded a division during World War II. In 1958, he was made First Deputy Commander of the Transcaucasus Military District; in 1961, Commander of the Volga Military District; in 1963, Commander of the Far Eastern Military District. In November 1967, became Commander in Chief of the reinstated Ground Forces command (this position had been abolished in June 1964), and Deputy Minister of Defense. From 1966-71, he was a Member of the Central Auditing Commission, and from 1971 a full Member of the Central Committee CPSU. He was a Deputy of the Supreme Soviet 6th through 9th sessions. Attended Frunze Military Academy (1941). Graduate of General Staff Academy (1948).

Marshal of Aviation Aleksandr Ivanovich Koldunov. Born 1923. Russian. Became Commander in Chief, Troops of National Air Defense (PVO Strany) and Deputy Minister of Defense in July 1978. Koldunov was one of the ten top Russian fighter aces of World War II, destroying forty-six enemy aircraft. In the postwar period, Koldunov commanded fighter aviation units. In November 1970, he was named Commander of the Moscow Air Defense District. In December 1975, Koldunov became First Deputy Commander in Chief of Troops of National Air Defense. Candidate Member of the Central Committee from 1971 to 1976. Deputy of the Supreme Soviet 9th and 10th sessions. Twice "Hero of the Soviet Union." Military Air Academy (1952), Academy of the General Staff (1960).

Chief Marshal of Aviation Pavel Stepanovich Kutakhov. Born 1914. Russian. Commander in Chief of the Air Forces and Deputy Minister of Defense since March 1969. In World War II, he flew 367 combat missions, shooting down fourteen enemy aircraft. Commanded the air forces of a military district before becoming First Deputy Commander in Chief of the Air Forces in 1968. Member of the Central Committee CPSU since 1971. Deputy of the Supreme Soviet 8th through 10th sessions. "Hero of the Soviet Union." Academy of the General Staff (1957). Distinguished Military Pilot USSR (1966).

Admiral of the Fleet of the Soviet Union Sergey Georgiyevich Gorshkov. Born 1910. Russian. He has held his present post as Commander in Chief of the Navy since 1956. 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 9th sessions. Graduate of Frunze Naval School (1931) and higher commanders' courses at the Naval Academy (1941).

—HARRIET FAST SCOTT

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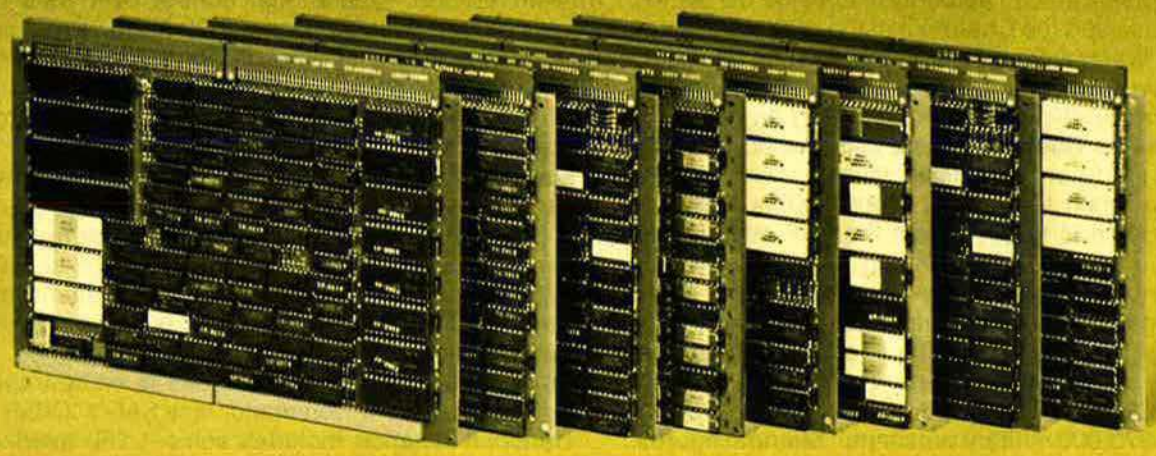

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SPERRY UNIVAC
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The major elements of aerospace power that make up the US Air Force are organized in three separate services in the USSR. All combat and principal support functions are headed by serving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

ORGANIZATION OF SOVIET ARMED FORCES

SOVIET armed forces are organized in five separate services: Strategic Rocket Forces, Ground Forces, Troops of National Air Defense (PVO Strany), 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 services do not include Troops of Civil Defense, Border Guards (KGB), Troops of the Ministry of Internal Affairs (MVD), rear service logistical support, construction troops, or other support organizations. A further precaution: The Soviets sometimes refer to all their services as the "Soviet Army."

The Ministry of Defense and the **General Staff** provide centralized command over all military services. 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, comes the Chief of the Warsaw Pact Forces, followed by the Chief of the General Staff, who heads a staff similar to that of prewar Germany. *(See charts on following 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 700 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 '79 issue of* AIR FORCE *Magazine)* credits the Strategic Rocket Forces with 375,000 military personnel. Strength figures for the services that follow are from *The Military Balance 1979/80.*

The Ground Forces, numerically the largest of the five services, are divided into four major branches: motorized rifle, tanks, rockets and artillery, and troop air defense. (The last must not be confused with Troops of National Air Defense.) Airborne forces (the USSR now has eight airborne divisions) are a special branch directly subordinate to the High Command. Ground Forces air defense equipment includes mobile surface-to-air missiles and antiaircraft artillery. Tanks, armored personnel carriers, self-propelled artillery, and personal equipment all are designed for a CBR environment. The Soviet Ground Forces (173 divisions) are well equipped for combat either with or without nuclear, chemical, and biological weapons. Ground Forces personnel number about 1,825,000.

The Troops of National Air Defense (PVO Strany) was separated from Ground Forces in 1948. Its three major components are antiaircraft defense, antimissile defense (PRO), and antispace defense (PKO). Its 2,600 fighter-interceptors and 10,000 SAM launchers, combined with its huge radar network, exceed NORAD's capabilities several times over. PVO has some 550,000 troops.

Soviet Air Forces has three major components: Frontal Aviation, Long-Range Aviation, and Military Transport Aviation, but does not include ICBMs or air defense systems. Personnel strength (excluding Long-Range Aviation) is about 475,000.

Frontal Aviation is comparable to the USAF's Tactical Air Command. Its 4,350 combat aircraft are assigned to military districts within the USSR, somewhat analogous to US joint commands, and to four "Groups of Forces" in Eastern Europe. Operational control over joint commands remains with the General Staff. However, the Air Forces commander in chief has major responsibilities for Frontal Aviation, which is charged with maintaining battlefield air superiority and working with the Ground Forces.

Long-Range Aviation has about 850 long-range (Bear, Bison, and Backfire) and medium-range (Badger and Blinder) bombers. Backfire and Blinder are supersonic, but the bulk of the bomber force is still subsonic. Capable of air-to-air refueling by LRA's small tanker force, the bombers can carry either nuclear or conventional weapons, including air-to-surface missiles. This component of the Soviet Air Forces is comparable to USAF's Strategic Air Command, less SAC's ICBMs.

Transport Aviation includes some 1,200 fixed-wing aircraft and helicopters, although some helicopters are also assigned to the Navy. 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 three 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 strike and reconnaissance fighters, a limited transport force, bombers, and surveillance aircraft. Navy personnel strength is about 433,000, including 59,000 in Naval Aviation.

The accompanying charts, prepared by Harriet Fa Scott, and current as of February 1, 1980, show th membership of the top military organization. It noteworthy that the Minister of Defense, Dmitriy Ustino although he holds the rank of Marshal of the Sovi Union, is the first essentially civilian Defense Minist since 1925, when Leon Trotsky was removed.

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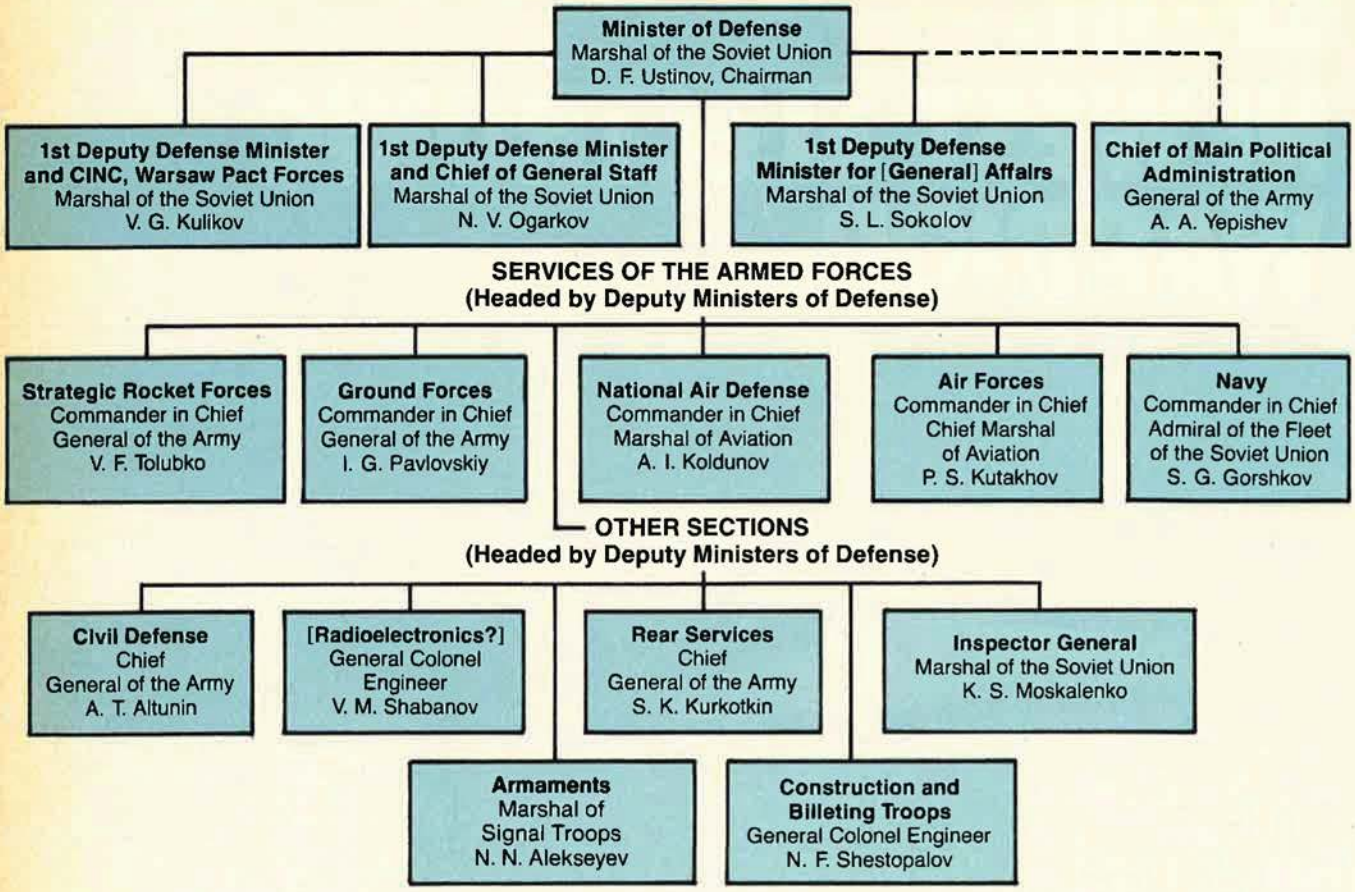

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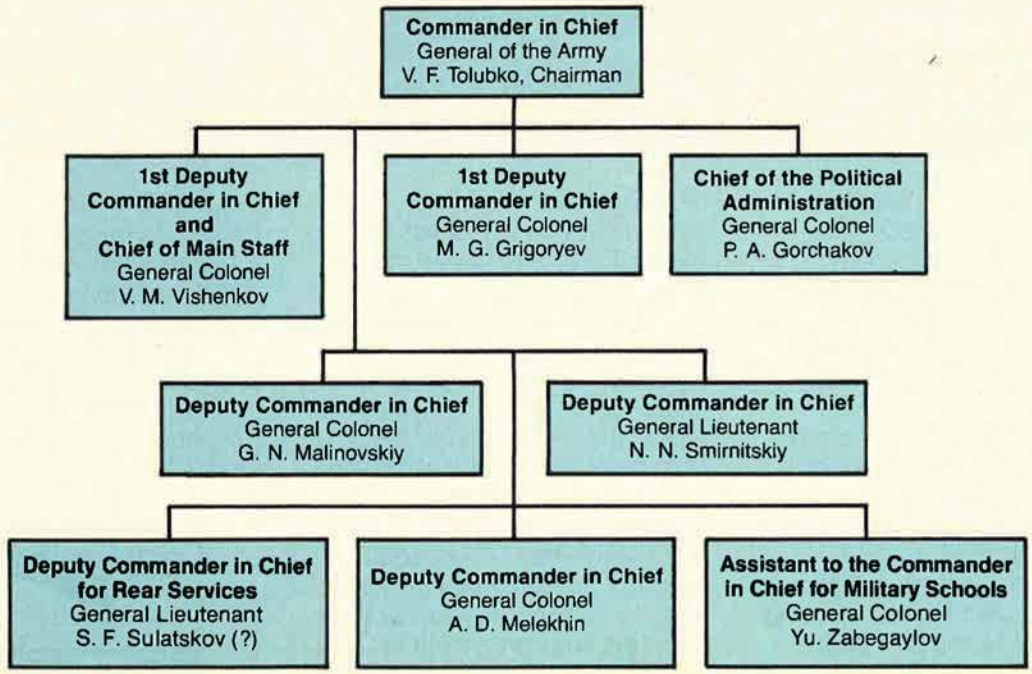

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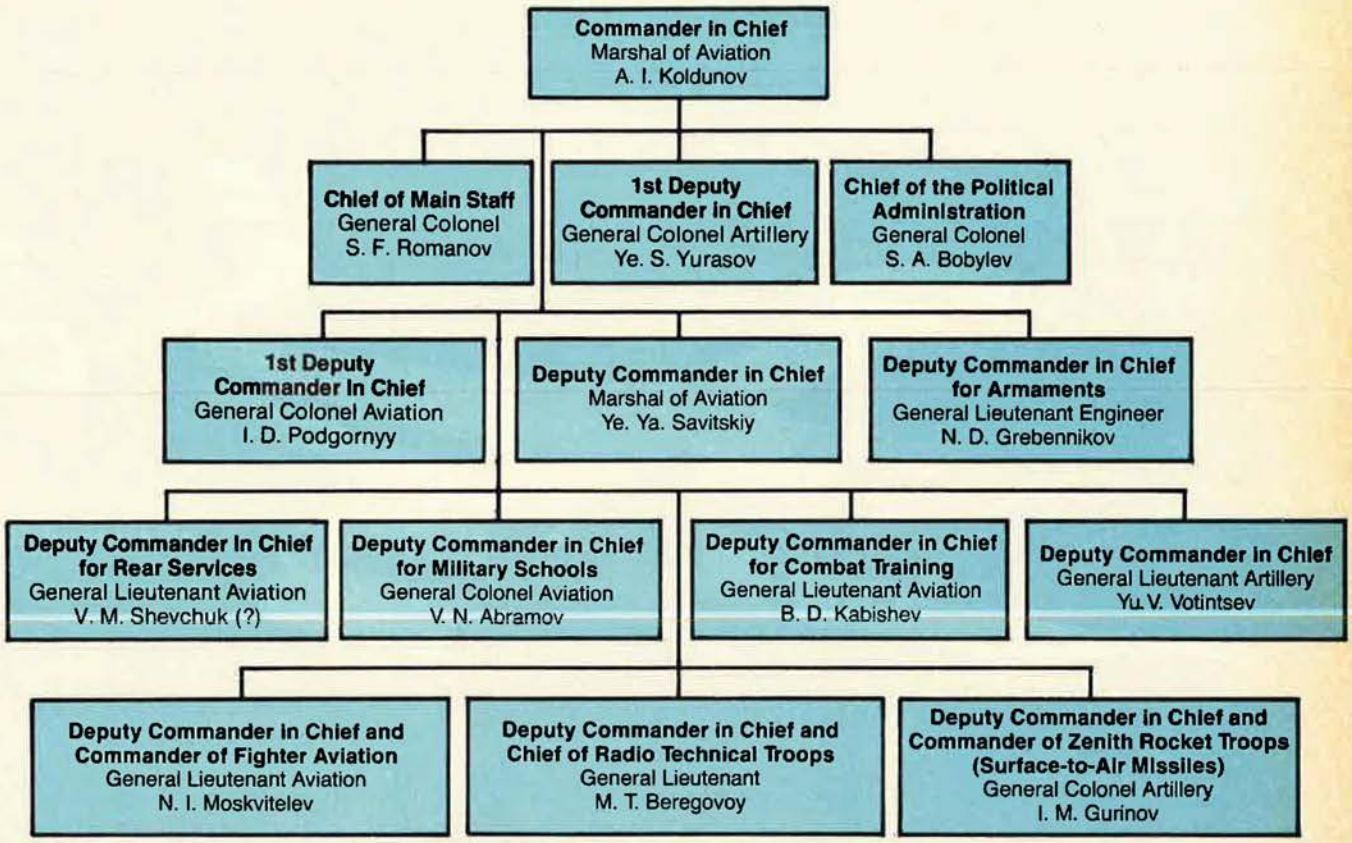

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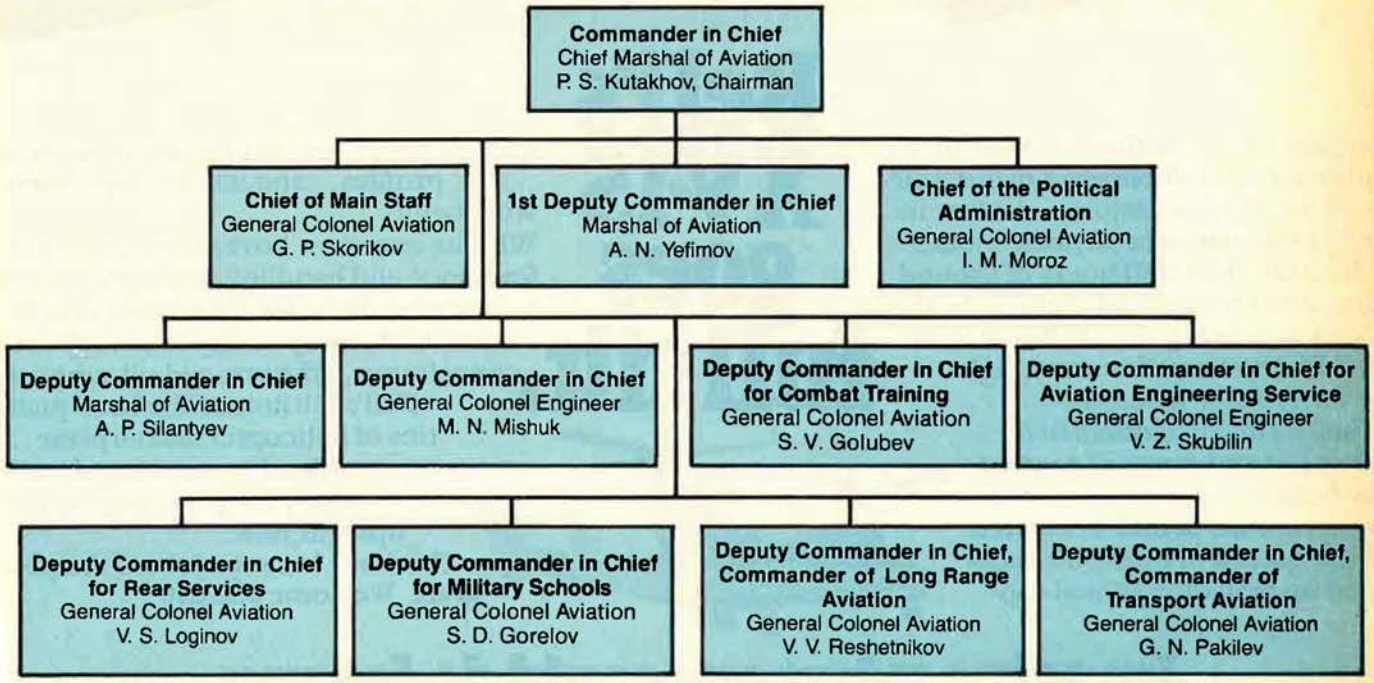

—CHARTS COMPILED BY HARRIET FAST SCOTT

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A CHARTER FOR BETTER UNDERSTANDING

BY MAJ. GENE E. TOWNSEND, USAF, CONTRIBUTING EDITOR

FOUR years ago, then Air Force Chief of Staff Gen. David C. Jones directed the Assistant Chief of Staff, Intelligence, to develop a program that would increase understanding among Air Force active-duty and Reserve Forces people of Soviet military doctrine, strategy, tactics, force structure, and combat employment.

From this initiative, the Soviet Awareness Program took shape. It now consists of these elements:

• **Soviet Press Selected Translations**—English translations of articles carried in Soviet military magazines and newspapers. A collection of these translations is published monthly and distributed to more than 5,000 US government organizations and individuals. Listed as AFRP 200-1, they may be requested through the Publications Distribution (PDO) system.

• **Soviet Military Thought Series**—English translations of professional writings by major Soviet military authors, such as *The Armed Forces of the Soviet State,* by the late Soviet Minister of Defense, Marshal Grechko. This series is aimed at military professionals, scholars, researchers, and others who need to understand official Soviet thinking and policy. Fifteen volumes have been published (*see below*), and five others will be released as soon as copyright permission is obtained. Individual titles can be purchased by anyone from the Government Printing Office.

• **The Soviet Military Power Week**—A classified five-day, thirty-five-hour course covering Soviet doctrine, strategy, tactics, force structure, and combat employment. Twelve classes are conducted each year in Washington, D. C. Air Force Manual 50-5 (AFIS Course 001) contains further information about the program. Some of the Soviet Military Power Week presentations are being recorded on videotape and may be obtained by contacting base audiovisual libraries.

• **The Soviet Awareness Team**—A one-day, eight-hour series of presentations given by a five- to seven-member team at Air Force bases in the US and overseas. The program is essentially a condensed version of the Soviet Military Power Week. Two-hour unclassified versions are offered, on a voluntary basis, for dependents and military or Air Force civilian personnel not having appropriate security clearances. So far, Soviet Awareness Teams have visited about eighty-five percent of bases in the US and all major overseas installations.

Officials estimate that approximately 74,000 military and civilians have attended a presentation given by one of the teams. They were on the road 124 days in 1978 and 185 in 1979. The presentations include a good mix of role-playing and straight lecturing accompanied by a variety of visual aids.

The following volumes in the *Soviet Military Thought Series* can be ordered by title and stock number (shown here after the title) from the Superintendent of Documents, US Government Printing Office, Washington, D. C. 20402. Prices are subject to change without notice.

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SOVIET AEROSPACE ALMANAC

Again this year, the Gallery has been prepared exclusively for AIR FORCE Magazine by John W. R. Taylor, the British authority on aerospace systems. Completely revised, it contains much new information on Soviet planes and missiles. Some specifications are necessarily estimated or approximate. British spelling and usage have been retained throughout.

GALLERY OF SOVIET AEROSPACE WEAPONS

BY JOHN W. R. TAYLOR: Editor, ***Jane's All the World's Aircraft***

Bombers and Maritime

New Bomber Programme

During the SALT II talks, Soviet delegates suggested that three new types of bomber were under development in the Soviet Union. No details were given, and the following notes represent no more than the results of careful analysis of reports received from a variety of international sources:

1. In the Department of Defense Annual Report for Fiscal Year 1979, Secretary Harold Brown stated: "The Soviet heavy bomber capability continues to rest principally in the small and aging 'Bison-Bear' force. . . . However, we now expect to see the first prototype of a new modern heavy bomber in the near future." If deployed, this aircraft would presumably replace the 'Bisons' and 'Bears' as the backbone of the Soviet intercontinental bomber force. Photographs taken by US satellites must have confirmed whether or not the prototype flew in 1979, as expected. All that is known for certain is that this aircraft is a variable-geometry (swing-wing) design, in the class of the USAF/Rockwell B-1 cancelled by President Carter. Four turbofans are said to give it a design range of about 7,250 n miles, with afterburners for an over-target dash speed of Mach 2.3. A suggested IOC of 1982 would appear optimistic even for an aircraft embodying considerable 'Backfire' technology.

