MARCH 1979/$3

AIR FORCE

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MAGAZINE

СОВЕТСКИЙ АВИАЦИОННО-КОСМИЧЕСКИЙ АЛЬМАНАХ 1979*

*** SOVIET AEROSPACE ALMANAC 1979**

een

Twenty-six years before Robert Goddard aunched his famous rocket, we were developing space technology.

When the first liquid-fueled ket made its 180-foot flight in 6, General Electric science and nology were already building a ndation for the exploration and ization of space.

It began in 1900 in GE oratories, the first industrial re-rch laboratories for pure re-rch. There, to make better light os, GE experimented with high uum technology, later critical materials and components that uld operate in the hostile space ironment.

New materials to meet challenges have been a major st of General Electric research e the company was founded in 3. GE used its long experience igh-temperature metallurgy to elop metal and ablative nose es which could survive the al heat of re-entry, for example. We even invented the synthetic materials used in the helmets of our astronauts and for the soles of their boots.

We pioneered in communications and electronics, too, inventing the magnetron tube in 1917, the radio altimeter in 1928, and a procession of other developments—image transmission, control systems, sensors, data processing, checkout systems, simulation systems, and command guidance, to mention a few.

Or, take propulsion. GE was working all through the 1920's to develop advanced technology that led to America's first jet aircraft engine. In the 1950's, GE designed, built and tested a series of rocket engines which led to the development of the Atlas and Titan launch vehicles.

This is the depth which has created today's long-lived GE-built Nimbus and Landsat earth observation systems, and fostered GE satellite communications systems, civil and military. This is the diversity which has made essential GE contributions to Viking, Pioneer, Mariner, Skylab, Voyager, Apollo and a host of other programs from Vanguard to the Space Shuttle.

Decades of technological innovation in all disciplines make General Electric unique among aerospace companies. To every space program we're involved in, we bring the resources of generations of advanced technology, plus the capabilities of more than 15,000 GE scientists and engineers still pioneering in more than 100 laboratories. Isn't that the kind of commitment you want on your next space program?

162-88

Space technology leadership—by tradition

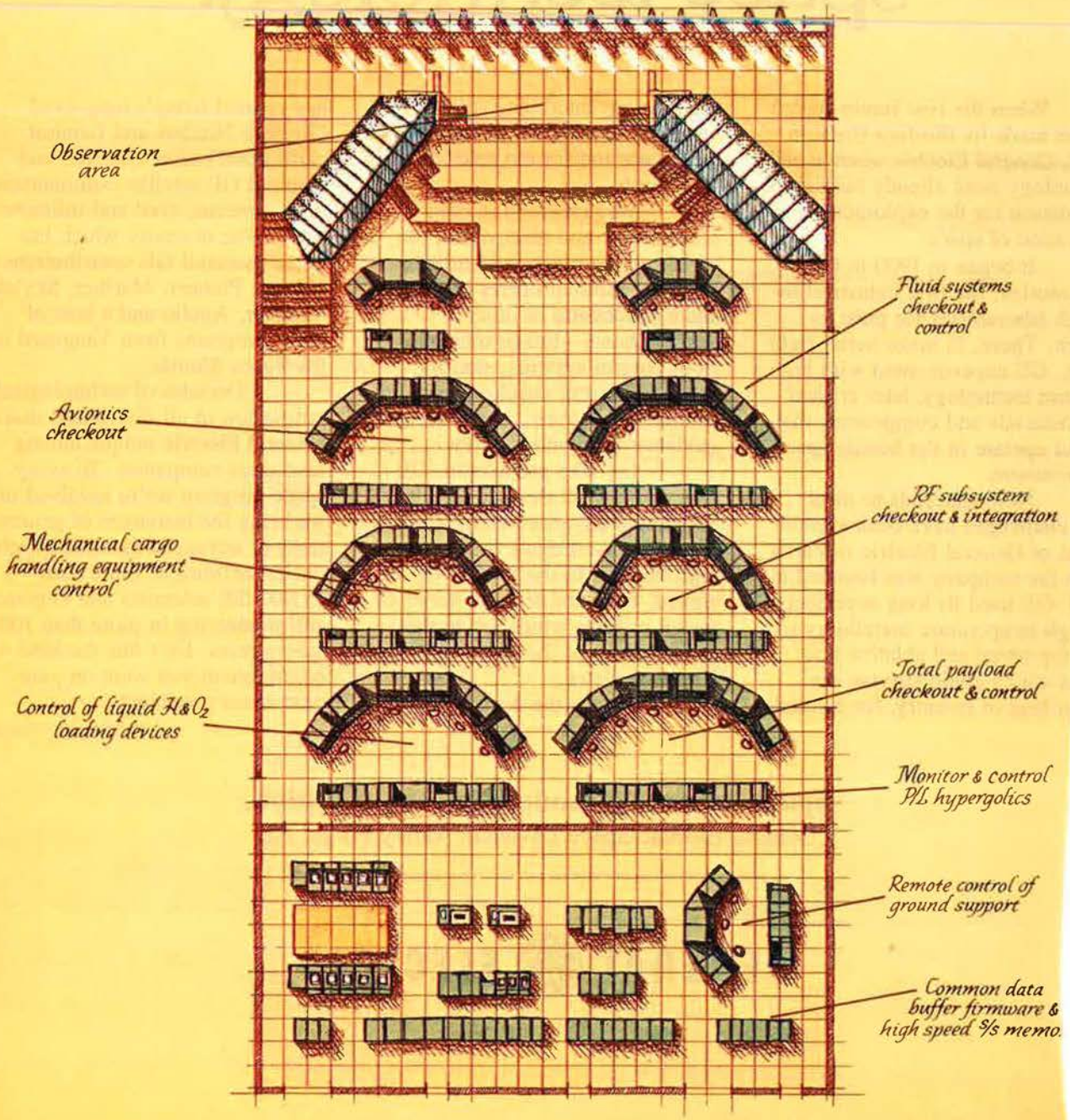
General Electric Space Division, Valley Forge, Pa.

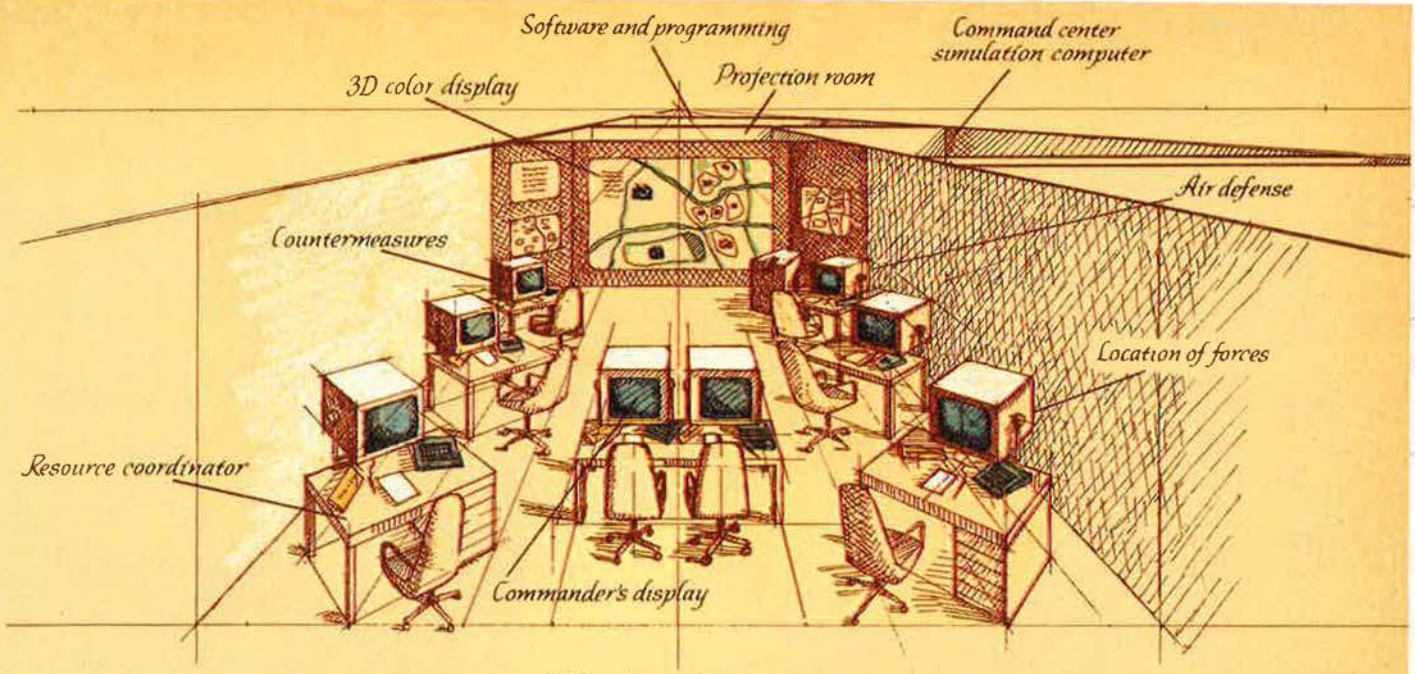
GENERAL ELECTRIC

What provides an edge for critical command decisions?

Knowing the right C^3 languages

Space Shuttle Launch Control (CCMS)





C³ Simulation Laboratory

The functions of command, control and communications have not changed since the battle of Thermopylae. The commander must still assess the situation, manage resources, plan a defense and execute it.

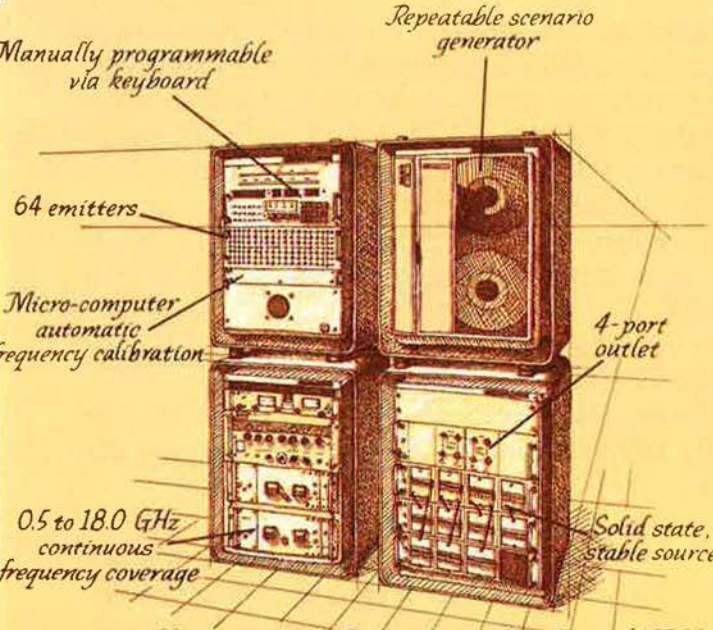
Today, however, with sophisticated weapons, increased geographic coverage and limited time to respond, the commander's need for timely intelligence is more vital than ever. While automation is required, what to automate and how is anything but obvious. Lack of knowledge about what is achievable or affordable makes even a definition of requirements difficult.

Over the years we have engaged in developing solutions to some very complex command and control problems—launch checkout and systems monitoring for Space Shuttle, Titan, and Pershing; the Viking Mars landing and operations missions; even hydroelectric control and management systems.

Based on this experience, we built a command, control and communications laboratory to evaluate requirements, concepts and technology in multiconfigurations of information handling, data processing and graphic displays. Designed to meet stringent military security requirements, it is capable of proving both software concepts and systems hardware in numerous operating command-center configurations.

Simultaneously, for various elements of the Defense Department, we are developing automated communications processes, electromagnetic intercept receivers, a variety of electronic countermeasure systems, multiple satellite controls, operational application of intelligence systems, and tactical communications analysis.

This experience in command, control and communications analysis, simulation and systems has prepared Martin Marietta Aerospace to support this vital segment of our national defense.



Multipurpose Electromagnetic Environment Simulator (MEES II)

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ECM

Electronic Countermeasures (ECM). Makes aircraft virtually invisible to enemy radar by using latest technology to disrupt signals and deceive operators. Essential for survival in today's dense threat environment and tomorrow's even more hostile combat conditions.

For U.S. Air Force F-15 Eagle, Northrop produces AN/ALQ-135 Internal Countermeasures Set (ICS), most advanced system yet developed for tactical aircraft. Seventy-five systems delivered to date—all on time, on cost, performance as promised.

For U.S. Air Force B-52 strategic bomber, Northrop produces AN/ALQ-155 (V) ECM power management system. System upgrades defensive avionics of B-52 to maintain bomber's effectiveness into 1980s.

Northrop developed ECM jamming transmitter for prototype B-1 strategic bomber. Also developed MULTEWS ECM system for U.S. Army helicopters.

Northrop teamed with Sanders Associates to compete for contract to produce Airborne Self Protection Jammer (ASPJ), advanced internal ECM system for new generation U.S. Navy and Air Force fighters.

NORTHROP

Making advanced technology work.

AIR FORCE MAGAZINE
PUBLISHED BY THE AIR FORCE ASSOCIATION

MARCH 1979
VOLUME 62, NUMBER 3

This Month

ABOUT THE COVER

This copyrighted photo of a Soviet MiG-23 was taken by Finland's Rainer Wiceen during a fly-in last summer. The aircraft epitomizes the USSR's formidable aerospace strength, growing at an alarming rate. AIR FORCE Magazine's fifth annual "Soviet Aerospace Almanac" begins on p. 39.

Departments

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AN EDITORIAL

The Valley of Shadow

IN contrast to President Carter's generally upbeat State of the Union message, Defense Secretary Harold Brown and JCS Chairman Gen. David Jones struck a somber note in their subsequent reports to the Congress on the state of national security. We wish the President had reflected in his message their evaluations of dangers inherent in the decline of US military power relative to that of the USSR. The media gave only brief and in some cases inaccurate notice to warnings of the Secretary and the Chairman.

One aspect of Secretary Brown's report deserves further comment, which we'll come to in a moment.

As readers will discover, this year's Soviet Aerospace Almanac is somewhat different from its predecessors. There is considerably more discussion of Soviet military doctrine, strategy, and negotiating goals; their relation to Soviet foreign policy; and their divergence from those values inherent in American counterparts. Why the change?

For nearly a decade American understanding of the Soviet Union—particularly in military affairs—has been heavily influenced by men who brushed aside a thousand years of Russian history in the belief that technology and industrialization had brought to the Soviets a new set of goals and values essentially similar to those of the industrialized West. The Russian cultural heritage—from Byzantium, from the East, and from Slavic mysticism—is not the same as that of Western civilization. Soviet leaders do not look at either domestic or foreign affairs through Western eyes, a fact that can be ignored only at our peril. It has been ignored or slighted for too long.

In Secretary Brown's report there is none of the cultural mirror-imaging that led Robert McNamara, his minions, heirs, and a good many academicians, to believe that the Soviets would react to a stimulus such as US unilateral arms reduction or restraint as would Westerners, especially Americans. Dr. Brown noted, for example, that "as our defense budgets have gone down, their defense budgets have increased again. . . . Nowhere is there any historical evidence that if we are restrained, the Soviets will reciprocate—except where specific and verifiable arms-control agreements are negotiated."

Encouraging, too, was General Jones's blunt warning that "a decade or more of slips, reductions, and cancellations has retarded US modernization appreciably, and our ability to accelerate production enough in the short term to keep pace in the event of an unrestrained competition is questionable."

In these pages is a good example of what General Jones may have had in mind. Peter Hughes, in his artic
beginning on page 48, demonstrates convincingly tha
despite SALT I and the probable terms of SALT II, th
Soviets soon will have the ability to knock out nine
percent of our silo-based ICBMs with less than half
their MIRVed missiles. The impact of that developme
on US resolve—or ability—to respond either to Sovi
blackmail or military initiatives is clear. The antidote
to make US ICBMs less vulnerable.

To continue the example, on page 40, Edgar Ulsam
reports Air Force Chief of Staff Gen. Lew Allen's su
mary of the MX missile program and its proposed mu
ple protective shelter deployment that would frustra
any Soviet hope of eliminating the bulk of US ICBMs ir
surprise first strike. The catch here is that the first te
missiles and 200 shelters couldn't be operational f
seven years, and the full complement of missiles ar
shelters for another five years. That period of vulnerabi
ity is euphemistically referred to by defense planners a
a "trough." To us, it looks more like a deep an
shadowed valley—the most perilous that ever has cor
fronted this nation.

We don't particularly like Secretary Brown's prescrip
tion for an expedient deterrent bridge over the valley
"launch under attack," or level catastrophic damage o
"the Soviet urban-industrial base," presumably wit
submarine-launched missiles. Morality aside, the la
ter's appeal is diminished by the fact that the Soviet
have an extensive civil defense program and we don'
Also, after a Soviet first strike, they still would have
large reserve of ICBMs to demolish our urban-industria
base and kill 100,000,000 or more Americans. Othe
immediate alternatives, however, are hard to find.

We heartily agree with the Secretary's belief that ther
is no "immediate prospect of ending the military compe
tition between the Soviet Union and the United States.
Long-discounted Soviet values, goals, and method
rule that out. His realistic assessment of the opponer
we're up against is a step toward setting the balanc
right.

Reading further in the Secretary's report to the Cor
gress, it isn't quite clear what kinds of forces, strategies
and tactics this country is planning against. Nor how th
proposed US defense budget which, according to D
Brown, may be from twenty-five to forty-five percer
smaller than that of the USSR, will lead us safely out
the valley of shadow that we've got ourselves into.

We'd be grateful if the President, himself, would ex
plain it to his 220,000,000 fellow citizens whose future i
at stake.

—JOHN L. FRISBEE, EDITO

We guide the new guiding star.

NAVSTAR.

"General Dynamics' role in the Navstar program was to design, build and operate the command/control station, the monitor stations and the receiver equipment. In doing so, we created the heart of the system. Using a unique inverted range test concept, we proved it will work."

(G. F. Breitwieser, Navstar GPS Director)

General Dynamics' Electronics Division is prime contractor to the U.S. Air Force for both the Control and User Programs of the Navstar Global Positioning System during concept validation. General Dynamics developed the command/control system that tracks the satellites in their near-circular orbit, 10,898 nautical miles above mean sea level, and periodically updates each with precise system time and its exact position.

Governed by synchronized rubidium clocks accurate to within nanoseconds, the satellites beam a constant stream of coded time and orbital position information to earth. Any suitably equipped GPS user can receive specific navigational data: His position within a few meters. Speed within a tenth of a knot. Time within a fraction of a second. In any weather, 24 hours a day, anywhere on earth.

The satellites now being tested for the space segment of Navstar were put into orbit by General Dynamics' Atlas F launch vehicle, a continuing high-technology performer.

If this kind of advanced systems engineering interests you, write:
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Phalanx, Standard Missile, Stinger, Sparrow AIM-7F, DIVADS, Viper

GENERAL DYNAMICS


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ACT Ø1/182

WITHOUT SENTRY WE ONLY GET PART OF THE BIG PICTURE.

The air defense of the United States has long relied on the surveillance capability of ground-based radar.

But since ground-based radars cannot detect low-flying aircraft, they've always had a blind spot.

That's one of the reasons why "Sentry," the USAF's airborne warning and control system, was developed.

Sentry sees over 250 miles beyond the horizon and can spot low flying aircraft over any type of terrain. It provides instantaneous television "Big Picture" information to ground control centers.

And in case of attack, Sentry becomes a highly mobile and survivable command and control center. Able to direct friendly fighters and coordinate operations of our defense forces.

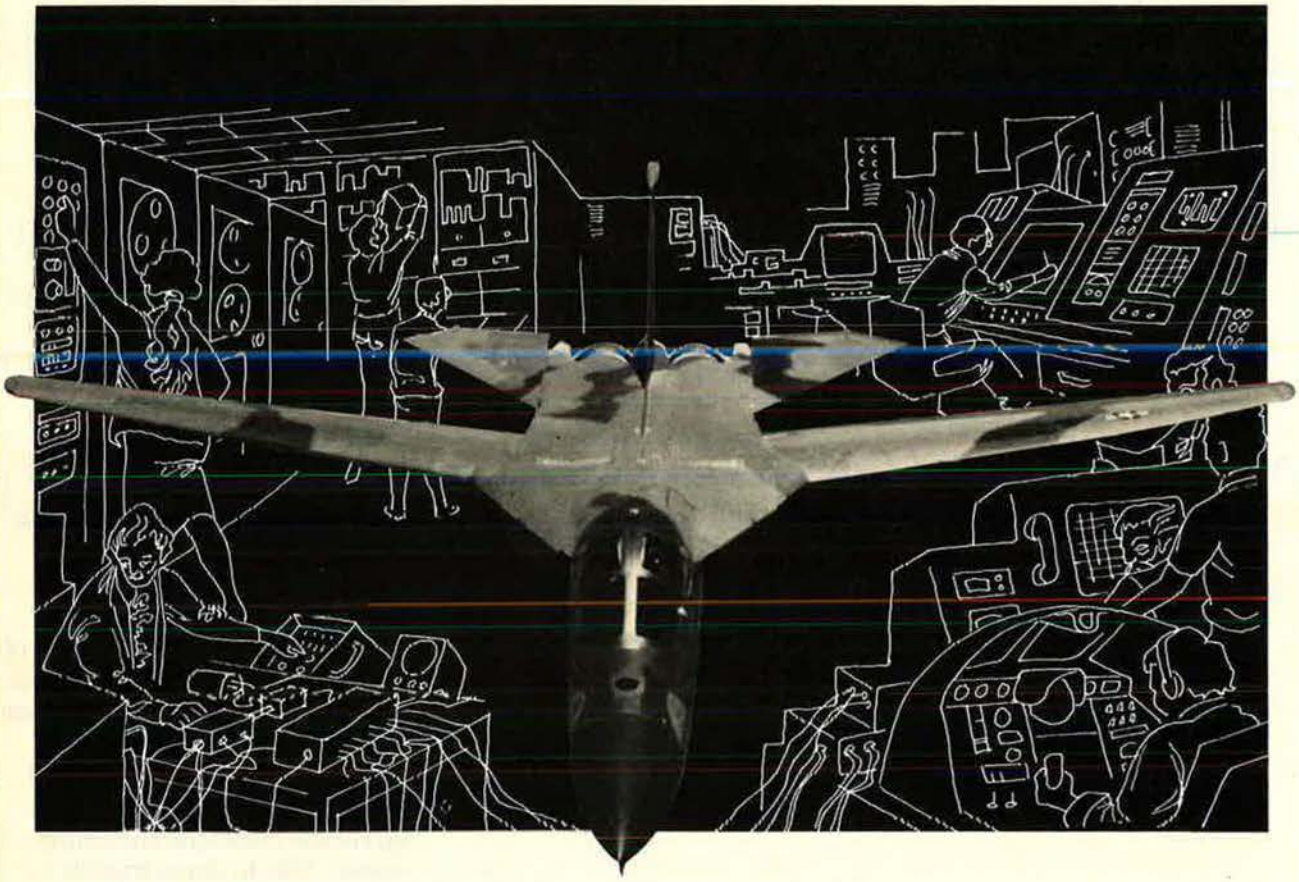
Sentry has already proven itself in over 5000 hours of inflight testing, including several Air Force tactical exercises. Fourteen Sentry systems will be delivered to the Tactical Air Command by the end of 1978, which will greatly improve our air defense system.

The Air Force sees a need for a total of 34 Sentry systems.

And when they're all in service, we'll have a better picture of what's going on than ever before.

BOEING

"DAIS" PUTS PILOTS ON TOP OF TECHNOLOGY



More and more military aircraft use complex computer architectures to handle the mass of information that aids aircrews in navigation, EW, fire control, and weapon delivery. In future, flight control and engine performance will also be computer-assisted.

DAIS (for Digital Avionics Information System) is the USAF program to demonstrate low-cost architectures, software, and support systems to meet these vital requirements in the 80s. TRW supports DAIS with sophisticated simulation technology, support software, and avionics integration and analysis.

We're also helping Logistics Command to apply these technologies in developing flight software support systems. The next step is to provide using commands with mission-to-mission reprogramming capability. We're hard at work on that, too.

For more information, contact Richard A. Maher, TRW Systems, One Space Park 55/2586, Redondo Beach, CA 90278. Or (213) 536-3238.

DIGITAL AVIONICS TECHNOLOGY

from a company called **TRW**

Airmail

ıe Ever-Widening Gap

enjoyed reading your editorial, The Great Imbalancing Act," in e January '79 issue. The concept ılating commitments and military ɔwer is intriguing, yet, after conderation, so obvious. . . .

Your comparison of Soviet deıse expenditures vs. NATO's apırently contingent agreement, and ɔviet military expansion vs. US efense spending levels has conderable merit. I suggest, however, at monetary commitments do not ınd alone as an all-inclusive easure of what action is being ken to bolster military power.

Certainly not a new concept, but ıe that is growing in popularity, the cliché of "doing more and ore for less and less." Agreed, ken to the naïve extreme, such a ıilosophy can lead to ultimate diaster. We have, however, not yet chieved optimum utilization of vailable resources. A growing emhasis and much effort is being irected toward that end.

We are concerned with increasıg productivity without commenurate increases in funding and esource utilization. With people, nlike machinery, it is difficult to ieasure effectiveness and efficieny, but changes can be measured gainst previously demonstrated riteria.

Without increasing defense spendıg to deter the effects of inflation, ɔ prepare and maintain an alert tate of readiness, and to stay ɔreast of technological advanceents, the gap between commitents and military power will widen. ut, without individual commitment nd united dedication, powerful naonal pride and allegiance, and ontinued impetus toward increased roductivity through efficient reɔurce utilization, the gap will connue to broaden regardless of dediated dollar allotments.