2. At the beginning of 1980, nothing had been stated officially concerning this bomber, which is intended as an intercontinental replacement for the Tu-95, for service from about 1983. Press reports have suggested that it is based on the airframe of the Tu-144 supersonic airliner. The same reports have mentioned a range of 10,000 n miles, without flight refuelling, and a maximum weapon load of 41,800 lb operating at *sub*sonic speed—which would appear illogical with such a configuration.

3. This is described as a further development of Backfire', with wedge-type engine intakes similar to those of the MiG-25. Such a change could have special significance if, as believed, 'Backfire' was designed to use the same basic power plant as the Tu-144 supersonic transport. Re-engining of the Tu-144 has resulted in an improvement of the full-payload range from about 2,000 n miles to 3,780 n miles. A similar change of engine in 'Backfire', with associated installation redesign, would much enhance the bomber's intercontinental capability.

Beriev M-12 (NATO 'Mail') (Swedish Air Force)

Beriev M-12 (NATO 'Mail')

Georgi Mikhailovich Beriev, the designer of this neat, twin-turboprop amphibian, died in July 1979. At a time when the only other modern flying-boat in first-line combat service is the Japanese Shin Meiwa PS-1, it will be interesting to see whether or not his design bureau survives him. Nearly 20 years after the M-12's first public appearance, at the 1961 Aviation Day display in Moscow, about 80 of the 100 production models continue to operate from shore bases of the Soviet Northern and Black Sea fleets, for near-zone anti-submarine and maritime patrol duties out to some 230 miles from shore. Generally clean lines and the high length-to-beam ratio of the hull, added to new turbine engines, made the M-12 a major advance over its predecessor, the piston-engined Be-6, examples of which still serve in China. It holds all 38 records listed by the Fédération Aéronautique Internationale for turboprop-powered amphibians (Class C.3 Group II) and flying-boats (Class C.2 Group II), at speeds of up to 371 mph over closed circuits, and with payloads of up to 10 tons.

Power Plant: two Ivchenko AI-20D turboprop engines; each 4,000 shp.

Dimensions: span 97 ft 6 in, length 107 ft 11¼ in, height 22 ft 11½ in, wing area 1,030 sq ft.

Weight: gross 65,035 lb.

Performance: max speed 379 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 Soviet Navy is expected to introduce soon a new open-ocean anti-submarine/maritime patrol aircraft. Until it does so, Il-38s will continue to be seen over the Atlantic and Mediterranean, in partnership with the longer-range Tu-142, and over the Indian Ocean, operating from an airfield in the People's Democratic Republic of Yemen. About 60 are in service, plus three flown from Dabolim, Goa, by No. 315 Squadron of the Indian Navy.

The Il-38 was developed from the Il-18 airliner in much the same way that the US Navy's P-3 Orion was based on the Lockheed Electra. Its lengthened fuselage retains few cabin windows. Added equipment includes a large radome under the forward fuselage and a MAD tail-sting, with an internal weapon/stores bay aft of the radome. To compensate for the effect on the CG position of these

Myasishchev M-4 (NATO 'Bison')

changes, and equipment inside the cabin, the wing had to be moved forward.

Power Plant: four Ivchenko AI-20 turboprop engines; each 4,250 ehp.

Dimensions: span 122 ft 8½ in, length 129 ft 10 in, height 33 ft 4 in.

Performance: max cruising speed 400 mph at 27,000 ft, max range 4,500 miles.

Accommodation: crew of twelve.

Myasishchev M-4 (NATO 'Bison')

The prototype of this heavy strategic bomber flew in 1953, making it one year younger than its US counterpart, the B-52; but it failed to match the latter aircraft's success and durability. The Soviet long-range air force, Dalnaya Aviatsiya, preferred the turboprop Tu-95 as its primary equipment; the Soviet Naval Air Force continues to operate Tu-142s long after its maritime reconnaissance versions of the M-4 were withdrawn from service. According to SALT II documents, only 43 M-4s remain available as heavy bombers; 31 more are now configured as in-flight refuelling tankers in support of the 'Bear-

Tupolev Tu-16 (NATO 'Badger-J')

Bison' attack force, with an internal probe-and-drogue hose-reel unit which makes them equally compatible with 'Backfire'. If SALT II is ratified, the tankers will be given functionally related observable differences (FRODs) which indicate that they cannot perform the mission of a heavy bomber. (*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 560 mph at 36,000 ft, service ceiling 45,000 ft, range 7,000 miles at 520 mph with 10,000 lb of bombs.

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 centre-fuselage.

Tupolev Tu-22 (NATO 'Blinder')

Tupolev Tu-16 (NATO 'Badger')

Last year's Gallery commented that "no aircraft illustrates better than the Tu-16 . . . Soviet competence in adapting a good basic airframe endlessly to meet new requirements and carry new equipment". Since then, details of another three NATO-identified variants have become available, and only one of the ten versions allocated reporting names over the past 26 years seems no longer operational. Production of the Tu-16 is believed to have totalled about 2,000 aircraft, of which almost half continue to equip first-line squadrons. Dalnaya Aviatsiya is believed to have about 300 in medium-range units, able to deliver nuclear or conventional weapons, and supported by a small number of Tu-16 tankers, more than 90 of various versions equipped for ECM duties, and 20 for reconnaissance. The Naval Air Force has about 275 Tu-16s for maritime attack, 80 tankers, 30 ECM, and 40 reconnaissance variants. Reporting names by which these aircraft are known to NATO are as follows:

Badger-A. Basic strategic jet bomber, able to carry nuclear or conventional free-fall weapons. Crew of seven. Glazed nose, with small undernose radome. Armed with seven 23 mm guns. Some equipped as in-flight refuelling tankers, using a unique wingtip-to-wingtip transfer technique. Nine supplied to Iraq. More than 80 operational with Chinese Air Force, mostly built at Sian in China under designation B-6.

Badger-C. Anti-shipping version, first shown in 1961 Aviation Day flypast, with 'Kipper' winged missile carried under fuselage. Wide nose radome, in place of glazing and nose gun of 'Badger-A'.

Badger-D. Maritime/electronic reconnaissance version. Nose like that of 'Badger-C'. Larger undernose radome. Three blister fairings in tandem under centre-fuselage.

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'). One photographed by pilot of Japanese F-86F in 1977, about 50 miles north of Noto Peninsula, carrying a new missile (NATO 'Kingfish') on port underwing pylon. Majority serve with anti-shipping squadrons of the Soviet Naval Air Force; others were included in the 25 'Badgers' supplied to Egypt as replacements for aircraft lost in the Yom Kippur War of October 1973.

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 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 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.

Weight: gross 150,000 lb.

Performance: max speed 587 mph at 35,000 ft, service ceiling 42,650 ft, range 3,975 miles at 480 mph with 6,600 lb of bombs.

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')

As the Soviet Union's first operational supersonic bomber, the Tu-22 caught the attention of the world press when it made a surprise appearance at the 1961 Aviation Day display in Moscow. However, its range proved so disappointing that production was limited to about 250 aircraft. Of these, about 130 are said to remain operational with medium-range units of Dalnaya Aviatsiya, plus about a dozen for reconnaissance duties. The Soviet Navy has around 40 for maritime attack, 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, with fuselage weapons-bay for free-fall nuclear or conventional bombs. Limited production only. 12 supplied to Iraq.

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 refuelling probe on nose. Major version for Dalnaya Aviatsiya. 24 supplied to Libyan 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.

Power Plant: two unidentified turbojet engines in pods above rear fuselage, on each side of tail-fin; each estimated at 27,000 lb st with afterburning. Lip of each intake is extended forward for take-off, 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, range 1,400 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')

Soviet reference to 'Backfire' as the Tu-22M during the SALT II discussions came as a surprise. It was always suspected to be a replacement for the disappointing

Tu-22 ('Blinder'), but addition of the suffix M to a Soviet designation usually implies a limited design modification (*Modifikatsirovanny*: modified), whereas this is clearly a completely new, variable-geometry design. A prototype of the initial version was observed on the ground near the manufacturing plant at Kazan, in Central Asia, in July 1970. Up to twelve pre-production models were tested subsequently, one of which remained airborne for a further ten hours after an in-flight refuelling. Two production versions have since been identified by non-classified NATO reporting names:

Backfire-A. Initial version, with large landing gear fairing pods on wing trailing-edges. Believed to equip only a single Dalnaya Aviatsiya squadron.

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. Main wheels retract inward into bottom of intake trunks.

A reported new version is listed as New Bomber No. 3 at the beginning of this Gallery.

Up to the time of the SALT II talks, DoD had referred to 'Backfire' as the **Tu-26.** More than 125 'Backfire-Bs' are thought to be in service, with production continuing at a rate of 30 per year (subject to ratification of SALT II). Deliveries appear to be divided equally between medium-range units of Dalnaya Aviatsiya and the Naval Air Force. To stress the peripheral/theatre range capability which excludes 'Backfires' from SALT II restrictions, the aircraft are now flown with the in-flight refuelling nose-probe removed, although the housing remains. Controversy over the aircraft's range continues, and State Department document 12A on the SALT Agreement states "Under certain flight conditions, the Backfire is assessed to have an intercontinental capability". Even more significant is its potential as a primary strategic and tactical offensive weapon directed at NATO in Europe, and against maritime reinforcement routes between the United States and its allies in both Europe and the Pacific. This was acknowledged in the FY 1979 DoD Annual Report, which stated: "There is increasing evidence 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." (*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 refuelling nose-probe.

Dimensions: span 113 ft spread, 86 ft swept; length 132 ft; height 33 ft.

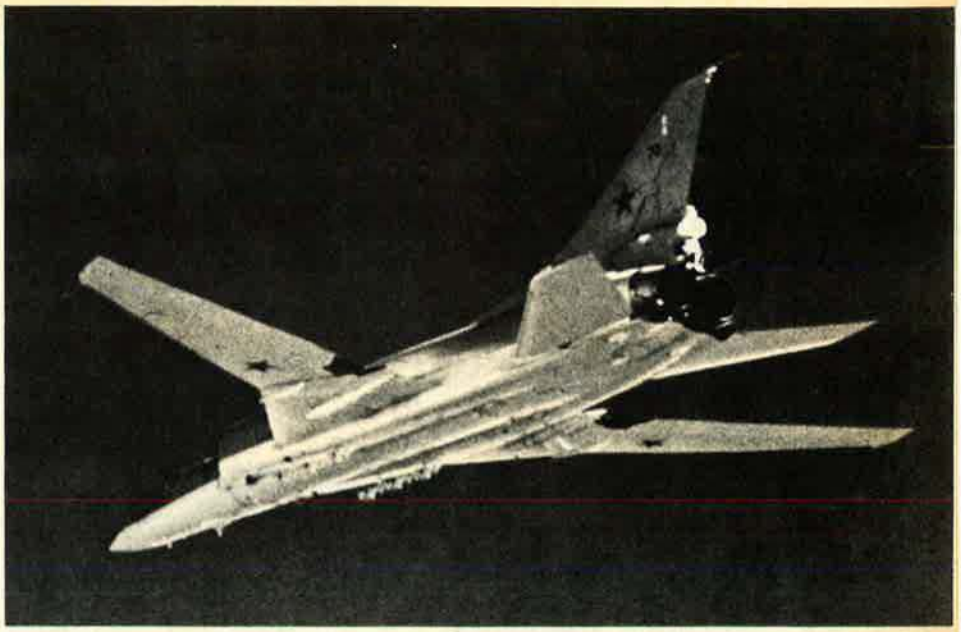
Weight: gross 270,000 lb.

Performance: max speed Mach 2 at high altitude, Mach 0.9 at low altitude, max unrefuelled combat range 5,000 miles.

Armament: twin 23 mm guns in radar-directed tail mounting. Nominal weapon load 20,800 lb. Primary armament of one 'Kitchen' air-to-surface missile semi-recessed in underside of centre-fuselage. 'Backfire' can also carry the full range of Soviet free-fall nuclear and conventional weapons, and Naval aircraft photographed by Swedish Air Force in 1978 had multiple racks for external stores under the front of its 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')

Documents issued by Washington concerning the SALT talks reinforced the belief that Western folk are well advised to use NATO reporting names rather than supposed Soviet designations when referring to Soviet aircraft. Even those who have always used Tu-95 rather than Tu-20 as the designation for 'Bear' discovered that they were only half right. It appears that Moscow uses Tu-95 for the 113 'Bear-As and Bs' that form the backbone of Dalnaya Aviatsiya's strategic bomber force; the assorted 'Bears', totalling about 75, used by the Naval Air Force are known as Tu-142s. The Naval aircraft, being employed only for anti-submarine warfare, are not subject to SALT restrictions. Although they have weapon bays, the US is satisfied that they already embody adequate FRODs (*see Myasishchev M-4 entry*), as the dimensions of their fuselage, their landing gear housings, and radome are all observably different from those of the Tu-95s. Those operated from Cuba and Angola are capable of covering the North and South Atlantic from the Mediterranean approaches westward to the US east coast, and southward to the Cape of Good Hope. Long range and endurance are only two of the attributes that have kept the huge four-turboprop Tu-95s and Tu-142s in first-line service for 25 years. Their high speed, exceeding that once considered possible for propeller-driven aircraft, eclipsed the contemporary four-jet Myasishchev M-4. Their size and payload potential enabled them to accommodate the largest air-to-surface missiles and radars that have yet been carried by operational aircraft. Thus, the six major versions identified by NATO reporting names, as follows, include a variety of sub-types, with differing operational equipment:



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

Bear-A. Basic long-range strategic bomber, first flown in the late Summer of 1954. 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 forward dorsal and rear 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 Naval Air Force, with large flight refuelling nose probe, and, sometimes, a streamlined blister fairing on the starboard side of the rear fuselage. Some 'Bears' are equipped to carry 'Kitchen' air-to-surface missiles. One was photographed in 1978 with a pointed canister under each wing, presumably for air sampling.

Bear-C. Maritime patrol version, first observed near NATO ships in 1964. Differs from 'Bear-B' in having a streamlined blister fairing on each side of its rear fuselage.

Bear-D. Identified during harassment of US Coast Guard icebreakers in the Soviet Arctic in 1967, this was the first version fitted with X-band radar in large blister fairing under centre-fuselage, for reconnaissance and important anti-shipping missile role. Tasks include pinpointing of targets for missile launch crews on board ships and aircraft which are themselves too distant to ensure precise missile aiming and guidance. Glazed nose like 'Bear-A', with undernose radome and superimposed refuelling probe. Rear fuselage blisters as on 'Bear-C'. Added fairings at tips of tailplane. I-band tail-warning radar in enlarged fairing at base of rudder. About 45 serve with Soviet Naval Air Force.

A 'Bear-D' photographed in the second half of 1978, after intercept by US Navy Phantoms, 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 refuelling probe as on 'Bear-C'. Six or seven camera windows in bomb-bay doors.

Bear-F. Much-refined maritime version, identified in 1973. Smaller X-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 to improve aerodynamics. 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 tyres. About 30 operational in early 1979.

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 500 mph at 41,000 ft, range 7,800 miles with 25,000 lb of bombs.

Tupolev Tu-142 (NATO 'Bear') (US Navy)

Faired tail, housing special equipment, on a 'Bear-D'

Fighters

MiG-21MF (NATO 'Fishbed-J')

MiG-23S (NATO 'Flogger-E')

New Fighter Programme

Several fighter prototypes are reported to have been observed under test at Jukovski experimental flight test centre, and elsewhere, during the past year. No details have been made available officially, and the following notes are based on the more reliable of the reports:

1. In tests against simulated cruise missiles, an aircraft described as a modified MiG-25 ('Foxbat') flying at about 20,000 ft detected a target flying below 200 ft at a range of 12.5 miles, fired an unarmed missile against it and achieved a theoretical 'kill'. In a later test of the same aircraft/missile combination, a UR-1 target operating at 70,000 ft was attacked with similar success by a modified MiG-25 flying at 55,000 ft. This so-called Super Foxbat' is said to have two seats in tandem, an armament of four radar-homing AA-X-9 missiles, and a radar that can display 20 targets and track four of them simultaneously.

2. An air superiority fighter in the class of the McDonnell Douglas F-18 is said to have been at the advanced flight testing stage by Spring 1979. Satellite photographs are said to have shown it to be a twin-fin, twin-engined single-seater, with wide-chord fixed wings embodying large root extensions. A T-O weight of around 25,000 lb has been suggested.

MiG-21 (NATO 'Fishbed')

This diminutive multi-role fighter continues to be the most widely-used combat aircraft in the world, serving with about 30 air forces. The latest, extensively-redesigned versions are very different from the initial production model (NATO 'Fishbed-A'), which proved woefully short on range, search capability, and punch, and reflected the unimpressive Soviet manufacturing standards of the 1950s; but the MiG-21's 25 years are beginning to show. A few months ago, eight Syrian-operated MiG-21s were caught over southern Lebanon by six Israeli F-15s and four Israeli-designed Kfir-C2 fighters, directed by an E-2C Hawkeye AWACS. Six of the MiGs were shot down, five of them by the F-15s in the Eagle's first-ever combat engagement, without loss to the Israelis.

The original E-5 prototype of 1955 was designed by the late Colonel-General Artem Mikoyan on the basis of jet-to-jet combat experience during the Korean War, with the emphasis on good transonic and supersonic handling, high rate of climb, small size, and modest power. Subsequent development, through a long succession of variants, has centred on improved weapons, electronics, and range, within the limitations of an airframe much smaller and lighter in weight than either of the US types that were built under the LWF (lightweight fighter) programme of the early 1970s. How many have been manufactured in the Soviet Union, Czechoslovakia, India, and China (as the F-7) we may never know. However, about 1,300 of the 4,350 fixed-wing aircraft estimated to equip Soviet tactical air forces are MiG-21s, including 300 of the reconnaissance models known to NATO as 'Fishbed-H'. The majority are multi-role 'Fishbed-J/K/L/N' variants, of which the last two represent such an advance over their predecessors in terms of constructional standards that they can almost be regarded as new types. Major versions flown by the Warsaw Pact air forces are as follows:

MiG-21F ('Fishbed-C'). Short-range clear-weather fighter, with 12,676 lb st Tumansky R-11 afterburning turbojet, internal fuel capacity of 618 gallons, and radar ranging equipment in small air intake centrebody of movable three-shock type. Armed with one 30 mm gun and two K-13 (NATO 'Atoll') air-to-air missiles or sixteen-round pods of 57 mm rockets. Pylon for 130 gallon fuel tank under belly. Semi-encapsulated escape system, in which pilot is protected by canopy, ejected with seat as shield against slipstream. Pitot boom under nose.

MiG-21PF ('Fishbed-D'). Basic model of second series, with R1L search/track radar (NATO 'Spin Scan A') in enlarged intake centrebody to enhance all-weather capability. R-11 uprated to 13,120 lb st with afterburning. Internal fuel increased to 753 gallons. Gun deleted. Late production PFs have provision for two JATO rockets, and a flap blowing system (SPS) which reduces landing speed by 25 mph. Pitot boom above nose.

MiG-21PFM ('Fishbed-F'). Successor to PF, with SPS, wide-chord fin to improve stability, conventional ejection seat, windscreen with quarter lights, and sideways-hinged canopy. R2L radar ('Spin Scan B') with reported lock-on range of under 8 miles and ineffective below 3,000 ft because of ground clutter. Max permissible speed at low altitude 683 mph.

MiG-21PFMA ('Fishbed-J'). Multi-role development of PFM, with 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 infra-red K-13As on inboard pylons. Above-nose pitot boom offset to starboard. Zero-speed, zero-altitude ejection seat. Late 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 centreline 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 multi-role air combat fighter/ground attack version, with wider and deeper dorsal fairing, updated electronics, and generally improved construction standards.

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 electronics indicated by 'bow and arrow' antenna under nose. *(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 13 ft 5½ 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, service ceiling 59,050 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 missiles.

MiG-23 (NATO 'Flogger-A, B, C, E, F, and G')

Production of the MiG-23/27 'Flogger' family of variable-geometry combat aircraft continues at a staggering pace. For some time 'Floggers' have outnumbered any other type of combat aircraft (helicopters excepted) in Soviet first-line use. Over the past year exports have been stepped up to other Warsaw Pact air forces, following earlier deliveries to countries such as Algeria, Cuba, Egypt, Ethiopia, Iraq, Libya, and Syria. As usual, the export models are equipped to a lower standard than the 450 aircraft serving with the Soviet PVO-Strany home defence force, and the 1,400 equipping units of the Frontovaya Aviatsiya tactical air forces. Early production aircraft were powered by a Tumansky R-27 turbofan, rated at 22,485 lb st with afterburning. This continues in use in training two-seaters and export fighters, but the current MiG-23S and MiG-27 for the Soviet armed forces have a Tumansky R-29B turbojet. 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, and small initial production series to equip one or two development squadrons from 1970. Experience with these dictated almost total redesign of the major production versions which followed.

MiG-23S ('Flogger-B'). Single-seat air combat fighter

for Soviet Air Force. Compared with prototype all tail surfaces except ventral fin moved rearward, increasing gap between wing and tailplane; size of dorsal fin increased; and fixed inboard wing leading-edges introduced. Equipment includes 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, undernose laser rangefinder, and Doppler. Described in FY 1979 *US Military Posture* statement as the first Soviet aircraft with a demonstrated, but rudimentary, ability to track and engage targets flying below its own altitude. *(See also 'Flogger-G'.)*

MiG-23U ('Flogger-C'). Tandem two-seater for both operational training and combat use. Identical to early MiG-23S (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-23S ('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 laser rangefinder or Doppler. Armed with 'Atoll' missiles and GSh-23 gun.

MiG-23 ('Flogger-F'). Export counterpart of Soviet Air Forces' MiG-27 ('Flogger-D') ground attack/interdictor. Has the nose shape, cockpit external armour plate, larger, low-pressure tyres, and fixed nozzle of the MiG-27; but retains the power plant, variable-geometry intakes, and GSh-23 twin-barrel gun of the MiG-23S.

MiG-23S ('Flogger-G'). First identified when six aircraft from Kubinka Air Base used for goodwill visits to Finland and France in the Summer of 1978. Much smaller dorsal fin, and absence of operational equipment such as underwing pylons and laser rangefinder, suggests possible modification for improved aerobatic capability as a display team.

On all versions, wing sweep is variable manually, in flight or on the ground, reportedly 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, and collectively after touchdown. Extended-chord 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-23S follow.)*

Power Plant: one Tumansky R-29B turbojet engine, rated at 25,350 lb st with max afterburning. Variable-geometry air intakes and variable nozzle. Provision for external fuel tank on centreline pylon.

Dimensions: span 46 ft 9 in spread, 26 ft 9½ in swept, length 55 ft 1½ in.

Weight: gross 28,000–33,050 lb.

Performance: max speed Mach 2.3 at height, Mach 1.1 at sea level, service ceiling 61,000 ft, combat radius 600 miles.

Accommodation: pilot only.

Armament: one twin-barrel 23 mm GSh-23 gun in belly pack. One pylon under centre-fuselage, one under each engine air intake duct, and one under each fixed inboard wing panel, for air-to-air missiles (NATO 'Apex' and 'Aphid') or various other stores.

MiG-25 (NATO 'Foxbat-A and C')

An unexpected development during the past year has been the appearance of MiG-25s in the insignia of the Algerian and Syrian Air Forces. The nationality of the pilots is not known, but deployment of the world's fastest and highest-climbing weapon-carrying aircraft to new areas of strategic importance must be significant. So, too, must reported successes against simulated cruise missiles achieved by MiG-25s fitted with improved 'look-down/shoot-down' radar/missile systems *(see entry on New Fighter Programme)*.

Five versions of the MiG-25 have been identified:

MiG-25 ('Foxbat-A'). Basic interceptor. 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 anti-flutter bodies housing CW target-illuminating radar. Nose radar (NATO 'Fox Fire') of MiG-25 examined in Japan in 1976 was the most powerful fitted to any interceptor of that period but embodied vacuum tubes rather than modern circuitry, with emphasis on anti-jamming capability rather than range. ECM/ECCM standards were high. Armament comprises four air-to-air missiles on underwing pylons. Known also in USSR as E-266.

MiG-25R ('Foxbat-B'). Reconnaissance version. Described separately in Reconnaissance, ECM, EW 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 radar or reconnaissance sensors in nose. The aircraft designated E-133 in which Svetlana Savitskaya set a women's world speed record of 1,667.412 mph on June 2, 1975, is believed to have been a MiG-25U.

MiG-25R ('Foxbat-D'). Reconnaissance version. Described separately.

E-266M. Soviet designation of aircraft which recaptured two time-to-height records from the McDonnell Douglas F-15 *Streak Eagle* on May 17, 1975, and set a further record by climbing to 35,000 m (114,829 ft) in 4 min 11.3 sec. Subsequent flights set an absolute height record of 123,524 ft and a record for climb to 121,654 ft with a two-ton payload. The engines of this version are uprated to 30,865 lb st each, and a corresponding production interceptor is expected to carry six underwing missiles and a large gun. *(Data for 'Foxbat-A' follow.)*

Power Plant: two Tumansky R-31 (R-266) turbojet engines; each 24,250 lb st with afterburning. Internal fuel capacity approx 30,865 lb. Electronically-controlled variable ramps in intakes.

Dimensions: span 45 ft 9 in, length 73 ft 2 in, height 18 ft 4¼ in, wing area 603 sq ft.

Weights: basic operating 44,100 lb, gross 79,800 lb.

Performance: never-exceed combat speed, with missiles, Mach 2.8, service ceiling 80,000 ft, normal combat radius 700 miles.

Armament: four air-to-air missiles. These may comprise one infra-red and one radar homing example of the AA-6 (NATO 'Acrid') under each wing. More usually, it is believed that one AA-7 (NATO 'Apex') and one AA-8 ('Aphid') are carried under each wing.

MiG-27 (NATO 'Flogger-D')

The single-seat ground attack aircraft known to NATO as 'Flogger-D' has many airframe features in common with the MiG-23, but differs in such important respects that its Soviet designation has been changed to MiG-27. It appears to have the same basic power plant as the Soviet Air Force's MiG-23S, but has a fixed nozzle and fixed engine air intakes, consistent with the primary requirement of high subsonic speed at low altitude. The forward fuselage is also completely different from that of the interceptor versions of the MiG-23. There is additional armour on the flat sides of the cockpit, and the nose is sharply tapered in side elevation, with a small sloping window under a laser rangefinder and marked target seeker at the tip. Larger, low-pressure tyres are fitted. There is provision for carrying a ferry tank under each outer wing, which must be kept in a forward position when this is fitted. Operational equipment includes a different gun, and an ECM antenna above the port glove pylon.

The 'Flogger-F' export counterpart of the MiG-27 is a member of the MiG-23 series (which see). *(Data for 'Flogger-D' follow.)*

Power Plant and **Dimensions:** As for MiG-23.

Weights: max weapon load 6,610 lb, gross 44,310 lb.

Performance: max speed Mach 1.75 at height, Mach 0.95 at S/L, max ferry range (3 external tanks) 1,550 miles.

Accommodation: pilot only.

Armament: one six-barrel 23 mm Gatling-type gun; five pylons for external stores, known to include rocket packs, bombs, tactical nuclear weapons, and, probably, AS-7 (NATO 'Kerry') air-to-surface missiles.

Sukhoi Su-9 (NATO 'Fishpot-B')

The International Institute for Strategic Studies' *Military Balance* suggests that Su-9/11 'Fishpots' still constitute nearly 20% of the 2,600-strong PVO-Strany home defence fighter force. However, after two decades of first-line service, the Su-9 must be nearing the end of its useful life. R1L (NATO 'Spin Scan') radar is standard.

MiG-25R (NATO 'Foxbat-B') reconnaissance version

MiG-27 (NATO 'Flogger-D') (Flug Revue)

Tupolev Tu-28P (NATO 'Fiddler')

Sukhoi Su-15 (NATO 'Flagon-D') (Tass)

Yakovlev Yak-28P (NATO 'Firebar') (Flug Revue)

Yakovlev Yak-36 (NATO 'Forger-A') hovering over the deck of the carrier Kiev (Tass)

Power Plant: one Lyulka AL-7F turbojet engine; 19,840 lb st with afterburning. Provision for two external fuel tanks side by side under fuselage.
Dimensions: span 27 ft 8 in, length 55 ft 0 in.
Armament: no guns; four 'Alkali' air-to-air missiles under wings.

Sukhoi Su-11 (NATO 'Fishpot-C')

As its NATO reporting name implies, the Su-11 limited all-weather interceptor is an uprated version of the Su-9. First displayed at Domodedovo in 1967, it has a lengthened nose of less tapered form, with an enlarged centrebody for the Uragan 5B (NATO 'Skip Spin') X-band radar, and two slim duct fairings along the top of the fuselage, as on the Su-7B. Its armament is also much improved, and an uprated version of the AL-7F turbojet is installed.
Power Plant: one Lyulka AL-7F-1 turbojet engine; 22,046 lb st with afterburning.
Dimensions: span 27 ft 8 in, length 56 ft 0 in.
Weight: gross 30,000 lb.
Performance: max speed Mach 1.8 at 36,000 ft, ceiling 55,700 ft.
Accommodation: pilot only.
Armament: no guns; two air-to-air missiles (NATO 'Anab') under wings, one radar-homing, one infra-red homing.

Sukhoi Su-15 (NATO 'Flagon')

Nearly 1,000 single-seat Su-15s are thought to be deployed with PVO-Strany, far outnumbering any other type of Soviet home defence interceptor. They are rated less highly than the MiG-23 and MiG-25, but represent a considerable advance over the Su-11 even though they seem to have inherited this aircraft's basic wings, tail surfaces, and cockpit section. Main innovations were 'Flagon's' two side-by-side engines and large conical nose radome, which necessitated the side intake boxes with splitter plates. Development led to a succession of significant changes, and six variants may now be identified by NATO reporting names:

Flagon-A. Basic single-seater, of which a prototype and nine pre-production models participated in the Aviation Day display at Domodedovo in 1967. Simple delta wings, identical in form to those of Su-11, with constant sweep of approx 53° and span of about 30 ft. Conical nose radome. Turbojets reported to be Tumansky R-11F2-300s, as used in MiG-21 series, each rated at 13,668 lb st. Probably limited to small initial quantity.

Flagon-B. Experimental STOL version with wings of compound sweep (different from those of 'Flagon-D/E/F'), and three vertically-mounted lift-jet engines in centre-fuselage. Demonstrated at Domodedovo, 1967. For R&D only.

Flagon-C. Two-seat training version of 'Flagon-D', probably with combat capability. Individual rearward-hinged canopy over each seat.

Flagon-D. Generally similar to 'Flagon-A' but with longer-span wings of compound sweep, produced by reducing the sweepback at the tips via a very narrow unswept section. Conical radome. First major production version.

Flagon-E. Wings similar to those of 'Flagon-D'. New and more powerful propulsion system, increasing speed and range. Uprated electronics. Major production version, operational since second half of 1973.

Flagon-F. Latest version in service, identified by ogival nose radome. Generally similar to 'Flagon-E'. *(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: 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: no guns; two missiles (NATO 'Anab') under wings, one radar homing, one infra-red homing. Two further pylons for weapons or fuel tanks under centre-fuselage.

Tupolev Tu-28P/Tu-128 (NATO 'Fiddler')

Largest purpose-designed interceptor ever put into squadron service, 'Fiddler' is generally designated Tu-28P, although the Department of Defense prefers Tu-128. When it was first displayed in public, at Tushino in 1961, it carried two missiles (NATO 'Ash'), each 18 ft long, had a large blister fairing under its fuselage, and was fitted with two ventral fins. Production 'Fiddlers' dispensed with the fairing and ventral fins, but appeared at Domodedovo in 1967 with armament increased to four missiles. No more than 150 are thought to be deployed by the PVO-Strany.
Power Plant: two unidentified afterburning turbojet engines; each estimated at 27,000 lb st. Half-cone shock-body in each air intake.
Dimensions: span 65 ft 0 in, length 85 ft 0 in.
Weight: gross 100,000 lb.
Performance: max speed Mach 1.75 at 36,000 ft, ceiling 65,620 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 infra-red homing.

Yakovlev Yak-28P (NATO 'Firebar')

Even by highly economical Soviet standards, the Yak-28 proved a remarkably versatile aeroplane. The same basic airframe was adaptable to a wide variety of roles, enabling the Yak-28 to take over most of the tasks performed by the earlier Yak-25/26/27 family, and add a few of its own. About 300 Yak-28P transonic all-weather interceptors remain operational in the PVO-Strany fighter force. The much 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, believed to be related to the Tumansky R-11 fitted in some MiG-21s; each 13,120 lb st with afterburning. Each intake houses a centrebody shock-cone.
Dimensions: span 42 ft 6 in, length 71 ft 0½ in, height 12 ft 11½ in.
Weight: gross 35,000 lb.
Performance: max speed Mach 1.1 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 infra-red or semi-active radar homing heads.

Yakovlev Yak-36 (NATO 'Forger')

First operational fixed-wing VTOL combat aircraft revealed by the Soviet Union, the Yak-36 was displayed openly on board the carrier/cruiser *Kiev* during its maiden voyage through the Mediterranean and North Atlantic, in July 1976. The aircraft seen on that occasion were almost certainly from an early production series, operated by a development squadron. Detail differences were noted between one aircraft and another. For example, those with an identification number above 20 painted on their intake trunks had a row of small auxiliary intake doors aft of each lip; those with lower numbers did not. No significant differences were visible on the Yak-36s carried by the *Kiev's* sister-ship *Minsk* in 1979. The only known versions of the type are therefore:

Forger-A. Basic single-seat combat aircraft. At least nine appear to be operational on each Soviet carrier/cruiser, in addition to about 15 Kamov Ka-25 helicopters. Primary operational roles are assumed to be reconnaissance, strikes against small ships, and fleet defence 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 ejector 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-36 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. As the main vectored-thrust nozzles turn up to 10° forward of vertical during take-off and landing, the total of four effluxes can be envisaged as forming a V under the fuselage. Only vertical take-offs were observed during operations from the *Kiev* and *Minsk*. It is difficult to conceive how STOL take-off could be effected with such a power plant arrangement, which also seems to rule out the possibility of thrust vectoring in forward flight, which has proved such an advantage on the Harriers of the US Marine Corps. Puffer-jets at the wingtips and tail help to give the Yak-36 commendable stability during take-off and landing.
Power Plant: one unidentified turbojet, without afterburner, based possibly on the Lyulka AL-21; thrust estimated at 17,500 lb. Two Koliesov lift-jets; each estimated at 5,600 to 8,000 lb st.
Dimensions: span 23 ft 0 in, length 49 ft 3 in.
Weight: gross 22,050 lb.
Performance: max speed Mach 1.3 at height, service ceiling 39,375 ft.
Accommodation: pilot only.
Armament: four pylons under inner wings for stores, including air-to-air missiles, gun pods, and rocket packs.

Attack Aircraft

Sukhoi Su-7BM (NATO 'Fitter-A') of the Polish Air Force

New Attack Aircraft Programme

In view of Soviet pioneering use of low-flying Il-2 Shturmovik aircraft for anti-tank and close support duties in World War II, it was logical to expect a modern counterpart to USAF's A-10 Thunderbolt II. Such a type is said to have been under test at Jukovski for the past year. It is described as looking more like Northrop's A-9 prototypes than the A-10, and to be a product of the Sukhoi design bureau; but no officially released information is available.

Sukhoi Su-7 (NATO 'Fitter-A')

More than a dozen countries continue to operate this sweptwing counterpart of the Su-9/11 interceptor, but only 200 are thought to await replacement in the Soviet Union's own tactical air forces. Standard versions are the Su-7B and Su-7BM, the latter with a low-pressure nosewheel tyre, necessitating bulged doors to enclose it when retracted.

Power Plant: one Lyulka AL-7F-1 turbojet engine; 22,046 lb st with afterburning. Internal fuel capacity 7,000 lb. Provision for two external tanks under belly, combined capacity 2,100 lb. Two JATO rockets can be fitted under rear fuselage to shorten take-off 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 200–300 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 and D')

The variable-geometry Su-17 ('Fitter-C/D'), with more powerful engine and improved avionics, is in a completely different class from the original 'Fitter-A'. The prototype was an R&D aircraft shown at Domodedovo in 1967 and allocated the NATO reporting name 'Fitter-B'. Only some 13 ft of each wing was pivoted, outboard of a very large fence, the remainder of the airframe being virtually identical with that of the Su-7. An attachment for an external store was built into each wing fence, but there seemed no reason to expect 'Fitter-B' to form the basis of a production aircraft, in view of the modest improvement in overall performance offered by such minimal modification. Discovery of at least one or two squadrons of generally-similar aircraft in service with the Soviet tactical air forces in 1972 came as a surprise, suggesting that even a small improvement in range and endurance by comparison with the Su-7 was considered worthwhile. About 650 are now deployed by Soviet tactical air forces, and by Soviet Naval aviation units assigned to anti-shipping strike and amphibious support roles in the Baltic Sea area. Differences between the various versions are as follows:

Su-17 ('Fitter-C'). Original Soviet AF model, with Lyulka AL-21F-3 turbojet, rated at 24,500 lb st with afterburning and offering better specific fuel consumption than AL-7F-1. Manual wing sweep control. Equipment said to include SRD-5M (NATO 'High Fix') I-band centrebody ranging radar, ASP-5ND fire control system, and Sirena 3 omni-directional radar homing and warning system.

Su-17 ('Fitter-D'). Su-17 with added small undernose radome, and laser marked target seeker in intake centrebody.

Su-20 ('Fitter-C'). Export model, with reduced equipment standard. Variations in rear fuselage contours by comparison with Su-17 suggest that Su-7's AL-7F-1 afterburning turbojet may be retained. Supplied to Algeria, Czechoslovakia, Egypt, Iraq, Libya, and Poland.

Su-22 ('Fitter-C'). Variant of Su-20 first delivered to Peru in 1977 and subsequently to Syria. Further reduced equipment standard, with Sirena 2 limited-coverage radar warning receiver, virtually no navigation aids, and IFF incompatible with Peru's SA-3 (NATO 'Goa') missiles. Weapons include 'Atoll' air-to-air missiles. *(Data for Su-17 'Fitter-C' follow.)*

Power Plant: see under model description. Provision for large drop-tank under each wing fence.
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, take-off clean 30,865 lb, gross 39,020 lb.
Performance: max speed Mach 2.17 at height, Mach 1.05 at sea level, ceiling 59,050 ft, combat radius with 4,409 lb external stores 224–391 miles according to profile.
Accommodation: pilot only.
Armament: two 30 mm NR-30 guns in wing roots; eight pylons under fuselage and wings for up to 11,023 lb of bombs, including nuclear weapons, rocket pods, and guided missiles such as the air-to-surface AS-7 (NATO 'Kerry').

Sukhoi Su-19 (NATO 'Fencer')

More than five years have passed since this variable-geometry attack aircraft entered squadron service with the Soviet tactical air forces, in December 1974. Still, the only photographs of the Su-19 that have appeared in the press were taken over such great distances that they reveal no more than its general configuration. To preclude the possibility of sightings by Western photographers, on the ground or in the air, no Su-19 has yet been based outside the USSR or allowed to fly beyond the eastern Baltic during exercises. At least 250 serve with first-line squadrons in the European theatre, including units in Lusatia and a regiment at Chernyakhovsk, near Kaliningrad on the Soviet Baltic coast.

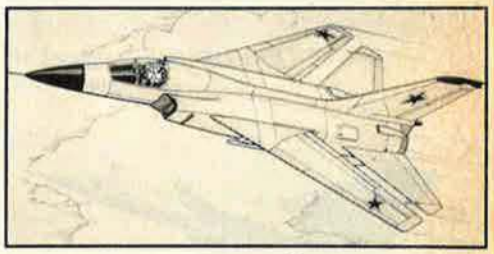
The Su-19 was the first modern Soviet fighter designed specifically for ground attack, and the first to carry a weapon systems officer, in the side-by-side two-seat cockpit. Wing sweep appears to be about 23° in the fully spread position, and 70° fully swept. The outer panels carry the first pivoting 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.

Power Plant: possibly two Lyulka AL-21F turbojets, as fitted in Su-17.
Dimensions: span 56 ft 3 in spread, 31 ft 3 in swept, length 69 ft 10 in.
Weight: gross 68,000 lb.
Performance: max speed above Mach 2 at height, combat radius (lo-lo-lo) over 200 miles.
Armament: one 23 mm GSh-23 twin-barrel gun in belly; six pylons under fuselage, wing-root gloves, and outer wings for more than 10,000 lb of guided and unguided air-to-surface weapons, including nuclear weapons.

Yakovlev Yak-28 (NATO 'Brewer-A, B, and C')

A small number of two-seat tactical attack Yak-28s remain in service with Soviet units in secondary areas. Most have been switched to support roles, as described under the *Reconnaissance, ECM, and Early Warning Aircraft* heading.

Sukhoi Su-17 (NATO 'Fitter-C')



Artist's impression of Sukhoi Su-19 (NATO 'Fencer')

Yakovlev Yak-28 (NATO 'Brewer-C') (Flug Revue)

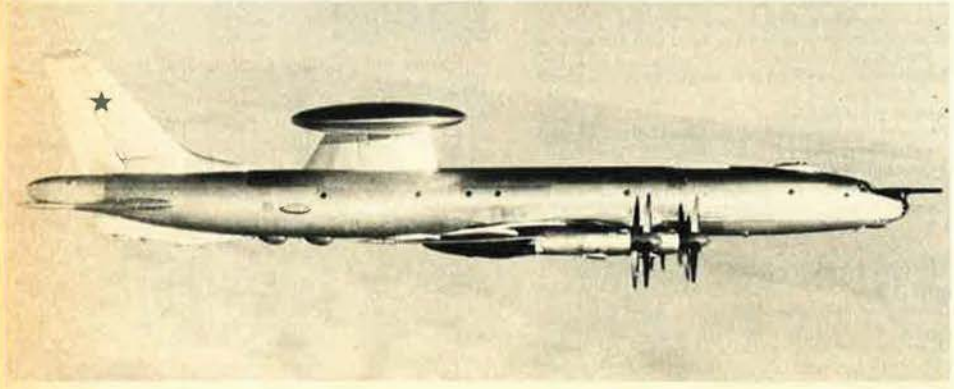
Reconnaissance, ECM, and Early Warning Aircraft

Ilyushin Il-18 (NATO 'Coot-A') (Royal Air Force)

MiG-21R (NATO 'Fishbed-H') (Flug Revue)

MiG-25 (NATO 'Foxbat-B') (Flug Revue)

Tupolev Tu-126 (NATO 'Moss') (US Navy)



Antonov An-12 (NATO 'Cub-B and C')

The large hold of this four-turboprop transport can accommodate a wide variety of equipment for special duties. Two variants may be identified by NATO reporting names:

Cub-B. Conversion of 'Cub-A' transport for electronic intelligence (elint) missions. An example photographed over international waters by the pilot of a Swedish combat aircraft had four additional blister fairings under the forward- and centre-fuselage, plus other antennae.

Cub-C. ECM version. Glazed nose and undernose radome of the transport version are retained, but an ogival 'solid' fuselage tailcone, housing electronic equipment, is fitted instead of the usual gun position. Additional electronic pods are faired into the forward fuselage and ventral surfaces. Reportedly in service with both Soviet Air Force and Navy.

Ilyushin Il-14 (NATO 'Crate')

The traditional Soviet reluctance to discard any aircraft that remains airworthy is exemplified by the variety of types that have been adapted for reconnaissance, ECM, and other support duties after replacement in their primary roles. Thus, small numbers of Il-14 transports, each powered by two 1,900 hp Shvetsov ASh-82T piston engines, are operated on ECM and reconnaissance tasks by the Soviet and other Warsaw Pact air forces.

Ilyushin Il-18 (NATO 'Coot-A')

This ECM or electronic intelligence (elint) aircraft appears to be a conversion of the standard Il-18 four-turboprop transport (see under *Transports* heading). 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 centre and rear fuselage, plus two large plates projecting above the forward fuselage.

MiG-21 (NATO 'Fishbed-H')

Two versions of this supersonic single-seat fighter are equipped as specialised tactical reconnaissance aircraft.

MiG-21R ('Fishbed-H'). Basically similar to MiG-21PFMA, but with a pod housing forward-facing or oblique cameras, infra-red sensors, or ECM devices, and fuel, carried on the fuselage centreline 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 300 '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 forward of cockpit. 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.

MiG-25R ('Foxbat-D'). Similar to 'Foxbat-B', but with larger SLAR dielectric panel, further aft on starboard side of nose, and no cameras. Total of about 170 'Foxbat-Bs and Ds' estimated in service with Soviet tactical air forces.

Dimensions: 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.

Mil Mi-4 (NATO 'Hound-C')

Superseded by turbine-powered helicopters in their original transport and anti-submarine roles, Mi-4s continue in service with support units. A version first identified in 1977 is known to NATO as 'Hound-C'. The multiple antennae of a communications jamming system project from the front and rear of the cabin, on each side.

Power Plant: one Shvetsov ASh-82V piston engine; 1,700 hp.

Dimensions: rotor diameter 68 ft 11 in, length of fuselage 55 ft 1 in, height 17 ft 0 in.

Weight: gross 17,200 lb.

Tupolev Tu-126 (NATO 'Moss')

The Tu-126 is the PVO-Strany's counterpart to the USAF's Boeing E-3A AWACS (Airborne Warning and Control System). About twelve are operational, with airframe and power plant developed from those of the Tu-114 turboprop airliner rather than from 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, at its present stage of development, the Tu-126 is believed by US defence experts to have only limited effectiveness in the warning role over water and to be ineffective over land. Western press reports have suggested the likely development of AWACS versions of both the Il-76 and Il-86 transports, as replacements for the Tu-126. The 1979/80 IISS *Military Balance* lists 8 Il-76 AWACS under PVO-Strany command.

Power Plant: four Kuznetsov NK-12MV turboprop engines; each 14,795 ehp. In-flight refuelling 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 refuelling 7,800 miles.

Accommodation: crew of twelve.

Armament: none.

Yakovlev Yak-28 (NATO 'Brewer')

The original 'Brewer-A, B, and C' versions of the Yak-28 were two-seat tactical attack aircraft, with the navigator/bomb-aimer stationed in the glazed nose. Most have been switched from first-line attack to support roles, and Yak-28s now operational include the following two versions:

Brewer-D. Reconnaissance aircraft, carrying cameras instead of weapons in its internal bomb-bay.

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.

Dimensions, weight, and **performance** should be in the same order as those of the Yak-28P ('Firebar') interceptor (which see).

Transports

Antonov An-8 (NATO 'Camp')

About 50 of the 100 An-8s built in the second half of the fifties are thought to remain in service with the Soviet military air transport force on support duties, such as paratroop training and monitoring of radioactive fallout.

Power Plant: two Ivchenko AI-20V turboprop engines; each 4,000 ehp.
Dimensions (approx): span 98 ft 5 in, length 85 ft 3½ in.
Weights: max payload 19,840 lb, gross 83,775 lb.
Performance: max speed 373 mph, range 2,175 miles at 298 mph.
Accommodation: designed to carry 42–48 passengers.
Armament: provision for one 23 mm NR-23 gun in manned tail position.