Lt. Ronald E. Brownell
Hill AFB, Utah

iG-23s in Cuba

am puzzled by the bewilderment Edgar Ulsamer over the MiGs in uba incident ("*In Focus . . .*," *January '79*). The evidence indicates a Russian test of American willingness to blank out unfavorable news. If the Senate ratifies a SALT treaty in the face of blatant Russian violation of earlier agreements, the Russian assessment can only be that we are pursuing "Peace at any price," or "Peace at a bargain price," or "Peace for our time"—a green light to Soviet ambitions.

It is more disturbing that the only letter relating to retention that did not blame pay/OERs/the up-or-out system came from the United Kingdom. Have we Americans lost sight of such values as commitment, patriotism, and loyalty that we only discuss retention in terms of benefits, working conditions, and status? We often blame Congress for shortsightedness, miserly defense appropriations, etc., but how many of us, not even asked to pledge our "lives, fortunes, and sacred honor," pass up the opportunity to accept lower pay than we might receive and put up with a few mindless or meaningless extra details? Whether this reflects a loss of spiritual values (as Solzhenitsyn claims) or simply that we don't see the issue clearly in terms of personal responsibility, the results on a personal level are consistent with national priorities.

Perhaps if American culture really has lost its vitality, the world will spend a generation or two under Soviet domination to relearn the value, and price, of liberty.

Capt. Thomas Johnson
Columbus, Ohio

A Sense of Belonging

Gen. T. R. Milton's "Impersonality Curtails Unit Pride," in the November '78 issue, and David A. Anderton's "POMO and POST: Keystones of TAC's Readiness," in January '79, have pinpointed an area in the Air Force that is vital and yet has been ignored for a number of years —individual pride and a feeling of being an important member of "my outfit."

Any military unit must have discipline, and this discipline comes easiest when a man feels that he belongs and will be held responsible by his teammates fully as much as by the first sergeant, who represents the commander and is backed by that commander. . . .

Prior to retiring, I've climbed into a plane and found the preflight a paper operation, not a full runup. The plane did not belong to a certain crew chief; it was just another plane serviced on the line.

I can remember when I had "my fighter" and "my crew," and they had "their pilot." We can't go back to one pilot for one plane, but we can come close. I've had an armorer sit up a good part of the night because one of "his cannons" jammed when I was working over a train; a crew chief, on his day off, ride my wing out to the end of the runway and sit there until I came back a few hours later because his plane and pilot were flying.

On the other side of the coin, they let me know I'd better start hitting the very end of the strip on landing as they had to bet on me against the other pilots. . . . I was their pilot when I flew, not just the unit commander. They knew I'd back them against anyone, and, just as important, punish equally anyone of them who broke a regulation without darn good cause.

Make the airmen feel they belong, are being backed, and have officers they are proud of, and pay and working hours will become less important. Do that and we'll have the Air Force we want and need.

Lt. Col. Bert S. Sanborn,
USAF (Ret.)
Guilford, Maine

Easy Readin'

For some time now I have enjoyed Gen. T. R. Milton's articles in AIR FORCE Magazine. I like the writing style; it's easy to read, and that's important in pieces that are often of a technical nature.

"Reflections From a Red Flag" in the January '79 issue was great! Let's have more of the likes of that!

Lt. Col. George W. Weber,
USAFR (Ret.)
Madison, Wis.

TAC Logistics

It was with a great deal of interest and pleasure that I read the January '79 issue of AIR FORCE Magazine. David A. Anderton's article on POMO and POST was a particularly gratifying and accurate treatment of two of our major logistics initiatives.

We in TAC Logistics have a story

Airmail

to tell, and magazines such as yours help us in that effort. My compliments to your staff for producing such a fine magazine. The POMO and POST article was timely, and yet another example of the high-quality journalism we have come to expect from your magazine. . . .

Col. Albert G. Rogers
Ass't DCS/Logistics, TAC
Langley AFB, Va.

Same Old Soviet Outlook

Congressman Downey ["Airmail," December '78] is advised not to view the development of weapon systems without also considering the political and social system that creates them in the first place. The world outlook of the Soviet Union has remained constant during the post-1945 era. This means that as its strategic position improved, there were fewer military constraints on its foreign policy.

The Soviet Union retains "friendly" relations only with those parts of the world that they control. Foreign policy in general is pursued on the basis that an outside world exists that remains basically hostile to them. All issues that arise are viewed in the context of Soviet interests alone; and Moscow believes that other governments will follow a similar approach. Concessions, should they be forthcoming, are accepted without recompensation. Morality is that which serves the Communist struggle. In the Soviet Union, there are no contrasting approaches to foreign policy issues; either a certain line is approved or it is forbidden. Once a negotiation is entered into, moreover, an expedient end is not permitted. . . .

Soviet foreign and domestic policy since 1917 has been infused with the need to establish legitimacy. The government that emerged in 1917 was the product of a violent act committed by a very well-organized and motivated minority. No popular election was ever held upholding the practical results of the revolution or the social and political principles that the victors promulgated. The one universally acceptable vehicle to establish legitimacy has been nationalism and that the new order is the defender of the homeland against both internal and external enemies. This means the perpetuation of a crisis atmosphere and the need to retain the essential policy of the Soviet leadership. This constant state of fear and suspicion has the price of a feeling of insecurity that can never really be dissipated; and this insecurity can be the foundation for aggressive foreign policy behavior.

Until 1914, countries that engaged each other in peace and war still held common values and beliefs. Since World War I, however, belligerents in major war have pursued diametrically opposed social constructs; with the extreme example, perhaps, of this phenomena being manifested in the competition between the United States and the Soviet Union, as the community of real interests between the two remains indeed limited. Nationalism has thus assumed a universal quality.

The United States has never been able to adequately grasp the phenomena of the Soviet Union, let alone devise a coherent strategy on how to deal with Moscow. As a result, US relations with the USSR have been marked by periods of blithe euphoria at one time, followed by a period of deep dismay. We have never quite decided when was the right time for cooperation or competition.

Jeffrey R. Thomson
Los Angeles, Calif.

Retaining Competent People

After eleven years in retirement, I see the Air Force no closer to solving the same old OER and retention problems.

No single reason explains why competent people leave prematurely. The career-oriented can be recognized within their first two or three years of service, and the noncareer oriented usually outnumber them. . . . Career people either possess more frustration tolerance than noncareer people or feel more at home in the service, but most retention devices have tried to keep the people who left at the first opportunity, no matter what. Few sample surveys I saw asked career people to say how the Air Force could improve. Those questions were asked of the people who planned to leave. It appeared personnel planners felt career people would stay despite mismanagement, inconsistent career guidance, unfavorable work e vironments, or whatever. But ev the most loyal can be driven out.

Professional, or limited promoti status, pilots are not the answ The Army Air Corps and Na phased them out during Wo War II in favor of General Arnol officer first, pilot second conce Flying organizations must be le and pilots are the only source f their leaders. Other specializ units also need leaders, rated nonrated, who understand them.

The Army idea, "Every seco lieutenant a Chief of Staff, eve corporal a Master Sergeant," w paraphrased by Brig. Gen. Frank Lackland in 1940 when he told every man in the Regular servic was an instructor and a leader. H statement is no less true tod when we say, "Every second lie tenant a Chairman of the JCS."

Only one reason to eliminate nonpromotion on schedule hol water, *i.e.*, to make room for n people. But such eliminations c prive the Air Force of experien gained at great cost and have n improved efficiency or promotion A more effective way might be eliminate the disruptive manage who need twenty-four hours to g a day's work done (your ave age workaholic). Personnel Ma agement Training said this begi ning in 1947–48, but this and oth simple management principles hav yet to be implemented. Some thing can never be changed lest we b come a mob rather than a milita force, but we can be concerned f our people and manage them b proven methods and consiste principles.

Competent career people will sta if we: Assign them in their best ski areas; give them responsibility an authority to carry it out; provid training where needed; be co cerned about problems but do n oversupervise; establish and r spect commanders' prerogatives avoid combat-type work schedule in peacetime except during comba training exercises; publish direc tives and regulations only to im prove military efficiency or mak the service a better place to liv

Maj. Sam H. Andrew
USAF (Ret.)
Austin, Tex.

I couldn't agree more with Colon Verdi's letter titled "Keep Them i the Cockpit," in December '78.

U.S. Air Force sets another record in F100-powered F-15s.

w it's a sortie record.
ecently, the 36th Tactical Fighter Wing of the U.S.
Forces of Europe (USAFE) held a grueling three-day
sion capabilities exercise.
uring the exercise, the USAFE record was set when 71 F-15 fighters flew 322 separate sorties in a 24-hour period.

The men and women of the "Fighting 36th", the McDonnell Douglas F-15 Eagle, the Pratt & Whitney Aircraft F100 engine—ready to defend Western Europe.

PRATT & WHITNEY AIRCRAFT GROUP
Government Products Division
West Palm Beach, Florida 33402 U.S.A.

UNITED TECHNOLOGIES

The U.S. Air Force asked for uncommonly high performance

and they got it.

Selected by the U.S. Air Force, Teledyne Ryan's AN/APN-218 Common Strategic Doppler Navigation System brings major advances in performance and reliability to the high, vast regions flown by SAC's B-52 and KC-135 aircraft.

The newest in a long line of successful Doppler radar systems designed and delivered by Teledyne Ryan over the last twenty years, this doppler navigation system met or exceeded tough specifications such as nuclear hardness and superior performance over land and sea. The system's performance was verified during intensive testing by the Air Force.

A versatile antenna radome design and multiple electronic interface assures system commonality with a variety of aircraft types.

Built for the long haul, the Teledyne Ryan Common Strategic Doppler Navigation System will do all that is asked of it in the high, cold world that is SAC country.

TELEDYNE
RYAN ELECTRONICS

Airmail

As a highly qualified B-52 Instructor Pilot with more than 125 combat missions in SEA, I was mandatorily retired in August 1971 at age forty years and six months simply because I was a Reserve officer, commonly referred to as Christmas help. I could have remained another fifteen to twenty years helping train new B-52 pilots and upgrading aircraft commanders to IP status, or, as Colonel Verdi states, "flying many motors for MAC."

When I returned from SEA for the last time, I had sixteen months retainability before retirement. The one place the Air Force could have really gotten full utilization of my talents for those sixteen months was at Castle AFB, Calif., where conventional training was being conducted. Do you think the personnel types at SAC and at Air Force would have it that way? I was sent to a northern tier base to transition into a new model of the -52, and to pull alert. All this after a short ground school at Castle for the different airplane. . . . I could have gone to Castle PCS, gone to work immediately, and been productive. The same was hardly true of the northern base due to the time necessary to transition into the newer model -52. . . .

One solution to the problem of pilot retainability is to go back to the Aviation Cadet Program and not require a college degree. The young officer today wants more than just life in the cockpit, and well he should if he is to win promotions commensurate with his education. There are many young people out there who would like to fly, but disdain a college education in order to do so. . . . Those of us who were commissioned through the Aviation Cadet Program loved flying more than the others who were commissioned elsewhere. I am convinced that the Air Force could have a professional pilot corps in much the same manner that they have a professional medical corps of doctors. We don't ask doctors to become planners, maintenance officers, schedulers, etc.

I must also join Colonel Verdi in his opinion that all graduates of pilot training should be fighter pilots first. I started that way, and I wouldn't trade those experiences for anything.

Thomas C. Dorsey
Riverside, Calif.

Duty Outside of CONUS

The 495th Tactical Fighter Squadron is attempting to research the history of the unit outside the CONUS, specifically, in England during WW II. Although Air Force archives show no history outside the US, we have received some pictures and information through RAF units that establish the existence of a 495th Bomb Squadron, 844th Bomb Group, 99th Bomb Wing, Ninth Air Force, stationed at Stanstead, Essex, England, around 1942–44. The unit would have served with the 494th, 496th, and 497th Bomb Squadrons. The group moved to northern France after D-Day.

We would appreciate any evidence to back up our claim. Any official letters, documents, pictures, or any personal snapshots, unit patches, or letters that can positively establish the date/place of assignment in England would be of great help. Any person, friend, or relative who can help is asked to contact me.

Any information and materials received would be handled with the greatest care and returned to the owner or included in the squadron history upon request.

Capt. Harvey W. Lyter III
495th TFS (USAFE)
Box 5247
APO New York 09179

B-17 Down in Denmark

I am a master sergeant in the Royal Danish Air Force and my hobby is investigating air battles over Denmark in the period 1939–45. I have recorded more than 600 crashes in Denmark, but there is one of particular interest.

On October 9, 1943, the USAAF attacked Anklam, Marienburg, Gdynia, and Danzig. One of the aircraft that attacked Marienburg was B-17F 100-B042-30336 of the 385th Bomb Group. With its engines overheated, it landed eleven kilometers north of Varde, a small town in the western part of Denmark.

I do not know much about what happened to the crew. At least two crew members were trying to destroy the airplane when a Danish road inspector called to them. They probably believed him to be German and fired at him, then ran away.

Soon after—and before the Germans—the Danish police arrived. One of these was a member of the Danish underground, and he took several pictures of the plane. Later that night he tried to make contact with the crew, but failed. His group almost made contact with them several times, but each time they ran away.

One of the crew was lucky. The pilot, Glynden Darwin Bell, came in contact with a Danish farmer, who was able to connect him with the Danish underground. From Vejle he was transported to Copenhagen and from there to Sweden.

The aircraft was soon guarded by the German Wehrmacht, and on October 16 a German crew flew the plane to Esbjerg for refueling and from there to the German test center at Rechlin. The name of the German test pilot was Lerche.

I would like to learn more about this particular plane, and the whereabouts of pilot Bell.

OSG C. Petersen
W-OPS
Karup Air Base
7470 Karup J, Denmark

Information for Museum

The United States Eighth Army Air Force Memorial Museum at Fritton Country Park, Norfolk, England, is dedicated to the men, women, and machines based in East Anglia from 1942 to 1945. Home of the museum is at Fritton Lake. The lake and its surroundings are owned by the Right Honorable Lord Sommerleyton, who has been of great help by donating the museum building free of charge. Our exhibits include uniforms and flying suits, USAAF equipment, airplane wreckage recovered from the many crash sites in East Anglia, paintings and photographs, models, etc. We have been given an F-100 Supersabre by the US Air Force as a modern-day memorial to its World War II ancestors.

The museum is run as a spare-time project by our small group of members. All profit made from museum activities goes toward the purchase and upkeep of the exhibits.

Fritton Lake itself has its bit of Eighth AAF history. On August 8, 1945, two P-47 Thunderbolts of the 5th Emergency Rescue Squadron crashed into the lake, killing both pilots. Their bodies were recovered a few days later. In 1971, a team of divers recovered a propeller blade

Airmail

from one of the P-47s. The prop was in first-class condition, still painted black with its yellow tip. The propeller, along with much other recovered wreckage, is now in the museum.

We would be pleased to hear from any ex-Eighth AAF personnel about their experiences in East Anglia during their service there.

J. P. Flanagan, Curator
US 8th AAF Memorial Museum
20 Cranleigh Road
Grove Farm Estate
Pakefield, Lowestoft
Suffolk NR33 7EX, England

Ghost Fighters in the Sky

Perhaps some readers could be of assistance to me in a research project. I am a theorist and paraphysicist deeply into UFO and anomalous phenomena, and am presently researching the "foo fighters" of WW II and the Scandinavian (Norway, Sweden, and Denmark) "ghost rockets" of 1946–47.

I'd appreciate first-hand accounts of either of the above phenomena from anyone who has detailed knowledge of specific incidents. Photos also would be highly desirable, and can be returned to the owner after examination.

Other UFO and anomalous phenomena incidents are also desired. Identity of correspondents will be protected at all times.

My work is scientific, involving a fundamental change of classical logic and uses a subset of the Everett/Wheeler/Graham theory of the universal wave function—a fundamental reinterpretation of physics that is consistent with all known laboratory experiments.

Assistance would be very much appreciated.

Lt. Col. Thomas E. Bearden, USA (Ret.)
1902 Willis Rd., S. E.
Huntsville, Ala. 35801

Wanted:

Information, photos, slides, mission tapes, films, etc., relative to AC-47, AC-119, and AC-130 aircraft, for duplication, to be used in a research project.

K. T. Wilhite, Jr.
4620 Georgetown Ct., #1
Indianapolis, Ind. 46222

UNIT REUNIONS

Association of Survivors
WW II Marine/Navy Paratroopers, June 22–24, Marines' Memorial Club, San Francisco, Calif. **Contact:** Association of Survivors, c/o Col. D. E. Severance, P. O. Box 1972, LaJolla, Calif. 92038.

Reunion in Europe
Galaxy Tours handling arrangements for "Reunion in Europe—Operation Friendly Invasion," marking 35th anniversary of V-E Day. Festivities in UK sponsored by British Government for US and Canadian vets of WW II, and visit to anniversary celebrations of D-Day on the Normandy beaches. **Contact:** Galaxy Tours, P. O. Box 45, King of Prussia, Pa. 19406.

USAF Academy Class '59
June 28–July 1, Colorado Springs, Colo. Also anyone who served on Academy staff between 1955–59 invited. **Contact:** Lt. Col. Joe DeSantis, 8905 Burbank Rd., Annandale, Va. 22003.

4th Strategic Support Sqdn. (SAC)
June 30, Howard Johnson Motel, Rapid City, S. D. **Contact:** Robert Betterton, 130 Cornwall Dr., San Antonio, Tex. 78216.

19th Bomb Group Ass'n
Two reunions in '79, one in '80. All past and present members, wing, supporting, or assigned units welcome. **Contact:** Herbert A. Frank, 90-13 201st St., Hollis, N. Y. 11423.

28th Air Refueling Sqdn.
20th Anniversary, in conjunction with 3d Annual Boom Operators, at Bernie Berg's ranch, Sturgis, S. D., June 15–17. Former 28th BW and 28th ARS commanders, and anyone ever associated with 28th ARS invited. Contact: John L. Bergeron, Rt. 6, Box 320, Rapid City, S. D. 57701.

Class 41-B
Southeast Training Command. **Contact:** Col. Dane W. Harlan, USAF (Ret.), 16403 Ledge Point, San Antonio, Tex. 78232.

Class 54-06
Navigators, 25th reunion, June 1979, Las Vegas, Nev. **Contact:** J. O. Brown, 2005 Maryvale Way, Rancho Cardova, Calif. 95670, or Thomas E. Convery, 4145 Via Marina #218, Marina Del Rey, Calif. 90291.

79th Airdrome Sqdn., 5th AF
June 29–July 1, Hotel DeSoto Hilton, Savannah, Ga. Other airdrome and interested persons. **Contact:** Fred Hitchcock, 29 Blueberry Hill Lane, Sudbury, Mass. 01776. Phone: (617) 443-6679.

80th Fighter Group
"Burma Banshees" reunion May 18–20, 1979. Sheppard AFB, Tex. Updating addresses. **Contact:** *in the East,* Bradfo P. Shuman, Pepperidge Farm, In Downingtown, Pa. 19335; *in the We* George F. Schlagel, Tiffany Texti Corp., 9930 Pioneer Blvd., Suite 101 Santa Fe Springs, Calif. 90670.

97th Bomb Group/Cadet Class 42-A
Combined reunion, June 15–16, Litt Rock AFB, Ark. **Contact:** Lt. Col. Pe Magness, RR 1, Box 156, Toltec Rc England, Ark. 72046. Phone: (501) 96 9348.

100th Bomb Group
And allied units, 8th AF, WW II, Jun 14–17, Menger Hotel, San Antonio, Te **Contact:** Don Merten, 413 Fenwick, Sa Antonio, Tex. 78239. Phone: (512) 65 0687.

325th Fighter Group
"Checkertail Clan," WW II, June 14–1 Cocoa Beach, Fla. **Contact:** Dan F. Pe rod, 69 Keswick Ave., Pittsburgh, F 15202. Phone: (412) 766-6190.

Jolly Green Rescue Forces
April 20–21, 1979, Ramada Inn, Ft. W ton Beach, Fla. **Contact:** Col. Ed M dica, 222 Sotir Ave., Ft. Walton Beac Fla. 32548. Phone: (904) 863-1959.

417th Bomb Group
Southwest Pacific, WW II. June 22–2 1979, Barksdale AFB, La. **Contac** Glenn E. Clark, 1705 Bradley St., Bos sier City, La. 71112. Phone: (318) 74 8570 or 746-7731.

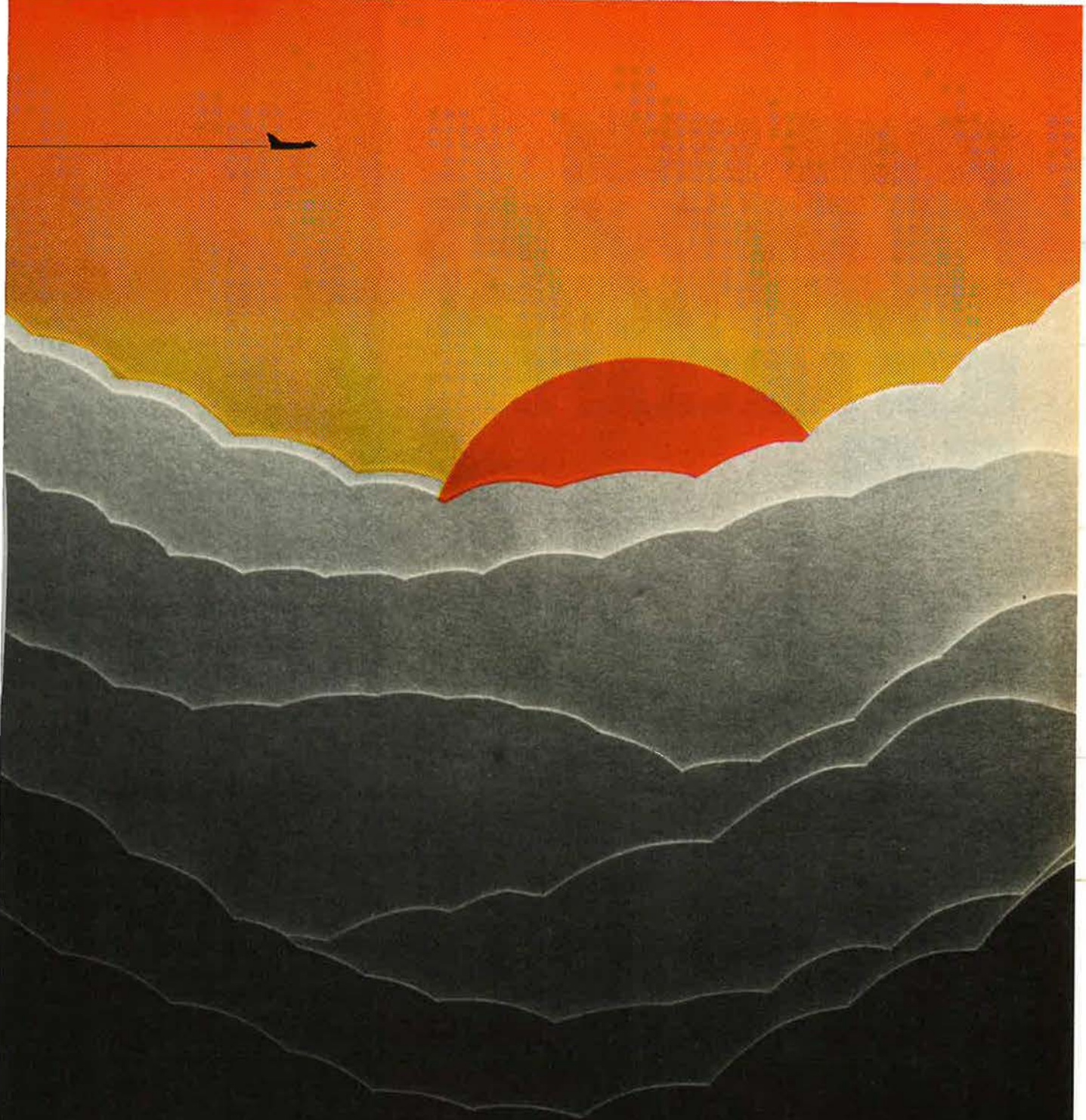
434th Bomb Sqdn., 12th BG (M)
34th reunion, June 27–July 1, Phoeni Ariz. **Contact:** Buck Hoag, 3345 E Cholla St., Phoenix, Ariz. 85028.

456th Bomb Group
4th reunion, June 21–24, Royal Sonest Hotel, New Orleans, La. Other group in 304th Bomb Wing or 15th AF we come. **Contact:** James F. Watkins, 1141 Minor Dr., Kansas City, Mo. 64114.

482d Service Sqdn, 8th SG
May 4–6, Williamsburg, Va., in conjunc tion with 11th Service Sqdn. **Contac** John J. (Jack) Heckler, 76 East Harbo Dr., Teaticket, Mass. 02536.

490th Bomb Group (H)
And associated units, serving at Ey Suffolk, England 1944–45. May 30–June Fort Worth, Tex. **Contact:** Asa L. Phelp 2701 Handley Dr. N, Fort Worth, Te 76112. Phone: (817) 451-4586.

511th Fighter Bomber Sqdn., 405th FB
May 11–15, in conjunction with P-4 Thunderbolt Pilots Association, Sher ton-Universal Hotel, Los Angeles, Cali Members of 511th FBS during 1944–4 WW II. **Contact:** George W. Janovitz, 22 Azalea Ct., Fairfield, Calif. 94533. Phon (707) 422-4429.



The Annual Air Force Almanac

■ In May, AIR FORCE Magazine will publish its annual Air Force Almanac issue . . . the largest and most authoritative reference work on the US Air Force. The 1979 issue will include reports, organization charts, and statistical data on the Air Force Commands and Agencies; a Guide to Air Force and Air National Guard bases worldwide; USAF and NASA R&D facilities; and expanded data on Air Force budgets, personnel, aircraft inventory, flying hours and procurement . . . plus special articles by the Secretary of the Air Force and the Chief of Staff, and the Chief Master Sergeant of the Air Force.

■ A Gallery of USAF Weapons is being prepared by the staff of "Jane's All the World's Aircraft" with comprehensive descriptions and photographs of all USAF aircraft and missiles.