Antonov An-12BP (NATO 'Cub')

Six years after the Il-76 began to enter service with the VTA (Military Transport Aviation) as a supposed replacement for the An-12, there are still some 560 An-12s on strength, compared with 50 to 100 of the new turbofan aircraft. Others fly in the markings of at least ten foreign air forces. Layout of the basic An-12BP transport version (NATO 'Cub-A') is conventional for a freighter, 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 air-dropping of supplies and equipment. A full load of 100 paratroops can be despatched via this exit in under one minute. The 'Cub-B and C' elint and ECM versions 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.
Weights: empty 81,730 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, and about 50 were delivered subsequently to the military air transport force. Each can carry a payload of up to 176,350 lb, including 'Scud-A' and 'Ganef' missiles on their tracked launchers; and the An-22 is the only Soviet transport capable of lifting a T-62 tank. Production 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 travelling gantries and two winches to speed freight handling.
Armament: none.

Antonov An-24 (NATO 'Coke')

A total of about 1,100 An-24s was built between 1960 and 1978. Aeroflot received several hundred; the last off the assembly line, delivered to Romania, was described as the 750th aircraft of the An-24/26 series to be exported. The number of An-24s in Soviet Air Force use must therefore be small. The **An-24T** freighter differs from the basic passenger-carrying **An-24V** in having a belly freight door at the rear, instead of the port-side passenger door, and two ventral fins instead of one. The belly door can be opened in flight for air-dropping payload or parachutists. The **An-24RV** and **An-24RT** versions differ in having a 1,985 lb st RU 19-300 auxiliary turbojet in the rear of the starboard engine nacelle, for turboprop starting and to provide additional power for take-off, climb, and cruising flight, as required. *(Data for An-24V follow.)*

Power Plant: two Ivchenko AI-24A turboprop engines; each 2,550 ehp.
Dimensions: span 95 ft 9½ in, length 77 ft 2½ in, height 27 ft 3½ in, wing area 807.1 sq ft.
Weights: empty 29,320 lb, gross 46,300 lb.
Performance: normal cruising speed 280 mph at 19,700 ft, service ceiling 27,560 ft, range 341 miles with max payload, 1,490 miles with max fuel.
Accommodation: crew of three to five; seats for 44–52 passengers in main cabin. (An-24T can carry 30 paratroops, 38 combat-equipped troops, or 24 litters instead of freight.)
Armament: none.

Antonov An-26 (NATO 'Curl')

This extremely useful twin-turboprop freighter was the first aircraft to feature Oleg Antonov's new-type 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. In other respects, the An-26 is basically an An-24T with more powerful engines and a completely redesigned rear fuselage. Conversion of the standard freighter to carry troops or litters takes 20 to 30 minutes in the field. Optional equipment includes an OPB-1R sight for pinpoint dropping of freight. Max payload is 12,125 lb.

Power Plant: two Ivchenko AI-24T turboprop engines; each 2,820 ehp. One 1,985 lb st RU 19-300 auxiliary turbojet in starboard nacelle *(see An-24 entry)*.
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 264–270 mph at 19,675 ft, service ceiling 26,575 ft, range 559 miles with normal 9,920 lb payload, 1,398 miles with 4,687 lb.
Accommodation: crew of five, plus station for load supervisor or despatcher. Electrically-powered mobile hoist, capacity 3,300 lb, and conveyor to facilitate loading and air-dropping. Provision for carrying 40 paratroops or 24 litters.
Armament: none.

Antonov An-12 (NATO 'Cub-A') (Tass)

Antonov An-22 (NATO 'Cock') (D. J. Holford)

Antonov An-26 (NATO 'Curl') (Tass)

Antonov An-32 (NATO 'Cline')

By the time of the 1979 Paris Air Show, only a single prototype of this "hot and high" variant of the An-26 had been built. Oleg Antonov commented that production would be undertaken only if sufficient orders were received in advance to justify such a move. Since then, the Indian defence minister has announced that An-32s will be manufactured under licence in India, to meet an Indian Air Force requirement for 95 aircraft. Factors influencing the choice were said to be commonality of engines with the IAF's An-12s, and a price only one-third that of Western competitors. The basic airframe is similar to that of the An-26, with much more powerful turboprops, a slotted tailplane, and enlarged ventral fins. The An-32 is able to operate from airfields 13,000 to 14,750 ft above sea level in an ambient temperature of 25°C, and can transport 3 metric tons of freight over a 683 mile stage length, with fuel reserves. Maximum payload is 6 metric tons.

Power Plant: two Ivchenko AI-20M turboprop engines; each 5,180 ehp.
Dimensions: as for An-26.
Weight: gross 57,320 lb.

Antonov An-32 (NATO 'Cline') (Tass)

Antonov An-72 (NATO 'Coaler')

Ilyushin Il-76 (NATO 'Candid')

Ilyushin Il-86 (NATO 'Camber')
(Brian M. Service)

Performance: normal cruising speed 317 mph, service ceiling 31,150 ft, max range 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')

The An-72 is being evaluated as a STOL replacement for the An-26, and is able to operate from unprepared airfields or from surfaces covered with ice or snow. Its high-set engines, reminiscent of those of the much larger Boeing YC-14 AMST, were intended primarily to avoid problems caused by foreign object ingestion. Their efflux is ejected over the wing upper surface and then down over large multi-slotted flaps, to provide a considerable increase in lift for short-field operation. The two prototypes had logged a total of just over 1,000 hours in about 300 flights by June 1979. Handling in the air is described as outstanding, and a completely automatic Doppler-based navigation system is standard.
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 16,535 lb, gross weight 67,240 lb.
Performance: max cruising speed 447 mph, service ceiling 36,100 ft, range 1,985 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.

Ilyushin Il-18 (NATO 'Coot')

With its airline service drawing to a close, this four-turboprop transport is finding important new military roles, of which the elint operations of 'Coot-A' (see under *Reconnaissance, ECM, and Early Warning Aircraft* heading) are typical. Eleven air forces have flown passenger versions, usually in a VIP configuration. The Soviet Air Force is thought to retain about 15 in this form.
Power Plant: four Ivchenko AI-20M turboprop engines; each 4,250 ehp.
Dimensions: span 122 ft 8½ in, length 117 ft 9 in, height 33 ft 4 in.
Weights: empty 76,350 lb, gross 134,925 lb.
Performance: max cruising speed 419 mph, range 3,230 miles with max fuel, or 1,990 miles with max payload.
Accommodation: crew of five; up to 122 passengers.
Armament: none.

Ilyushin Il-76 (NATO 'Candid')

Replacement of the An-12 with this four-turbofan heavy freighter has proceeded more slowly than might have been expected, with between 50 and 100 in first-line squadrons of the VTA transport force. However, it must never be forgotten that the Soviet state airline, Aeroflot, has 1,300 medium and long-range aircraft available to provide inter-theatre support, thereby freeing VTA aircraft for tactical missions. Aeroflot uses its own Il-76s in areas like Siberia, the north of the Soviet Union, and the Far East, where conditions are often difficult, with short, unprepared airstrips. Delivery of military Il-76s to a development squadron began in 1974, only three years after the first flight of the prototype, on March 25, 1971. An official film, released in the following year, showed that the military version has a rear gun turret, and can carry paratroops as an alternative to freight. One has been evaluated as a tanker for the 'Backfire' bomber force, and the Il-76 has been expected to supersede the Myasishchev M-4 ('Bison') in this role. The IISS's 1979/80 *Military Balance* lists 8 in military service in an AWACS role.

Basic requirement to which the Il-76's designers worked was to provide the ability to transport 40 metric tons of freight for a distance of 3,100 miles (5,000 km) in under six hours. Design features include rear-loading ramp/doors, a T-tail, full-span leading-edge slots, 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 pressurised. Advanced mechanical handling systems are fitted for containerised and other freight. Equipment for all-weather operation includes a computer for automatic flight control and automatic landing approach.

A series of 24 official records set by the Il-76 in July 1975 includes a payload of more than 70 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.
Power Plant: four Soloviev D-30KP turbofan engines; each 26,455 lb st.
Dimensions: span 165 ft 8 in, length 152 ft 10½ 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 maximum payload of 88,185 lb, max range 4,163 miles.
Accommodation: crew of three to five.
Armament: gun turret in tail.

Ilyushin Il-86 (NATO 'Camber')

To date, there have been no indications that this first Soviet wide-bodied transport aircraft is intended for anything but Aeroflot use. However, the capaciousness of its interior makes it a prime candidate for the key military tasks of replacing the Tu-126 ('Moss') in the AWACS role, and the Myasishchev M-4 ('Bison') in the flight refuelling tanker role (as an alternative to the Il-76). Production Il-86s began to leave the assembly line in October 1977, less than a year after the first flight of the prototype, on December 22, 1976. Many components are manufactured by the Polish aerospace industry.
Power Plant: four Kuznetsov NK-86 turbofan engines; each 28,660 lb st.
Dimensions: span 157 ft 8 in, length 195 ft 4 in, height 51 ft 10½ in, wing area 3,444 sq ft.
Weights: max payload 92,600 lb, gross 418,875–454,150 lb.
Performance: cruising speed 560–590 mph at 30,000–36,000 ft, max range 2,858 miles, range with max payload 2,235 miles.
Accommodation: crew of three or four; up to 350 passengers in basic nine-abreast seating.

Trainers

Aero L-29 Delfin (NATO 'Maya')

MiG-15UTI (NATO 'Midget')

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 standardised 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 can still be seen in the markings of 15 air forces.
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 all Warsaw Pact air forces except that of Poland. Many hundreds have been delivered already, and the eventual production total is expected to match that of the L-29. There are three current versions:

L-39C. Basic and advanced flying trainer, delivered to the air forces of Afghanistan, Czechoslovakia, the German Democratic Republic, and the USSR.

L-39Z0. Weapon training version, with four underwing weapon stations. Strengthened wings. Exported to Iraq and Libya.

L-39Z. Weapon systems training/ground attack version, with underfuselage gun and underwing weapon stations. Strengthened wings and landing gear. Production was expected to begin before the end of 1979.
Power Plant: one Ivchenko AI-25-TL turbofan engine; 3,792 lb st. *(Data for L-39C follow.)*
Dimensions: span 31 ft 0½ in, length 40 ft 5 in, height 15 ft 5½ in, wing area 202.36 sq ft.
Weights: empty 7,341 lb, gross (trainer, clean) 10,075 lb.
Performance: max speed 485 mph at 19,700 ft, service ceiling 37,730 ft, range 683 miles on internal fuel.
Accommodation: crew of two, in tandem.
Armament: (L-39Z): underwing bombs, rockets, air-to-air missiles, guns, or reconnaissance packs, on four hardpoints, and a 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 once-renowned MiG-15 jet fighter. The airframe differs from that of the original single-seater mainly in having an aft cockpit for an instructor in place of some fuselage fuel tankage. Armament is reduced to a single gun on most of

MiG-21U (NATO 'Mongol-A') of the Czech Air Force

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 described after this entry.

Power Plant: one Klimov VK-1 turbojet engine; 5,952 lb st.

Dimensions: span 33 ft 0⅝ in, length 32 ft11¼ in, height 12 ft 1⅝ in.

Weights: empty 8,818 lb, gross (clean) 10,692 lb.

Performance: max speed 631 mph at sea level, range 590 miles (clean) or 885 miles (with two underwing tanks) at 32,800 ft.

Accommodation: crew of two, in tandem.

Armament: normally one 23 mm NS-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 main wheels and tyres, 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 122.)

MiG-23U (NATO 'Flogger-C') (Flug Revue)

MiG-25U (NATO 'Foxbat-C')

(See page 123.)

Sukhoi Su-7U (NATO 'Moujik')

The Soviet and nine 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 aft cockpit is fitted with a slightly-raised canopy, from which a prominent dorsal spine extends back to the base of the tail-fin.

Sukhoi Su-9U (NATO 'Maiden')

This operational training version of the Su-9 single-seat all-weather fighter has a tandem cockpit installation identical with that of the Su-7U.

Sukhoi Su-15 trainer (NATO 'Flagon-C')

(See page 124.)

Tupolev Tu-22U (NATO 'Blinder-D')

(See page 120.)

Yakovlev Yak-11 (NATO 'Moose')

Operated still by nearly twenty air forces, this tandem two-seat basic trainer, evolved from the wartime Yak-9 fighter, is used for second-stage instruction of all Soviet pilots after graduation from the Yak-18. Small wings give it a long take-off run but a smart rate of roll.

Power Plant: one Shvetsov ASh-21 piston-engine; 800 hp.

Dimensions: span 30 ft 10 in, length 27 ft 10¾ in, height 9 ft 2½ in.

Weights: empty 4,630 lb, gross 5,512 lb.

Performance: max speed 286 mph.

Armament: provision for one machine-gun and underwing practice bombs.

Yakovlev Yak-18 (NATO 'Max')

Like the Yak-11, the prototype of this primary trainer first flew in 1946. About 8,000 have since been built, mostly for the civilian or paramilitary schools at which pilots of the Warsaw Pact air forces receive their primary training, including the Soviet DOSAAF centres. 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.

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, similar to that of the 'Brewer' attack versions, projects forward of the nosecone.

Yakovlev Yak-36 trainer (NATO 'Forger-B')

(See page 124.)

Yakovlev Yak-50 and Yak-52

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 360 hp engine, a reduced span with no wing centre-section, and a semi-monocoque rear fuselage instead of the Yak-18's fabric-covered steel tube structure. It has been followed by the tandem two-seat Yak-52, which differs mainly in having a tricycle undercarriage which leaves all three wheels fully exposed when retracted to reduce damage in a wheels-up landing. The Yak-52 is being manufactured at Bacau in Romania to replace the Yak-18s of DOSAAF and other training organisations. *(Data for Yak-52 follow.)*

Power Plant: one Vedeneev M-14P piston-engine; 360 hp.

Dimensions: span 31 ft 2 in, length 25 ft 2 in, height 9 ft 8¼ in.

Weights: empty 2,205 lb, gross 2,844 lb.

Performance: max speed 177 mph, service ceiling 19,750 ft, max range 341 miles.

Armament: none.

Yakovlev Yak-52

Helicopters

Kamov Ka-25 (NATO 'Hormone-A') ASW helicopters on the cruiser Moskva (US Navy)

Mil Mi-2 (NATO 'Hoplite') in Polish Air Force service

Mil Mi-6 (NATO 'Hook') (Tass)

Mil Mi-8 (NATO 'Hip')

Kamov Ka-25 (NATO 'Hormone')

About 460 Ka-25s were built in 1966–75, to replace Mi-4s in the Soviet Navy's ship and shore-based force of around 275 helicopters, and for export in small numbers to countries such as India, Syria, and Yugoslavia. Some of the tasks performed by these aircraft cannot yet be discussed, and the only variants that may be identified by NATO reporting names are as follows:

Hormone-A. Basic ASW version, with large flat-bottomed housing for undernose search radar, and racks for small stores on each side of the fuselage. Other equipment varies from one aircraft to another. Some have an underfuselage weapon bay. A few have a streamlined blister fairing built into the base of the central tailfin; others have a fairing of flower-pot shape, with a transparent top, above the central point of the tailboom. Each of the four wheels of the landing gear is usually 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 is said to be inoperable at night or in adverse weather. An electro-optical sensor and a towed magnetic anomaly detector are carried. Ka-25s fly from cruisers of the *Kara* and *Kresta* classes, the carrier/cruisers *Kiev* and *Minsk*, each of which carries 27 'Hormone-As' and 3 'Bs', and the helicopter cruisers *Moskva* and *Leningrad*, each of which accommodates about 18 aircraft.

Hormone-B. Special electronics variant, able to acquire targets 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. *(Data for 'Hormone-A' follow.)*

Power Plant: two Glushenkov GTD-3 turboshaft engines; each 900 shp.
Dimensions: rotor diameter (each) 51 ft 8 in, length of fuselage 32 ft 0 in, height 17 ft 7½ in.
Weight: gross 16,100 lb.
Performance: max speed 137 mph, service ceiling 11,500 ft, range 405 miles.
Accommodation: crew of two on flight deck; other crew members 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. Reported installation of small air-to-surface 'fire and forget' missiles on some aircraft.

Mil (WSK-PZL-Swidnik) Mi-2 (NATO 'Hoplite')

Well over 10,000 turbine-powered helicopters of Mil design have been manufactured, with production in the USSR continuing at a rate of more than 1,000 a year. They include the largest, fastest, and most-heavily armed types in the world; and a total of at least 4,000 are deployed with first-line units of the Soviet tactical air forces. Only type not built in the USSR is the small Mi-2, of which manufacture was transferred to the WSK-PZL at Swidnik in Poland in 1964. More than 3,000 have been delivered for military and commercial service, with the air forces of Bulgaria, Czechoslovakia, Hungary, Poland, Romania, and the Soviet Union among known operators. The USSR has received over 2,000, and production is continuing at a rate of 300 per year.

Power Plant: two Polish-built Isotov GTD-350P turboshaft engines; each 400 or 450 shp.

Mil Mi-10 (NATO 'Harke') (Novosti)

Dimensions: rotor diameter 47 ft 6¾ in, length of fuselage 39 ft 2 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' air-to-surface 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 the Soviet Union (about 470 currently operating with the tactical air forces), Algeria, Bulgaria, Egypt, Ethiopia, Iraq, Peru, Syria, and Vietnam. Task of these helicopters is to haul guns, armour, vehicles, supplies, freight, or 65 troops at a time, in combat areas, a technique which helped to turn the tide of battle in the Ogaden area of Ethiopia.

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 404 miles with 13,228 lb payload.
Accommodation: crew of five; up to 65 passengers, 26,450 lb of freight; or 41 litters and two medical attendants.
Armament: some aircraft have a gun of unknown calibre in the nose.

Mil Mi-8 (NATO 'Hip')

It is easy to think of this twin-turbine general-purpose helicopter in terms of the elegant 28-passenger airline version operated by Aeroflot. However, more than 6,000 have been built, in at least six variants identified by NATO, including the most heavily-armed combat helicopters in the world. Their task, for which the crews are well trained, is to put down assault troops, combat equipment, and supplies behind enemy lines, within 15–20 minutes of a nuclear or conventional bombardment/strike. Versions serving with about 30 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-E. Described by DoD as the world's most heavily armed helicopter. 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' infra-red homing anti-tank missiles above racks.

Hip-F. Export counterpart of 'Hip-E'. Missile armament changed to six 'Saggers'.

Production of Mi-8s is thought to be continuing at a rate of about 750 a year.

Power Plant: two Isotov TV2-117A turboshaft engines; each 1,500 shp.
Dimensions: rotor diameter 69 ft 10¼ in, length of fuselage 60 ft 0¾ 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 264 miles as passenger transport.
Accommodation: crew of two or three; up to 32 passengers, 8,820 lb of freight, 12 litters and attendant.
Armament: see individual model descriptions.

Mil Mi-10 (NATO 'Harke')

So impressive have been the achievements of Soviet flying crane helicopters in combat areas such as the Ogaden region of Ethiopia that the Mi-10 was reinstated in production after a six-year break. Even now, production is very limited by Soviet standards, but at least 60 Mi-10s are thought to have been delivered. Each embodies the power plant, rotor system, transmission, gearboxes, and most equipment of the Mi-6. The depth of the fuselage is reduced considerably, and the tailboom is deepened so that the flattened undersurface extends unbroken to the tail. The Mi-10 also lacks the wings of the standard Mi-6. Payloads can be carried by sling or cable, clasped under the belly, or on interchangeable wheeled platforms slung between the legs of the wide-track, stalky landing gear. Further freight, or up to 28

passengers on tip-up seats, can be accommodated in the main cabin.

Dimensions: rotor diameter 114 ft 10 in, length of fuselage 107 ft 9¾ in, height 32 ft 2 in.

Weights: empty 60,185 lb, gross 96,340 lb, max payload including platform 33,070 lb.

Performance: max speed 124 mph, service ceiling 9,850 ft, range 155 miles with 26,455 lb platform payload.

Mil Mi-14 (V-14) (NATO 'Haze')

Clearly derived from the Mi-8, this new shore-based anti-submarine helicopter is the first Soviet production type to have a boat hull of the kind used on the Sikorsky Sea King series. Together with a sponson on each side at the rear, this should give the helicopter a degree of amphibious capability. Other features evident in photographs include a large undernose radome, a towed magnetic anomaly detection (MAD) bird stowed against the rear of the fuselage pod, and fully retractable landing gear. Dimensions, power plant, and dynamic components are assumed to be generally similar to those of the Mi-8. Production began in 1975 and around 50 Mi-14s have been delivered to Soviet Naval Air Force units, as replacements for piston-engined Mi-4s, with manufacture continuing at a rate of 25 per year.

Mil Mi-24 (NATO 'Hind')

The capability of this formidable assault helicopter has become increasingly apparent during the past year. Reports from press and TV correspondents in Afghanistan have stressed its invulnerability to ground fire. This follows structural hardening by substitution of steel and titanium for aluminium in critical components. Glassfibre-skin rotor blades also replace the original blade-pocket design. Armament has been increased dramatically, enabling the Mi-24 to fulfil a variety of combat roles additional to its early-1970s design tasks of delivering a squad of eight assault troops into the battlefield, and attacking with air-to-surface missiles and rockets any tanks encountered on the way. Today, the Mi-24 is regarded as not only an anti-tank 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, responsible for suppressing anti-aircraft defences en route. A report in *Red Star* has claimed that they are "superior to other anti-tank weapons in terms of field of vision, manoeuvrability and firepower; and capable of hitting armoured enemy targets while remaining out of reach of anti-aircraft weapons. The correlation between tank and helicopter losses is 12:1 or even 19:1 in the helicopter's favour." Variants of the Mi-24 that can be identified by NATO reporting names are as follows:

Hind-A. Armed assault transport, with large enclosed flight deck for crew of four. Power plant and transmission based on those of Mi-8. Fully-retractable landing gear. Auxiliary wings of this version have considerable anhedral. One 12.7 mm machine-gun in nose; four hardpoints under stub-wings for 32-round packs of 57 mm rockets, or bombs; four 'Swatter' infra-red homing anti-tank missiles on wingtip launchers (replaced by 'Saggers' on export helicopters). Anti-torque rotor, originally on starboard side of offset tail pylon, repositioned to port side on later and converted aircraft. Initial production Mi-24s were of this type.

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 is believed to have preceded 'Hind-A' and was not built in large numbers.

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 tail rotor on port side, but with front fuselage completely redesigned for primary gunship role. 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 machine-gun in a turret with a wide range of movement in azimuth and elevation. Undernose pack for sensors including possibly radar and low-light-level TV. (Reports that forward-looking infra-red might be fitted were premature, as such equipment is not expected to be ready for service in the USSR for several years.) Wing armament retained. Many small antennae and blisters. Nosewheels semi-exposed when retracted.

Hind-E. As 'Hind-D', for Soviet armed forces, but with four laser-homing 'Spiral' anti-tank missiles instead of 'Swatters', and structural hardening.

Hind-F. Export version of 'Hind-E', with 'Sagger' missiles instead of 'Spirals'.

The helicopter known to the Soviet authorities as A-10, in which various FAI-approved records have been set since 1975, is now known to be an Mi-24, with the 'Hind-A/C' type of front fuselage. Engines fitted for the first seven record flights were 1,500 shp TV2-117A turboshafts, as used in the Mi-8. The A-10 in which Gourguen Karapetyan achieved a helicopter absolute speed record of 228.9 mph over a 15/25 km course in September 1978 is listed as having two TV3-117 engines, each rated at 2,200 shp.

Deliveries of all models of the Mi-24 are thought to exceed 1,000, with production continuing at the rate of 30 per month. Full regiments of these aircraft are known to have been based at Parchim and Stendal, northwest and west of Berlin, near the border with the German Federal Republic, since the Spring of 1974. (*Data for 'Hind-A' follow.*)

Power Plant: two Isotov turboshaft engines, related to the TV2-117A; each 1,500 shp.

Dimensions: rotor diameter 55 ft 9 in, length of fuselage 55 ft 9 in, height 14 ft 0 in.

Weight: gross 22,000 lb.

Accommodation: crew of four; eight combat equipped troops.

Armament: one machine-gun in nose; mountings for four anti-tank missiles (NATO 'Swatter') and four other stores, including rocket pods (each thirty-two 57 mm rockets), under stub-wings.