■ This issue will be a most valuable desktop reference, consulted many times during the year by decision-makers in the Air Force, government and the aerospace industry.

■ You are invited to participate in this important issue with your advertising.

■ ***Closing for advertising reservations is March 23, copy by April 4.***

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In Focus...

BY EDGAR ULSAMER, SENIOR EDITOR

Washington, D. C., Feb. 5

USAF's MX Report

Air Force Chief of Staff Gen. Lew Allen, Jr., recently responded to a congressional request for information about ICBM vulnerability and the future of the strategic triad with a nine-page letter marked by candor and thoroughness. Addressed to Chairman Melvin Price of the House Armed Services Committee, General Allen's letter affirmed that the Air Force is ready for and has recommended to the Secretary of Defense full-scale engineering development of the MX missile and its basing mode.

"During the past year, we have carried on an intense review of numerous alternative basing options and concluded that, from military and technical viewpoints, the vertical shelter, multiple protective structure (MPS) system (formerly referred to as multiple aimpoint, or MAP) represents the best means to assure ICBM survivability. Most scientific advisory groups who have studied the problem in depth agree with this conclusion," General Allen told Congress.

Pointing out that the Air Force, therefore, recommended go-ahead on the MX program with this basing mode in FY '79, General Allen reported that because of concerns at higher levels of government about the compatibility of MPS with SALT verification standards and its basic survivability, the Air Force was "directed to examine further a variant of the airmobile concept. [*See p. 14, January '79 issue.*] In addition, we are to continue R&D on both the MX missile and MPS basing," General Allen wrote.

While MPS survivability—a function of hiding the ICBM in shellgame fashion—poses challenges, General Allen assured Congress that "we have evolved a concept for MPS using countermeasures and operational procedures which we believe will provide high confidence that location uncertainty and concealment will be maintained."

Chairman Price asked if the Soviets' adoption of MPS would increase their opportunity for secretly producing and storing substantial numbers of ICBMs. General Allen replied that "this worrisome possibility has confronted us for many years and will continue to exist until we succeed in establishing verifiable limits on strategic missile production, inventory, and ultimate disposition, perhaps within SALT III. There is no justification for linking the problems of Soviet breakout solely to an MPS system. While the multiple protective structures might offer a convenient deployment site, the Soviets would almost certainly be better able to pull off such a potentially sensitive deception operation by deploying their extra ICBMs in remote areas which would be under less careful and continuous scrutiny than an MPS deployment area."

An MPS system of about 4,500 vertical shelters, if developed by USAF in accord with environmental impact procedures and in step-by-step fashion, could be fully operational about eleven years after the go-ahead decision. Developing the missile itself—the program's basic pacing factor—and its full-scale deployment would take at least twelve years, or an additional year if MX is to be fully common with the Navy's new D-5 SLBM, General Allen disclosed. (USAF's definition of IOC [Initial Operational Capability] is ten missiles and 200 shelters in operation. Another five years would be required to deploy the full complement of MX missiles.)

On the other hand, "modifying a Minuteman III for deployment in vertical shelters requires only about two years; consequently the pacing item in this case would be development and deployment of the basing mode . . . ," he asserted.

General Allen also reported that the Air Force will continue some work on the hybrid, covered trench basing mode to provide a backup option and a "degree of IOC protection should unforeseeable problems arise with the vertical shelters."

The most salient aspect of the Air Force position is the letter's polite rejection of the Administration's contention that MPS or any other ICBM basing mode requires further research before a program go ahead.

The office of the Under Secretary of Defense for Research and Engineering had reviewed, initialed, and returned without criticism a copy of the Air Force letter before it was sent to Chairman Price. Yet, after the letter was published, Under Secretary William J. Perry strongly criticized it. Dr. Perry's action came after he and Secretary Brown reportedly were told by President Jimmy Carter that MPS was not acceptable. Highly placed congressional sources claim that the meeting between the President and the two Defense officials was "heated."

FY '80 Defense Budget

The Defense Budget for FY '8 amounts to $135 billion in TOA (Total Obligational Authority, or funds obligated but not necessarily spent in given year), and $122.7 billion in outlays (*i.e.*, actual spending). The request went to Congress along with a FY '79 supplemental request for $2.2 billion. Based on FY '79 totals including the supplemental, the new budget in constant dollars reflects an increase of 1.7 percent in TOA and of 3.1 percent in outlays over the preceding year. Defense Secretary Harold Brown said the new budget signals "President Carter's determination to counter the Soviet military buildup and to fulfill his pledge to NATO to increase US defense spending by three percent per annum in real terms."

The FY '80 defense budget represents 4.9 percent of the Gross National Product (GNP), unchanged from the previous year but considerably lower than in 1964, the last year before the Vietnam War buildup when it was eight percent. Defense accounts for about twenty-three percent of all federal outlays, a slightly larger share than in the two preceding years but still considerably lower than the 41.8 percent value of 1964.

Of the three services, the Air Force scored the greatest gain—up by $1.1 billion in constant dollars from FY '79—but still trails the Navy's budget of $44 billion by $5 billion. The Army's new budget is $34 billion. The Air Force is taking cuts in both active-duty military personnel—down by about 4,000 slots to 559,000—and direct-hire civilians, by 7,00

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Bob Buzard
Senior Vice-President
Vought Corporation

"Providing greater support for ground and sea-based forces in the face of increasingly sophisticated defenses presents some real challenges to today's tactical aircraft.

"As a result, some planners now advocate the use of guided missiles for the tactical aircraft role. Nevertheless, human decision-making power at the point of conflict often provides the key to victory; strong argument in favor of tactical aircraft's continued use.

Aircraft must be made effective and survivable, but ways of achieving these goals vary."

"In general, two avenues to weapons system selection are open: quality or quantity. Produce relatively small numbers of highly sophisticated aircraft at high cost per unit. Or, build a great many less-expensive aircraft to achieve mission goals by sheer weight of numbers. It is indeed rare for one aircraft to fit both categories.

"Whichever course the United States and its NATO allies choose, it is critical that existing forces be maintained at peak combat readiness and that the technologies required for both types of systems be advanced.

"At Vought we're examining all aspects of aircraft effectiveness, including both Navy and Air Force requirements for tactical aircraft training systems, small-ship prerogatives like projected Navy V/STOL's, plus highly-effective methods of using existing, proven systems at very low cost.

Vought's combat-ready A-7 provides the rare combination of sophistication and relatively low cost. It also serves as a working model for the development of advanced features valuable to the next generation of aircraft."

"The A-7 set the pace for automatic navigation and weapons delivery systems, and its weapons-carrying and long-duration flight capabilities are unquestioned. It is extremely cost-effective and offers superbly well-balanced mission functions.

"Most significantly, it has a vastly extended airframe fatigue life to accommodate continued low-cost modernization and modification. As a result, its operational capability and survivability are being constantly enhanced.

"Forward Looking Infrared Radar (FLIR), for example, now provides a night target scene on the aircraft's Head-Up Display which is virtually identical to that viewed in daylight.

"Automatic Maneuvering Flaps also are being added to significantly improve performance. And a pod-mounted 30 mm gun has been tested with excellent results. A pair of these added to the existing internal 20 mm makes the aircraft a potent tank killer.

"With these and other advances, such as laser hardening, fiber optics, and lightweight composites, the A-7 leads the way to a new generation of aircraft with great survival advantages: sophisticated technology at a cost that allows for quantity as well.

USAF-Vought A-7D with a podded 30mm Oerlikon Gun.

"No matter how well it performs or how 'smart' its systems are, the attack aircraft will always require a well-trained pilot."

"The need for fully-integrated combat training increases with every technological advance. That's one reason Vought is building two-place trainer-attack TA-7C's for the Navy through low-cost conversion of existing single-seat A-7's.

"It's also why we're deep into a new training package concept called the Undergraduate Pilot Training System (UPTS), designed to serve the U.S. Navy and many other potential markets. The system calls for a new fixed-wing jet trainer known as VTX, plus the most comprehensive program yet of ground school, combat simulator training, and flight operations to prepare graduates for assuming duties in advanced aircraft with minimum transition.

"This is just one more example of Vought's commitment to aircraft programs and the pilots who fly our products. They're both part of our heritage. And we're ready for the next generation with aircraft that are cost-effective, sophisticated, and best suited to their mission."

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It's already in service with the U.S. Army as a primary subsonic training target for missile test and evaluation.

This swept-wing variable speed target can be surface launched from a zero length launcher with rocket booster assistance. It operates by remote ground control at speeds from 250 to 500 knots and at altitudes from sea level to 40,000 feet. Endurance may extend up to 3½ hours. And maneuverability has been demonstrated at 6gs.

Developed specifically as a reusable target vehicle, the MQM-107 can be recovered on command with a two-stage parachute system. The target nose cone is engineered to reduce impact damage on recovery.

And with a total external payload of 500 pounds, the MQM-107 airframe is capable of carrying both radar and IR augmentation systems, scoring systems, countermeasure devices, tow targets and gunnery banners.

Above all, the MQM-107's low initial cost, reusability, minimal maintenance requirements, and total Beech product support combine to make it one of the most cost-effective target systems in any military inventory.

For further information, please call or write E. C. Nikkel, Vice President—Aerospace Programs.

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In Focus...

o 227,000. Air National Guard trength remains level at 93,000 /hile the Air Force Reserve climbs y about 1,000 spaces to 57,000.

Defense-wide, active-duty military anpower remains level at 2,050,-00, but Reserve strengths decline y about 12,000, and civilian man-ower drops by 13,000. Defense elated employment in industry is ex-ected to rise by about 120,000 to ust below 2,000,000 as a result of the ew budget.

The FY '80 budget as well as the upplemental—presumably for rea-ons related to the impending SALT accord—provides for some growth strategic forces and the intelli-ence and communications sector. unds for strategic systems and rces climb to $10.8 billion—com-ared to $9.1 billion in FY '79 and 10.3 billion in FY '78 (both in con-tant dollars)—and include money or another Trident SSBN and in-reased spending on the MX mod-rn, survivably based ICBM, and the ir-launched cruise missile (ALCM). The combined total sought for MX is close to one billion dollars. The corresponding figure for ALCM is slightly more than half a billion dollars.

Strategic missile force levels re-main constant at 450 Minuteman II ICBMs, 550 Minuteman IIIs, fifty-four Titans, and 656 Polaris/Poseidon SLBMs. The number of B-52 and FB-111 squadrons remains un-changed at twenty-five, and includes 316 B-52s and sixty FB-111s. The new budget allocates $5 million to Air Force RDT&E for a "new manned bomber" and continues evaluation of the B-1 through test-flights and other R&D.

Testifying on the budget request before the Senate Armed Services Committee, SAC's Commander in Chief, Gen. Richard H. Ellis, under-scored the importance of replacing the aging B-52 fleet "at some point in the future." A near-term solution "to the penetrating bomber prob-lem is to modify our existing FB-111s and F-111Ds into more effective aircraft. With a vigorous program, we could have stretched, reengined FB-111s operational in slightly over three years from program start," he told the committee.

While the new budget includes no funds for modifying the FB-111, SAC's Commander in Chief told the committee that Dr. William J. Perry, Jr., Under Secretary of Defense for Research and Engineering, and USAF Chief of Staff Gen. Lew Allen, Jr., had "assured" him that such a program "will be given full con-sideration in the FY '81 budget which is [now] in preparation."

General-purpose forces—at $50 billion—once again are the single largest item in the new budget even though the corresponding total in FY '79 was higher by about $300 million. The Air Force's long-sought goal of bringing the twenty-six fighter wings in its active force up to full strength will move closer to realization during FY '80, but won't be completed until FY '81. During FY '80 four F-4 squadrons will be replaced and the tactical force augmented by two F-15 squadrons, two A-10 squadrons, and three F-16 squadrons. All told, the Air Force is authorized to buy 388 new air-craft. FY '80 procurement of F-15s is down by eighteen and totals sixty units, while the F-16 buy in-creases from 145 to 175. The A-10 buy remains level at 144 aircraft. Other aircraft procurement includes four KC-10 Advanced Tanker/Cargo aircraft, three E-3A AWACS, and two TR-1s, a new reconnaissance air-craft derived from the U-2.

Flying hours, once again, are curtailed severely and remain "at the minimum required to maintain an acceptable level of readiness and well below the desired level. While the FY '80 flying-hour pro-gram contains a small growth over the FY '79 program, this growth is due primarily to a slightly larger aircraft inventory and undergradu-ate pilot training rates. It does not represent an increase in readiness training. In fact, the flying-hour pro-grams of many weapon systems have been reduced," the Depart-ment of the Air Force reported to Congress.

The combined force level of the Air Force Reserve and the Air National Guard goes up from 10½ fighter/attack wing equivalents to eleven wing equivalents.

Somewhat surprisingly, the Ma-rine Corps' AV-8B Improved Har-rier V/STOL R&D program was terminated. Instead, Secretary Brown announced, the Navy will pursue R&D of "more advanced [V/STOL] designs" that could be used by more than one service.

To nobody's surprise, the Ad-ministration made good on last year's promise to seek $1,624 mil-lion for a conventionally powered (CCV) aircraft carrier to replace the larger, nuclear-powered carrier that Congress added to last year's budget. That add-on caused Presi-dent Carter to veto the FY '79 De-fense Authorization bill—an action that the House of Representatives subsequently sustained. The pro-posed new carrier, approximately 912 feet long, is scaled down to about two-thirds of the capacity of the *Kitty Hawk*-class nuclear-powered carriers—about fifty-five aircraft vs. ninety—and will be able to accommodate all aircraft, includ-ing future V/STOL designs, in the Navy's inventory.

Research, Development, Test and Evaluation (RDT&E) is budgeted at $13.6 billion—the same as last year. These funds, Dr. Brown asserted, "will provide a strengthened tech-nology base, a vigorous modern-ization of our strategic forces, and continued development of a number of key tactical programs to support our commitment to our European allies through NATO."

The Defense Department's long-term budget forecast, calculated in constant dollars and expressed in TOA, envisions an FY '84 budget level of $150.5 billion, involving real growth factors of 2.2 percent in 1981 and 1982, and 3.1 percent in 1983 and 1984. The forecast for out-lays envisions a more or less even growth of about three percent an-nually, and FY '84 outlays of $138.4 billion.

Looked at in a historic context, two factors stand out. Measured against the Administration's prior long-range budget forecasts, in 1977 and 1978, the new budget falls sig-nificantly short. In TOA, the 1977 forecast for the FY '80 budget was $146 billion, or more than $10 billion greater than now requested. In outlays, the comparable shortfall is more than $11 billion.

Lastly, one of the most conse-quential flaws of the new budget is the proposed continuation of the 5.5 percent pay cap for DoD military and civilian personnel, coupled with forecast pay raises of 5.25, 5.0, 4.75 and 4.5 percent, respectively, for the subsequent four fiscal years. It would seem a safe bet that the im-pact of this policy on the all-volun-teer force will be major and nega-tive.

InFocus...

North Korean Military Growth

Largely because of persistent congressional pressure, the White House instructed the Central Intelligence Agency to conduct a belated reexamination of North Korea's burgeoning military might. The results of this in-depth analysis reportedly contradict broadly the superficial, optimistic assessments used by the Administration to justify the continuing withdrawal of US ground troops—a move President Jimmy Carter espoused during the 1976 election campaign.

The new study, "briefed" to the President and Secretary of Defense Harold Brown in December 1978, was germinated in part through painstaking research and fact-finding visits to the Far East a year ago by the Investigative Subcommittee of the House Armed Services Committee as well as subsequent independent analyses by the US Army. As Rep. Robin L. Beard (R-Tenn.) pointed out to this writer, it is ironic and alarming that the US would start the withdrawal of ground troops from South Korea and then, *ex post facto,* decide to conduct an intelligence study to determine whether or not the military power balance justifies the *fait accompli.*

The chairman of the subcommittee—Rep. Samuel S. Stratton (D-N. Y.)—and Mr. Beard, its ranking Republican member, urged President Carter in a joint letter dated January 3, 1979, "that you immediately defer any further withdrawal of US troops from South Korea until the Armed Services Committee can evaluate the full significance and long-range implications of this new information for America's national security posture in the Far East."

The letter pointed out that the reputedly "new information" corresponds "with everything presented to our subcommittee on this subject over the past year and a half, not only from US military officials familiar with the Korean balance of forces, but from responsible officials of allied nations stationed in the Far East as well."

The two congressmen informed the President that "the new, disturbing information [about North Korea's growing arsenal] has never been presented to our subcommittee or to the full commitee" and they, therefore, requested that "you direct the CIA and DIA to give us these estimates without further delay."

Washington Observations

• Several recent developments will figure prominently in the Senate's coming SALT II review. At about the time a meeting on SALT II between Secretary of State Cyrus Vance and Soviet Minister of Foreign Affairs Andrei A. Gromyko got under way late in December 1978, the Soviets conducted another fully encrypted test flight of the newest version of their SS-18 ICBM. US analysts now believe that the SS-18 used in the encrypted test flight was not the so-called "Mod 4," ten-warhead system but a still newer design whose features are being concealed deliberately from the US.

Secondly, there is strong evidence that the US SALT negotiators either didn't mention to their Soviet counterparts that the MPS ICBM basing mode would use multiple "vertical shelters," or that the Soviets rejected vertical shelters in combination with a mobile deployment scheme. It seems doubtful that the Administration, at this late date, can get the Soviets to accept MPS under SALT II. If this question is not resolved, the very basis of SALT II, and the prospects of Senate ratification of the accord, become questionable.

The loss of US intelligence facilities in Iran puts in question this country's ability to verify Soviet compliance with SALT II so far as important ICBM test flights are concerned. Without these ground-based sensors—some of them may remain operational in Turkey but are of limited "reach"—the US is unable to monitor and assess the performance of the first two stages of Soviet ICBM test flights. This country's other NTM systems (National Technical Means of verification, in the main space-based) don't "see" the missile until its third and final stage ignites. But in order to establish throw-weight, it is essential to have knowledge of specific propellant impulse and other vital factors of the performance of the first two stages.

As disclosed here last month, the Soviet Backfire bomber, following detailed in-flight assessment by a USAF EC-135, clearly emerges as a design stressed for two Gs, not four Gs as originally claimed by the CIA. Because of the new information, the CIA has now revised upwards its estimate of Backfire range. Also, when asked by a member of the House Armed Service Committee about Soviet development of long-range cruise missile for use on Backfire, Secretary Brow acknowledged that the Soviet "have some new ones under development," and added: "If the equip a Backfire bomber with cruise missile of more than 60 kilometers' range, then it is counte as a heavy bomber in the aggregat and in the sublimit" specified b SALT.

• State Department and Arm Control and Disarmament Agenc planners now expect that a Con prehensive Test Ban (CTB) trea will be concluded before the end this year. The US probably will i sist that all work on inertial confin ment fusion—attempts to achie fusion power by means of partic beam, electron beam, and hig energy lasers—be barred und CTB because the lines betwee weapons technology and pow generation in this field becom blurred.

• US-Soviet talks on bannin antisatellite (ASAT) weapons hav resumed in Bern, Switzerland, wit the US now favoring the positio that dismantling the existing ope ational weapons could be verifie through "cooperative measures, including on-site inspection.

• Recent Soviet underground nu clear weapons tests at Novay Zemlya island resulted in "venting radioactive debris into the atmos phere. This is a violation of the tes ban treaty, under which the U agreed to conduct no weapons test that would vent either radioactiv gases or debris, while the Soviet consented only to stop the releas of debris.

• The February issue of *The Bu letin of American Scientists* dis closes in a report by Donald F Westervelt, a prominent nuclea physicist, that the 1958–61 mora torium on nuclear weapons testin put some thermonuclear weapon in jeopardy because the rate o radioactive decay of certain ele ments in their fission devices ha been underestimated. Subsequen tests "showed that these effect had been so severely underest mated that a cloud of then-unknow proportions immediately fell ove many of our weapons."

We've added a new dimension to C⁴

COST-EFFECTIVENESS

It all began with Command and Control. Then it was Command, Control and Communications. Of late, we have been hearing a great deal about C⁴—Command, Control, Communications and Computers. While it may be a new concept to some, we at SPERRY UNIVAC Defense Systems have been aware of that concept for twenty years or more.

We have, in fact, taken that concept one step further by adding yet another C-Dimension—a dedication to COST-EFFECTIVENESS. When we say "cost-effective", we don't mean just low initial bid. We are as concerned with maintenance, operational, software and, in fact, all life-cycle costs as much (if not more) than competition. But one of the main reasons for our outstanding cost-effectiveness in computer-based systems is that we listen carefully to our customers. Our 25 years of digital systems experience qualifies us to better understand their requirements; to see beyond the "here and now" to solve their problems.

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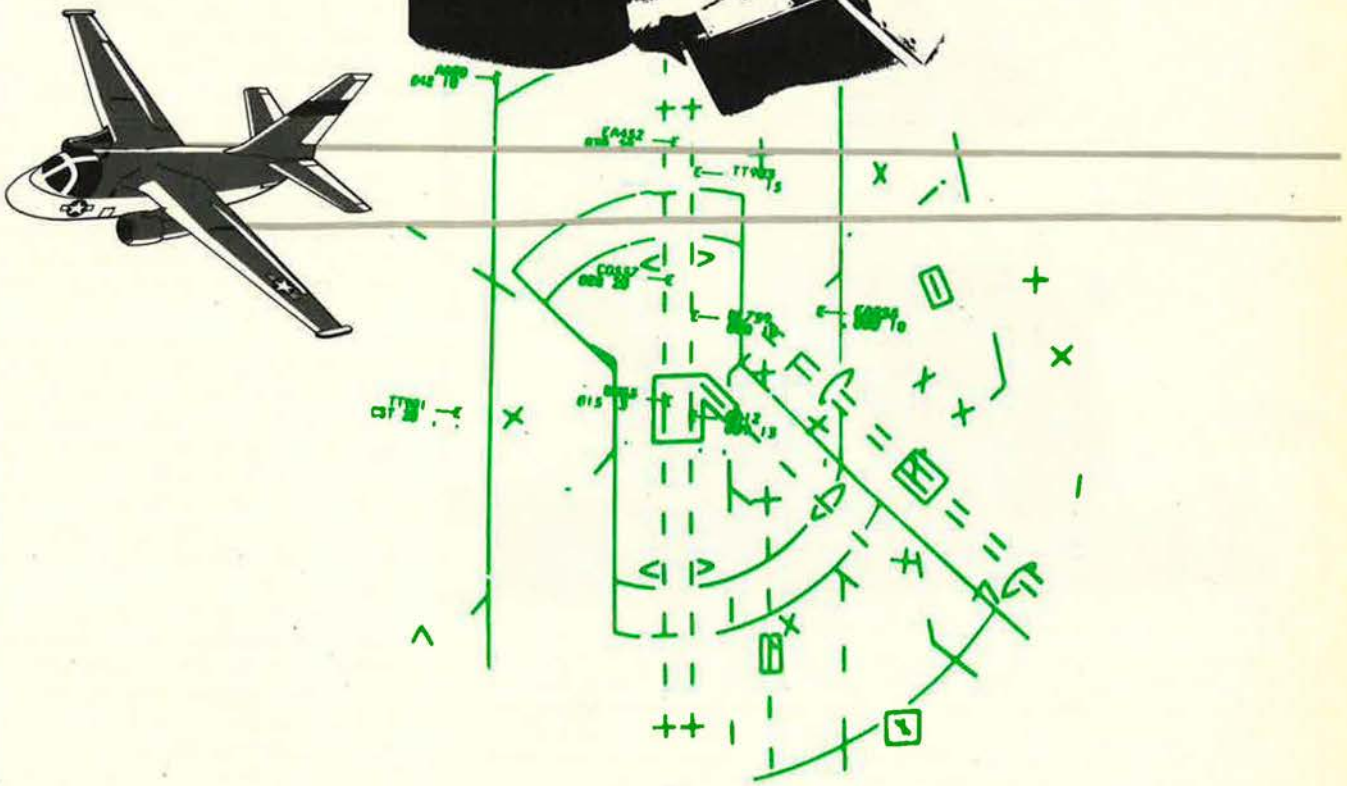
SPERRY UNIVAC Defense Systems also has a capability that includes a unique know-how in merging hardware, software and people into cost-effective programs. Take our work on the S-3A ASW avionics system, for example. Our in-depth risk analysis enabled the project team to determine hardware/firmware/software "trade-offs" within more realistic modes than others might offer. As you know, the S-3A was delivered on schedule and within budget.

Dedication to cost-effectiveness such as this is the "something extra" our customers have come to expect of us. We stake our reputation on it. We're SPERRY UNIVAC Defense Systems, Univac Park, St. Paul, MN 55165.



SPERRY UNIVAC
DEFENSE SYSTEMS

The "On Time—On Target" Company

Aerospace World News, Views & Comments

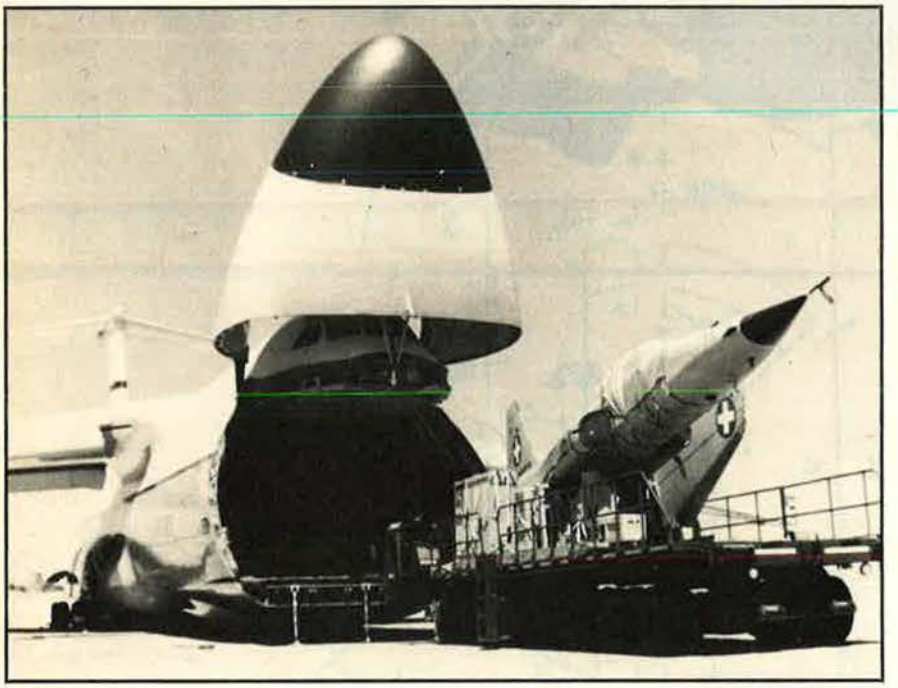
By William P. Schlitz, ASSISTANT MANAGING EDITOR

Washington, D. C., Feb. 6

★ In this era of cordiality between Mainland China and the US, an agreement was reached late in 1978 on the first cooperative space venture for the two nations. (The Chinese are keenly interested in modern technology: Last year, a high-level group of space experts studied Japan's space facilities and programs. At the conclusion of their visit, one official said that China plans to use foreign technology to "speed up our own development. . . . For this purpose, we plan to send as many scientists, engineers, researchers, and exchange students overseas as possible." *(For a report on China's fledgling space program, see January '79 issue, p. 20.)*

The "informal" agreement arrived at by the Chinese and US delegations focused on the development of a civil communications system for the People's Republic of China. Involved will be the purchase of a US satellite system, including ground-receiving and distribution equipment, with the US undertaking launch operations.

The Chinese also want to acquire a ground station capable of receiving earth-resources data from the US's Landsat sensing satellites, including the Landsat-D currently under development.



An F-5E Tiger II intended for the Swiss Air Force is unloaded from a C-5 following the giant transport's flight from McClellan AFB, Calif., to Emmen AB near Lucerne. It was the first visit of a C-5 to Switzerland. The Swiss have ordered sixty-six F-5Es and six F-5F two-place tactical fighters. Initial deliveries are ahead of schedule and "the Swiss Air Force is very pleased with the new aircraft," the Swiss government said in a recent message to USAF, prime contractor Northrop Corp., and engine manufacturer GE. The first twenty-nine flights of F-5s were logged "without writing up a single squawk," the message read.

Both sides agreed to further talk to "consider other forms of civ space cooperation that could be mutual interest and benefit."

In conjunction with the Washing ton discussions, the Chinese del gation visited several NASA cente and US aerospace industrial faci ities.

★ In another action involving th People's Republic of China, Pa American World Airways has soug CAB approval to provide thric weekly round-trip flights betwee the US and Mainland China. On flight would operate nonstop be tween San Francisco and Pekin and the other two would be exte sions of Pan Am's current nonstc service between San Francisco ar Hong Kong.

Pan Am service to China dat back to 1937, when the airline pi neered the transpacific flights of famed China Clippers. Some se vice to the mainland continued eve during the war years, but ende with the severance of diplomat relations in 1949.

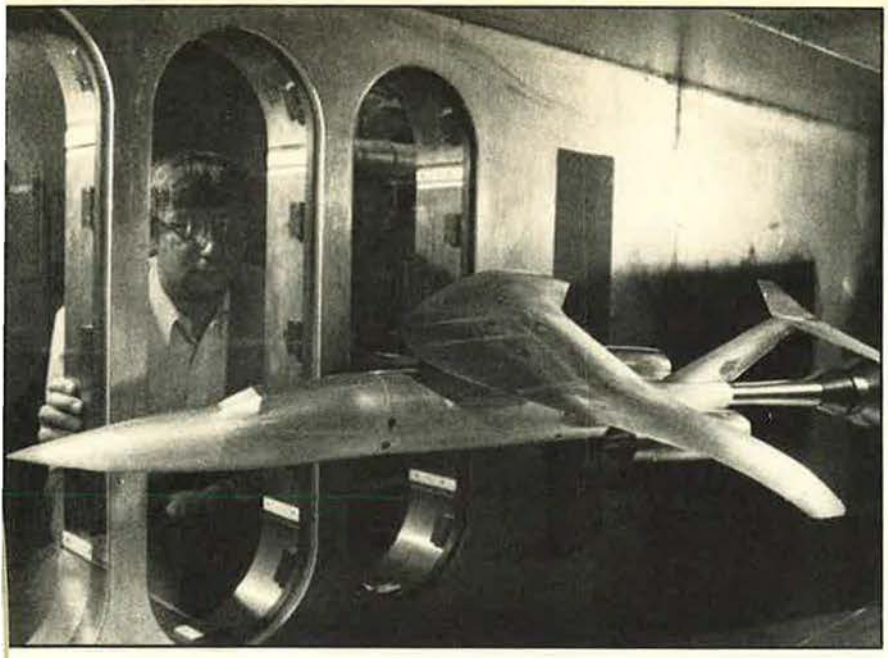
Pan Am has also asked the CA for permission to fly from Lo Angeles, San Francisco, Seattle Honolulu, Chicago, Houston, Wash ington-Baltimore, New York-Newark and Miami to Shanghai, Canto Peking, and Sian via intermediat points in the Pacific.

According to Pan Am, which flie Boeing 747SPs, it is the only U carrier capable of nonstop opera tions between the continental U and the PRC. Its wholly owne subsidiary, Inter-Continental Hotels has agreed to assist in the expan sion of tourism facilities and th construction of hotels in the PR

★ USAF's new E-3A Sentry warn ing and control system aircraft ha been in the news recently: In De cember, NATO defense minister agreed to purchase eighteen US built AWACS aircraft for use in Eu rope and, in January, Air Forc E-3As began flying operational mis sions over CONUS *(see Februar issue, p. 18)*.

AWACS's radar, now capable o guarding against low- or high-leve attack and providing early warnin of enemy aircraft movements, being modified to give it a maritim surveillance capability.

Under contract to Boeing Aero space Co., E-3A prime contracto Westinghouse Electric Corp.'s De



This scale model is the subject of wind-tunnel tests at AFSC's Arnold Engineering Development Center, Arnold AFS, Tenn., in the long-term effort to develop an advanced jet fighter-interceptor. Such a plane could cruise at Mach 4.5 (3,000 mph; 4,827 km/hr.). The "parasol" shape of the wing is crucial, in that high pressures behind the shock wave slanting back from the aircraft's nose "impinge" on the wing's underside, creating lift. Additional thrust is also produced, in turn, as the curved wing reflects pressure under the aft fuselage.

fense and Electronic Systems Center, Baltimore, Md., is modifying AWACS radar systems to give them the ability to detect ships at anchor or track them if moving, either at sea or near shorelines.

A modified radar is slated for flight tests aboard an E-3A this coming summer, with incorporation of the maritime surveillance capability in the twenty-fifth production radar unit scheduled for delivery to the Air Force in 1981. Essentially, the maritime surveillance mode of the radar scans with a very short pulse "to provide the high resolution necessary to detect moving and anchored surface ships," Westinghouse said.

★ A specially modified and equipped Boeing 747—dubbed E-4B—has been delivered to Offutt AFB, Neb., for extensive operational testing. The E-4B is an upgraded version of the E-4A National Emergency Airborne Command Post (NEACP).

The plane is to undergo more than 130 hours of flight tests by per-

NASA's Fiscal Year 1980 Budget

The NASA budget for FY '80, reflecting President Carter's focus on earth applications rather than space exploration, falls $300 million short of NASA's original request.

NASA's annual budget message on January 22 asked Congress for $4.7 billion. This represents an increase of some $160 million over FY '79, but because it falls short of the expected inflation rate for the period, represents less money in real terms than the amended FY '79 budget.

The President's Office of Management and Budget, for policy and economy reasons, cut eight new projects and $300 million from NASA's original request.

NASA Administrator Robert A. Frosch told newsmen that he was not very proud of the "stringent" budget. He said the budget not only does not accommodate new programs, but a total of 674 employees at NASA Headquarters and ten field centers will have to be cut.

The budget provides increased funds for the exploration of space, for practical applications of space to problems on earth, and for the advancement of aeronautical and space technology.

Money for the Space Shuttle, however, was cut from $1.6 billion in FY '79 to $1.4 billion in Fiscal '80, reflecting an Administration move to hold costs down by slipping launch schedules. Overall, the Space Transportation Systems account is budgeted at $1.9 billion in FY '80, compared to $2.1 billion in the current fiscal year.

The current schedule calls for the first orbital test flight of the Shuttle on November 19, 1979. (*See also p. 30.*) A total of fourteen space launches is scheduled by NASA in calendar 1979, as compared to twenty in 1978. The US, including thirteen military space shots, had a total of thirty-three space launches in 1978. The Soviet Union, by comparison, completed eighty-seven space missions in 1978, of which sixty-four were military launches.

The budget provides a growth of some $100 million, for a total of $601 million, for space science. Projects funded include the Space Telescope, the Galileo orbiter and probe of Jupiter, the third High Energy Astronomical Observatory, Spacelab, the Solar Polar Flight and Solar Maximum Mission, and the Infrared Astronomy Satellite.

NASA has asked for more money to reenter the field of communications satellite research and development. It will concentrate on the development of the technology required to increase the usable capacity of the radio frequency spectrum for communication satellites in geosynchronous orbit, including the development of multibeam antennas and on-board switching techniques.

For aeronautics, NASA has asked for a fourteen percent increase, to $300 million. Programs are designed to improve aircraft performance, safety, and economy while reducing energy requirements and adverse environmental effects. Mr. Frosch said the research would support the Defense Department's efforts at maintaining the superiority of US military aircraft over those of other nations.

—BONNER DAY

SCIENCE/SCOPE

Hughes is one of two AMRAAM finalists selected by the Joint System Program Office at Eglin Air Force Base to participate in the validation phase of the Advanced Medium-Range Air-to-Air Missile program. The Hughes design provides track-while-scan, multi-shot, and launch-and-leave capabilities, even against severe electronic countermeasures. AMRAAM will replace the AIM-7 Sparrow, now in use with the U.S. Air Force and U.S. Navy. It will outperform Sparrow yet be half the size and weight, and cost less. AMRAAM will be used with the F-14, F-15, F-16, and F/A-18 aircraft. The validation phase is expected to last 33 months, at which time the winning design will be carried into full-scale engineering development.

The ability of U.S. Roland to withstand the roughest operating conditions while the fire unit is on the move was tested at Aberdeen Proving Ground, Md. The unit was taken over a rough track with its radar operating. Tests of the XM-975 tracked vehicle carrying the Roland all-weather air defense system included maneuverability, braking, noise level, and safety. Roland suffered no major problems during 1935 kilometers of road tests, or when subjected to the impact of railroad switching. Roland is the first European-designed weapons system to be adopted for use by U.S. troops. It is being built for the Army by Hughes and principal subcontractor, Boeing Aerospace Co., under license from Euromissile, a joint venture of Messerschmitt-Boelkow-Blohm of West Germany and SNI Aerospatiale of France.

Neither darkness, smoke, nor haze will deter a new imaging infrared missile seeker from picking out targets on the ground. The sensor, by detecting very small differences in heat radiated by objects, produces TV-like imagery on a cockpit display so the pilot or crew member can lock on the target. After the missile has been fired, the pilot is free to engage a second target or take evasive action while the missile homes on the first target. Developed by Hughes under a joint Air Force/Navy program, the seeker has been flight-tested in the U.S. Air Force Maverick air-to-ground missile and the U.S. Navy Walleye glide weapon. It also is compatible with the Air Force GBU-15 glide bomb.

The U.S. Navy has awarded a Hughes subsidiary a contract to build and operate a worldwide satellite communications system. The system, known as LEASAT, will consist of four satellites and ground equipment supplied by Hughes. It will augment the Navy's fleet communications network and improve the Defense Department's ability to send and receive messages from ships at sea. LEASAT also will be used by ground units of the Army, Air Force, and Marine Corps. The first satellite will be launched from the Space Shuttle in 1982. When all four satellites are on station, the Navy will lease the system for at least five years from Hughes Communication Services, Inc.

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:onnel of Hq. SAC, the 55th Strategic Reconnaissance Wing, and he Office of the JCS, NEACP. The rogram is to certify that the air:raft can perform SAC's continuous irborne alert mission as well as hat of the NEACP. The flights—rom Offutt and other bases and to ast as long as thirty hours—are to rove out aircraft subsystems and o study the effects of crew fatigue. Three E-4As are currently operaonal.

In another SAC matter, in Janury KC-135 boom operators began esting a new head-up display, "the rst time a head-up display has een designed for an aircrew memer other than a pilot," said SMSgt. reg Oveson, SAC's Air Refueling ystem Acquisition Manager.

Installed in a tanker from the 07th Air Refueling Group, Travis FB, Calif., the display will be evalated during normal operational raining missions, officials said.

The display is intended to increase aircraft safety during refueling operations, cut operator fatigue, mprove skills, and reduce training ime.

★ Following the investigation of ast September's collision of a small lane and a jetliner over San Diego hat killed 144 people, the Federal viation Administration has proosed "sweeping-and-comprehenive" changes in the US's air conrol system.

The changes would expand strinent collision protection from the ixty-seven percent now covered to inety-seven percent of the passeners on scheduled airlines.

This would be accomplished by dding fifty-four more airports to he twenty-three major airports now overned by blocks of airspace alled "terminal control areas." Aircraft must receive permission to nter such areas and must be quipped with special radio and avigation aids. Student pilots are anned from these areas.

About eighty smaller airports will e added to those in the "terminal adar service areas," where aircraft an request the services of air traffic controllers. To do so is voluntary, but about ninety percent of the pilots flying in those areas request the service, FAA said.

Improved radar display units are to be installed in towers to provide controllers with altitude data and other information about planes in their areas. The San Diego tower was not equipped with the improved radar.

The ceilings above which aircraft cannot fly without specific permission will be lowered in various parts of the country.

New instrument landing systems are to be installed at about twenty-four nonairline airports in metropolitan areas. (The small plane in the San Diego collision was practicing on the system there because it was the closest available.)

While a number of the proposed changes can be instituted relatively quickly, the complete package should be in force by about 1985, FAA said.

Applauded by representatives of the scheduled airlines as steps in the right direction, the FAA proposals were condemned by a spokesman of the Aircraft Owners and Pilots Association because of the further restrictions placed on private aircraft.

★ USAF has taken delivery of the first production units of a new kind of airport precision approach radar designed to help land planes in weather conditions that ordinarily would halt normal operations.

The radar—called AN/GPN-22 (V)—can track as many as six aircraft simultaneously at distances up to twenty nautical miles, compared to conventional approach radars that can handle only single aircraft from ten miles out. It also can be tied into existing airport approach control centers, where air controllers can follow the progress of inbound aircraft.

The first unit to go operational, at Keesler AFB, Miss., will be used to train air traffic controllers.

Built by Raytheon Co.'s Equipment Division, Waltham, Mass., a total of thirty-nine of the radars will be deployed to USAF facilities around the world having high air traffic densities. These and a tactical version "are the first ground control approach radars capable of

CMSAF Display Unveiled at Pentagon

Unveiled recently at the Pentagon was the Chief Master Sergeant of the Air Force Display. It features photographs of the four previous top enlisteds—CMSAFs Paul W. Airey, Donald L. Harlow, Richard D. Kisling, Thomas N. Barnes—and the currently serving CMSAF Robert D. Gaylor.

The display was the idea of CMSgt. Jack Steed, senior enlisted advisor at Robins AFB, Ga., and was created to honor enlisted personnel of all ranks, officials said.

Officiating at the ceremony dedicating the display was Air Force Chief of Staff Gen. Lew Allen, Jr., the former CMSAFs, Air Force Secretary John C. Stetson, and other dignitaries.

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meeting modern Air Force requirements for all-weather aircraft operations," company officials said.

★ AFSC's Aeronautical Systems Division, Wright-Patterson AFB, Ohio, is currently testing the operational capability of the "open loop oxygen generating system" (OLOGS) in a flight environment, officials said.

Flight tested aboard a C-130 of the 4950th Test Wing, OLOGS has already produced an oxygen supply safe enough for aviators to breathe.

Without going into the technical details of the system's oxygen generation, OLOGS taps into the bleed air from the engine compressor used in de-icing aircraft windscreens and pressurizing cabins.

If proved feasible, the system could make future aircrews independent of bottled oxygen, officials said.

Installed fleet-wide, technicians said, the system would be less expensive than buying bottled oxygen and would allow aircraft to fly into areas where bottled oxygen isn't available.

★ NASA plans a modest launch schedule for 1979, the highlight of which will be the first orbital flight of the manned Space Shuttle. *(See also p. 27.)* (Late in December a pump in a Shuttle engine being test-fired exploded, heavily damaging the engine and its test stand. The accident set the date of the first flight, originally planned for September 28, back "several weeks," NASA officials said.)

Nine of the fourteen planned 1979 launches will be "reimbursables," according to the space agency. As in 1978, most will emphasize the use of space as directly benefiting people in such fields as communications, environment, and meteorology. In 1978, NASA logged twenty launches, eleven reimbursable.

In March, Voyager-1, launched in September 1977, will make its closest approach to Jupiter and journey on to make a close approach to Saturn in November 1980. Voyager-2, launched in August 1977, is to make its closest approach to Jupiter in July and to Saturn in August 1981. Pioneer-11, launched in April 1973, will follow its primary mission to Jupiter with its closest approach to Saturn's rings in September 1979.

★ Following FAA certification of the Concorde SST in early January, Braniff International became the first US airline to operate the plane over the continental United States.

Braniff began scheduled servic between Dallas-Ft. Worth Interna tional and Dulles International nea Washington, D. C. The subsoni flights, connecting with British Air ways and Air France SST flights "provide the only daytime crossin from an inland gateway to Europ as well as a seven-hour through plane service between Texas an London or Paris."

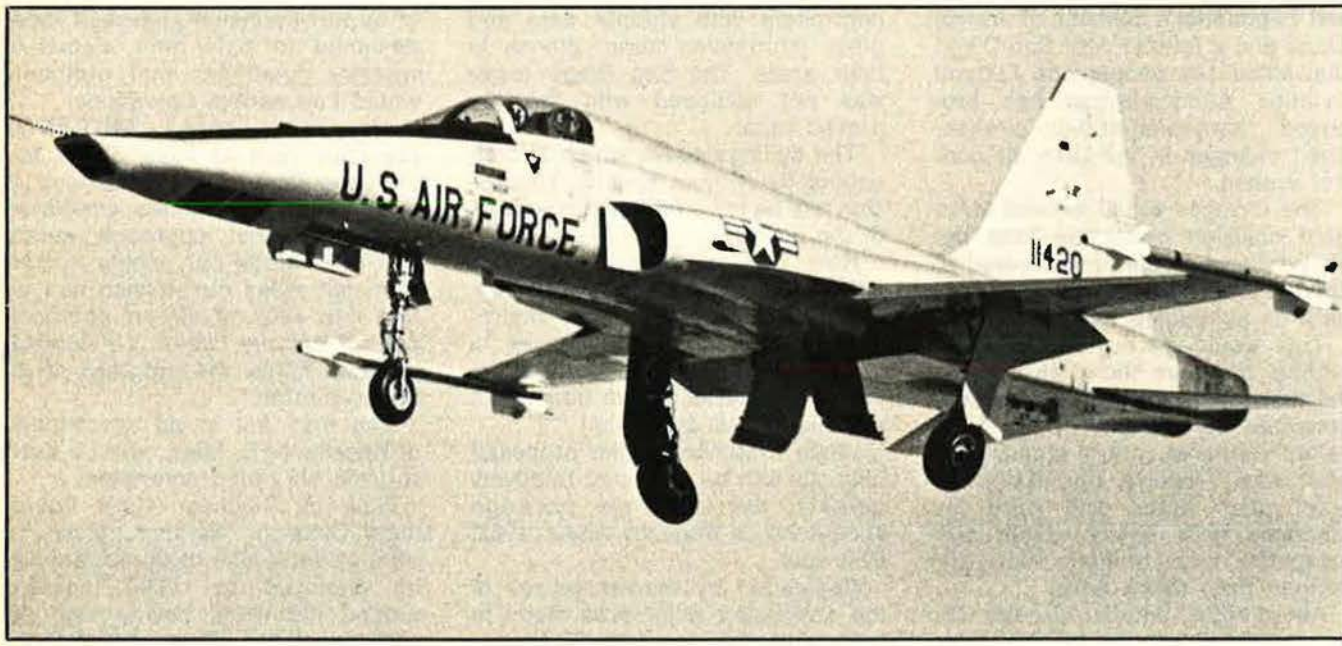
★ In late January, NASA orbited a satellite dubbed SAGE (for strato spherical aerosol and gas experi ment) designed to measure the ef fect that aerosols may be having o the earth's protective ozone layer.

Aerosols have been used as pro pellants in such products as ha sprays, deodorants, and the lik Their use has recently been banne in the wake of theories that the could be destroying the ozone laye that shields the earth from harmfu solar radiation.

The satellite study, the first of it kind, will take place over the nex year and perhaps longer.

★ Applying tremendous pressure Cornell University scientists for the first time created a metal out of the rarest of rare stable gases, xenon.

In tests sponsored by NASA David A. Nelson, Jr., and Professo Arthur L. Ruoff, of the university's Department of Materials Science and Engineering, subjected xenon



The RF-5E, designed for high-performance photo reconnaissance and the latest in the family of Northrop F-5 tactical aircraft during its first flight at Edwards AFB, Calif., on January 29.

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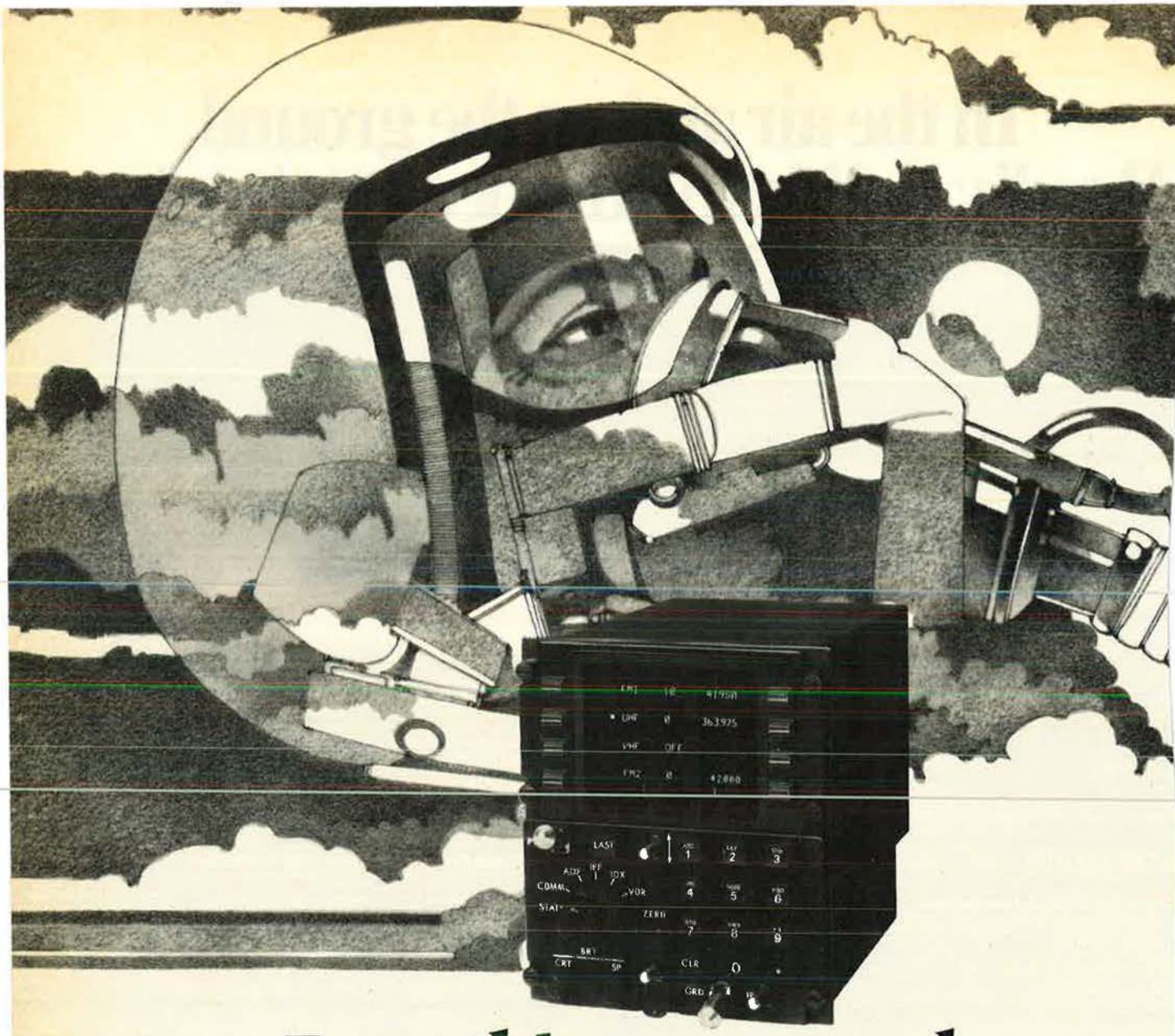

Everything you need to control your avionics: The Rockwell-Collins AN/ASQ-166.

If there's one thing today's pilots are, it's busy. So busy, in fact, that anything technology can do to reduce cockpit workloads is a giant step toward mission success. And that's precisely the idea behind the Rockwell-Collins AN/ASQ-166 Integrated Avionics Control System.

Thanks to its shared information CRT display, the AN/ASQ-166 ends long search times for individual avionics controls. Panel clutter is reduced. Com, nav, ident, security and mission avionics controls are all replaced by one integrated control display unit. Critical flight information, system status and even checklists can be displayed in bright, easy-to-read digital presentation.