New Mil heavy-lift helicopter (NATO 'Halo')

Nothing has yet been released officially, in the Soviet Union or the West, concerning the helicopter produced by the Mil bureau to replace the now-abandoned Mi-12 (V-12), which lifted loads of up to 88,636 lb during record attempts. It is believed to have a single main rotor/tail rotor configuration, with clamshell rear loading doors. Representatives of the Mil bureau have discussed their current involvement in heavy-lift helicopters with a total installed power of around 25,000 shp.

New Mil Naval helicopter

The US *Military Posture* statement for FY 1979 contained the remark: "Another new [Soviet] naval helicopter is projected in the mid-1980s for ASW and reconnaissance roles." No details were given.

Mil Mi-24 (NATO 'Hind-A')

Mil Mi-24 (NATO 'Hind-D')

Strategic Missiles

SS-4 (NATO 'Sandal')

First deployed in 1959, this is the medium-range ballistic missile (MRBM) that precipitated the Cuba crisis three years later. Its development, via the earlier SS-3 ('Shyster'), drew heavily on wartime German V-2 technology. About 500 are thought to remain operational, mostly near the western borders of the Soviet Union but some east of the Urals, targeted on China. The age of the weapon system is indicated by the fact that 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 77 ft 0 in, diameter 5 ft 7 in.

Launch weight: 60,000 lb.

Performance: max speed Mach 6.7, max range 1,200 miles.

SS-5 (NATO 'Skean')

About 90 of these intermediate-range missiles supplement SS-4s and SS-20s in the 710-strong Soviet IRBM/MRBM force. All are thought to be in the western USSR, some in silos. The SS-5 represented a further development of the SS-3/SS-4 concept, with control by vanes acting on the motor exhaust rather than by external fins.

Power Plant: single-stage liquid-propellant engine with four chambers.

Guidance: inertial.

Warhead: nuclear (1 megaton).

Dimensions: length 80 ft 0 in, diameter 8 ft 6 in.

Performance: max range 2,300 miles.

SS-9 (NATO 'Scarp')

When the SALT I agreement was signed, in May 1972, there were 288 of these huge three-stage missiles ready to fire, with silos for 25 more under construction. The Fractional Orbital Bombardment System warheads once tested on SS-9 Mod 3 vehicles, from Tyuratam, are banned under SALT II. The 100 launchers that remained op-

SS-4 (NATO 'Sandal')

SS-5 (NATO 'Skean')

SS-9 (NATO 'Scarp')

SS-13 (NATO 'Savage')

SS-14 (NATO 'Scamp/Scapegoat')

erational in 1979 were suitable for one, or all, of the following versions:

SS-9 Mod 1. First displayed in Moscow on November 7, 1967. Operational deployment thought to have started in 1965. Only a relatively small number still emplaced, each with a single re-entry vehicle of slightly smaller yield than that of the Mod 2. Before deployment of the current generation of missiles began, these were the only operational Soviet ICBMs considered to possess the combination of yield and accuracy needed to attack successfully hard targets like America's Minuteman missile silos.

SS-9 Mod 2. This version constituted the bulk of the SS-9 force. Single re-entry vehicle, with the largest yield of any known ICBM prior to the new SS-18.

SS-9 Mod 5. Launch vehicle for the Soviet Union's satellite-killing payloads. Tests from Tyuratam against satellites launched from Plesetsk suggested that an operational launch of the SS-9 Mod 5 could be made within 90 minutes of receiving an order to intercept. The effect of SS-9 deactivation on this programme is not known. *(Data for SS-9 Mod 2 follow.)*

Power Plant: three-stage liquid-propellant.
Guidance: inertial, offering CEP of better than 1.5 km (0.9 mile).
Warhead: nuclear (25 megatons).
Dimensions: length 121 ft 5 in, diameter 11 ft 2 in.
Performance: range 7,500 miles.

SS-11 (NATO 'Sego')

A total of 970 of these 'light' ICBMs were deployed in May 1972, with 66 new silos under construction. All 1,036 launchers are expected to carry SS-17 and SS-19 missiles in due course, and the SS-11 force had been reduced to an estimated 638 missiles by Summer 1979. No photograph of an SS-11 has ever been identified. It is believed to be about 3 ft shorter than the SS-13, with no space between its liquid-propellant stages. There are three versions:

SS-11 Mod 1. Operational since 1966. Single re-entry vehicle, of slightly higher yield than that of the comparable American Minuteman, but considerably less accurate. Of 970 originally deployed, more than 60 were replaced by SS-11 Mod 3 and others have been superseded by SS-17s and SS-19s.

SS-11 Mod 2. Similar to Mod 1, but fitted with penetration aids. Included in Mod 1 totals.

SS-11 Mod 3. First operational Soviet missile with MRVs (three 500 kiloton). Tests began in 1969, and greater targeting flexibility and accuracy led to rapid deployment; more than 60 emplaced. Range about 6,200 miles.

SS-13 (NATO 'Savage')

In the Minuteman category, only 60 SS-13s are deployed. The top two stages are, however, used by themselves in the SS-14 IRBM.

Power Plant: three-stage solid-propellant.
Guidance: inertial, offering CEP of 2 km (1¼ miles).
Warhead: nuclear (1 megaton).
Dimensions: length 66 ft 0 in, max diameter 6 ft 6 in (first-stage skirt).
Performance: range 5,000 miles.

SS-14 (NATO 'Scamp/Scapegoat')

The 'Scapegoat' intermediate-range ballistic missile carried by this mobile weapon system appears to comprise the top two stages of the SS-13, giving it an overall length of about 35 ft. The NATO reporting name 'Scamp' refers to the complete weapon system, based on the JS III heavy tank chassis. The missile, inside its hinged container, is raised to a vertical position for launch by hydraulic jacks at the rear of the vehicle. The container is then moved away from the missile and its launch platform before firing. Range of this IRBM is estimated at 2,500 miles. Areas of deployment are reported to include the Chinese frontier near Buir Nor, in Outer Mongolia.

SS-X-16

Only solid-propellant missile among the four current-generation Soviet ICBMs, the SS-X-16 has always created special problems. For some time, covered facilities at a Soviet test range impeded US ability to associate the SS-X-16 with its launcher. Such concealment would be prohibited under SALT II, as would production, testing, and deployment of the SS-X-16 itself. Pending ratification of the treaty, the missile remains a major potential threat because of its relationship with the SS-20, which *is* deployed. By building and storing large numbers of SS-X-16 third stages, the Soviet Union would possess the means to convert all its SS-20 mobile IRBMs into ICBMs at any time, thereby increasing greatly the intercontinental force. The SS-X-16 is about the same size as the SS-13, which it was expected to replace, with greater range and payload capacity. It is fitted with a post-boost vehicle (PBV, known in the US as a bus-type dispensing system), but has been tested to date with only a single re-entry vehicle. The Department of Defense believes that, like the SS-20, the SS-X-16 could be deployed in land-mobile form. Its range is at least 5,000 miles.

SS-17 (Soviet designation RS-16)

Known in the Soviet Union as the RS-16, this two-stage "light" liquid-propellant 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. The pace of conversion of SS-11 silos to SS-17 configuration is slower than expected, probably to avoid having too many launchers out of action simultaneously. Nonetheless, more than 100 SS-17s are operational, with conversion of other silos under way. **Mod 1** missiles each have four MIRVs, shaped for high-speed atmospheric re-entry to ensure greater accuracy, and may soon achieve capability against hard targets. Tests with a single large re-entry vehicle on the **Mod 2** missile were initiated in February 1976. The Department of Defense believes that some of the silos modified for current-generation ICBMs have been hardened to resist very high over-pressure.

Warhead: nuclear (four MIRVs of 1 megaton each).
Dimensions: length 75 ft 0 in, max diameter 8 ft 6 in.
Performance: range 6,200 miles with CEP of around 500 m (0.3 mile).

SS-18 (Soviet designation RS-20)

The number of SS-9 launch groups being converted to SS-18 configuration has increased annually for the past five years, and about 200 of these cold-launched "heavy" two-stage liquid-propellant missiles were operational by Summer 1979. It is expected that all SS-9 silos will be converted eventually, giving a force of 300 SS-18s, each with a greater throw-weight capability than any other Soviet or US ICBM. Four versions have been identified:

SS-18 Mod 1. Initial operational type, with single 25 megaton warhead.

SS-18 Mod 2. Operational with eight to ten relatively large (1–2 megaton) MIRVs dispensed by a post-boost vehicle (PBV) similar to that employed on the US Minuteman III and Poseidon missiles.

SS-18 Mod 3. Longer-range version, with single re-entry vehicle lighter and more accurate than that of Mod 1, which it may ultimately replace. Crew training launches began in February 1976. CEP better than 590 ft achieved in trials.

SS-18 Mod 4. Press reports have suggested that this new version has been tested with 14 payloads. Four of these must have been decoys or other penetration aids, as no more than ten warheads have been tested on an SS-18 according to the Soviet authorities, who have agreed under SALT II not to exceed this number, if the treaty is ratified.

Dimensions: length 118 ft 0 in, max diameter 10 ft 0 in.
Performance: range 7,450 miles.

SS-19 (Soviet designation RS-18)

Like the SS-17, the SS-19 is rated as a "light" ICBM, and is replacing older SS-11s. It is a hot-launched two-stage liquid-propellant missile, with a range of about 6,300 miles. Being longer than the SS-11 and SS-17, it requires more extensive modification to existing silos in which it is emplaced; yet at least 300 are already operational. This lends weight to DoD's belief that the SS-19's combination of accuracy and yield makes it the most capable of the current generation of Soviet ICBMs, although it carries fewer re-entry vehicles than the SS-18 Mod 2. Testing began in 1974, leading to rapid deployment of the **SS-19 Mod 1**, with a MIRVed payload of six re-entry vehicles (each 800 kilotons to 1 megaton yield). A **Mod 2** version, with a single large re-entry vehicle, has been tested. Under the terms of SALT II, all SS-17, SS-18, and SS-19 silos would count as MIRVed missile launchers, since these ICBMs have been tested in a MIRV mode.

SS-20

This mobile solid-propellant IRBM, which consists of the first two stages of the SS-X-16 ICBM, represents the most formidable Soviet threat to NATO nations in Western Europe. It is not, however, subject to any restrictions under SALT II, as its range is less than 5,500 km (3,417 miles). About 120 had been deployed by Summer 1979, each with a MIRVed payload of three re-entry vehicles (yield 500–600 kilotons). CEP is reported to be about 2,500 ft when the SS-20 is fired from its tracked carrier/launcher at a pre-surveyed site, and the vehicle offers a multiple reload capability. Eventual force total is expected to be 300/400 plus reloads. SS-20s could reach the Aleutian Islands and western Alaska from present and likely deployment areas in the eastern USSR, but could not reach the contiguous 48 States.

New ICBMs

The FY 1979 DoD Report stated: "The Soviets have a fifth generation of ICBMs in development, estimated to consist of four missiles. Flight testing of one or two of these missiles could begin at any time, with the others following by the early 1980s." If ratified, SALT II will limit each party to flight testing and deploying a single new type of ICBM, which must be in the "light" category (*i.e.*, not more than the launch weight of the SS-19). The Soviet Union would have to choose, for example, between: (a) replacing the MIRVed SS-17 (4 warheads) and SS-19 (6 warheads) with a 10-warhead light ICBM, or (b) replacing the SS-11 with a single-warhead light ICBM that differed substantially from the SS-11. It could not do both.

AS-3 (NATO 'Kangaroo')

When comparing the range of Soviet air-to-surface and submarine-launched cruise missiles with their US counterparts, it is important to remember that the Soviet requirement for long range is minimal. Fifty-five important US cities with some 74,000,000 inhabitants are within 530 miles (850 km) of the 100 fathoms depth curve in the Atlantic and Pacific Oceans. Only six of the major cities in the Soviet Union, with some 2,200,000 people, are located within a similar distance of the 100 fathoms depth curve. There is, however, no doubt about Soviet capability to develop a strategic cruise missile if it were required. Largest current Soviet air-to-surface missile is the AS-3, which resembles a sweptwing jet fighter in size and configuration, and was displayed for the first time under its Tu-95 carrier aircraft on Aviation Day 1961. It is known still to be operational in large numbers with alternative nuclear or high-explosive warhead on Tu-95 'Bear-B' and 'C' bombers.

Guidance: initial beam-riding; subsequent pre-programmed flight under autopilot control.
Dimensions: span 30 ft 0 in, length 48 ft 11 in.
Weight: 24,250 lb.
Performance: max speed Mach 1.8, range 400 miles.

AS-4 (NATO 'Kitchen')

Developed as a stand-off weapon for the Tu-95 and Tu-22 strategic bombers, and now carried also by the 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, semi-submerged in the fuselage, and production by 1976 was stated by the UK Defence Minister to be 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 or high-explosive warheads can be assumed.
Guidance: inertial, with infra-red 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')

First sighting of this air-to-surface missile was by the pilot of a Japan Air Self-Defence Force F-86F, in late December 1977. When scrambled to investigate a Tu-16 ('Badger') flying 50 miles to the north of the Noto Peninsula, he was able to photograph the aircraft which was carrying a 'Kingfish' under its port wing. The missile has a cylindrical body with ogival nose; two short-span, long-chord wings; and a cruciform tail unit with folding ventral fin. Propulsion is said to be by liquid-propellant rocket motor, with inertial midcourse guidance, and active radar terminal homing, giving an exceptional degree of accuracy. Primary carrier is expected to be the variable-geometry 'Backfire'.
Dimensions: span 8 ft 2½ in, length 34 ft 6 in.
Performance: max speed Mach 3, range 135 miles at low altitude.

Airborne and Tactical Defence Missiles

AS-2 (NATO 'Kipper')

First seen nearly 20 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 anti-shipping weapon. Radar is carried in the nose of the Tu-16 carrier aircraft, and guidance is believed to comprise initial beam-riding, subsequent pre-programmed flight under autopilot control, and infra-red terminal homing. A nuclear warhead can be fitted.
Dimensions: span 16 ft 0 in, length 31 ft 0 in.
Weight: 9,260 lb.
Performance: max speed Mach 1.2, range 130 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 defences, to hit a supply depot and two radar sites in Sinai.

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 pre-programmed flight path, with radar terminal homing which can be switched from active to passive as required. A high-explosive warhead is standard.
Dimensions: span 15 ft 0 in, length 31 ft 0 in.
Performance: max speed Mach 1.2 at 30,000 ft, Mach 0.9 at low level, max range 200 miles.

AS-7 (NATO 'Kerry')

Nothing is known about this tactical air-to-surface guided missile, except that it is carried by the Su-19, and by the current generation of Soviet close support aircraft. It is said to have a radio command guidance system, to weigh about 2,650 lb, and to have a range of 6.2 miles.

AS-8 and AS-X-10

There is reason to believe that these designations were applied, mistakenly, to the missile now designated AT-6 'Spiral'.

AS-X-9

A reported anti-radiation missile, with a range of 50–56 miles, to arm the Su-19 ('Fencer').

AT-2 (NATO 'Swatter')

This standard Soviet anti-tank 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. 'Swatter' is steered in flight via elevons on the trailing-edges of its rear-mounted cruciform wings, and embodies infra-red terminal homing.
Dimensions: span 2 ft 2 in, length 3 ft 8 in.
Weight: 58 lb.
Performance: cruising speed 335 mph, range 2,000–8,200 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, and 'Hind-F' version of the Mi-24, as well as arming the Polish-built Mi-2.
Dimensions: span 1 ft 6 in, length 2 ft 10¼ in.
Weight: 24 lb.
Performance: speed 270 mph, range 1,650–9,850 ft.

AT-6 (NATO 'Spiral')

Unlike previous Soviet helicopter-launched anti-tank 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-1 (NATO 'Alkali')

First Soviet air-to-air missile to become operational, 'Alkali' equipped the older generation of PVO-Strany interceptors, such as the Su-9 and all-weather versions of the MiG-19, and can be expected to disappear from service soon. It has a solid-propellant rocket motor and I/J-

'Atoll' and 'Advanced Atoll' missiles on MiG-21 (Flug Revue)

band semi-active radar guidance system.
Dimensions: length 6 ft 2 in, body diameter 7 in, wing span 1 ft 10¾ in.
Weight: 200 lb.
Performance: range 3.7 to 5 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 infra-red 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. A solid-propellant rocket motor is fitted.
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.

'Advanced Atoll'

The multi-role 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 infra-red homing 'Atoll' on the inboard pylon. The radar version is known as 'Advanced Atoll'.

AA-3 (NATO 'Anab')

The UK Ministry of Defence estimates production of this solid-propellant air-to-air missile as being "in the thousands". It was first observed as armament of the Yak-28P all-weather fighters which took part in the 1961 Aviation Day display at Tushino. Subsequently, it became standard on the Sukhoi Su-11 and Su-15 interceptors. Each aircraft normally carries one 'Anab' with an I/J-band semi-active radar seeker and one with an infra-red 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 have been produced as armament for the Tu-28P and MiG-25 interceptors of PVO-Strany. The version with infra-red homing head is normally carried on the inboard pylon under each wing of the Tu-28P, with an I/J-band semi-active radar homing version on each outboard pylon.
Dimensions: length 18 ft 0 in (IR) or 17 ft 0 in (SAR).
Performance: range 18.5 miles.

AA-6 (NATO 'Acrid')

This is the air-to-air missile that 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. Photographs suggest that the version of 'Acrid' with an infra-red 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.
Dimension: length 20 ft 0 in (radar version).
Performance: range at least 23 miles.

AA-7 (NATO 'Apex')

This long-range air-to-air missile is one of the two types known to be carried as standard armament by interceptor versions of the MiG-23, and is reported to be an alternative weapon for the MiG-25. No details are available, except that 'Apex' has a solid-propellant rocket motor. It is likely to exist in both infra-red and radar-homing versions. The following data should be regarded as provisional:
Dimensions: length 14 ft 1¼ in, body diameter 9.4 in, wing span 3 ft 5½ in.
Weight: 705 lb.
Performance: range 17 miles.

AA-8 (NATO 'Aphid')

Second type of missile carried by the MiG-23, 'Aphid' is a close-range solid-propellant weapon with infra-red homing guidance.
Dimensions: length 6 ft 6¾ in, body diameter 5.12 in.
Weight: 121 lb.
Performance: range 3.5–5 miles.

AA-X-9

The missile known in the West as AA-X-9 is reported to have achieved successes against simulated cruise missiles, after 'look-down/snap-down' launch from a modified MiG-25 interceptor. No details are yet available.

Surface-to-Air Missiles

SA-1 (NATO 'Guild') (Tass)

ABM-1 (NATO 'Galosh')

The SALT I agreement permitted each nation a total of 100 ABMs (anti-ballistic missiles) on launchers for defence of the national capital and 100 more for defence of an ICBM launch area. ABM deployment was further reduced to one site for each country at the Moscow Summit meeting of late June and early July 1974. The Soviet 'Galosh' ABM system deployed around Moscow consists at present of 64 operational launchers and associated radars. It is believed to be capable of protecting the city adequately against small attacks using unsophisticated missiles without penetration aids. There is no indication that the other 36 launchers are to be added to the system, although Soviet ABM R & D continues at a high priority, with two completely new systems reported. Missiles purported to be 'Galosh' have been paraded through Moscow, inside containers 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 warhead is fitted.

SA-1 (NATO 'Guild')

This missile was first displayed in a Moscow military parade on November 7, 1960. Although subsequently reported to be deployed as a standard anti-aircraft weapon, it took no further part in the regular Moscow parades until 1968, when it appeared on May Day. The SA-1 is not thought to have been supplied to any country outside the USSR, and its phase-out there has probably started.
Dimensions: length 39 ft 0 in, body diameter 2 ft 3½ in.
Performance: range 20 miles.

SA-2 (NATO 'Guideline')

This missile is a standard anti-aircraft weapon in about 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. One variant, first exhibited in Moscow in November 1967, has an enlarged, white-painted warhead without the usual small canard surfaces. It was claimed to be far more effective than earlier versions, and may have a nuclear warhead. About 3,500 SA-2 launchers are thought to remain operational in the Soviet Union, although the number declines annually. Data for the standard 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 terminal homing.

Warhead: normally 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: 5,000 lb.
Performance: max speed Mach 3.5, slant range 25 miles, effective ceiling 60,000 ft.

SA-3 (NATO 'Goa')

Soviet counterpart of the American HAWK, the SA-3 is deployed in increasing numbers by the Soviet Union, its allies, and friends as a mobile low-altitude system 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, fired from a roll-stabilised 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: 1,323 lb.
Performance: max speed Mach 2, slant range 21.75 miles, effective ceiling 49,200 ft.

SA-4 (NATO 'Ganef')

Ramjet propulsion gives this anti-aircraft missile a very long range. Its usefulness is further enhanced by its mobility, as it is carried on a twin-round tracked launch vehicle which 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 for defence of combat areas. It is reported to be operational also with the East German and Czech forces.
Power Plant: ramjet sustainer; four wrap-around solid-propellant boosters.
Guidance: radio command.
Warhead: high-explosive.
Dimensions: length 28 ft 10½ in, body diameter 2 ft 8 in, wing span 7 ft 6 in.
Launching weight: 3,975 lb.
Performance: slant range 43 miles, effective ceiling 80,000 ft.

SA-5 (NATO 'Gammon')

There is reckoned to be a total of 12,000 missiles on 10,000 surface-to-air missile launchers operational at 1,650 sites throughout the Soviet Union. However, deactivation of SA-2 sites has been under way for some time, at a slightly faster rate than the commissioning of new SA-3 and SA-5 sites. The SA-5 is described by the US Department of Defense as providing long-range, high-altitude defence for Soviet targets, and about 1,100 are deployed. Suggestions of a possible ABM capability were denied during the SALT II talks.
Power Plant: two-stage solid-propellant, possibly with terminal propulsion for warhead.
Guidance: radar homing.
Dimensions: length 54 ft 0 in, body diameter 2 ft 10 in, wing span 12 ft 0 in.
Performance: max speed above Mach 3.5, slant range 155 miles, effective ceiling 95,000 ft.

SA-6 (NATO 'Gainful')

This mobile low-altitude 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 which 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 Bulgaria, Czechoslovakia, Egypt, Hungary, Iraq, Libya, Mozambique, Poland, Syria, and Vietnam.
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; semi-active 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 22 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, including the use of decoy flares, and deflecting upward the exhaust of helicopters. In addition to being a standard weapon throughout the Warsaw Pact forces, it has been supplied to about 15 other nations, and to various guerrilla/terrorist movements. Designed for use by infantry, the SA-7 is also carried by vehicles, including ships, in batteries of four, six, and eight, for both offensive and defensive employment, with radar aiming. An uprated version has a more powerful motor, giving higher speed and an effective ceiling of about 14,000 ft. *(Data for basic version.)*
Power Plant: solid-propellant booster/sustainer.
Guidance: infra-red homing with filter to screen out decoy flares.
Warhead: high-explosive, weight 5.5 lb.
Dimensions: length 4 ft 5 in, body diameter 2.75 in.
Performance: max speed Mach 1.5, slant range 2.25 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 surface-to-air weapon system has much in common with the European Roland. Missile configuration is conventional, with canard foreplane control surfaces and fixed tail-fins. Fire control equipment and quadruple launcher are mounted on a rotating turret, carried by a new 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 a total of about 8 missiles.
Power Plant: probably dual-thrust solid-propellant.
Guidance: command guidance by proportional navigation. Possible infra-red terminal homing.
Warhead: high-explosive, about 90–110 lb weight.
Dimensions: length 10 ft 6 in, body diameter 8.25 in.
Performance: range up to 5 miles.

SA-9 (NATO 'Gaskin')

This weapon system comprises a BRDM-2 amphibious vehicle, carrying a box launcher for two pairs of missiles described as uprated SA-7 'Grails'. The launcher rests flat on the rear of the vehicle when not required to be ready for launch. Range of the missile is approximately 5 miles.