Operation is easy to learn. Easy to remember. Remote readout display is available, too.

Growth capability? A reprogrammable coupler/computer with plug-in cards enables control and display for virtually any combination of avionics, current or future. Add microwave landing system, chaff dispensers, weapons management. Add instrument landing systems, performance monitors, ECM/ESM systems. Add doppler, GPS, OMEGA, Inertial and RNAV.

Cost of ownership? Lower, thanks to fewer avionics controls, less weight and multiplex wiring. You get high reliability, too.

The new AN/ASQ-166. Today's busy pilots should have it so good.

For details, contact Collins Government Avionics Division, Rockwell International, Cedar Rapids, Iowa 52406. 319/395-4412.

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Winter weather greets troops airlifted o Europe from CONUS to participate in Reforger '79, a joint Army, Air Force, and Navy exercise conducted in January and February.

solidified at −241 degrees Celsius (−402 degrees Fahrenheit) to pressures of 320,000 atmospheres to produce the new metal. (In contrast, the pressure in the deepest part of the ocean is only about 1,000 atmospheres.)

While no engineering applications are apparent from this breakthrough, the scientists believe they now have the capability to make metals out of oxygen and krypton, and possibly nitrogen, argon, and hydrogen. (Even diamonds, which are composed of crystalized carbon, might become metallic at pressures of several million atmospheres.)

If frozen hydrogen could be made metallic and kept that way after pressure is removed, it could lead to extremely powerful rocket propellants, superconductors, and improved sources for fusion energy, the scientists said.

★ **NEWS NOTES—McClellan AFB, Calif.,** has been picked as one of three DoD installations to serve as a **showcase for innovative energy programs,** officials said. McClellan's Sacramento Air Logistics Center will be used to test new coal-fired boiler technology, wind-generated energy, solar-energy uses, electrical-mechanical conversion systems, and conservation measures.

In January, **an F-16, USAF's newest fighter,** was delivered to the **388th TFW, Hill AFB, Utah.** The 388th is the first operational unit in the world to receive the aircraft. It will train the first US and foreign F-16 pilots and is scheduled to receive a total of 103 F-16As and F-16B fighter-trainers.

In February, the **United Service Organization** celebrated its thirty-eighth anniversary of serving US military personnel around the world. USO is still going strong, tailoring its roles to meet the needs of people ranging from young military marrieds to veterans in VA hospitals.

James E. Webb, former NASA Administrator who led the program to put Americans on the moon and make the US a space power, was awarded the **Gardiner Greene Hubbard/National Geographic Society Medal** in mid-January.

In the wake of successful tests of a dual inertial navigation system, MAC has announced it will **reduce**

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its navigator force assigned to C-141 StarLifters by about half. The cuts will be made by reassignment, normal attrition, and retirements, and not by mass forced reassignments.

MAC's **Aerospace Rescue and Recovery Service** is credited with **saving 553 lives in 1978,** as well as **another 166** under the Military Assistance to Safety and Traffic program.

Late January marked the **first squadron-size deployment of A-10s from CONUS to Europe** when eighteen Thunderbolt IIs from the 354th TFW, Myrtle Beach AFB, S. C., made the trip.

Following launch of twin satellites aboard a single Titan booster in December, positioning in stationary orbit over the Pacific, and checkout, the **Defense Satellite Communications Systems** (DSCS) network linking military, State Department, and other US officials around the world **has gone operational,** under control of the Defense Communications Agency. DSCS also has one satellite each orbiting over the Atlantic and Indian Oceans. A fifth network satellite is in reserve over the Pacific.

Lt. Col. Robert W. Hunter has been named Air Force Academy Director of Information. Deputy Director since September 1977, he served with AIR FORCE Magazine under the Education With Industry program in 1972–73.

Air Force Academy **Cadet Jeffi A. Jackson,** twenty-one and a se nior, is the twentieth Academ graduate to be named a Rhode Scholar.

The **new airport terminal** a Gainesville, Fla., believed to be th largest solar heated/cooled build ing in the world, has been name for a native son, **John R. Alison** a retired USAF Reserve major gen eral who is an AFA past presiden and current member of its boar of directors. ■

Index to Advertisers

WHO'S ON FIRST...IN SPACE?

There are hundreds of military satellites in orbit and more on the way. It's vital to our defense to know which types are where at all times...particularly those that may be maneuverable.

To detect and track satellites beyond radar range, the Air Force is now developing GEODSS, which stands for "Ground based Electro-Optical Deep Space Surveillance System". It uses astronomical telescopes with electronics that enhance the light from objects far below the threshold of unaided vision.

As a leader in systems engineering in general and space technology in particular TRW has formed a team of high-technology companies to develop the overall system. Our computer specialists have worked out an ingenious solution for the most difficult problem of all: that of rapidly sorting out, from all the millions of points of light, those anomalous sources that need to be more carefully analyzed. The work is done by high-speed minicomputers and the crucial technology is in their programming. TRW's Moving Target Indicator (MTI) software, developed under contract to the Air Force Systems Command's Electronic Systems Division, almost immediately recognizes and eliminates the natural light sources and zeroes in on the ones that need analysis.

This is one of many areas of space defense in which TRW is active. We're also building military satellites and global communications systems as well as the complex, realtime software that's needed for defense against intercontinental ballistic missiles. We support the Air Force with systems engineering for the Minuteman and Space Transportation System programs... and our electronics people are developing advanced components and systems for digital communications. If you want to know more about our space defense capabilities, please contact Herb Greenbaum, TRW Defense and Space Systems Group, One Space Park, Redondo Beach, CA 90278.

SPACE DEFENSE TECHNOLOGY

from a company called **TRW**

Capitol Hill

By the Air Force Association Staff

Washington, D. C., Jan. 29

Organizing the Ninety-sixth

There are few surprises in the makeup of the Ninety-sixth Congress. On the House side, Thomas P. (Tip) O'Neill (D-Mass.) continues as Speaker of the House, along with Jim Wright (D-Tex.), Majority Leader; John Brademas (D-Ind.), Majority Whip; John J. Rhodes (R-Ariz.), Minority Leader; and Robert H. Michel (R-Ill.), Minority Whip.

The Senate picked Warren G. Magnuson (D-Wash.) for the post of President Pro Tempore, replacing retired Sen. James O. Eastland (D-Miss.). Robert C. Byrd (D-W.Va.), Alan Cranston (D-Calif.), Howard Baker (R-Tenn.), and Ted Stevens (R-Alaska) were reelected as Majority Leader, Majority Whip, Minority Leader, and Minority Whip, respectively.

Committee Assignments: House Armed Services Committee

Membership of this pivotal body was increased to forty-five: **Democrats:** Chairman Price (Ill.), Bennett (Fla.), Stratton (N. Y.), Ichord (Mo.), Nedzi (Mich.), C. Wilson (Calif.), White (Tex.), Nichols (Ala.), Brinkley (Ga.), Mollohan (W. Va.), D. Daniel (Va.), Montgomery (Miss.), Runnels (N.M.), Aspin (Wis.), Dellums (Calif.), Davis (S. C.), Schroeder (Colo.), Kazen (Tex.), Won Pat (Guam), Carr (Mich.), Lloyd (Calif.), McDonald (Ga.). **Republicans:** B. Wilson (Calif.), Dickinson (Ala.), Whitehurst (Va.), Spence (S. C.), Treen (La.), Beard (Tenn.), Mitchell (N. Y.), Holt (Md.), R. Daniel (Va.), Hillis (Ind.), Emery (Me.), Trible (Va.), Badham (Calif.). **New members:** Fazio (D-Calif.), Leach (D-La.), Byron (D-Md.), Mavroules (D-Miss.), Wyatt (D-Tex.), Bailey (D-Pa.), Doughtery (R-Pa.), Courter (R-N. J.), Evans (R-Virgin Islands).

On a first tally, thirty-two members are rated as defense supporters.

House Appropriations

Jamie L. Whitten (D-Miss.), replaces George H. Mahon (D-Tex.) as Chairman of the committee. **New members are:** Ginn (D-Ga.), Lehman (D-Fla.), Hightower (D-Tex.), Jenrette (D-S.C.), Sabo (D-Minn.), Dixon (D-Calif.), Stewart (D-Ill.), Rudd (R-Ariz.), and Pursell (R-Mich.). With pro-defense holdovers, defense supporters are expected to have a two-to-one edge.

Under the chairmanship of Joe Addabbo (D-N. Y.) the HAC Defense Subcommittee is certain to be critical of many defense issues, but on balance the outlook is better than in the past two years.

House/Senate Budget Committees

Robert N. Giaimo (D-Conn.) retains his position as Chairman of the House Budget Committee, and Edmund S. Muskie (D-Me.) again chairs the Senate Committee. **New House members are:** Gephardt (D-Mo.), Brodhead (D-Mich.), Panetta (D-Calif.), Solarz (D-N. Y.), Wirth (D-Colo.), Jones (D-Okla.), Nelson (D-Fla.), Gray (D-Pa.), and Shuster (R-Pa.). **New Senate members:** Metzenbaum (D-Ohio), Moynihan (D-N. Y.), Hart (D-Colo.), Riegle (D-Mich.), Exon (D-Neb.), Packwood (R-Ore.), Armstrong (R-Colo.), Kassebaum (R-Kan.), Boschwitz (R-Minn.), Hatch (R-Utah), and Pressler (R-S. D.).

The Budget committees—which were established under the Congressional Budget Act of 1974—have rapidly gained in prestige and power and are expected to pose the most serious challenge to the FY '80 defense budget. The two committees are probably divided about evenly as far as defense issues are concerned.

Senate Armed Services Committee

The Senate reduced membership of the SASC from eighteen to seventeen with pro-defense members leading by three to one. **Democrats:** Chairman Stennis (Miss.), Jackson (Wash.), Cannon (Nev.), H. Byrd (I-Va.), Nunn (Ga.), Culver (Iowa), Ha (Colo.), Morgan (N. C.). **Republicans** Tower (Tex.), Thurmond (S. C.) Goldwater (Ariz.). **New members** Exon (D-Neb.), Levin (D-Mich.) Warner (R-Va.), Humphrey (R-N. H.) Cohen (R-Me.), and Jepson (R-Iowa)

Senate Appropriations Committee

The addition of several pro-de fense senators should result in sizable advantage for defense sup porters. **New members of the com mittee are:** Durkin (D-N. H.), McClur (R-Idaho), Laxalt (R-Nev.), Garn (R Utah), and Schmitt (R-N. M.).

Senate Foreign Relations Committee

Under the leadership of Fran Church (D-Idaho), a more assertiv role clearly is in the offing for th committee. Central here is SALT on which Senator Church will hol the lead-off hearings. Under the d rection of Dr. William Bader, newl appointed committee staff directo significant staff changes are ex pected. The objective is said to be more balanced staff with more tech nical expertise. New conservative committee members are expected to engender a more assertive atmosphere. This could be of critical importance because the committee's decisions may well be the bellwether of the Senate's floor actions. Committee membership: **Democrats** Chairman Church (Idaho), Pell (R.I.) McGovern (S. D.), Biden (Del.) Glenn (Ohio), Stone (Fla.), Sarbanes (Md.). **Republicans:** Javits (N. Y.) Percy (Ill.), Baker (Tenn.). **New members:** Zorinsky (D-Neb.), Muskie (D-Me.), Hayakawa (R-Calif.), Helms (R-N. C.), and Lugar (R-Ind.).

New Legislation

Sen. Harry Byrd (I-Va.) and Sen. Sam Nunn (D-Ga.) have introduced a bill calling for reinstituting procedures for registration of young men under the Selective Service System. Senator Nunn, in a press release, stated that this bill would provide for debate and consideration of the steps necessary to ease serious and growing problems of the All-Volunteer Force. He further stated that he "hoped the Congress and American people would give serious attention to a national service system in which America's young people can serve in both military and civilian functions to meet the country's needs." ■

Sperry Update 6

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

.S. Army orders nproved ASN-43.

Sperry Flight Systems will supply n improved version of its ASN-43 aved gyromagnetic compass stem for U.S. Army aircraft under $1.02 million preproduction con act from the Army Materiel evelopment and Readiness ommand.

Improvements to the ASN-43 stem, widely used for a number of rs in Army aircraft, include addi- a of a microprocessor to the ctional gyro control electronics a magnetic-only heading mode.

Use of the microprocessor along ith a pre-indexed magnetic flux alve contributes to greater long- rm heading accuracy and dynamic ompensation capability. The nproved ASN-43 is specifically esigned for use with the ASN-128 oppler navigation system.

The new "emergency" magnetic ode provides steady magnetic eading information from the emotely-mounted flux valve in the vent of gyro failure, reducing ependence on the standby whiskey" compass.

eech selects Sperry system or Navy CTX transports.

Beech Aircraft Corp. has selected ne Avionics Division of Sperry Flight ystems to supply integrated auto- atic flight control systems for the st 22 Navy CTX utility transport rcraft.

The CTX, Navy version of the eech Super King Air 200 and Air orce/Army C-12 turboprop, will be quipped with the Sperry SPZ-200 utopilot and SPI-54 flight director ystem.

In addition to the dual flight irector instruments, the Sperry CTX ackage will include dual VG-14A emote vertical gyros, C-14-43 slaved yrocompass system, and AA-215 adio altimeter.

Deliveries of CTX avionics by perry to Beech will begin early in 979.

B-52 control display system to be produced by Sperry.

A controls and displays subsystem (CDS) for the updated B-52 bomber offensive avionics system (OAS) will be supplied by Sperry under a $2.74 million contract with Boeing Wichita Company.

The contract for preproduction units includes production options for retrofit of up to 269 aircraft.

The Sperry CDS will be the major control center for the entire OAS, interfacing with other avionics to generate and display a variety of mission-essential data. The system consists of two 10 in. cathode ray tube multi-function displays, a display electronics unit (DEU), digital radar scan converter, video recorder and two integrated control keyboards.

Under the initial contract, deliveries are to begin in May 1979. Boeing-Wichita is the prime contractor, sponsored by USAF/AFSC Aeronautical Systems Division, Directorate of Aircraft Modernization, Wright-Patterson AFB, Ohio. The OAS preproduction work will update the offensive avionics in the B-52G and H model strategic bomber fleet.

In the Sperry CDS, the DEU is the focal point for control and supervision of weapon delivery and navigation display processing and presentation.

Two integrated keyboards located at the radar navigator and navigator stations will control the CDS in conjunction with the navigator's management and presentation panels.

Operators will call up information from various sensor modes, including digitally processed continuous viewing radar returns (with or without alphanumerics), external viewing system imagery with superimposed symbology, and alphanumeric data alone.

A digital data bus interfaces the CDS with other OAS components, including the general purpose digital computers of the computational subsystem.

The portable, airborne, laboratory, hostile environment, MIL-spec recorder-reproducer.

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Nearly 18 months of exhaustive environmental testing qualified the original design to MIL-E-16400 for the U.S. Navy. It was modified to MIL-E-5400 for the U.S. Air Force. A high density digital model has been delivered for shipboard and airborne applications. Yet another version is being supplied for the LAMPS MARK III program. Among its other major program credits are WLQ-4, WLR-6, NOMAD and ARIA.

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For applications involving ELINT, ACINT, high density digital, or general test telemetry data, investigate AN/USH-24(V).

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AIR FORCE MAGAZINE'S FIFTH ANNUAL

SOVIET AEROSPACE ALMANAC

MiG-25R Foxbat-D (above) and Foxbat-B reconnaissance aircraft

SOVIET AEROSPACE ALMANAC

The accelerating momentum of Soviet military—especially offensive strategic—growth is significantly greater than Western analysts consider consonant with legitimate defense objectives, providing further support for the theory that the Soviet Union's ultimate goal is . . .

World Hegemony Through Military Superiority

BY EDGAR ULSAMER, SENIOR EDITOR

DÉTENTE, it can be argued in retrospect, has cost the Soviets nothing, yet has paid off in bonanzas that extend from Western credits—some $60 billion to date, used mainly to strengthen heavy industry, the pivot of the Soviet military-industrial complex—to promoting appeasement and unilateral arms control in the West.

It probably is moot to argue either for or against the proposition that the Soviet Union, because of détente, has curbed significantly its arms buildup or its propensity for interventionism by testing "open doors," from Afghanistan and Yemen to Iran. The answer to either question is likely to reflect no more than the politics of the questioner.

A case can and is being made in behalf of the notion that détente—especially in the form of SALT, its only codified manifestation—is limiting the Russian strategic inventory. It becomes more difficult for the arms-control enthusiasts to prove that these Soviet "cuts" amount to more than weeding out chaff, to wit, the technologically obsolete SS-7 and SS-8 ICBMs.

A better measure of the value of Soviet SALT concessions, at least in discrete financial terms, is a 1978 CIA analysis of trends in Soviet defense spending, which concludes that the difference between SALT II and no accord is likely to amount to a picayune 0.2 percent annually in the Soviet defense budget over the next few years. In the view of other US analysts, even this miniscule reduction may be illusory.

On the related question of whether or not the Soviet Union is willing to respond to unilateral US arms reductions or deferral of weapons modernization, it is possible to answer with an unhedged "No." The House Armed Services Committee's Panel on SALT and the Comprehensive Test Ban Treaty reports that its members raised the issue of reciprocity with senior Soviet officials on several occasions in 1978 with the unanimous response that "decisions by the United States to forego weapons deployment are unilateral US decisions, independent of joint United States-Soviet arms-control efforts; the United States should not, therefore, expect any Soviet reciprocity. The members [of the panel] were told that whether Soviet forces were excessive or sufficient i a matter to be decided only by the Soviet Union. Thes Soviet responses are consistent with the assessment tha there is no history of the Soviets responding in kind to U unilateral restraints."

If the Soviets see détente merely as window dressing on the road to military superiority, the Kremlin's long-term goals obviously are at odds with Western objectives of stability and maintenance of the *status quo*. While these Soviet goals—and the timetable for reaching them—undergo occasional facelifts, they seem to remain immutable in basics. The Chinese—who probably understand better than most Western analysts the mix of Marxist-Leninist zealotry and traditional Great Russian militarism and imperialism that motivates the Soviet leaders—long ago warned of the Soviet drive toward world hegemony. This scholarly term probably deserves to become a household word because it aptly captures Moscow's quintessential goal without overstatement or understatement. Prof. Richard Pipes, Director of Harvard's Russian Research Center, defines a *hegemon* as one who enjoys a monopoly on violence within his imperial realm and who, therefore, without directly administering and occupying, has the authority to insist on his will being done on any issue of interest to him, and the capacity to apply coercion, if other means of persuasion should fail.

The importance of defining Soviet global ambitions as hegemony, rather than as out-and-out world conquest in a Hitlerian sense, is that the former may be credible and attainable while the latter is neither. Recognizing the Soviet goal of hegemony helps in understanding Moscow's attitude toward strategic nuclear warfare, and the associated drive toward nuclear superiority. There is no evidence to suggest that the Soviet political or military leaders seek to incinerate the West in nuclear war. But neither is there evidence that the Soviet elite will shrink from going to the brink of nuclear war, especially once they are persuaded that they could emerge from such a conflict as a still-viable although damaged state.

The terminus of this train of thought—and the

aramount US concern—is, of course, the evolution of oviet strategic capabilities tailored to perform two cen- al, interrelated functions: On the one hand, their trategic forces must be able to help pave the way toward lobal hegemony through the demonstrable ability to ow resisters; on the other, they must demonstrate con- incingly to the men in the Kremlin as well as the outside /orld that the Soviet Union can and will prevail in any ind of nuclear conflict if such a war does break out.

Initially, the USSR probably committed itself for deological reasons to the doctrine that nuclear war is hinkable and winnable. In their eyes, admitting other- /ise would be tantamount to defeatism and pacifism. But s Fritz Ermarth, a senior official of the National Secu- ity Council, wrote recently in *International Security*, ' . . . strategic victory and survival in nuclear conflict iave become more incredible to the United States as the trategic power of the Russians has grown. For the Soviets, however, the progress of arms and war-survival rograms has transformed what was in large measure an deological imperative into a more plausible strategic po- ential."

A noteworthy and alarming aspect of the intensifying rowth in Soviet military capability, senior US analysts oint out, is the iron-willed determination by the USSR's Defense Minister Dmitriy F. Ustinov to correct "sys- ematically and thoroughly all the deficiencies of the Soviet military forces and their weapons." Ustinov, de- cribed as a brilliant technocrat totally committed to achieving Soviet military superiority, has built up within he Communist Party a power base rivaling that of Presi- dent Leonid I. Brezhnev and, if anything, is expanding the primacy of the military-industrial complex in Soviet society. US analysts grudgingly admit that under Us- tinov's leadership the Soviets are "correcting almost all of the flaws in their military, and especially strategic ca- pabilities, that the US had counted on in order to main- tain a degree of parity." In addition, Ustinov relentlessly pushes the Soviet military toward further advance in fields where Russia already clearly leads the US.

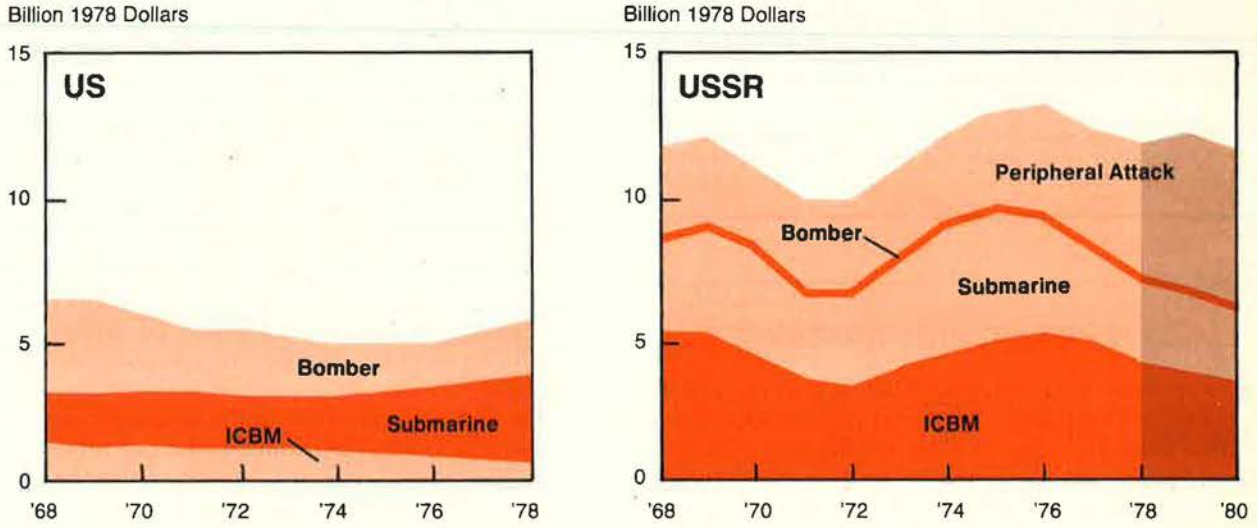
The singlemindedness of the Soviet arms race was captured by JCS Chairman Gen. David C. Jones in his FY '80 Military Posture Statement with the comment that the Soviets continue "to outman, outgun, and outdeploy us in most meaningful military categories, all the while shortchanging our qualitative lead in many important areas." The direction and momentum of the growth in Soviet military power, his report reiterated, are "far out of proportion to any rational calculation of their defense needs. . . . With each passing month, I grow increasingly apprehensive about the severity of the challenges ahead and about the direction, pace, and strength of our responses in some critical areas."

Noteworthy insights into what might motivate the Soviets toward inordinate military growth were furnished by Defense Secretary Harold Brown's FY '80 Annual Defense Report that suggests the military sector is the only field where the Soviets can compete successfully with the US. But, at the same time, Secretary Brown suggested, "their failure to compete successfully in other areas can increase the incentive for the Soviets to use their military power to increase their influence and to gain political advantage, whether by direct application of military force, through intimidation, through proxies, or through arms transfers."

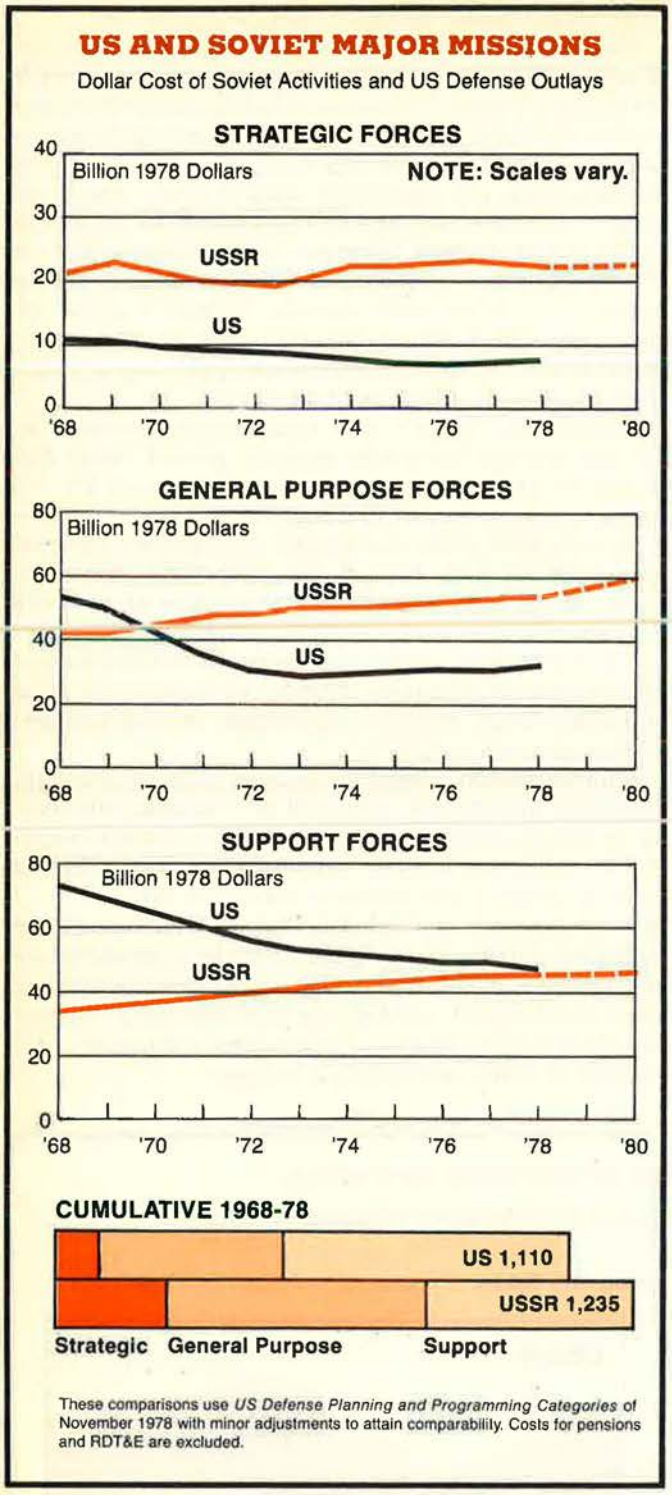
Another reason behind the excessive Soviet buildup, Secretary Brown said, may well be "bureaucratic inertia, or rather—in a less-benign formulation—the strength of the military industrial establishment in the Soviet political process and resource allocation process. . . . My own concern and belief is that, to whatever extent Soviet capabilities in the 1980s might be engendered by motives that seem less alarming to us, these capabilities could then be used—or their use threatened in dangerous and destabilizing ways—" unless arms control or a US buildup, or both, can restore a balance.