SA-10

If all reports emanating from the US press are to be believed, this is the weapon that finally sealed the fate of the B-1 and now threatens the viability of 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 31 miles in the 1,000–16,500 ft height band is suggested, with active radar terminal homing. Reported dimensions are a length of 23 ft and body diameter of 17.7 in. Predicted IOC varies from 'about now' to the mid-1980s. Full deployment is likely to be protracted, as the DoD considers that an effective anti-ALCM defence system would need between 500 and 1,000 sites, each with ten launchers, and would cost $50 billion if manufactured in the US.

SA-11

This new weapon system comprises a three or four-rail launch vehicle for Mach 3 radar-guided missiles with a reported ability to deal with targets at altitudes between 80 and 49,000 ft, at ranges up to 12 miles. SA-11s are said to be deployed already alongside SA-6s, and may represent an improved version of the latter.

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 may have started, is believed to use a laser beam for beamriding guidance.

SA-N-1 (NATO 'Goa')

Ship-launched variant of SA-3.

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 the carrier/cruisers *Kiev* and *Minsk*, helicopter cruisers *Moskva* and *Leningrad*, and *Kara* and *Kresta II* cruisers, carry a new and more effective missile than the SA-N-1 ('Goa'). Known as the SA-N-3, this could be similar to the SA-6.

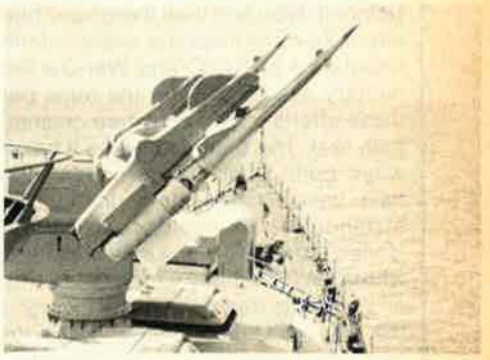
SA-N-4

Little is known about this naval close-range surface-to-air weapon system, although SA-N-4 installations are operational on eight classes of ships of the Soviet Navy. The retractable twin-round 'pop-up' launcher is housed inside a bin on deck. It is likely that the missiles are similar to those that are used in the land-based mobile SA-8 system.

SA-2 (NATO 'Guideline') (Tass)

SA-4 (NATO 'Ganef') (Tass)

SA-8 (NATO 'Gecko') (Tass)



SA-N-1 (NATO 'Goa') shipboard twin-launcher (Novosti)

The shifting balance between the US and the USSR during the last fifteen years has been the parable of the tortoise and the hare, writ large. Afghanistan may be a milestone on the way to the finish line, but it is not . . .

What Really Matters

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

DR. Henry Kissinger has made an observation in his book, *The White House Years*, that deserves some reflection. "Throughout history the political influence of nations has been roughly correlative to their military power. . . . In the final reckoning weakness has invariably tempted aggression and impotence brings abdication of policy in its train." It seems obvious enough when we read it. How, then, did we come to disregard so plain a truth?

In the years of our strategic dominance, the Western world grew fat and prosperous under the American strategic umbrella. The ominous goings-on across the no-man's-land that divides NATO Europe from the Soviet empire were deemed to be Soviet private business, after the heroic uprising in Hungary revealed the helplessness of the West to intervene in any meaningful way.

Year after year the NATO Ministers have listened to the gloomy assessments of the NATO Military Chiefs. Without exception, each year's report has been more pessimistic than the one before it. Now and then there have been attempts to redress the overwhelming imbalance of NATO and Warsaw Pact military assets, but, for the most part, these efforts have been more cosmetic than real. The plain fact is, as it has always been, that the European allies have based their security on Soviet reluctance to risk nuclear war with the United States. To some extent, then, the whole NATO military structure is simply an elaborate trap baited with enough in the way of United States forces and treasure to ensure a United States nuclear response if the trap is sprung. In the early days of NATO this was, in fact, the official and accepted NATO strategy, if not quite so baldly stated.

By the mid-sixties, this strategy—if it really merited that title—of relying on a massive American nuclear response to a Soviet attack in Europe began to be questioned. General de Gaulle asked the cruelest question, to which he supplied his own reply. The Americans, he inferred, could not be relied on to risk their own destruction in a defense of Europe. Whereupon he pulled out of the NATO military alliance. He was only just persuaded from abandoning NATO altogether as he set about creating his nuclear-armed *force de frappe*, meanwhile pretending to look in all directions—*tout azimut*—for France's enemies.

Despite the fact that a military strategy for the defense of Europe cannot ignore the existence of France, the allies went ahead with one anyway on the assumption that France would come along on D-Day. This strategy, the so-called strategy of flexible response, is designed to put greater reliance on local and conventional resistance before calling on the Armageddon forces. The trouble is simply that no one in our prosperous and comfortable family of free nations has been willing to pay the price for the flexible response strategy. And so, in the thirteen years or so since NATO adopted this new and self-reliant concept, the Soviet side has vastly increased its own conventional superiority, meanwhile catching up to us on the strategic side. The Warsaw Pact has taken the flexible-response strategy far more seriously than have its NATO authors.

Now we have begun to see the results of these long years of Soviet activity. There was a time, for instance, when we all took comfort, and some amusement, in the botched performance of Soviet airlift forces. No one is laughing now. The disciplined Red Army troops in Kabul are no laughing matter either. From the pictures we see they bear little resemblance to the wristwatch-happy primitives wandering around Berlin in the late forties.

Cassandras have never been popular figures, beginning with the original from Greek mythology, who was murdered. The long years of this Soviet climb toward military preeminence has seen the doomsayers effectively countered and rebutted by an articulate and seemingly rational body of opinion. Our strength lies in our economy, not in wasteful military forces, goes one argument. The fact that our economy relies on such things as imported oil, manganese, chrome, and titanium, any or all of which might be denied us by military force, is rarely mentioned. Then, there are the optimists who remind us of the USSR's domestic troubles—its low GNP, its growing ethnic problems. It is all true, but perhaps it ought to be a source of worry rather than comfort to us, for the have-nots of the world, whether muggers or nations, tend to covet what others have.

If the polls are accurate, the nation is once more awakening, as it did after Pearl Harbor, to the need for a strong military. Some very unlikely politicians are suddenly and firmly on the side of increased defense spending. SALT II, which was to have been the great détente initiative of this Administration, is now just an irrelevant curiosity. It is, of course, very late in the game for us and our allies. The Soviets have taken a good many years to build their forces, and there will be a strong temptation, going back to Dr. Kissinger's observation, to use them before the advantage is lost. Maybe they will stop in Afghanistan, as some hopefuls suggest, and maybe not. In a way, it does not matter. What does matter is whether or not we finally see our national interests—our very existence—threatened, and if we do, how we propose to protect them. ■

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Airman's Bookshelf

Jungle Ordeal

Escape from Laos, by Dieter Dengler. Presidio Press, San Rafael, Calif., 1979. 211 pages with maps. $10.95.

From the air, the rain forests of Southeast Asia present the eye with a picture of savage, unspoiled beauty. This picture becomes a nightmare of almost impenetrable jungle on the ground, and survival is brutish under the best of conditions. For Dieter Dengler, this nightmare became reality when he was shot down over Laos and taken prisoner in the early days of the Vietnam conflict.

Dengler was a refugee from the Third Reich and no stranger to the rigors of war. After the war, he came to America with hopes of becoming a pilot. He received his wings in the Navy and was posted to the USS *Ranger*, stationed in the Gulf of Tonkin in early 1966. On his first mission over the North, Dengler's Skyraider was shot down, and his jungle nightmare began.

Dengler was unhurt after the crash, but was captured by guerrillas and subjected to a forced march through the jungle. He was beaten by the Pathet Lao when he refused to cooperate. Once, after an escape attempt, he was hung upside down from a tree and beaten until unconscious. When he came to, the guerrillas had smeared his face with honey, and he watched in horror as one of them broke a nest of black ants over his face.

Dengler survived to reach a prison camp, where in his weakened condition he was abused and forced to live on a meager diet. He and his fellow prisoners coped with sickness, boredom, and fights among them. However, escape remained the uppermost thought in his mind.

The prisoners broke out, but freedom in the jungle was perhaps worse than life as a POW. Dengler traveled with another of the prisoners, Air Force pilot Duane Martin. They subsisted on snails and iguana and were plagued by omnipresent leeches as they struggled to evade recapture. Martin was killed when they stumbled across Laotians, but Dengler avoided recapture and proceeded alone, hallucinating from disease and hunger.

At the brink of death, Dengler was rescued by a miraculous stroke of luck. As he lay semiconscious he heard the rumble of aircraft engines. Signaling wildly, he caught the attention of Eugene Deatrick, an Air Force newcomer to Vietnam, circling overhead. Deatrick was flying a familiarization mission and noticed a patch of white amidst the jungle green. He called in choppers and an exhausted Dengler was rescued from under the guns of guerrillas attracted by the commotion.

Dengler recovered from his ordeal and is today a pilot living in San Francisco. His unprecedented escape is a testament to the human will to survive, and *Escape from Laos* portrays simply his struggle against overwhelming odds to remain, in his words, a "free man."

—Reviewed by Hugh Winkler, Editorial Assistant.

Arab-Israeli Warfare

Elusive Victory: The Arab-Israeli Wars, 1947–1974, by Trevor N. DuPuy. Harper & Row, New York, N. Y., 1979. 669 pages, with maps, diagrams, photographs, bibliography, and index. $25.

Elusive Victory is another DuPuy triumph. This is a well illustrated, well worth the price, massive treatment of the continuous Arab-Israeli conflict.

DuPuy provides the detail for which he has become known (such as complete orders of battle for each war), yet never lets the particulars mar the narrative. He sensibly and sensitively deals with all aspects of the many wars: politics, doctrine, strategy, tactics, and results, making this volume an especially valuable addition to the professional airman's bookshelf.

The author chronicles Israeli success, from the guerrilla battles against both the British and Arabs before independence to the dramatic recovery by the Israelis in the 1973 war. Israel's military victory was effected by preeminent organization, training, equipment, and marked capability to mobilize the population. Superior mobilization of active and reserve forces is Israel's device for dealing with Arab numerical superiority. Advanced doctrine, strategy, and tactics are her methods for employing her forces at the decisive point. Those eager for lessons on how to fight outnumbered and win might start with this book.

Most useful for active professionals is DuPuy's treatment of the 1973 war. He covers all bases including object lessons on the future utility of weapon systems that make up a predominant portion of Soviet and United States arsenals. The author also deals extensively with the human element in war.

Complete strategic and nearly complete tactical surprise on October 6, the first day of the war, brought about by clever Arab planning (magnified by Israeli self-deception), all but determined the political outcome of the three-week-long war. DuPuy believes that Egypt's surprise of Israel at the Suez Canal doubled the effectiveness of her troops, yet Israel was able to stem the initial attack and go on the offensive after absorbing the first shocks. DuPuy examines the effect of the continuous effort by Israel after the 1967 war to sharpen both combat training and mobilization practices, and concludes that behavioral considerations—such as combat effectiveness, leadership, and surprise—are considerably more important in warfare than comparisons of men, numbers, weapons, and technology.

DuPuy also makes a major contribution to war literature with his able treatment of airpower—beginning with the Israeli downing of five British fighters during the guerrilla phase, and ending with the 1973 war with its massive early Israeli losses caused by able Arab use of Soviet SAMs and antiaircraft artillery. In the face of Soviet-supplied antiaircraft weapons, the Israeli Air Force in 1973 was unable to dominate the battlefield to the

same degree it had in previous wars. That lack means to DuPuy that from 1973 forward the combat role of tactical airpower must be considered in the calculus of war in relation to surface-based means of air defense. Professional airmen can learn much about airpower's past and a provocative lesson about its possible future from this excellent book.

—Reviewed by Lt. Col. Alan L. Gropman, Hq. USAF.

Two World War II Sagas

Return From the River Kwai, by Joan and Clay Blair, Jr. Simon & Schuster, New York, N. Y., 1979. 338 pages with index, photographs, and maps. $12.95.

Behind Japanese Lines, by Richard Dunlop. Rand McNally, Chicago, Ill., 1979. 480 pages with index, photographs, and maps. $12.95.

Next to the Holocaust, the events portrayed in *Return From the River Kwai* could well be the horror story of World War II. Its telling is a masterful tribute to the human will to survive despite degradation and tragedy almost too terrifying for words.

Early in 1942, 60,000 POWs of the Japanese, the majority British and Australian, were impressed to build a 265-mile railway in Burma and Thailand. (While part of this railway was built along the Kwai River, The Bridge Over never existed except in the novelist's fertile imagination.)

In mid-1944, 2,218 Australian and British survivors of the railroad construction were selected to go to Japan as laborers. Both ships transporting them were torpedoed by US submarines in the South China Sea. Agonizing days afterward, only 815 had been rescued by the same US sub wolfpack that had sunk them and one benevolent Japanese ship captain. This is as much the story of the 1,603 who perished as it is of those who lived.

Return From the River Kwai proves that Winston Churchill was correct when he said the human body can stand more punishment than brick and mortar. In short, it is a classic study of the triumph of the human spirit.

For those interested in recapitulations of World War II intelligence activities, *Behind Japanese Lines* is a welcome departure from the spate of books on the market about Ultras, codebreakers, and the generally more glamorous spying activities in Europe.

These are first-hand experiences from one of the early Office of Strategic Services (OSS) operatives, telling about the emergence of Wild Bill Donovan's clandestine forerunner of today's CIA. Typically for an American operation, OSS started well behind the world's intelligence power curve. But a combination of ingenuity and unholy liaisons with all sorts of strange allies led to a lot of productive "ungentlemanly warfare."

In this case, the alliance was with native Kachin tribesmen, headhunters, in the formidable jungles of northern Burma. The exploits of the Western-raised OSS agents and the gritty little jungle warriors are high adventure indeed.

Half a gross of on-the-spot wartime photographs add unusual realism to what is sometimes a rambling account of missions and exploits against the Japanese and the elements.

—Reviewed by Tommy L. Wilson, aerospace executive, former USAF officer, and student of military history.

New Books in Brief

The Aerofilms Book of England from the Air, edited by Stuart Booth. From the rural countryside of Devon to the industrial complexes of Teeside, the beauty of England as seen from the air is captured in this volume. Some 100 quality photos depicting the English countryside, rocky seacoasts, modern industrial cities, quaint villages, elegant cathedrals, and ancient monuments offer the would-be traveler a detailed, aerial survey of the English environment. Historical text complements each photo. Available from Sterling Publishing Co., Inc., New York, N. Y., 1979. 100 pages. $12.95.

Air Power and Warfare, edited by Col. Alfred F. Hurley, USAF, and Maj. Robert C. Ehrhart, USAF. Here are the proceedings of the Eighth Military History Symposium held at the Air Force Academy in October 1978. Entitled "Air Power and Warfare," the symposium brought together American and foreign scholars, both civilian and military, and surviving shapers of airpower history to assess the record and offer new insights. This collection of essays, commentaries, and reminiscences should enhance both the teaching and public understanding of airpower's role and its potential in the future, according to the editors. Superintendent of Documents, Government Printing Office, Washington, D. C. 20402, 1979. 461 pages. $6.50.

Air War—Vietnam, introduction by Drew Middleton. Written and edited by Air Force officers, this book examines the air war in Vietnam and the technical innovations and what they portend for future conflicts. As journalist Drew Middleton writes in the introduction, a popular and largely negative view of the war has obscured the achievements and innovations of American fighting men in Vietnam. This book contains as much as we are likely to learn about how the air war was fought and, to a great extent, won in Vietnam, he says. Photos, maps, glossary, index. The Bobbs-Merrill Co., Inc., Indianapolis/New York, 1978. 361 pages. $15.

Apollo: Ten Years Since Tranquillity Base, edited by Richard P. Hallion and Tom D. Crouch. Commemorating the tenth anniversary of the Apollo voyage to the moon, Smithsonian's National Air and Space Museum has published a collection of essays on the program and what it means ten years later. Included is a photographic essay. Bibliography, research guide. Smithsonian Institution Press, Washington, D. C., 1979. 174 pages. $6.95 paper; $17.50 cloth.

Battleship, by Martin Middlebrook and Patrick Mahoney. In late 1941, Churchill sent the battleship *Prince of Wales* and battle cruiser *Repulse* to Singapore as a show of force against Japan. It was a mistake. Both ships were sunk by Japanese air strikes. The full story of this tragic episode, from the cabinet meeting in which Churchill decided to send the ships, to the rescue of their survivors is told, based on recently released secret documents from British government archives. Appendices, index. Charles Scribner's Sons, New York, N. Y., 1979. 302 pages. $12.50.

Chieftain, by George Forty. The author examines the conceptual design of the Chieftain, a tank that has been in service with the British Army for more than a decade. Mobility, firepower, and armor, the author states, are the three vital elements in the design and construction of armored fighting vehicles. Another basic consideration that has become increasingly important in weapon-system design is cost. The author

Airman's Bookshelf

studies this British tank based on these key considerations. Photos, illustrations. Charles Scribner's Sons, New York, N. Y., 1980. 128 pages. $14.95.

Gunmarks: Trade Names, Code Marks, and Proofs from 1870 to the Present, by David Byron. This is a book for the gun collector. It features manufacturers' identifying marks, classified and arranged by structure, for firearms throughout the world. This reference includes descriptions of the firearms and names and locations of the manufacturers. Crown Publishers, Inc., New York, N. Y., 1980. 185 pages. $10.

Guns in the Sky, by Chaz Bowyer. Searching and waiting for the shadows that warned of a Luftwaffe night fighter, the air gunner of WW II kept a tense, lonely vigil as the only bomber crew member capable of retaliation. What did he feel when enemy aircraft came into view? Through personal accounts, Americans, Britons, Australians, and Canadians offer a probing look at the air gunner's skill, courage, and tenacity under fire. Glossary, bibliography. Charles Scribner's Sons, New York, N. Y., 1979. 182 pages. $14.95.

In the Cockpit, edited by Anthony Robinson. As only they could, fifty-five pilots recreate the drama of flight from the early Bleriots through today's supersonic Concorde, Harrier, and Mach 2 F-15. The book is beautifully illustrated with superb aerial color photos and an outstanding series of action paintings that complement the text in recapturing the sensation of flight. Ziff-Davis Publishing Co., New York, N. Y., 1979. 304 pages. $29.95.

Jane's Ocean Technology 1979/1980, edited by Robert L. Trillo. This fourth edition examines the vast potential the oceans offer mankind, from the extraction of energy and food to the continuing development of research submersibles. Photos, line drawings, specifications, and index. Franklin Watts, Inc., Jane's USA, New York, N. Y., 1979. 824 pages. $89.50.

Numerical/Chronological/Author Index, 1954–1978, compiled by Horace Jacobs and Robert H. Jacobs. Here is an index to all American Astronautical Society papers and articles from 1954 through 1978. It covers articles that appeared in: Advances in the Astronautical Sciences; Science and Technology Series; AAS History Series; AAS Microfiche Series; Journal of the Astronautical Sciences; and the Astronautical Sciences Review. Order from Univelt Inc., P. O. Box 28130, San Diego, Calif. 92128, 1979. 446 pages. $40, hardcover; $30, softcover.

Present Danger: Towards a Foreign Policy, by Robert Conquest. The author, a Senior Research Fellow at the Hoover Institution, offers a timely and incisive examination of the principles and tactics most likely to lead the West out of its present cycle of defeatism, appeasement, and humiliation. The twin aims of avoiding nuclear war and of averting surrender depend, he states, on the correct interpretation of the motives of the West's principal opponent, the Soviet Union. The author analyzes the combination of cynicism and shortsightedness which he believes has led to the present predicament. Hoover Institution Press, Stanford University, Calif. 94305, 1979. 159 pages. $12.

Pursue & Destroy, by Leonard "Kit" Carson. The author was there, he lived it, and now, for the first time, he does for the fighter pilots of the Eighth what several writers have already done for the Eighth's bomb crews. In compelling detail, the author describes the missions, the planes flown, the tactics used by both sides, the strategy of long-range escort, the persistent menace of weather, the problems of maintenance and supply, and, most important, his impressions of what he saw six miles above the earth during aerial combat. The book is also the developmental and operational story of the P-51 Mustang and its use as an effective strategic escort fighter. More than 400 photos and drawings complement this story. Sentry Books, Inc., 10718 White Oak Ave., Granada Hills, Calif. 91344, 1978. 175 pages. $19.95.

The P-80 Shooting Star, by E. T. Wooldridge. Here is the history of Lockheed's P-80 Shooting Star from its inception through the hectic development program in World War II and its operational life in the Air Force. The author's research reveals the difficulties America's first operational jet fighter encountered, as well as its successes and limitations. Photos, drawings, bibliography. (The book is part of the "Famous Aircraft of the National Air and Space Museum" series.) Smithsonian Institution Press, Washington, D. C., 1979. 110 pages. $5.95.

The Saga of Iron Annie, by Martin Caidin. Two stories are told: The history of one of the last surviving World War II Junkers Ju-52s, and her restoration to flying condition by the author, who is also a pilot. The Ju-52, of which nearly 5,000 were built, formed the backbone of Germany's commercial and military air transport between 1935 and 1945. *Iron Annie* has been the star of numerous airshows since her salvation from the junk heap. Doubleday & Co., Garden City, N. Y., 1979. 243 pages. $14.95.

Six U.S. Perspectives on Soviet Foreign Policy Intentions, by Robert J. Pranger. While Americans at all levels have difficulty understanding the complexities of Soviet global intentions, the author, a former Deputy Assistant Secretary of Defense for International Security Affairs and director of the American Enterprise Institute's foreign and defense policy studies, scans a spectrum of American perceptions. He classifies US perspectives under six categories: revisionism, polycentrism and interdependence, ambiguity and détente, ambiguity and conflict, mutual suspicion, and containment of expansion. American Enterprise Institute for Public Policy Research, 1150 17th St., N. W., Washington, D. C. 20036, 1979. 28 pages. $2.50.

Thunderbolt, by Roger Freeman. That the top two US fighter pilots in World War II in Europe flew Thunderbolts is testimony to one of the most famous single-seat warplanes of that conflict. This book, by the author of *The Mighty Eighth*, tells the technical and dramatic tales of the Thunderbolt, its development, tactical employment as an escort fighter, and its adaptation to the role in which it excelled—ground attack. Included are details of use by Allied air forces, accounts by pilots in different theaters of war, and technical data on all Thunderbolt models. More than 200 photos complete the volume. Charles Scribner's Sons, New York, N. Y., 1980. 152 pages. $14.95.

—Reviewed by Robin Whittle

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By James A. McDonnell, Jr., MILITARY RELATIONS EDITOR

Graduate Education Battle Intensifies

Frustrated and alarmed over the government's steady chopping away at the officer graduate education program, USAF authorities are sounding warning signals.

"The reduction in graduate education is a dilemma that the Air Force may not be able to tolerate much longer," according to the Air Force Institute of Technology, which operates the program. Since FY '69, AFIT officials point out, USAF's fully-funded graduate education system has been reduced by sixty percent. Yet, requirements for technical expertise increase each year. And just recently Congress, in the FY '80 military appropriations act, laid on another cut that reduces the AFIT graduate man-year quota to a mere 832 this year and under 800 in FY '81. Just seven years ago, the man-year total stood at a healthy 1,820.

The reductions are eroding USAF's scientific and engineering (S&E) capabilities. Together with growing shortages of new officers from ROTC and OTS, it adds up to a serious problem. Secretary Hans M. Mark, Chief of Staff Gen. Lew Allen, Jr., and other USAF leaders convened recently at AFIT Headquarters, Wright-Patterson AFB, Ohio, to review the dilemma with AFIT officers. The occasion, which marked the Institute's sixtieth birthday, was devoted partially to organizing the newly formed AFIT Association of Graduates.

The thousands of AFIT graduates and those yet to participate, officials feel, can help promote and sell the program and explain to important circles why AFIT programs are so vital to the Air Force. Lt. Gen. Lawrence A. Skantze, Commander of the Aeronautical Systems Division, AFSC, at Wright-Patterson AFB told the meeting to organize the new Association that AFIT graduates should help to create an understanding "that in order to produce technical excellence and qualitatively superior systems, we've got to have the educational excellence and talent to do it."