US AND SOVIET FORCES FOR STRATEGIC OFFENSE

A Comparison of US Outlays with Estimated Dollar Costs of Soviet Activities if Duplicated in the US



The strategic offense mission is defined according to the *US Defense Planning and Programming Categories* of November 1978 with minor adjustments to attain comparability. Costs for pensions, nuclear materials for warheads, and RDT&E are excluded.



Soviet Growth Statistics

In a recently released comprehensive study, titled "A Dollar Cost Comparison of Soviet and US Defense Activities, 1968–78," the Central Intelligence Agency reported that the Soviet Union last year spent nearly forty-five percent more on defense—$146 billion vs. $102 billion—than the United States. Over the past ten years, the CIA found, Soviet defense activities increased at an average annual rate of three percent when measured in constant dollars. SALT I seemingly had no effect on Soviet defense investments, for the CIA found that "while growth rates fluctuated somewhat from year to year—reflecting primarily the phasing of major procurement programs for missiles, aircraft, and ships—the pattern was one of continuous growth. Evidence on weapon systems currently in production and development, continuing capital construction at major defense industry plants, and the increasing costs of modern weapons indicate that the long-term growth trends in Soviet defense activities will probably continue into the 1980s."

Soviet spending on strategic forces, exclusive of RDT&E, during the past ten years was two and a half times that of the United States, according to the CIA. Last year the ratio widened to three to one in favor of the USSR. During the ten-year period covered by the CIA report, the Soviet ICBM force absorbed about fifty-five percent of funds allocated to intercontinental attack forces, compared with only about twenty percent for comparable US outlays.

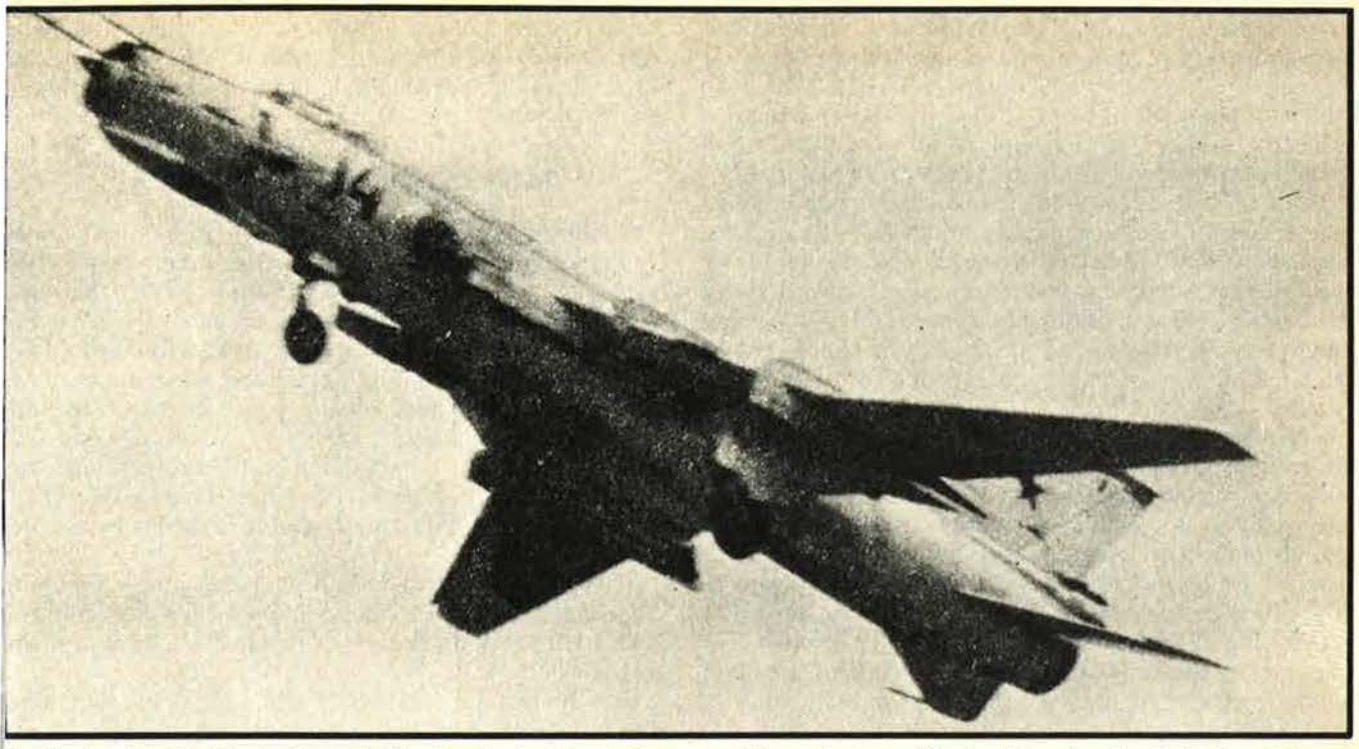
Soviet spending on general-purpose forces, including airlift and sealift, exceeded the US total by about thirty-five percent over the past ten years. Within this category land forces accounted for the largest share of Soviet spending and have grown steadily over the last ten years, the CIA reported. In general-purpose naval forces—excluding attack carriers—Soviet spending last year topped the US investment by about twenty-five percent. Soviet outlays on tactical air forces—including attack carriers and their associated aircraft—amounted to about one-half the US costs over the past ten years. But if US Navy and Marine airpower is removed from the comparison, the dollar costs of the Soviet tactical air forces for 1978 and for the entire period are only slightly below the US level, the report said.

While the CIA noted a dip in Soviet investments in tactical airpower in 1978, this decline reflects merely the completion of some major aircraft procurement programs. "It does not appear to represent the start of a downward trend; we expect the introduction of new aircraft to raise procurement costs for 1979 and 1980," the CIA predicted.

In the military hardware sector—including major spares and facilities—the Soviets outspent the US by about sixty-five percent last year and by about thirty percent over the past ten years.

The CIA avoided specific estimates about the price tag of the Soviet military RDT&E activities, but asserted that in 1978 the Soviet program was "substantially larger" than that of the US. In his Annual Defense Report, Secretary Brown suggested that, measured in US prices, "Soviet expenditures in military research and development may be seventy-five percent larger than ours, [even though] we are supposed to be—and are—depending on our technology to overcome their [greater] numbers."

The CIA estimated the uniformed personnel strength of Soviet forces at about 4,300,000, or about twice the US level. Estimated Soviet military manpower has grown by more than 500,000 since 1968, with the largest increase—almost 300,000—occurring in ground forces. But, on a percentage basis, the CIA found, the greatest increase was scored by the air forces, which grew at an



The Soviets, like the US, rely for much of their tactical nuclear delivery capability on dual-capable aircraft, such as the Su-17 Fitter C/D (shown above), Su-19 Fencer, and some versions of the Flogger (MiG-23 and MiG-27).

annual rate of about two and a half percent over the past decade.

Overall US military manpower, by contrast, dropped from 3,600,000 to 2,100,000 during the ten years covered by the CIA report.

The Soviet Drive Toward Superiority

President Jimmy Carter has tended to avoid shrill public statements about the growth in Soviet military capabilities. Nevertheless, he felt compelled in an address at Wake Forest University—in Winston-Salem, N. C.—about a year ago to assert that "over the past twenty years, the military forces of the Soviets have grown substantially, both in absolute numbers and relative to our own. . . . Discounting inflation, since 1960, Soviet military spending has doubled, rising steadily in real terms by three or four percent a year, while our own military budget is actually lower now than in 1960. . . . The Soviets have continued to modernize their forces beyond a level necessary for defense."

The Joint Chiefs' testimony before Congress was blunter: " . . . although the Soviets seek to avoid war, preferring to attain their strategic objectives in other ways, their military doctrine is premised on the notion that war is an instrument of policy and that success in war, even nuclear war, is attainable. . . . The available evidence suggests that the USSR is engaged in a program designed to achieve superiority, but they have not yet attained this goal. The Joint Chiefs of Staff are concerned, however, that the recent US and Soviet trends in military programs and civil defense could permit the USSR to attain superiority."

Possibly more revealing and portentous is this statement—confirmed as "correct" by authoritative congressional experts—featured in a recent, formal letter by 170 retired generals and admirals of the US armed forces to President Carter: "The National Intelligence Estimate, the most authoritative US government evaluation of intelligence data, acknowledges at last that the Soviet Union is heading for superiority—not parity—in the military arena. This represents a complete reversal of official judgments that were a substantial factor in allowing our government to pursue détente and overall accommodation with the Soviet Union."

The joint letter to the President further pointed out that "under the umbrella of growing strategic nuclear and tactical military superiority, the Soviet leaders have become more aggressive. Soviet influence and power are increasingly evident in the Eastern Mediterranean and the Red Sea and Persian Gulf littoral. Afghanistan is being brought under Soviet control. Anti-American forces harass the governments of Iran and Turkey. Through the use of Cuban mercenaries, the USSR has moved north from Angola to Ethiopia and Zaire. Some Cuban forces have returned to Syria from Angola and also are entering Lebanon. Soviet imperial objectives appear to include the neutralization of Western Europe, in part by denying it access to critical raw materials; the encirclement of China; and the isolation of the US."

Soviet expansionism, according to the Central Intelligence Agency, is also increasingly evident in fast-growing military sales to less-developed countries. During 1977, the last year for which figures could be compiled, Soviet sales of this type reached $4.2 billion for an aggregate total since the mid-1950s of almost $30 billion, the CIA reported. Despite Moscow's apparent preoccupation with sub-Saharan Africa—where its Cuban surrogates play an increasingly important role—"three-fifths of the $4 billion military commitment in 1977 went to

support radical Arab regimes. Moscow's most decisive supply action was in the Horn of Africa. . . . The USSR gave more active support to African insurgent groups through new and heavier assistance. The 21,000 Cuban military personnel in black Africa at year-end (almost twice the number at year-end 1976) were further testimony of Moscow's heightened interest in the area."

The CIA also noted that the record $3.3 billion in actual deliveries of Soviet arms during 1977 "featured a larger portion of advanced weapons systems and naval craft. Egypt's ongoing peace initiatives toward Israel provided Moscow with further opportunities to cement relations with Algeria, Lybia, and Syria—members of the 'Steadfastness Front' opposing accommodation with Israel."

Expansionism—backed and fostered by emerging military superiority—is finding concrete recognition *inside* the Soviet Union in two specific ways. Strong drives are under way to inculcate the Soviet people with the notion that in addition to defending their homeland they may be asked to go abroad to fight in furtherance of socialism. Supporting this new orientation is a rash of books glorifying the role of Soviet troops fighting in the Spanish civil war, so far the only major and formal assignment of Soviet forces to an interventionist task in the history of the USSR.

Secondly, the character of the Soviet general-purpose forces is undergoing a distinct change, with force projection and strategic mobility receiving high priority and visibility.

Pentagon analysts point with considerable concern at the fact that Soviet forces assigned to the Far East, normally assumed to be deployed only against China, are acquiring—especially in terms of airpower and naval forces—extensive force projection capabilities that are not required for operations against China. But these forces do constitute an ominous and destabilizing threat against Japan.

The Strategic Equation

Briefing newly elected members of the Ninety-sixth Congress in mid-January, General Jones made this trenchant statement: "Since the early 1960s, the estimates of growth in Soviet military capability have been underestimated far more than overestimated. The greatest underestimations have been those concerning strategic nuclear forces, the most destructive and dangerous area of military capability. For many years the Soviets have been outspending us on strategic nuclear forces by a factor of between two and three to one. They have built the most destructive force in the history of the world."

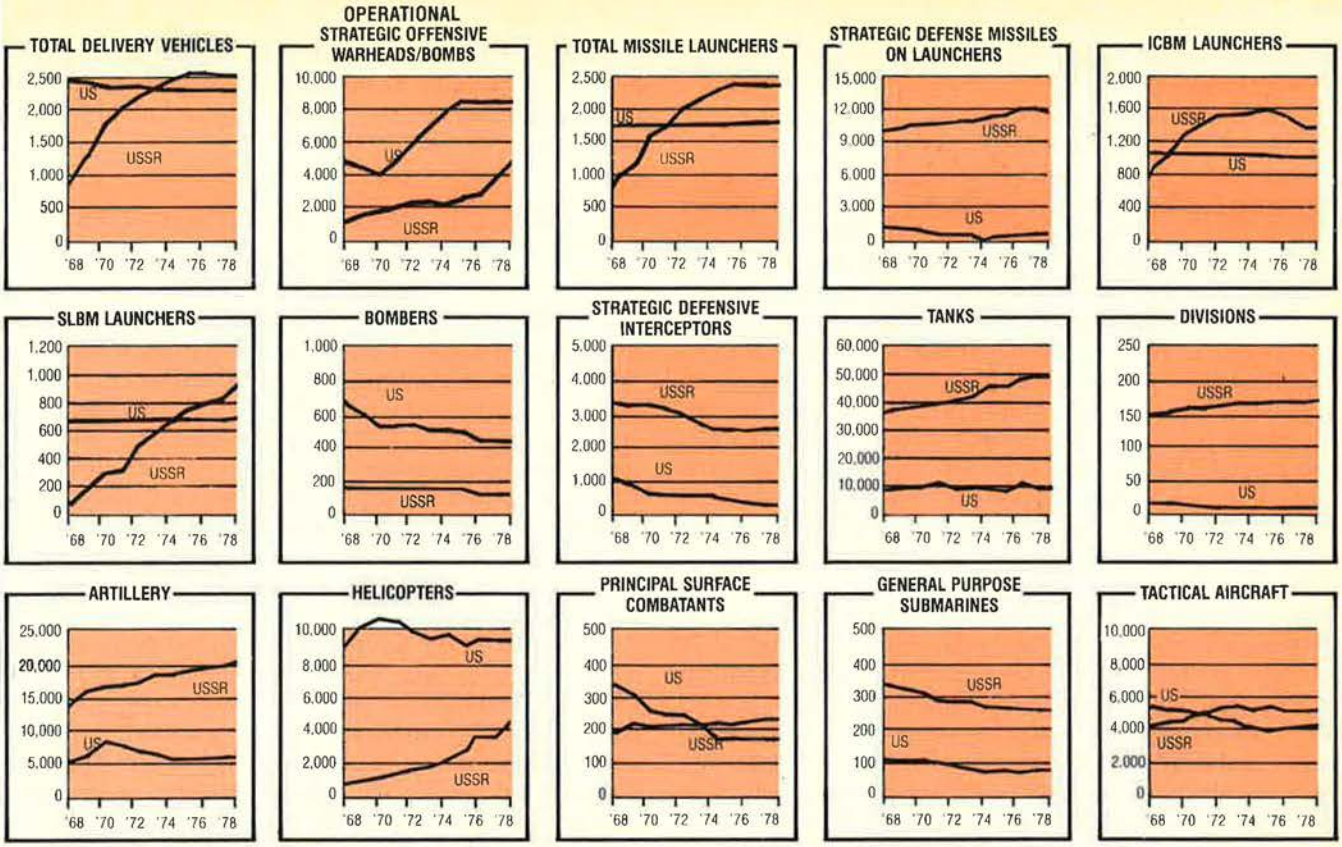
The greatest increase in Soviet capability, the JCS Chairman pointed out, "has occurred since the signing of SALT I, and I don't see any evidence of slackening effort on their part."

The Soviets, General Jones said, "are deploying three new intercontinental ballistic missiles, including the very large SS-18, which can carry up to ten high-yield warheads and deliver them with great accuracy. They are deploying new sub-launched ballistic missiles. They are continuing with the deployment of the Backfire bomber that has some capability for intercontinental missions. In addition, they have a number of new ICBMs under development, as well as research and development in many

US AND USSR STRATEGIC FORCE LEVELS

	JAN. 1, 1978		JAN. 1, 1979	
	US	USSR	US	USSR
Offensive				
Operational ICBM Launchers [1,2]	1,054	1,400+	1,054	1,415+
Operational SLBM Launchers [1,2,3]	656	900+	656	950
Long-Range Bombers [4]				
Operational [5]	349	140	347	150
Others [6]	225	0	225	0
Variants [7]	0	120	0	105+
Force Loadings [8]				
Weapons	9,000	4,000+	9,000	5,500
Defensive [9]				
Air Defense				
Surveillance Radars	57	6,500	57	7,250+
Interceptors [10]	324	2,600	330	2,650
SAM Launchers [11]	—	10,000	—	9,550
ABM Defense				
Launchers [2]	—	64	—	64

[1] Includes on-line missile launchers as well as those in construction, overhaul, repair, conversion, and modernization.
[2] Does not include test and training launchers, but does include launchers at test sites that are thought to be part of the operational force.
[3] Includes launchers on all nuclear-powered submarines and, for the Soviets, operational launchers for modern SLBMs on G-class diesel submarines.
[4] Excludes, for the US, 4 B-1 prototypes and 68 FB-111s; for the USSR: Backfire.
[5] Includes deployed, strike-configured aircraft only.
[6] Includes, for US, B-52s used for RDT&E, other miscellaneous purposes and those in reserve, mothballs, or storage.
[7] Includes, for USSR, Bison tankers, Bear ASW aircraft, and Bear reconnaissance aircraft. US tankers (641 KC-135s) do not use B-52 airframes and are not included.
[8] Total force loadings reflect those independently targetable weapons associated with the total operational ICBMs, SLBMs, and long-range bombers.
[9] Excludes radars and launchers at test sites or outside CONUS.
[10] These numbers represent Total Active Inventory (TAI).
[11] Some of the launchers have multiple rails.



These charts reflect the latest information on numerical balances between the US and the USSR in terms of major strategic and general-purpose force weapon systems. Most trends favor the Soviets.

other areas of strategic weapons. There is no question that the Soviet buildup and modernization of their strategic forces have outpaced ours by a considerable margin and continue to do so."

In 1973—one year after SALT I took effect—the Soviets began flight-testing a new family of modern weapons—the SS-17, SS-18, and SS-19. The new missiles started entering the inventory in 1975 and carry multiple independently targetable warheads (MIRVs). The Soviets caught up with US-developed MIRV technology several years ahead of US intelligence community expectations. Similarly, progress in Soviet ICBM accuracy—now better than the best deployed US weapons—far exceeded the "worst-case" predictions of US analysts.

Conversion of the Soviet ICBM inventory to these three new missiles, the fourth-generation of Soviet ICBMs, will more than double Soviet ICBM throw-weight, from about 6,000,000 pounds in 1972 to 13,000,000 by 1982. US ICBM throw-weight—by contrast—will remain constant at about 3,000,000 pounds over this period. An even more telling measure of Soviet ICBM force growth is the vast increase in warheads from about 1,600 in 1972 to an estimated 9,000 a decade later.

The latter figure could go higher yet if the Soviets increase the number of MIRVs per ICBM. The SS-18, the world's largest ICBM with a throw-weight seven times that of Minuteman III, so far has been flown with no more than ten warheads. Recent activities by the Soviets suggest, however, that the USSR plans to retain the option to increase that number, possibly to about twenty warheads, by testing new reentry vehicles before SALT freezes at ten the number of warheads that can be test-flown on the SS-18. There also is the suspicion that the Soviets may experiment with using two post-boost vehicles (or buses that dispense the individual RVs) on the SS-18.

Under SALT II, the Soviet Union is permitted to deploy 326 SS-18s, even though the US is denied the right to deploy *any* ICBMs larger than the Soviet SS-19, the throw-weight of which is half that of the SS-18. The enormity of the SS-18's throw-weight can be gauged in practical terms by the realization that ten of these ICBMs have the total throw-weight of all the SLBMs carried by all the US fleet ballistic submarines on station at one time.

As of this writing, the Soviet ICBM inventory consists of about 1,415 weapons, a number that has not changed appreciably from a year ago. But within this total, the number of new fourth-generation systems increased by about 150 and replaced a corresponding number of obsolescent older systems. About 500 fourth-generation systems are now deployed. There is some uncertainty about the planned mix of SS-17s and SS-19s. Most analysts are inclined to believe that there will be more SS-19s than SS-17s because the former carries two more warheads (six vs. four) than the latter. There is little doubt that the Soviets will build up the SS-18 inventory to the maximum allowed under SALT, which is either 308 or 326, depending on whether or not eighteen fully operational test systems are counted. Recent evolutionary improvements of the SS-18—specifically in the new "Mod-4" version, which accommodates various MIRV payloads—have been dramatic. Accuracy of recent test-flights exceeded that of the newest Minuteman IIIs and caused revisions of US estimates of when the Soviets could achieve a first-strike capability against this nation's ICBM force.

That threat level is now anticipated for as early as 1980, rather than by 1985.

One of the more ominous aspects of the Soviet ICBM force is the SS-16, a missile about the same size as Minuteman III. There is some indication that this weapon, designed for mobile deployment, has been so deployed and is being intermingled with the MIRVed SS-20 intermediate-range ballistic missile (IRBM), to which it is related. Another worrisome development is the installation of SS-20 IRBMs near the geographic center of the Soviet Union in a former ICBM site that had to be disestablished under the terms of SALT I. The SS-20 consists of the two lower stages of the SS-16 and thus can be converted into a full-fledged ICBM. US concern is increased by the fact that some SS-16s already seem to be intermixed with SS-20s at one silo complex, in a location where a weapon with greater range than the SS-20 makes more sense.

Now a fifth-generation of ICBMs—involving at least four different designs—appears to be nearly ready for testing, according to US analysts. General Jones's 1980 Military Posture Statement graphically contrasts Soviet and US strategic efforts, especially in the ICBM sector, with this statement: "A decade or more of slips, reductions, and cancellations has retarded US modernization appreciably and our ability to accelerate production enough in the short term to keep pace in the event of an unrestrained competition is questionable."

The Soviet SLBM Forces

The number of Soviet SLBMs reached 950 by the end of last year. The US total remains constant at 656. More than 250 Soviet SLBMs are SS-N-8s with a range of more than 4,200 nautical miles. A still newer, more capable missile, the SS-N-18, with a range of about 5,000 nautical miles is being readied for operational deployment. This weapon has been tested with up to seven warheads and uses stellar inertial guidance systems to boost accuracy through dead reckoning. The long range of these new missiles, which exceeds that of the best US SLBM currently operational, offsets an intrinsic disadvantage of the Soviet ballistic missile fleet. Soviet submarines have to pass through "choke points," such as the Greenland-Iceland-UK (GIUK) gap, the Baltic Sea, the Black Sea, and the Sea of Japan—all patrolled by US and NATO ASW forces—once they leave their home ports of Murmansk and Vladivostok. Subs stationed at the Siberian port of Petropavlovsk do have direct access to the ocean, but must transit through areas monitored by US Navy acoustic arrays.

The new long-range SLBMs, of course, can be launched from such sanctuaries as the Barents Sea and still strike targets in the US. Longer-range SLBMs also compensate for the fact that, on a day-to-day basis, the Soviets have only about fifteen percent of their SSBNs at sea, compared to about fifty-five percent for the US Navy.

While there is little doubt that in the short- and mid-term the US SSBNs enjoy significant advantages over the Soviet ballistic missile fleet, a breakthrough in ASW could reverse the picture. According to a special panel of the House Armed Services Committee, the Soviet Union "is devoting a major effort and significant resources toward developing a successful antisubmarine warfare . . . capability. Soviet ASW capability involves not only acoustic technology but also several highly sophisticated nonacoustic techniques."

The Strategic Aviation and Air Defense Picture

The 1980 Military Posture Statement pegs the current inventory of Soviet Long-Range Aviation at more than 800 aircraft, including long- and intermediate-range bombers, air-to-surface missile carriers, tankers, and reconnaissance units. The long-range strike force, according to the Posture Statement, "includes turboprop Tu-95 Bear, subsonic turbojet M-4 Bison, and variable-sweep Backfire aircraft." The number of Backfire bombers is thought to be about 100—counting units assigned to naval aviation—while there are about 150 Bear and Bison aircraft operational.

"Since 1974, the Soviets have alluded to the development of a new, long-range swingwing bomber, which could be refueled in flight, achieve supersonic dash speeds, and carry internal and external munitions. Even if a prototype should be completed in the near future, it is unlikely that the first units could become operational before 1983," according to the Joint Chiefs of Staff.

As AIR FORCE Magazine reported last month, the Soviets are test-flying a new air-launched cruise missile with a range close to 1,000 miles and designed for use by Backfire.