That's a big order, because the services' graduate officer education problems spring from the influential House Appropriations Committee. The Committee for years has cut funding, claiming the military establishment has more officers with graduate degrees than are needed. About 54,000 officers in all the services currently hold graduate degrees, the Committee points out. But most of them are not in the critical S&E disciplines. Only eleven percent of the USAF advanced degrees are in S&E areas.

The Committee also periodically knocks the "validation process" the services use to establish graduate-degree job requirements.

As in previous years, the full Congress bought the Committee's reduction recommendations in the FY '80 appropriations measure. Earlier the Committee directed the Defense Department to "review the need to continue the operation" of both AFIT and the Naval Postgraduate School. After Defense responded that both institutions are important, the lawmakers okayed their continued operation, at least for the time being. But on a scale many hold is inadequate.

Women Pilot Corps Expansion Under Way

After three years of testing the waters very cautiously on training women officers as pilots, the Air Force is embarked on a major expansion of the program. At the start of this year, only sixty-five Air Force women had entered Undergraduate Pilot Training. Of these, thirty-one had won their wings (including four in the Air Reserve Forces), twenty-two were still in training, and twelve had washed out.

The 18.5 percent wash-out rate is slightly higher than that for Air Force males.

Instead of enrolling twenty new women pilot trainees each year, USAF is now looking for 122 distaff officers to enter UPT this fiscal year. Authorities say the sharp increase reflects official satisfaction with the products so far and confidence that ample numbers of new, qualified female officers will opt for rated status. Recruiting efforts are well under way.

The expanded program is not designed to offset any possible lack of male trainees to replace pilots leaving the Air Force, because the service has more male pilot trainee candidates than it has training quotas. Officials also say the expanded women's pro-

Identical twins Denise (left) and Debra Frey, AFROTC scholarship students at Manhattan College, Riverdale, N. Y., get some classroom pointers from Capt. David Jones, assistant professor of aerospace studies for the school's 100-member AFROTC unit. The first-year students, majoring in math and computer sciences, became interested in the Air Force through their father, former USAF veterinarian Dr. Richard Frey. The students' scholarships include tuition, fees, and $100 per month in cash.

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gram has nothing to do with any possible governmental move to abolish curbs on assignment of women to aircraft on a combat mission.

During recent congressional hearings, the Defense Department and USAF asked the lawmakers to repeal the curbs on women in combat. But there was opposition from many other quarters and no legislation to change things has emerged. Nor is it likely.

USAF's women navigator program is also expanding. Twenty-nine hopefuls are to begin training this year, compared to only eight during FY '79. Until this year, twenty-two USAF women had entered navigator school. Twelve of them, including two in the Reserve Forces, now wear wings, two washed out, and eight were still in training.

The other services continue with token female aviator programs. The Navy reports it has trained thirty-one distaff pilots and all but two are on active duty; six to eight new ones are being trained each year. Army's female pilot inventory numbers about thirty, and most of these are helicopter pilots.

MSgt. Wayne L. Fisk, a pararescue technician at Scott AFB, Ill., and a 1979 AFA Citation of Honor Award recipient, has been named one of the Jaycees' Ten Outstanding Young Men of America. Sergeant Fisk was chosen in recognition of his humanitarian work among Filipinos during a recent tour there, where, among other exploits, he saved a young girl's life and gave over $3,000 from his own pocket to provide life-saving surgery for a young boy. He is the first USAF airman to be so honored by the Jaycees.

Veterans Health Programs Improved

Newly enacted legislation improves government-sponsored health care for various groups of veterans and survivors. Called the "Veterans Health Programs Extension and Improvement Act of 1979," the measure expands the eligibility of veterans served by VA outpatient clinics to receive government-paid emergency care at non-VA hospitals. This benefits vets in clinics not near VA hospitals and those in serious medical trouble.

Other provisions of the new law: (1) make the almost 600,000 veterans of World War I and the Mexican border campaign of 1916–17 eligible for outpatient care at VA clinics for any disability, regardless of whether it is service connected; (2) authorize home health services, worth up to $600, to housebound veterans or veterans in need of regular aid and attendance; and (3) require the VA to conduct a study of veterans exposed to defoliants, (including Agent Orange) while serving in Vietnam to determine if they are suffering ill effects from the exposure. Other government agencies, including the Air Force, have Agent Orange studies under way or planned. In other developments the VA:

- Says it will pay a record $566 million in dividends this year to 4,100,000 vets holding GI insurance policies. Payments will average nearly $300 for World War I policyholders, less for others.
- Urged military personnel planning to use VA benefits soon after separation to obtain copies of discharge certificates at their final separation processing point for presentation to their local VA office in order to establish entitlement. Waiting for the agencies to distribute copies takes considerable time, the VA indicated.

Retiree Recall Action Plan Sought

Air Force officials are staffing the forty-odd recommendations recently submitted by the Air Force Retiree Council, the most important of which calls for specifics on how retirees may be recalled and utilized in event of a national emergency. Retirees say they are irked over USAF's delay in hammering out a detailed recall program.

Air Staffers, who have said retired recalls will be limited to those who have been off active duty just a few years, expect to spell out the program sometime this year.

At their annual meeting in San Antonio last fall, members of the Retiree Council also advanced numerous recommendations calling for the protection of benefits. AFA President Victor R. Kregel addressed the Council. A report of the Air Force's response to the recommendations will be announced at the 1980 Council meeting, scheduled to convene in September or October.

At another recent event in San Antonio, a symposium for retirees sponsored by the Alamo Chapter of the Air Force Association, Mr. Kregel introduced the keynote speaker, Air Force Chief of Staff Gen. Lew Allen, Jr. The Chief again focused strongly on the personnel retention issue, telling the audience of 1,500 that military pay and benefits are uncompetitive with the civilian market. He also expressed his concern over the adequacy of retirement benefits to meet recipients' expenses.

Two Views of Retired Pay

The major crusader against rising military retirement costs and pension payments to relatively young service members has struck again. Rep. Les

Aspin (D-Wis.), just before Congress reconvened, declared that the government spent $72 billion on military pensions during the past decade, "the majority of it going to able-bodied men in their 30s, 40s, and 50s." He wants sharp curtailments.

New military retirees, however, see things differently. They note that members of the same rank and length of service who retired just a few years ago now outdraw them substantially. That's because active-duty pay has been restrained by pay caps and not kept pace with inflation, while retired pay is tied to the cost-of-living index. It works out that an E-7 with twenty-two years of service who retired in 1974 now draws $790 a month, compared to $652 for his counterpart retiring today.

And the discrepancy is expected to widen since active-duty pay raises seem likely to continue to lag behind the CPI raises retirees receive. Accordingly, many persons view the situation as a continuing decline of the value of military retirement.

But to equalize matters, removing the retired pay "inversion" would increase what Aspin and some others consider an already too-large military pension budget.

Congressman Aspin said the country could be "a long way toward energy independence" if the gov-

Ed Gates . . . Speaking of People

Is the Air Force Losing by a Hair?

When it all began more than ten years ago, military authorities didn't approve of it. But they weren't dismayed. There was no panic. "Just one of those fads . . . can't last . . . give it a year at most," they said.

That year came and went. Then another. And another. The flap was still with us, only more so. Instead of disappearing, it expanded and intensified. Most of the troops, the younger ones particularly, sympathized with and wanted to join the new movement, but the military leadership stiffened its opposition. The battle lines were drawn and set in concrete. And they have remained that way.

All this refers to the hair-length issue. For the troops, hair, sideburns, mustaches, beards, and wigs constitute a highly emotional matter. Many are frustrated at what they consider the "old-fashioned" hair look they must endure under Air Force's strict hair style regulation. These people, many say, burn when their superiors lean on them for strict compliance with the directive. "They lean too much," critics contend.

The troops' most frequent complaint is that they feel conspicuous, out-of-place, when in town, at home on leave, or elsewhere in the civilian community. "I felt like a freak when I visited my former high school—the kids snickered, even laughed at my close-cropped Air Force-style haircut," a young airman told AIR FORCE Magazine.

That reaction is hardly surprising. Student-age males are devoted to their thick and lengthy coiffures, and the multitudes with facial fuzz aren't about to shave it off either. Some military officials have felt the long-hair fad would gradually die a natural death. That doesn't appear to be in the cards, but the day of the closely trimmed head seems here to stay in the Air Force.

Accordingly, most future candidates for military service are almost certain to resent the military's short hair-length rules as strongly as youths already in uniform. But both groups probably would accept minor modifications to these rules, many USAF members say.

AFR 35-10, the service's grooming directive, covers hair and related topics in depth. It underscores a favorable military image as the main reason male military hair can't touch the eyebrows, caress the ears, stick out in front of hats or caps; be braided; receive the duckbill, Mohawk, or pageboy treatment; exceed 1¼ inches in bulk and, except for the closely cut or shaved hair on the back of the neck, can't touch the collar. Sideburns can't extend below the lowest part of the ear opening, a rule that doesn't make for much of a sideburn.

The section on "tapered appearance" gets extended treatment, in a nit-picking manner. Example: ". . . when viewed from any angle, the outline of an individual's hair on the sides and back must conform generally to the shape of the skull, curving inward to the termination point. The bulk of hair at the termination point must not exceed ¼-inch. This does not mean that each hair must diminish gradually in length from the top of the skull to the termination point, although this is necessary to some degree to effect the tapered appearance. The 'block' cut in the back is permitted, as long as a tapered appearance is kept. . . ."

Another section of 35-10 attempts to define hair "bulk," while others rule out beards and curtail mustaches, to assure "an acceptable military image."

Active-duty USAF men, unless they are bald, cannot wear wigs. Interestingly, Air Reservists and Air Guardsmen can wear them (tucking their own long tresses up underneath) during drill periods. This concession to the Reservists and Guardsmen emerged some years ago in response to concern that recruiting for the components might otherwise be devastated.

Critics of USAF's tough hair-wear rules insist that recruiting and retention would perk up if the hair rules were eased. That is highly debatable, though it is possible a few more youths "on the fence" about joining or staying in the service might respond favorably if the rules were eased. Certainly the Reserve-Guard wig decision hasn't hurt those organizations, both of which continue to remain overstrength.

On the other hand, the Navy, right along, has embraced a more liberal hair-length policy than the Air Force. Navy is less fussy about the length of hair and the length of sideburns. Its big departure from the other services is with beards—sailors can display them without fear of punishment or a chewing out, though the whiskers must be neat and closely trimmed. Yet, despite its relaxed hair rules, Navy recruiting and retention continue to lag behind USAF's performance.

The case for easing USAF's hair-wear provisions is compiled from many quarters. Recruiters talking with high school students are asked why the service requires short haircuts. The normal response cites safety, hygiene, discipline, and good image. Young people don't buy that. Instead, they counter that business executives, hard-hat workers, politicians, professional athletes—indeed people in all kinds of occupations—get along fine without interference from their hair styles. "So why can't the Air Force bend, even just a little?" they wonder.

College ROTC instructors must cope with similar opposition to what students regard as unrealistic restrictions. "On the hair issue, the military services are living in another world," a typical report from campus declares.

Military retirees contribute, indirectly, to the case for relaxing hair regulations. Having served twenty to thirty years in an almost 100 percent short-haired environment, retired military members might logically be expected to retain their short locks forever. But not so; an astonishing number of retirees we have bumped into lately have let them grow out, some just a bit, some a lot. A number seem to have forgotten what a barbershop looks like. Many retirees, it would seem, are hardly contributing to the good military image their service is seeking.

One Air Force critic put his finger on the root of the hair issue recently. In a letter, he asked policymakers how they would have felt if, during their younger years, they had been forced to wear their hair long while most everyone else wore their's short?

The policymakers would have felt like outcasts, he asserted, noting that's the way today's young service members feel when they step off the military reservation. ■

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ernment had put some of the $72 billion into research or alternative energy sources. He did not mention that the same thing could be said if the vast array of governmental welfare, educational, farm subsidy, foreign aid, and other federal programs had been trimmed.

Mr. Aspin noted that military pensions this year are budgeted to cost $11.5 billion, 9.4 percent of the defense budget. This compares with an outlay of $2.8 billion, or 3.5 percent of the 1970 defense budget.

"While we're doing a lot of talking (about pension costs) and very little reforming, we are being bled dry by the present system," he stated. The Congressman, who would end pension payments to future retirees who are not disabled or of "normal" retirement age, has received little visible support within Congress for his campaign.

Article 15 Rules Eased

A new shake-up of the rules governing Article 15 punishments is expected to result in a better deal for USAF members with disciplinary problems. The changes affect the unfavorable information file (UIF), promotions, officer effectiveness reports (OERs), airman performance reports (APs), and assignments.

Article 15 of the Uniform Code of Military Justice (UCMJ) was originally designed to give commanders a quick, effective means of disciplining troops for minor offenses. It wasn't meant to clobber persons for a long period. Punishments considered minor include reduction in rank, extra duty for several days, pay forfeiture, admonition, and reprimand.

In recent years, however, many "quality control" actions have been tied to Article 15 punishment, placing severe restrictions on what commanders could do. Such actions required creation of a UIF for two years, and automatic promotion ineligibility. Now, under the new changes, commanders can keep such persons eligible for promotion.

Whereas commanders formerly had to keep all Article 15s in a member's UIF, they now can withdraw them once the punishment period ends. No longer is putting Article 15 information in officer or senior NCO selection folders automatic. Commanders will decide. And "mention of an Article 15" is no longer allowed in OER and AP reports.

What it means, officials say, is that commanders can now punish minor transgressors whose overall records are favorable without endangering their careers, promotions, etc.

USAF authorities are pleased with the changes, feeling they are more equitable and may even improve retention.

The Article 15 changes tie in with Air Force's new BUCK STOP campaign. This is a special project of Chief of Staff Gen. Lew Allen, Jr., to enhance leadership, simplify procedures, and make operations more efficient "through delegation of authority to lower levels of organization."

General Allen recently asked major air commanders to "take a personal interest" in BUCK STOP's implementation. He also told the Hq. USAF Air Staff to "explore opportunities to delegate additional authority to the field." Delegating responsibility for decisions to the "lowest possible level of supervision" will help make Air Force life more challenging and rewarding, he said.

Here's How to Recover Lost Property

The Air Force has come up with a clever plan to help present and future members recover lost and stolen property. The new project's creator, the Air Force Office of Security Police, Kirtland AFB, N. M., is asking personnel USAF-wide—including retirees, Reservists, and Guardsmen—to mark their personal property with their Social Security number preceded by the letters "AF," by etching or indelible ink.

Capt. John R. Baker of the 94th TFS recently received the 1979 Risner Trophy, awarded to the top graduate of the USAF Fighter Weapons School. Captain Baker is an F-15 pilot at Langley AFB, Va. The trophy is named in honor of Brig. Gen. Robinson Risner, USAF (Ret.), a distinguished fighter pilot and former POW in Southeast Asia.

Thus, your identifier might be AF 281-14-0857. Property so marked, the Kirtland office points out, is easily identified as belonging to a past or present USAF member. Civilian police departments are being asked to contact security police at the nearest Air Force base when they recover property with an "AF" prefix. Once alerted, base police will trace the property owner, even if he has been discharged, through local records or the USAF personnel worldwide locator.

"Operation Identification Program" is the official name of the new plan.

Short Bursts

Hq. USAF officials, their sights riveted squarely on retention-building, were not exactly overjoyed with a recent **General Accounting Office report**. It urged Congress, for which GAO is the fiscal watchdog, **to force military commissaries to increase prices and cut customers' twenty-five percent savings** to eleven to fifteen percent. Sound familiar? And with a particular eye on the nine military commissaries in the Washington, D. C., area, the GAO called for the closing of "unneeded" commissaries around big cities. The mere mention of commissary cutbacks, of course, is a retention-destroyer, as officials discovered during earlier commissary battles. Incidentally, Washington-area newspapers and radio and TV stations gave the new GAO report a big play. AFA strongly supports the present commissary program.

AFP 36-28, **the Air Force Register**, once more **is available**. It lists all active-duty officers and dates of rank, but not Social Security numbers (prohibited by the Freedom of Information Act). Air Force libraries can get free copies from the Superintendent of Documents, Washington, D. C. Otherwise, the per volume tab is eleven bucks! A companion Register, AFP 36-27, includes the SS numbers; it's available to official users through base publication distribution offices.

Airmen overseas are now drawing, if they wish, up to a year's **advance**

station housing allowance. In other words, if their SHA rate is $125 a month, they can get up to $1,500 in a lump sum—to pay advance rent, deposits, and other "moving-in" costs. The only catch: they've got to start paying it back the following month.

It seems likely that Congress this year will make certain that all federal employees, including military members, will continue receiving **regular paychecks even if appropriations bills aren't enacted** before a new fiscal year begins. Several bills to do this have been introduced. The lawmakers, who blew it last year when their incredible fumbling brought payless paydays to some agencies and threatened others, now talk as if they'll plug the dike.

That **new court case** declaring a 1975 USAF **temporary majors promotion board illegal** hasn't panicked Headquarters officials. All scheduled boards this year will go forward as planned, though they'll follow developments closely. The basic question: How many Reserve officers should sit on a board considering both Reserve and Regular officers? A recent US Claims Court decision indicated that the 1975 board was illegal because the board membership included only one Reservist. Therefore, it said in a preliminary decision, the nonselection of the officer fighting his ouster should be voided. The legal maneuverings may delay a final decision for a long time.

More members of Congress are getting behind **legislation to require better active-duty mileage** out of new service people. Right now, newcomers need serve only six months to enjoy VA benefits, and many manage to do that or serve just a bit longer. It's money and effort down the drain, a rising tide of legislators says. The latest of several reform bills would require eighteen months' service to qualify for VA benefits (except in disability and hardship cases). Its backers are Sens. Alan Simpson (R-Wyo.), Gordon Humphrey (R-N. H.), and Robert Morgan (D-N. C.).

Senior Staff Changes

PROMOTIONS: To be **General**: Robert C. **Mathis.**

To be **Lieutenant General**: Philip C. **Gast**; William R. **Nelson**.

To be **Major General**: Harry **Falls**, Jr.; Lawrence D. **Garrison**.

To be **AFRES Major General**: Stuart P. **French**; Frank E. **Humpert**; Joseph W. **Kovarick**; Donald T. **Schweitzer**; Joseph A. **Thomas**.

To be **AFRES Brigadier General**: William W. **Bassnett**; James L. **Colwell**; Arthur W. **Green**, Jr.; Donald J. **Licker**; Patrick J. **Marckesano**; Gerald E. **Marsh**; Louis C. **Riess**; Thomas F. **Talbot**; James D. **Thurmond**; James L. **Tucker**, Jr.; James C. **Wahleithner**; Robert A. **Wheasler**.

RETIREMENTS: M/G Richard N. **Cody**; Gen. James A. **Hill**; B/G Garry A. **Willard**, Jr.

CHANGES: B/G Walter J. Bacon II, from Chief of Staff, Hq. TAC, Langley AFB, Va., to Dep. Cmdr., Caribbean Contingency Joint Task Force, Key West, Fla. . . . **B/G Robert E. Chapman**, from Dir., Computer Resources, USAF Compt. Ofc., Hq. USAF, Washington, D. C., to Vice Cmdr., Armament Div., AFSC, Eglin AFB, Fla. . . . **M/G Robert W. Clement**, from DCS/Ops. & Intel., Hq. USAFE, Ramstein AB, Germany, to Vice Cmdr., Sixteenth Air Force, USAFE, Torrejon AB, Spain, replacing M/G (L/G selectee) William R. Nelson . . . **B/G (M/G selectee) Harry Falls, Jr.**, from Cmdr., 86th TFW, Hq. USAFE, Ramstein AB, Germany, to DCS/Ops. & Intel., Hq. USAFE, Ramstein AB, Germany, replacing M/G Robert W. Clement.

B/G (M/G selectee) Lawrence D. Garrison, from DCS/Log., Hq. ATC, Randolph AFB, Tex., to Dir., Maint. & Supply, DCS/L&E, Hq. USAF, Washington, D. C., replacing M/G Waymond C. Nutt . . . **M/G (L/G selectee) Philip C. Gast**, from Ass't. for Readiness, Hq. TAC, Langley AFB, Va., to Vice Cmdr., Hq. TAC, Langley AFB, Va., replacing L/G (General selectee) Robert C. Mathis . . . **B/G William H. Greendyke**, from Cmdr., Malcolm Grow USAF Med. Center, MAC, Andrews AFB, Md., to Surgeon, Hq. SAC, Offutt AFB, Neb., replacing M/G Max B. Bralliar . . . **L/G (General selectee) Robert C. Mathis**, from Vice Cmdr., Hq. TAC, Langley AFB, Va., to Vice Chief of Staff, Hq. USAF, Washington, D. C., replacing retiring Gen. James A. Hill . . . **M/G (L/G selectee) William R. Nelson**, from Vice Cmdr., Sixteenth Air Force, USAFE, Torrejon AB, Spain, to Cmdr., Twelfth Air Force, TAC, Bergstrom AFB, Tex., replacing L/G James V. Hartinger.

SENIOR ENLISTED ADVISOR CHANGES: CMSgt. Charles P. Zimkas, Jr., from Administrative Sup't., Hq. ADCOM, Peterson AFB, Colo., to SEA, Hq. NORAD, Peterson AFB, Colo., replacing retiring CMSgt. Wesley H. Skinner. ■

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AFA News

By Vic Powell, AFA AFFAIRS EDITOR

AFA National Director J. Gilbert Nettleton, Jr., second from left, received a Medal of Merit Award at a recent meeting of the Iron Gate Chapter in New York City's "21" Club. Gen. W. L. Creech, Commander, Tactical Air Command, was the featured speaker. Tallmadge L. Boyd, Iron Gate Treasurer, is at the far left, and Richard V. Cook, Vice President, Lockheed Corp., is on the right.

Bryan Allen, center, who piloted the Gossamer series of man-powered aircraft to international fame, was the speaker at a recent dinner meeting of the Galaxy Chapter in Dover, Del. He showed slides and film of his flight across the English Channel in the Gossamer Albatross. *Galaxy Chapter President Joseph H. Allen, no relation to Bryan, left, and Delaware AFA State President Jack Strickland, right, helped arrange a tour of Dover AFB and a C-5 simulator for the man-power pilot.*

The Fresno, Calif., Chapter recently sponsored the Eighth Gathering of Warbirds at the Madera, Calif., Municipal Airport. Fifty-five aircraft of World War II and the Korean War were displayed and flown. In the photo, Fresno Chapter President Melvin Kilner is on the left. Korean War ace Robert Love, center, served as aircrew briefing officer and air safety coordinator. James H. Estep, right, was general chairman. Mr. Kilner reports that this year's gathering will be at the same location on August 16–17.

US Sen. Dale Bumpers (D-Ark.), center, was the keynote speaker at a recent Awards Dinner of the David D. Terry Chapter at Little Rock AFB. Others, from left, include William Demit, Chapter Vice President; Ms. Bobbie McCracken, Chapter President; James Canfield, Chapter Secretary; and Alexander Harris, AFA National Director.

chapter and state photo gallery

Colorado AFA members and guests were briefed on the mission of the Strategic Air Command during a recent miniconvention of the State organization. From left to right are Otis Moore, Vice President for State Programs; Jim Taylor, National Vice President, Rocky Mountain Region; Lt. Gen. Lloyd B. Leavitt, Vice Commander in Chief, SAC; Maj. Gen. William B. Maxson, Commander, Lowry Technical Training Center; and Steve Brantley, President, Colorado AFA.

AFA National President Vic Kregel, left, presented the Medal of Merit to Missouri AFA State President Stuart Popp at the fifth annual joint banquet of the Spirit of St. Louis and the Scott Memorial Chapters.

The Indiana State AFA recently presented a flag to the new Color Guard of the Indiana Wing, Civil Air Patrol. Indiana AFA State President Roy Whitton, right, learning of the unit's need for equipment, presented the colors to CAP Capt. Davy Crockett, Indiana Wing public affairs officer, as part of AFA's Pearl Harbor Observance on December 7.