The Soviet Union's strategic surface-to-air missile (SAM) force consists of about 10,000 launchers, while its air defense interceptor force has 2,600 aircraft capable of all-weather interception at medium and high altitudes. "A limited capability to intercept low-altitude targets is being improved by the deployment of MiG-23 Flogger-B aircraft, the first aircraft believed capable of tracking and engaging lower flying targets," according to the Posture Statement.

Further, an airborne warning and control system "capable of detecting, tracking, and vectoring interceptors against targets at all altitudes, is under development," according to the Joint Chiefs. The number of Soviet ground-based air defense surveillance radars shot up from 6,500 to more than 7,260 during the past year.

The SALT Panel of the House Armed Services Committee, in a recent report, stated that "testimony provided to the committee reveals that the Soviets have had the technology which could defend against first-generation air-launched cruise missiles for a decade, and this technology is now embodied in the Soviet SA-10 surface-to-air missile defense system. This system appears well suited to defend important terminally defended Soviet targets, and these targets could constitute a significant portion of the cruise missile's retaliatory requirement. Thus, a significant attrition of cruise missiles and a reduction in US retaliatory power could be expected."

Additionally, there is evidence that the Soviets are now installing SA-10 SAMs on destroyers to extend the perimeter of their air defenses farther out to sea; that the Soviets are providing fighter aircraft operating at altitude with prototype look-down-shoot-down capability

gainst low-flying targets of any kind, including drones nd cruise missiles; and that the Soviets are beginning to nstall SA-10s and elevated tracking radars around some rget complexes. Presumably the purpose of these adars is to acquire and track cruise missiles by taking dvantage of their relatively large radar cross section hen looked at from the side and horizontally.

One of the potentially most threatening and destabiliz- ng actions to be taken by the USSR would be the de- loyment of a modern antiballistic missile (ABM) system o protect its ICBM force, backed up by a broadly effec- ve civil defense effort. Such a combination, in effect, ould deny the US a second-strike, assured destruction, apability.

The Subcommittee on International Security and Sci- ntific Affairs of the House Committee on International elations recently cited evidence of a broad range of oviet ABM activities—from "loitering" interceptors to nfrared homing devices—suggesting "that the Soviets ay have a 'breakout' advantage: the ability to deploy a rge-scale ABM rapidly if the ABM Treaty [SALT I] ere abrogated." Overall, there is considerable evi- ence that the Soviet Union has overcome the original JS lead in ABM technology and because of more ener- etic and sustained research programs either has over- aken the US in this field, or soon will.

Few defense issues have been debated with as much crimony and divergence of views as the Soviet civil de- ense program. The controversy is over the relative effi- acy of Soviet civil defense under various scenarios, and ot about its magnitude. The Military Posture Statement uts the issue in perspective by concluding that "civil defense is considered by the Soviets to be an integral part f their overall military strategy. Soviet leaders assert hat a credible civil defense contributes to deterrence, strategic stability, and the ability of the state to survive. The Soviet civil defense program has been conducted at a generally sustained pace since the 1960s. To date, blast shelters have been built for an estimated 110,000 leaders and for twenty-five percent of the essential labor force. Hardened shelters exist for the protection of about fif- een percent of the general urban population. Plans call for the remainder of the population to be evacuated to rural areas."

Theater Nuclear Forces

"The former clear-cut US lead in theater nuclear capability has been overtaken by the Soviets . . . the widening Soviet lead in long-range theater nuclear capa- bility (such as the mobile MIRVed SS-20) is an added source of deep concern to defense planners in all NATO capitals," General Jones reported to Congress.

While US knowledge of the number of theater nuclear warheads available to the Warsaw Pact is sketchy, some analysts on both sides of the Atlantic believe that there is a rough match, with both sides now having inventories of about 7,000 weapons of this kind.

Two Soviet weapons, the SS-20 and the Backfire bomber, according to Gen. Alexander M. Haig, NATO's Supreme Allied Commander, are "producing an increas- ng disparity in the mid- and longer-range theater nuclear forces which favors the Soviet Union." The SS-20, a mobile intermediate-range ballistic missile with three in- dependently targetable warheads and a range of nearly 3,000 miles, is now being employed in a string of bases to provide a crescent of coverage that extends from the Sea of Japan, China, the Indian subcontinent, the Middle East to Western and Northern Europe. About 300 launchers will probably be fielded by 1983 and dispersed to several dozen bases. The SS-20 launcher is reusable and on the average is probably meant to fire three missiles. The total SS-20 missile inventory is expected to reach about 900 within a few years.

Addressing European NATO leaders last summer, General Haig pointed to the "particular irony" that deployment of the SS-20 "has occasioned no public outcry comparable to that which accompanied discussion of the enhanced radiation/reduced blast warhead. This awesome new weapon system [the SS-20] has 2,000 times the destructive capability of the much-maligned 'neutron bomb.' "

General Haig listed these other elements of the theater nuclear threat confronting NATO:

- Growing numbers of improved quality Frog, Scud, and Scaleboard missiles deployed at division level and higher echelons. Over the long term, these three weapons types will probably be replaced by "new and more capable systems";
- Increasing Soviet nuclear artillery capabilities;
- Large numbers of new Soviet nuclear-capable tactical aircraft and;
- Backfire, which can attack Western Europe from bases deep within the Soviet Union.

Backing up, and probably meant to work in conjunction with the Soviet Union's theater nuclear capability, is what the Joint Chiefs of Staff term "the world's most fully trained and equipped chemical warfare (CW) force, which is prepared to operate in a chemical, biological, and radiological (CBR) environment."

Soviet offensive and defensive CW capabilities keep on growing in spite of the Kremlin's participation in arms-limitation talks that seek prohibition of chemical weapon development, and "there is no evidence of Soviet restraint in efforts to maintain superiority in combat operations involving the use of chemical weapons," according to the JCS.

Soviet forces are known to train regularly and with awesome realism in a toxic environment. A variety of modern agents, multiple delivery systems, and the tactical doctrine necessary for large-scale use have been developed. Soviet ability to produce and stockpile large quantities of CW agents and munitions is evident, according to the JCS: "Whether the Soviets would initiate CW in a nuclear or nonnuclear war, and under what conditions, is not certain; however, their ability to do so is undeniable."

Combined with the juggernaut of Soviet conventional forces, the Kremlin's growing strategic, theater-nuclear, and CW capabilities seem to be focused on the goal of world hegemony—by political coercion if possible, by war if necessary. In his report to the nation on its military posture, General Jones described with forceful clarity both the challenge of and the solution to Soviet imperialism: "I see little cause for optimism in the future unless the United States maintains both the power and the will to deter encroachment, defend our interests, and steer Soviet policy away from adventurism." ■

SOVIET AEROSPACE ALMANAC

In the absence of an effective US response, the less-than-comprehensive terms of SALT I and of SALT II, as presently understood, will not prevent the USSR from legally attaining strategic superiority.

SALT and the Emerging Strategic Threat

BY PETER HUGHES

In 1969, the United States entered the strategic arms limitation negotiating process (SALT I) with the Soviet Union. The purpose of these negotiations, according to then President Nixon, would be to secure a "stable strategic relationship" with an "equitable limit on both offensive and defensive strategic forces." Specifically, the US wanted to contain the emerging Soviet threat against US ICBM forces, the vulnerability of which was and still is considered inimical to strategic stability—a central element of US deterrence policy. The Nixon Administration also was concerned about the "unchecked extension of [Soviet] defensive capabilities"—a reference to possible Soviet ABM deployment to protect its cities. As noted by Mr. Nixon, such a capability "might [lead the USSR to] believe that its defenses could clearly limit the damage [to its society] it might suffer from retaliation and therefore that it was in a position to strike first."

With the signing of SALT I in 1972, Nixon Administration officials argued that the agreement to limit offensive strategic weapons would check the rapid buildup of Soviet strategic forces and stop several Soviet programs from being developed and deployed. The second element of the SALT I agreement—the ABM treaty—was considered even more important than the limitations on offensive strategic forces. Ambassador Gerard Smith, then Director of the US Arms Control and Disarmament Agency, reflected this view when he said of the ABM treaty:

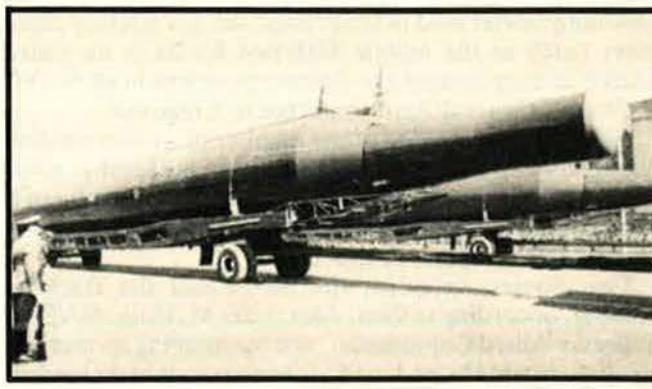
> In effect [the treaty] says that neither nation is going to try to defend its nationwide territory. This is an admission of tremendous psychological . . . recognition that the deterrent forces of both sides are not going to be challenged. When you think of the concern that we have had for the last twenty-five years about first strike, and counterforce, it seems to me [that] a general recognition by both countries that they are not going to field a nationwide [ABM] system is of first importance, politically, psychologically, and militarily.

Subsequent to ratification of SALT I, US defense officials called Soviet strategic developments unprecedented, and beyond any reasonable requirements for purely deterrent or defense objectives. Indeed, illustrating the failure of SALT I to contain the momentum of Soviet strategic programs, US defense officials in the aftermath of SALT I testified before Congress that the issue was no longer "how to avoid initiatives that migl continue or accelerate the arms competition [if it ev was]," but how to "interpret and respond to a wide ran of potential Soviet initiatives."

Soviet Programs After SALT I

In 1973, the Soviet Union had begun to flight test i fourth-generation ICBM systems, now known as th SS-16, SS-17, SS-18, and SS-19. The SS-18, expected t replace the SS-9, is a large liquid-fueled system with throw-weight increase of thirty to forty percent. It wa expected that the third-generation SS-11 would be re placed by the SS-17 and the SS-19, both medium liquid fueled systems, estimated to have three to five times th throw-weight of the SS-11. The SS-16, a light solid-fuele system, was believed to be a replacement for the SS-13 Of these four new Soviet ICBM systems, only the SS-1 had then not been tested in a MIRV configuration. How ever, the SS-16 uses a post-boost vehicle (PBV), or bu dispensing system, and thus appeared (and has sub sequently proved to be) MIRV-capable.

All of these fourth-generation ICBMs incorporate new guidance concepts, with computers aboard th PBVs, and the so-called cold launch technique was in troduced with the SS-17 and SS-18. Two different type of post-boost vehicle propulsions were used. The SS-17 and SS-19s (and more recently the SS-18) illustrated im proved Soviet missile accuracy; their reentry vehicle (RVs) were shaped for high-speed atmospheric reentry which, in combination with further PBV guidance re



The SS-18 can be cold-launched, will carry up to ten MIRVs, and is more accurate than the SS-9 (above) which it replaces.

finements, would reduce the missile CEP and hence provide a greater hard-target kill capability. New and significantly improved and hardened Soviet ICBM silo construction was also begun. Moreover, the SS-16 was being developed in both a fixed and land-mobile mode. Deploying these fourth-generation ICBM systems, it was feared, would increase Soviet ICBM throw-weight from between 6,000,000 and 7,000,000 pounds to between 10,000,000 and 12,000,000 pounds, and enable them to deploy on the order of 7,000 one- to two-megaton ICBM warheads. In particular, if the Soviets were to replace the 300 SS-9s permitted under SALT I with some 300 SS-18s, it was estimated that the yield and CEP combination of these 300 MIRVed systems alone could pose a serious threat to the fixed silo-based US ICBM force. That is precisely what has happened.

In addition to these ICBM developments, the Soviets began flight testing the SS-N-6 submarine-launched ballistic missile (SLBM) with a multiple reentry vehicle (MRV), although apparently the longer-range SS-N-8 had not then been tested in either MRV or MIRV configuration. During the same time, Soviet emphasis in ballistic missile submarine construction shifted from the Y-class SSBN capable of carrying sixteen missile launchers to the D-class, each then equipped with twelve missile tubes. There was, however, evidence that modification of the D-class SSBN to accommodate sixteen tubes also was under way. Some nineteen D-class SSBNs had either been launched or assembled by 1973, which in combination with thirty-three Y-class SSBNs (each with sixteen launchers) gave the Soviets a total of 744 SSBN launchers. At the then existing rate of SSBN production (six to eight annually) it was estimated that the Soviet Union would reach the SALT I allowable ceiling of sixty-two operational modern SSBNs by 1977 or 1978, which they indeed did.

The third area illustrating a major Soviet strategic initiative was the Backfire bomber. Although the US intelligence community was not in agreement over its capabilities, then Defense Secretary James Schlesinger argued that the Backfire-B model, with its known refueling capability, could be used as a peripheral, and possibly as an intercontinental, bomber. This view subsequently has been confirmed.

President Carter's March 1977 comprehensive SALT II proposals that were summarily rejected by the Soviets sought again to contain through the SALT process the Soviet capability to destroy US ICBMs in a first strike. Indeed, in these Carter Administration proposals, the ICBM aggregates were too high for strategic stability—given the present composition of US and Soviet strategic forces—and would not have preserved the survivability of the US ICBM force. Equally important, the proposed qualitative restrictions posed no significant impediment to Soviet progress in missile accuracy. More significantly, within months after the March 1977 SALT proposal, a Soviet SS-18 flight test demonstrated that the fourth-generation Soviet ICBMs appear qualitatively equal to the US Minuteman III with INS-20 guidance, and probably capable of achieving CEPs on the order of 0.1 nautical mile. This capability resulted, as mentioned earlier, from dramatically improved guidance systems and high beta, spin-stabilized RVs. Additionally, the footprint of the RVs was more than doubled. This would allow the Soviets to increase their reliability, cross-target US Minuteman fields, and use the second RV attacking a given silo for reliability, not to compound damage, thereby overcoming any limitations assumed to result from the so-called fratricide effect.

Vulnerability of US Land-Based ICBMs

(Assume: Soviet first strike and SALT limit of 820 MIRVed ICBM launchers)

MIRVed Missiles	Warheads
308 SS-18s with 10 warheads each	3,080
200 SS-17s with 4 warheads each	800
312 SS-19s with 6 warheads each	1,872
MRV Missile	
400 SS-11s with 1 to 3 MRVs	800
Total ICBM warheads deployed	6,552

(Assume: CEPs of 0.2nm, 0.15nm, 0.1nm; yield of all RVs at 0.75 megatons; reliability of 0.85; number of RVs per MIRVed missile as above; Soviets target two RVs on each of the 1,000 Minuteman silos)

		If each ICBM has a CEP of:	
Either 240 SS-18s or 312 SS-19s and 120 SS-17s or 312 SS-19s and 50 SS-18s	will kill	720 Minuteman or 910 Minuteman or 930 Minuteman	0.2nm 0.15nm 0.1nm

The United States had seriously underestimated Soviet technological achievement, and hence the time by which US ICBMs would become vulnerable. Increasingly, US defense officials stated that by the early 1980s the Soviets, using only one-third of their ICBMs, could credibly threaten ninety percent of the US ICBM force. The US, in effect, would not be confident of any survivors.

The accompanying chart, a variation of one originally prepared by Paul Nitze, illustrates Soviet ICBM capabilities against US ICBMs under the proposed SALT II constraints.

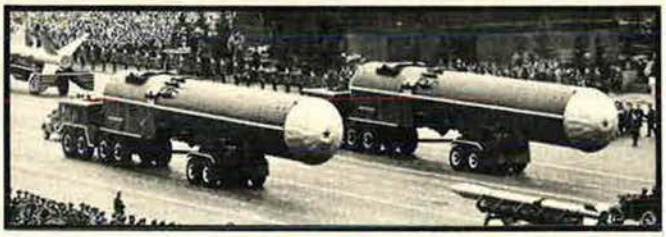
The failure to contain the Soviet threat against US ICBMs led US officials to argue that ICBM vulnerability was a problem neither created nor solvable by the arms-control process. It is indeed true that US ICBM vulnerability was not directly created by SALT, but it is also true that for a decade it had been a primary US arms-control objective to prevent this threat from emerging. Further, according to its proponents, this was the very essence of the Anti-Ballistic Missile (ABM) treaty: both nations accepted the desirability of strategic stability and would not threaten each other's strategic (read ICBM) forces.

In retrospect, it is evident that whatever political benefits the SALT I agreements may have entailed, these agreements did not put a "cap on the arms race." Indeed, as noted by the Chairman of the Joint Chiefs of Staff, Gen. David C. Jones, the "greatest increase" in Soviet military capability "has occurred since the signing of SALT I, and we don't see any evidence of slackening effort on their part."

Limits on the number of Strategic Nuclear Delivery Vehicles (SNDVs) permitted each side under the terms of SALT I were such that the Soviets needed several years to reach those ceilings. Moreover, the inability to

conclude verifiable qualitative restrictions on strategic forces also allowed both the United States and the Soviet Union to significantly increase their strategic capabilities, not least through MIRVing their missile forces. It is worth noting that, despite the claims of domestic critics that the US was unprepared to accept SALT MIRV restrictions, the Soviets themselves clearly proved unwilling to accept MIRV development restrictions that would have precluded their equaling or surpassing US MIRV technology; hence the inability to conclude SALT I MIRV restrictions.

Despite SALT I, the Soviets will complete the deployment of their fourth-generation ICBM forces, with new and more effective guidance systems, significantly increased throw-weight, and improved MIRV capabilities. All of this would be ratified by SALT II. Further, the Soviets have developed and deployed the so-called cold-launch technique for their SS-17 and SS-18 ICBMs. This launch technique has enabled the Soviets not only to install larger missiles in existing launchers (thus effectively and legally allowing them to circumvent the SALT I limitations on missile size), but it also enables the Soviets to rapidly reuse existing silos for launching additional missiles. Unclassified congressional testimony indicates that it would require no more than twelve hours to refurbish and reuse a missile silo after a cold launch. Thus, the Soviets again and quite legally have circumvented the intent of the SALT I agreement, which sought to limit missile deployment by restricting the number of ICBM launchers.



Missile tubes of the D-class submarine (top) were increased from twelve to sixteen and modified to handle a new, long-range, MIRVed SLBM. The Soviets also are investing heavily in R&D on antiballistic missile system components that will give them missile defense capabilities vastly better than the existing Galosh ABM missile (lower photo).

SALT II Loopholes

The terms of the SALT II agreement also will not restrain the continuing momentum of the Soviet strategic force buildup. There are, for example, no restraints on future SLBM developments and deployments, except for the overall restrictions on aggregate numbers deployed. In this area Soviet emphasis has been on developing a solid-propellant SS-NX-17 (2,500 pounds of throw-weight, 2,500-nm range, and a single RV of one-half megaton yield); the SS-N-18, with emphasis on stellar inertial guidance and improved MIRV capability (2,500 pounds of throw-weight, 5,000-nm range, and reportedly tested with up to seven RVs); and a new, not-yet-flight-tested missile (believed to be equivalent to the US D-5 SLBM, with a 6,000-nm range, 5,000 pounds of throw-weight, and probably capable of carrying fourteen RVs) for their still-under-development Typhoon SSBN (a Trident submarine equivalent). Modification of the Delta-class boats to accommodate the new missile may also be under way, as may be a rapid-fire capability for the SLBM tubes. Since the SALT II MIRV ceiling for SLBMs is fourteen warheads, it is apparent that a major Soviet strategic growth program is being codified by SALT II.

The failure to impose restrictions on new Soviet SLBM developments also tends to undermine the objectives of the proposed SALT restrictions related to ICBMs. Under the terms of SALT II, both nations will be permitted to deploy one new ICBM, with modernization restrictions intended to ban improvements on presently deployed types. Modernization or changes to an existing system, beyond those defined, would move such a sys-

em into the category of a new type.

Through the provision imposing fractionation restrictions on presently deployed ICBMs (ten warheads for the SS-18, six for the SS-19, and four for the SS-17) the US hopes to prevent the Soviets from exploiting the throw-weight of their ICBMs. Further, the United States hopes to prevent deployment of the fifth-generation Soviet ICBM systems. Since the Soviets are free to develop new SLBMs, there is simply no way the United States can prevent the testing on SLBMs of propulsion, guidance systems, RVs, etc., that could be used for ICBMs. Beyond that, the restrictions on ICBM fractionation make little sense without a ban on testing decoys, penetration aids, chaff dispensers, etc. The Soviets could test twenty objects and claim ten were decoys—which they well might be. The issue is less that the US might or might not have difficulty distinguishing between the objects released, but rather that the Soviet Union can quite legally gain the necessary confidence and test experience to circumvent the intent of the proposed ICBM fractionation restrictions by using such things as decoys or penetration aids. Even with restrictions on the use of penetration aids or decoys, the Soviets could continue to gain confidence and experience by testing RVs with weight variations. Thus, to the extent that imprecise SALT definitions concerning RV weights, or variations in actual RV weights during missile flight tests, were permitted, the intent of the fractionation restrictions could also be circumvented.

It has been widely argued that were the Soviets to agree not to encrypt their telemetry flight test data, the United States could nonetheless verify Soviet compliance. Unfortunately, the Soviets have only agreed not to encrypt telemetry flight test data necessary for the US to verify Soviet compliance with the terms of the agreement. On its face that would seem a reasonable provision. The United States, however, is not about to tell the Soviets what information it requires, thus leaving to the Soviets the final judgment on how to exploit this ambiguity.

It is also unfortunate that the issue of encryption is viewed by some as the critical measure of the adequacy of SALT II. It is worth noting that there are several alternate methods for the Soviets to deny the US the information it seeks. They include using telemetry systems that are above the frequency range of US collector systems, reducing power in telemetry systems to a point below the sensitivity of US collectors, and recording flight test data and then recovering the recorder after the flight.

To what extent the Soviets would be willing to cheat, and thus jeopardize the arms-control process, is open to question. As mentioned earlier, the present fourth-generation Soviet ICBM systems are estimated to be capable of achieving CEPs on the order of 0.1 nautical mile. With well over 6,000 ICBM warheads, that accuracy satisfies any Soviet military requirements. Also, the SALT II exclusion of "gray-area" systems, like the SS-20 IRBM and Backfire bomber, provides the Soviets the means to dramatically increase their strategic capabilities in a legal way. The SS-20 is not a "small" missile; in throw-weight and lift-weight, it is equal to the US Minuteman, and it carries three warheads of a half-megaton yield.

There are also very real difficulties in accurately assessing the range of the SS-20. For example, if second-stage termination were used during the SS-20's flight tests, the US would underestimate the range of a fully loaded SS-20. Present estimates, however, indicate that its distance with three warheads is 4,000 kilometers, extending to 8,000 kilometers as payload is reduced. By adding the third stage of the SS-16 (the SS-20 itself consists of the first two stages of that system), the SS-20 IRBM becomes an SS-16 ICBM. US verification of Soviet compliance with proposed SALT II restrictions on the SS-16, intended to preclude Soviet exploitation of the SS-20s, is also dependent on observing the logistic support of the missile, as is true of all Soviet missile systems. US ability to monitor Soviet compliance would be significantly lowered if changes in Soviet operational procedures occurred. But again, within the constraints of SALT II the Soviets can deploy as many SS-20s as they wish. Thus, by 1985, several hundred SS-20s can be expected to be deployed, with each of the missiles' three warheads having about three times the yield of the US Minuteman III warhead.

Problems associated with US intelligence-gathering facilities in Iran also illustrate quite clearly the potential vulnerabilities of US SALT II monitoring capabilities resulting from political instability in foreign countries. Despite President Carter's assurance to the contrary, the US intelligence-gathering facilities in Iran do provide unique monitoring capabilities critical for verifying Soviet compliance with several provisions of SALT II, particularly as they relate to Soviet ICBM developments.

The proposed SALT II restrictions on the Backfire bomber are known: no increase in present production rates, refueling prohibitions, and basing restrictions. With these constraints the Soviets can be expected to deploy some 400 Backfire bombers (constituting an increase of thirty-five percent in Soviet megatonnage). An alternate way of looking at it is that thirty Backfires can carry the equivalent megatons (EMT) of 100 SS-19s. By 1985, the Soviets can be expected to have deployed some 400 Backfire bombers—that would not be counted under the provisions of SALT II—equal in EMT to more than 1,300 SS-19s.

The Soviets may well decide to deploy a new heavy bomber, but why they would is not immediately clear, given the freedom to deploy a significant Backfire force that does not count against the strategic nuclear delivery aggregates permitted by SALT II.

Soviet Strategic Defenses

It is difficult to envision how SALT II will contain Soviet strategic developments. As with SALT I, US critics contend the SALT II agreement merely codifies planned Soviet strategic deployments—a view substantially bolstered by the CIA analysis done by former CIA employee Dave Sullivan. Sullivan's analysis, based on US intelligence information assessments of Soviet communications, reportedly illustrates quite clearly that the Soviet military has not allowed the SALT process to infringe on planned Soviet strategic forces and programs. Further, according to the CIA:

> . . . a SALT II agreement along the lines currently being envisioned would not in itself significantly alter

[the CIA] projection of Soviet defense spending. Such an agreement would probably reduce the rate of growth of total Soviet defense spending by only about 0.2 of a percentage point per year. The resulting savings would amount to less than 1.5 percent of total defense spending projected through the early 1980s in the absence of an agreement.

If Soviet strategic defense expenditures and programs will not be affected by SALT II, it is difficult to argue that US expenditures will be affected.

The US-Soviet strategic trends in the aftermath of SALT I, and in the shadow of SALT II, have illustrated not only asymmetries in the respective force structures of each nation, but also significant asymmetries in US-Soviet perspectives concerning "stability" and the purpose of the arms-control process. According to press reports, Defense Secretary Harold Brown told President Carter:

> . . . there are many indications that the Soviets are structuring their forces [to be able] to fight [a nuclear war]. Their plans and exercises point the same way. If they think they have such a capability, and we both know that the United States does not, adverse military consequences are possible, and adverse political consequences very likely.