COMING EVENTS

AFA Board of Directors Meeting, March 1, Fort Walton Beach, Fla. . . . **AFA Midwest Symposium,** "Time for Decision: Crises of the 1980s," March 1, O'Hare Inn, Park Ridge, Ill. . . . **Iron Gate Chapter's 17th National Air Force Salute,** March 22, Sheraton Center, New York, N. Y. . . . **Fifth Annual Arizona AFA Ball,** April 12, Arizona Biltmore, Phoenix, Ariz. . . . **Tennessee State AFA Convention,** April 18–19, Alcoa, Tenn. . . . **South Carolina State AFA Convention,** May 3, Sumter, S. C. . . . **Connecticut State AFA Convention,** May 10, Windsor Locks, Conn. . . . **Washington State AFA Convention,** May 16–17, Tacoma, Wash. . . . **California State AFA Convention,** May 16–18, Merced, Calif. . . . **AFA Golf and Tennis Tournaments,** May 23, The Broadmoor, Colorado Springs, Colo. . . . **AFA Nominating Committee and Board of Directors Meetings,** May 24, The Broadmoor, Colorado Springs, Colo. . . . **Twenty-first Annual Dinner Honoring the Air Force Academy's Outstanding Squadron,** May 24, The Broadmoor's International Center, Colorado Springs, Colo. . . . **Ohio State AFA Convention,** May 31, Dayton, Ohio. . . . **Pennsylvania State AFA Convention,** June 6–8, State College, Pa. . . . **New York State AFA Convention,** June 13–15, Rome, N. Y. . . . **Oklahoma State AFA Convention,** June 20–21, Tinker AFB, Okla.

Chief Master Sergeant of the Air Force James M. McCoy was one of several speakers at the recent Retiree Symposium sponsored by San Antonio's Alamo Chapter. The one-day event was attended by 1,500 people in the city's convention center. Chaired by Lt. Col. Kaye H. Biggar, this first-of-its-kind symposium was made possible by volunteer efforts of Chapter members and other participating organizations.

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.

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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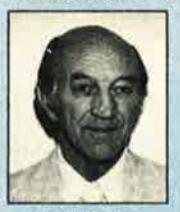

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AFA News photo gallery

Brig. Gen. Walter C. Schrupp, Commander, 40th Air Division, Wurtsmith AFB, Mich., right, addressed a recent Huron Chapter dinner. From left to right are Col. Jesse S. Hocker, Commander, 379th Bomb Wing, Wurtsmith AFB; Mrs. Hocker; Mrs. Cornelius; Maurice Cornelius, Huron Chapter President; and General and Mrs. Schrupp.

A report on AFA's national symposium, "New Defense Horizons," held recently in Los Angeles, was given by Edward M. Dougherty, President of Aerospace Research Organization, at a dinner meeting of the H. H. Arnold Chapter at Arnold AFS, Tenn. From left to right are Robert Boyles, President of the H. H. Arnold Chapter; Dan Callahan, Chairman of the AFA Board of Directors; Mr. Dougherty; and Gilbert Smith, President of the Middle Tennessee Chapter, Nashville.

Mrs. George S. Brown, widow of former JCS Chairman Gen. George S. Brown, was recently presented a deed for one square foot of Pikes Peak. Tom Shoop, left, President of the Colorado Springs Chapter, made the presentation. Former National Board Chairman George Douglas, right, presented Mrs. Brown an AFA Certificate of Appreciation.

AFA's national Outstanding Small Chapter award was presented to Dorothy Sadler, past President of the Air Force Mothers Chapter, Pittsburgh, Pa., at a recent dinner meeting of the western Pennsylvania Chapters. Chapter President Mary Coyne looks on as Vic Powell, Associate Executive Director for Field Operations, makes the presentation.

ON TA

The Boeing Cruise Missile scores wit

On November 29, 1979, the U.S. Air Force launched the Boeing-developed Air Launched Cruise Missile from a B-52 over the Pacific Ocean.

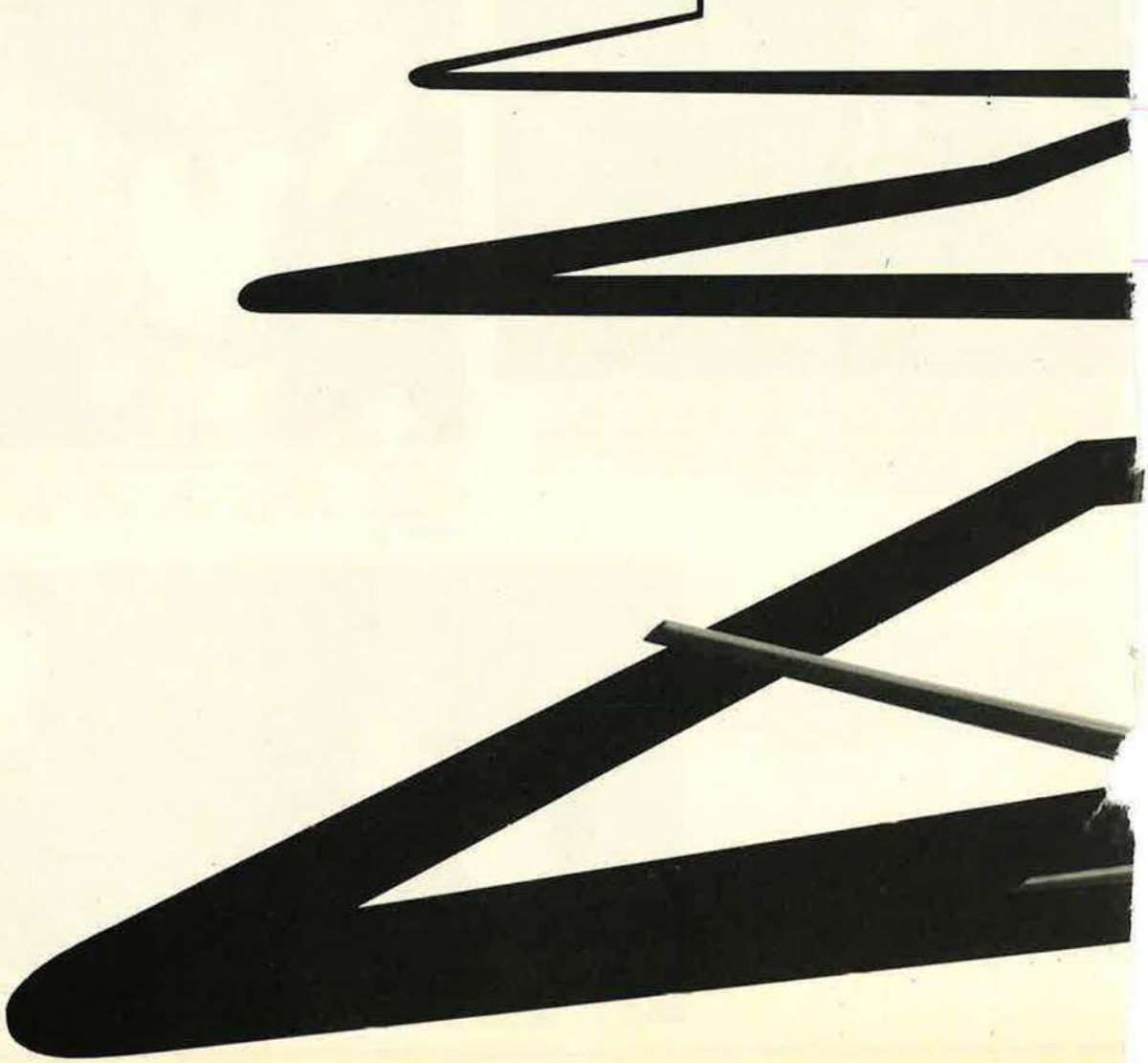
The missile performed successfully, sweeping over California and Nevada to the Utah Test and Training Range.

This flight was the first time a simulated attack had been made on a continent from over water.

There was something else special about this flight. It was flown with a cast aluminum missile.

A major feat? You bet.

This use of cast aluminum technology replaced an original fabrication process involving many time-consuming steps of hand-machining, welding and



RGET.

new cost-cutting technology.

sembly.

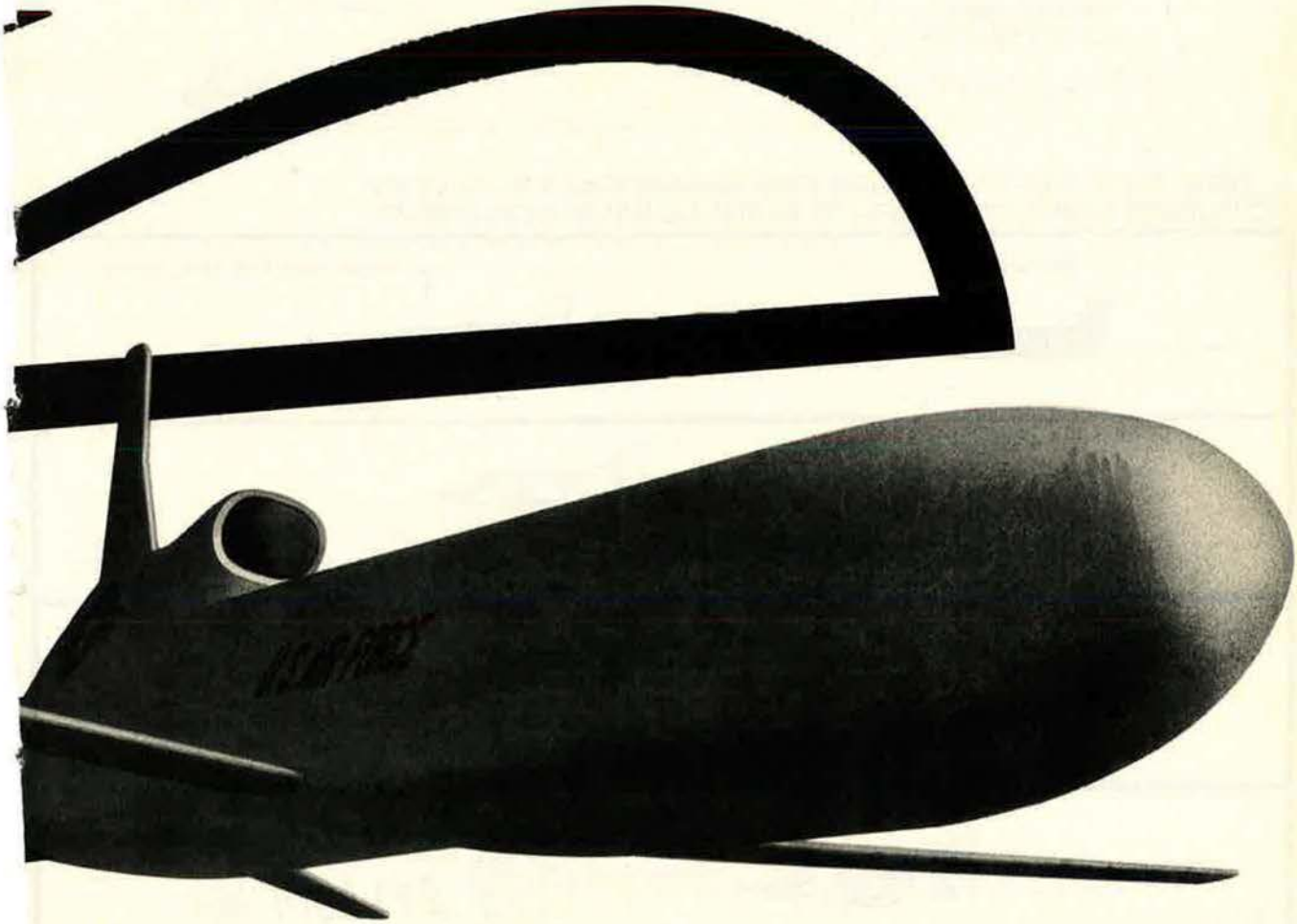
It was developed by Boeing gineers, working with experts in e aluminum industry and the Air rce's Aeronautical Systems ision.

The result: a substantial savings in man-hours which could save millions of dollars in manufacturing costs.

Since that flight, there have been two other successful over-water launches of the Boeing cast aluminum missiles. Proving without a doubt that all this can be accomplished without altering the critical performance characteristics of the missile one iota.

In everyday language — better return for your tax dollar.

BOEING AEROSPACE COMPANY

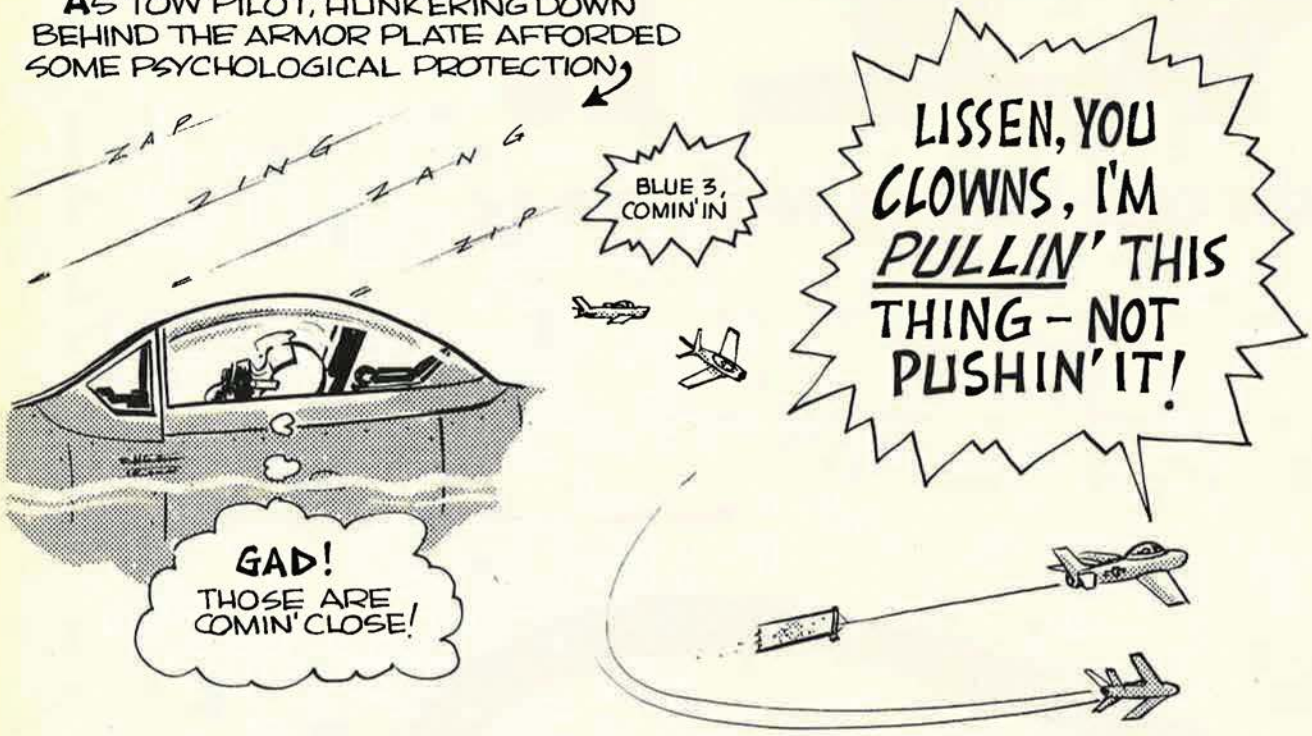


Bob Stevens'

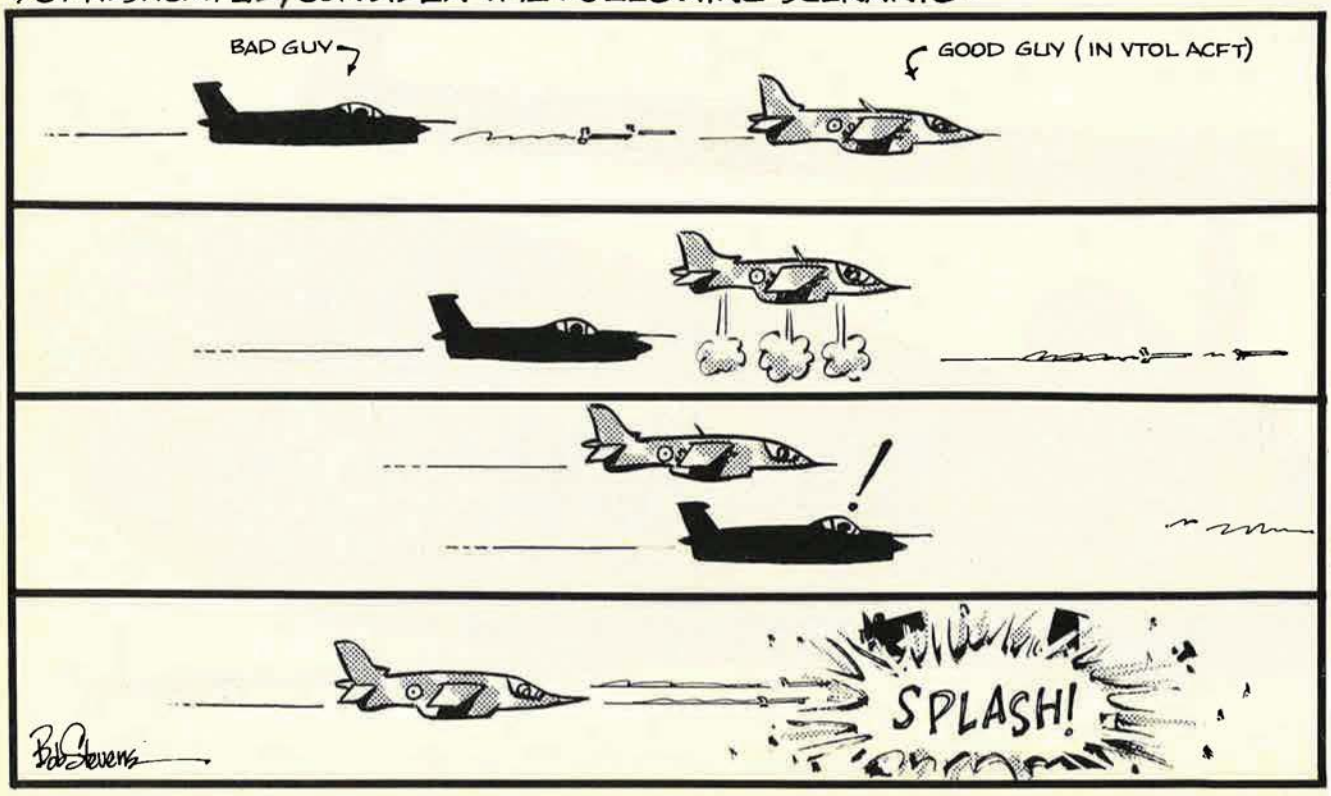
"There I was..."

IN THE DAYS OF YORE WE TOWED OUR OWN AERIAL GUNNERY TARGETS WITH TACTICAL AIRCRAFT FOR OUR SQUADRON SHOOTOUTS... IT WAS A HAIRY JOB NOT MADE ANY EASIER BY PRIMITIVE TOW GEAR. YOU BECAME A TOW PILOT BY DRAWING THE SHORT STRAW.

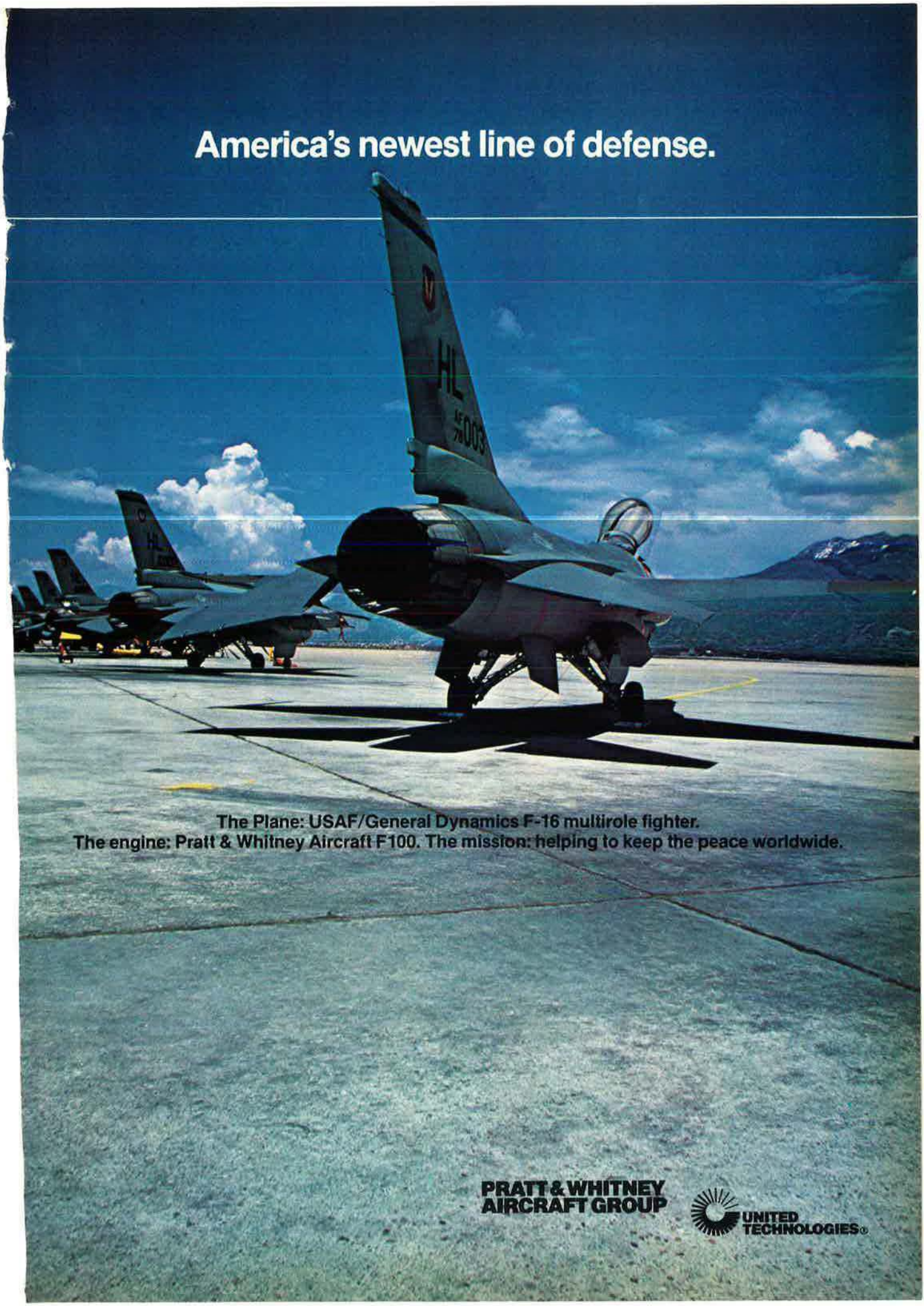
AS TOW PILOT, HUNKERING DOWN BEHIND THE ARMOR PLATE AFFORDED SOME PSYCHOLOGICAL PROTECTION,



NOW THAT AIR-TO-AIR WEAPONS and AIRCRAFT ARE MORE SOPHISTICATED, CONSIDER THE FOLLOWING SCENARIO:



America's newest line of defense.



The Plane: USAF/General Dynamics F-16 multirole fighter.
The engine: Pratt & Whitney Aircraft F100. The mission: helping to keep the peace worldwide.

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The F-15 Eagle.
Consider the alternative.

Compare the McDonnell Douglas F-15 to any fighter in the air or on the drawing board.

Compare the F-15's incredible firepower: Sparrow missiles, Sidewinder missiles, high-firing-rate cannon, and 15,000 pounds of air-to-surface ordnance. Compare its Mach 2.5 speed, its rate of climb, its unprecedented maneuverability.

Match the Eagle's advanced electronic search, guidance and tracking systems against those of the top competitors. Consider its combat, reliability and maintainability record.

What you'll find is precisely what Israel, Japan, Saudi Arabia and the U.S. Air Force discovered: Nothing outflies, outfights or outperforms the Eagle. Anything else is second best, and that's no alternative at all.

There is none.

The F-15 Eagle
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