It is, of course, the ABM treaty that was widely heralded as precluding the emergence of such a problem. However, despite this treaty, the Soviet ABM program has not abated. Soviet activities include developing phased array radars, modular component rapidly deployable radar systems, and new early warning regional acquisition radars; testing and continued development of Sprint-like high acceleration endo-atmospheric interceptors; continuing development of new radars at the Sary Shagan test site; and developing a rapidly deployable radar at Kamchatka (where targets for US ICBMs exist). Indeed, since signing the ABM treaty much Soviet ABM technology, including the Sprint-like interceptors and mobile and transportable phased-array radars, has been directed toward incorporation into high-performance, mobile air defense systems. These new air defenses can be deployed under the provisions of the ABM treaty and could give the Soviets a potentially very effective damage-limiting ABM system for defense against US ICBMs and particularly against SLBMs in low traffic areas. Soviet air defenses are the most advanced and extensive anywhere. They are integrally linked with Soviet ABM activities, and can be used against cruise missiles, SRAMs, and high-performance penetrating aircraft. Moreover, the expanding ground-based Soviet air defense system is coupled with look-down, shoot-down capabilities for their interceptor aircraft.

William J. Perry, Under Secretary for Defense Research and Engineering, has argued that a crash program "could provide many operational [Soviet] ABM sites by the early 1980s." US defense officials also concede that the Soviet Union has, in fact, "pulled together all the elements of a workable ABM system." According to Secretary Perry, they have a ballistic missile defense system "which appears to be rapidly deployable," and which may "seriously erode" or may have negated the technological ABM advantages believed to have been possessed by the United States. In short, the present level of Soviet ABM activities not only matches but exceeds the maximum US effort at the time of the short-lived US ABM deployment.

In addition to ABM activities, it is also widely conceded that Soviet civil defense preparations have been significantly expanded, costing the Soviets on the order of $2 billion annually. In the context of its active strategic offensive and defensive programs, the Soviet leadership attaches importance to a national civil defense effort, even if some US critics do not. Moreover, the present study of US nuclear weapons targeting, directed in Presidential Decision Memorandum 18 as an outgrowth of Program Review Memorandum 10, reportedly advocates restructuring US targeting precisely because of problems associated with the US inability to deny or significantly prolong Soviet economic recovery—even without attributing effectiveness to civil defense. As an element of Soviet national policy, then, civil defense simply cannot be ignored as a factor in the strategic equation. If the proposed changes in US nuclear weapons targeting—reportedly being promulgated in the PDM-18 studies—are adopted, priority will be given to military targets; hence, even a marginal Soviet civil defense capability would become more effective.

In combination, these trends illustrate a significant asymmetry in the US-Soviet perception of what constitutes deterrence, with Soviet strategic forces somewhat clumsily characterized as based on a "war-fighting, war-winning" posture. The Soviets, however, are indeed pursuing both an active and a passive damage-limiting posture. Their strategic forces have the characteristics and capabilities required for a preemptive strike (as illustrated by its ICBM forces), while those of the United States have historically been designed to deter by absorbing a Soviet first strike and still fulfill US objectives in response. It is thus not surprising that the survivability of US ICBM forces has become a focal point for the SALT II debate.

The Hesitant US Response

It is quite understandable why the Soviets do not want the United States to redress the vulnerability of its ICBM forces. The Soviets, after all, have used the arms-control process to limit US ABM defense of its ICBMs, and they have devoted considerable resources to achieving forces that can threaten US ICBMs. Conversely, the United States has always refrained from developing that capability on the grounds that it is inimical to crisis stability.

In the US defense and scientific community, a broad consensus has emerged supporting the Multiple Aim Point (MAP) ICBM basing system, more recently referred to as Multiple Protective Shelters (MPS), as the technically and economically preferred solution to US ICBM survivability.

Objections to deploying a US MAP system are tied primarily to verification—namely, how does the US verify Soviet compliance if the Soviets choose to deploy a MAP system similar to that proposed by the US? Inherent in this view is the belief that it is all right for the Soviets to threaten US ICBMs so long as they do not cheat to do it. In fact, however, since SALT does not control missile production—or even really launchers,

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but rather only holes in the ground—the Soviet ICBM breakout threat is not a MAP-induced problem. The Soviets would, thus, not have to cheat, and jeopardize the SALT process, to confront the United States with an ICBM breakout threat; they could legally and effectively build and store extra missiles and simply set them up to be launched from canisters whenever the situation dictated.

Further, the SALT II agreement incorporates what are essentially cooperative verification procedures, and there is no reason why such procedures could not be adopted for MAP deployment. Even without cooperative verification, and were the Soviets to risk jeopardizing SALT by cheating, it would take them several years to overcome the stability provided by US deployment of a MAP system—a process not likely to escape US detection and allow for an appropriate US response.

The widely touted alternative to MAP—the so-called airmobile variant carried by the Advanced Medium STOL Transport (AMST)—poses no fewer verification problems. Also, it undoubtedly would cost more to develop and deploy (twenty to thirty percent more if all goes well—$25 to $30 billion—and significantly more if things do not) and two to three times more to operate and maintain (possibly close to $1 billion annually). Cost aside, it would not really preserve the triad characteristics or unique ICBM capabilities. It is at best a distant second-choice solution, being reviewed and restudied by the Air Force at OSD direction because of fears that the White House will not accept a US MAP deployment. The AMST/ICBM combination is seen as a better alternative than adopting a single-option launch-under-attack policy for US ICBMs, or going to a dyad strategic force composed of SLBMs and bombers only. It is an alternative that will encounter increasing opposition, if the MAP program should be terminated because of technical, cost, and political problems.

Defense Secretary Brown recently said he is "disappointed" in the "accelerating Soviet arms buildup." The Secretary attributes this Soviet effort to a blend of "bureaucratic inertia" and a "vague feeling that the more powerful you are militarily, the more influence you have." Similarly, the former Director of the US Arms Control and Disarmament Agency, Paul Warnke, has termed the Soviet attitude toward the role of strategic forces, power, and conflict "primitive." Regardless of these or other interpretations, the simple fact remains that if the Soviets view military power as a means to advance their political or diplomatic objectives the United States cannot ignore this Soviet view. Further, while Soviet motivation or intent is not unimportant, it is less precisely measurable than actual Soviet capabilities—past, present, and emerging.

In retrospect, it is apparent that the United States has underestimated the breadth and growth of Soviet military programs. Soviet strategic R&D and programs have reflected Soviet capabilities: The Soviets have done what they are capable of doing. There can also be no disagreement that SALT I failed to constrain the momentum of Soviet strategic forces. Of SALT II the same will be said. It can be further observed that unilateral US arms restraint has not been similarly matched by the Soviets, although the present Administration also believes "appropriate restraint in our programs and actions is still warranted." Contrary to the popular view, it is also unlikely that US strategic initiatives will induce the Soviets to accept significant restrictions through the arms-control process—although it is more likely that they will be so motivated if they perceive the US prepared to counter Soviet strategic initiatives than if they do not.

US frustration with Soviet behavior was recently expressed by Secretary Brown when he said the 1980s are "likely to be quite dangerous for the United States." He also observed that:

> What concerns me most about the continued Soviet military buildup is its persistence and how that continues regardless of what the United States does. . . . We build up our forces, they build up theirs. We reduce our forces, they build up theirs. . . . If the present trends continue for another five years, I believe the relative military positions [of Russia and the United States] would be a cause of real difficulty for the United States.

To the extent the Soviet strategic force structure is dictated by perceived Soviet military objectives and requirements, the impact of the arms-control process will be hampered in its progress. Thus, despite what political benefits SALT II may or may not entail, the agreement will not diminish the requirements of US national security or defense expenditures anymore than the failure to achieve an agreement will significantly increase those requirements or expenditures. Neither will the terms of SALT II and the deployed strategic force structures under SALT II contribute to strategic stability. They could, in fact, undermine stability if SALT II is viewed as a means of obviating US requirements for improving the survivability of its strategic forces. Indeed, it is not necessary to mirror-image Soviet offensive strategic forces to preserve a stable strategic environment. Strategic stability would probably be better served if the US countered Soviet strategic offensive force developments by using its advanced technology to diversify and increase the survivability of US strategic forces.

The foregoing comments, while critical, need not convey pessimism. As aptly noted—although in a different context—by Fritz Ermarth, a staff member of the National Security Council:

> . . . if we understand the situation clearly, there should be no grounds for fatalism. Along with a very uncomfortable degree of competitiveness, Soviet strategic policy contains a strong element of professionalism and military rationalism with which we can do business ourselves. The Soviets respect military power and they take warfare very seriously. When the propaganda and polemics are pared away, they sometimes wonder if we do. We can make a healthy contribution to our own future, and theirs, by rectifying this uncertainty. ■

SOVIET AEROSPACE ALMANAC

Soviet military doctrine and strategy have remained relatively constant for the past quarter century. By preserving tactical flexibility and investing heavily in developing and deploying offensive and defensive systems, Soviet forces are approaching a point where they soon may be able to perform all the missions assigned to them.

Soviet Military Policy: Objectives and Capabilities

BY WILLIAM T. LEE

INCREASING concern over the growth of Soviet military power in recent years has been accompanied by growing uncertainty about Soviet motivations. To some, expanding Soviet military capability is reminiscent of German rearmament in the 1930s and arouses fear that the Soviet leaders might use their military power as Hitler did. Others argue that: (1) the Soviets are proceeding at a much slower pace than the Germans did forty years ago, (2) the Soviets are just maintaining and modernizing their inventories, rather than increasing them rapidly, and (3) the Soviets accept and seek to stabilize "mutual deterrence" based upon mutual "assured retaliatory capabilities." Some argue that the Soviets think they can "fight and win" a nuclear war now. Others believe the Soviets are convinced that a nuclear war with the West would be suicidal.

Each time a new Soviet missile appears, US officials ask, "What are they up to?" and then offer the public such explanations as that the Soviets don't know what else to do with their missile designers, or that the Strategic Rocket Forces (SRF) are just trying to maintain their share of the budget. Soviet civil defense has been discovered for the third time since World War II by the US intelligence community, and is being pooh-poohed by some government officials and congressmen and by most pundits and academics. Analysis of Soviet literature on military doctrine and strategy, widely discounted a decade ago, has become fashionable now that the literature no longer is very informative.

This article cannot settle all these arguments, but it will attempt to throw some light on the issues by explaining the motivation for the Soviet buildup in terms of Soviet military policy, by evaluating the capabilities of Soviet forces relative to the requirements of their missions and objectives, and by explaining the resulting budgetary and manpower impact.

Objectives of Soviet Military Policy

The objectives of Soviet military policy are derived from Soviet military doctrine and strategy, which were formulated in the period 1953–60 and published widely in the early 1960s. In the mid-1960s, the Soviets modified their doctrine to allow for an initial conventional phase in a war with US/NATO. Around 1967, the Strategic Rocket Forces (SRF) adopted launch-on-warning of a US attack. Beyond these modifications, the tenets of Soviet military doctrine and strategy have changed little, if at all, since the axial period 1953–60. Hence, the objectives of Soviet military policy also have been relatively stable over the last two decades, particularly since the fall of Khrushchev in 1964.

Soviet military policy has three principal objectives. The first is to deter a US/NATO attack, which the Soviets fear both from their reading of history and from the tautological theses of Marxism-Leninism on the nature of "capitalism" and "imperialism." There is nothing "mutual" about the Soviet concept of deterrence; it is strictly one-sided. They must deter the US/NATO, but there is no reason why we should have to deter them.

The second objective of Soviet military policy is to acquire a total military and economic posture that is capable of fighting and winning a nuclear war if their policy of "peaceful coexistence" fails. This means balanced offensive and defensive forces that can defeat the enemy while limiting damage to the USSR, which is a tall order. Preemption, on warning, is the preferred Soviet option, but Soviet forces must be equally prepared to retaliate.

The third objective is to achieve "superiority" over the enemy by procuring larger numbers of more effective weapon systems. As one political officer put it, the USSR is "confidently" building up a "military advantage" over its probable enemies because "it is impossible to request peace from the imperialists, but only possible to dictate to them by force, by the inevitability of retaliation."

To the Soviets, the initial nuclear exchange is not the primordial spasm of two scorpions in a bottle, but the means of gaining a decisive military advantage. If the Soviets do not succeed in preempting, the "answering blow" must regain the military initiative in order to ensure the full defeat of the enemy. "Victory" in a nuclear war means: (a) The USSR continues to function politically, economically, and militarily after the initial ex-

change; (b) Soviet forces prosecute the war to defeat and disarm all remaining enemy military forces and occupy Europe; (c) the USSR recovers with the aid of European assets; and (d) "socialism" becomes the only politico-economic system in the world.

None of this suggests, however, that the Soviet leaders are bent on starting a war. Drawing a historic parallel with Germany before World War II is misleading in this respect. The same political officers who have touted "superiority" and "victory" also have argued that the USSR would not be justified in attacking the US/NATO coalition, even though such a war would, by definition, be a "just" war.

The Soviet course is neither "peace" nor "war" as most Americans understand these terms, but "struggle" to bring about the Marxist-Leninist ontology of history. Soviet military policy is one instrument in that struggle. However, because the policy objectives derived from military doctrine and strategy are very ambitious, many gaps remain between the *capabilities* of Soviet forces and the *missions* assigned to them, despite the steady shift in national priorities to the military establishment that began under Khrushchev and has continued under the Brezhnev-Kosygin regime.

Military Operations and Service Missions

While the litany of weapons numbers and characteristics is one essential dimension of the Soviet threat, one should try to simulate a Soviet appreciation of the capabilities of their forces to perform the missions assigned to them. Although the Soviets allow for the possibility of a conventional opening in a superpower coalition conflict, they seem to view escalation as inevitable. Because the issue in such a conflict is the survival of "imperialism" as a social system, the "imperialists" will not suffer defeat without resorting to nuclear weapons.

In the late 1960s, the editors of the Soviet journal, *Military Thought,* asked General Lieutenant G. Semenov to define the concept of an "operation" in response to requests from readers. General Semenov defined a military operation as a combined arms offensive to exploit strategic nuclear strikes with operational-tactical nuclear strikes to completely defeat enemy forces and to capture the enemy's territory. This is the classic Soviet concept of a campaign in the NATO theaters of operation (TVDs). In the Soviet view, nuclear weapons are to be used to win the war and not for limited demonstrative purposes. No doubt the Soviets have studied US concepts of limited nuclear operations, and may have experimented with such concepts, but are not likely to accept them because limited use of nuclear weapons has nothing to do with winning a nuclear war. The Soviets like to cite a dictum from Lenin: "Wage war seriously or not at all."

In their doctrine and training, the Soviets put great emphasis on combined arms operations designed to exploit a strategic offensive in theater warfare.

The Soviets envisage three basic types of operations: strategic offensive, strategic defensive, and combined arms in the Eurasian TVDs. Strategic offensive operations are designed to destroy the enemy's nuclear delivery systems and weapons stocks, command control centers, other elements of the enemy's military establishment, and selected industry, transport, and communications facilities to prevent their employment and the reconstitution of enemy forces. Soviet strategic offensive operations are not directed against population and industry as such. Collateral damage in the vicinity of valid targets is unavoidable but unnecessary victims are to be avoided. The Soviets do not want to inhibit, much less prevent, "social progress" for decades or even centuries. Enemy governments, however, are to be destroyed because, by definition, they will have been responsible for starting the war.

Of all the mirror images the US has created, one of the most pernicious is that the Soviets have an insatiable appetite for inflicting fatalities on the general population. On the one hand this image constitutes a nearly insuperable barrier to understanding Soviet weapon developments; on the other hand, it provides the basis for talking ourselves out of sensible programs. Ironically, the image mirrored is the US declaratory policy of the 1960s (MAD), which the US itself never accepted as the basis for targeting nuclear weapons.

Strategic defensive operations consist of air, missile, and space defense against enemy forces. The term "air defense" in Soviet usage includes all three. Active defense is supplemented by civil defense to reduce losses of population, industry, and transport; to maintain some level of military production; and to restore essential production and services as rapidly as possible. The bottom line for both strategic offensive and defensive operations is to limit damage to the USSR—military forces, population, and industry—while destroying enemy military capabilities to prosecute the war. This is what "repelling" an enemy attack means to the Soviets.

Combined arms operations—Ground Forces, Frontal Aviation, Military Transport Aviation, Airborne, and Navy—are to exploit the results of strategic offensive operations in the Eurasian TVDs. The Soviets expect to complete such operations in a few weeks after the initial exchange, but allow for the possibility of a protracted war if their strategic offensive operations do not make it possible to finish off the enemy and occupy his territory (in Europe) quickly. To support the combined arms offensive, large stocks of weapons must be procured in peacetime and located in forward areas because industry and transport probably will be severely disrupted by the

initial exchange. Units must be either maintained at combat strength in peacetime or be capable of rapid mobilization during a crisis.

Service missions follow these concepts of operations. The IR/MRBMs and ICBMs of the Strategic Rocket Forces (SRF) have primary responsibility for destroying enemy nuclear delivery systems and fixed targets, generally in both the Eurasian and "transoceanic" TVDs. Medium and heavy bombers assigned to Long-Range Aviation (LRA) back up the SRF, but their primary role is to attack all types of mobile targets and targets of opportunity in the Eurasian TVDs. (If the war opens with a conventional phase, the LRA would be the primary strategic strike force—until escalation occurred.) Navy SLBMs would participate in the initial nuclear exchange, but their primary role is to provide a secure reserve force. National air defense (PVO Strany) has primary responsibility for air, missile, and space defense, assisted by the Naval Air Force and the Navy's submarine-launched cruise missiles (SLCMs) operating against enemy carriers, and strategic antisubmarine warfare (ASW) operations against enemy ballistic missile submarines (SSBNs). The Red Navy also is responsible for sea-lane interdiction after enemy naval forces are defeated, defense of its own SSBNs, defense of sea approaches to Soviet territory, and support of Ground Forces operations in the Eurasian TVDs.

Capabilities vs. Missions and Objectives: Strategic Offense

Viewed in perspective, the *capabilities* of Soviet forces to perform all of these ambitious missions leave a number of requirements to be satisfied by future weapon systems. Much remains to be done, and two or three technological breakthroughs would help a lot. While the Soviets are deadly serious about fighting and winning a nuclear war, they know they are not now in a position to do so in most scenarios. Nevertheless, they have made much progress and are striving to acquire forces commensurate with their ambitious objectives.

Since the early 1960s, the SRF has had an effective counterforce capability in the Eurasian TVDs. Although vulnerable because deployed in concentrated, mostly soft launchers, the SRF's IR/MRBMs provided complete coverage of the fixed targets in the Eurasian TVDs and, because these targets were predominantly soft, could destroy most of them with weapons yielding fifty to 500 kilotons. At the end of the 1960s, NATO began to harden its airfields somewhat by installing hangarettes designed to reduce vulnerabilities to nonnuclear munitions. French IRBMs also became operational around 1970. The Soviets responded by deploying hardened ICBMs in MRBM fields and then by modernizing them with more accurate versions. If the Soviets had intended to replace all of their aging IR/MRBMs with ICBMs, which were more accurate, cheaper, and much less vulnerable, the SALT I ceiling eliminated this option. However, the mobile SS-20 was available, and unconstrained by SALT limits.

Development and deployment of the SS-20 to replace the SS-4s and SS-5s raised the usual question of "What are they up to?" amongst Western officials. The answer is straightforward military requirements and strategi considerations: being mobile, the SS-20 is relatively in vulnerable; its greater accuracy and MIRVed payloac increase effectiveness against the NATO target arra while reducing total megatonnage substantially; hence occupation of Europe becomes more feasible, mor European assets will survive to assist the USSR's recov ery, and fallout drifting back to the Soviet Union on the prevailing westerlies also will be reduced. Moreover, SS-20 deployment can be expanded to counter the Chinese threat if necessary.

Meeting requirements for a disarming strike in the "transoceanic" TVD has been much tougher. From the Soviet point of view, their decision in the late 1950s to give first priority to strategic missile systems for the Eurasian TVDs, like the earlier decision to build medium rather than heavy bombers, made good sense. As General Colonel Zheltov, Commandant of the Lenin Political-Military Academy put it, "The Americans and their allies have a total of 6,700 military bases, depots and facilities, most of which are located in Europe." So naturally IR/MRBMs had priority over ICBMs in the late 1950s. In addition, the original Soviet ICBM, the SS-6 displayed at the Paris Air Show in 1967, was too ungainly a beast, and much too expensive, to deploy widely. Success with this missile made it a good rocket for Khrushchev to rattle when the West didn't know what it looked like, or that Khrushchev had only a few of them. Once the latter fact was established in 1961, however, that game was up. The Soviets were stuck with the ICBM gap and a very vulnerable missile force for nearly a decade.

Whether the Soviets originally thought they could pace US ICBM deployments with the SS-7 and SS-8 in the early 1960s is a moot point to which we are not likely to have the answer for decades, if ever. More importantly, by the time these systems became operational, they had been rendered ineffective by US Minuteman silos and the submarine-launched Polaris. The Soviets adapted to this change with the SS-9 heavy ICBM to attack Minuteman launch control centers, which appeared to be the vulnerable "link" in the Minuteman system—one control center for each ten silos—and with the smaller, cheaper SS-11 to attack soft targets. Deploying both the SS-9 and SS-11 in silos reduced Soviet sensitivity as to whether they succeeded in preempting (on warning) or were forced to retaliate and then try to regain the initiative.

Once again, however, Soviet counterforce aspirations were frustrated. By the time the first SS-9s became operational, the US had introduced an airborne command post that could launch Minuteman missiles from their individual silos even if the launch control centers had been destroyed. About the same time, the Soviets probably also realized how much redundancy the US had built into the Minuteman system; even if nine out of ten

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The Soviets are deploying low-altitude air defense systems to augment some 10,000 surface-to-air missiles such as these SA-3s, and about 2,700 manned interceptors.

command-control "nodes" were destroyed, the system would function anyway. Meanwhile, however, the Soviets had demonstrated in 1964 the MIRV concept in two space shots, and the Eighth Five-Year Plan (1966–70) included development of the current generation of ICBMs—SS-16 through SS-19. As one Soviet writer put it so candidly in 1967, the Eighth Five-Year Plan provided larger numbers of more advanced weapons of all types "for maintaining military superiority over imperialism in the field of principal and decisive types of weapons, and first of all nuclear-rocket weapons."

After nearly two decades of effort, the current generation of Soviet ICBMs, with improvements in guidance accuracy, will soon provide the Soviets with an effective counterforce capability against Minuteman. Coverage of other military targets will be complete on a worldwide basis, as it has been complete since the early 1960s in the Eurasian TVDs. Warhead yields have declined as accuracy has improved, hence total megatonnage delivered, hence also collateral damage and fallout, will be reduced in all TVDs. The four new ICBMs under development will continue these trends, although deployment of these systems may be delayed somewhat by SALT II protocols. The objective is to "execute the assigned mission with minimum expenditure of explosive power."

Having negotiated and built up to the 950-launcher limit on SLBMs, the Soviets now have enough of these missiles to play a significant role in the initial exchange and to fulfill their primary mission of providing a large, secure reserve force. The Soviets require reserve forces for operations after the initial nuclear exchange and probably also to enforce the peace if "victory" can be achieved. They will soon begin modernizing their SLBM forces with the "Typhoon" system, the Soviet equivalent of Trident. Older SSBNs, as was noted years ago in *Military Thought*, can be converted to other missions, such as mine laying, where additional boats are needed.

Despite the imminent promise of counterforce capabilities and complete fixed target coverage in all TVDs (unless frustrated by multiple aimpoint deployment of Minuteman or MX to which the Soviets are not likely to agree), the Soviets recognize the limits of counterforce operations. As was pointed out in *Military Thought* during the 1960s, neither side can prevent the other from delivering an enormously destructive second strike. Some observers have wrongly interpreted these passages as Soviet acceptance of mutual deterrence. Having themselves adopted launch-on-warning in the mid-1960s, the Soviets probably assume the US would try to do the same thing. Moreover, one cannot count on catching the bombers on the ground, or on destroying more than about one-third of the SLBMs in port. Mutual retaliatory capabilities cannot be eliminated by preemptive counterforce operations alone. One must have strategic defenses to supplement the offenses.

Strategic Defense

While the inexorable march of technology has been on the side of the SRF and the Soviet Navy's SLBMs in performing their missions, the National Aerospace Defense Forces (PVO Strany) fell far behind in the mid-1960s despite the deployment of thousands of radars, surface-to-air (SAM) launchers, and interceptors. After two decades of effort, by the late 1960s PVO Strany had fielded a formidable defense against aircraft penetrating at high altitude, although still vulnerable to ECM, but was ineffective against low-altitude penetration tactics and short-range attack missiles (SRAMs). During the next five years, the Soviets are expected to begin fielding their response to these threats: the SA-10, the Soviet AWACS, and interceptors with look-down, shoot-down capabilities. Meanwhile, the US once again has raised the technological ante with cruise missiles, against which an advanced version of Foxbat reportedly is being tested. Clearly, PVO Strany will be able to perform its mission better in the next decade than in the past, but just how much improvement can be achieved will be a matter of much uncertainty to both sides, and a subject of lusty controversy amongst US analysts. Nevertheless, cruise missiles notwithstanding, PVO Strany will be gaining rather than losing ground against the aerodynamic threat in the 1980s.

Although tightly limited in number of launchers and sites by the ABM treaty, ballistic missile defense continues to be a PVO Strany mission. Maintaining and improving PVO Strany air defenses are not responses to Chinese aerodynamic threats and make no sense—indeed, are a waste—as long as ballistic missile defenses are lacking. Reported advances in Soviet ABM technology since SALT began in 1969 indicates that by about the time PVO Strany receives its new interceptors and SAMs, the Soviets probably will have the capability to deploy the kind of ABM defenses the US started to deploy in the late 1960s, possibly supplemented by some advanced optical technologies later in the 1980s. Such missile defenses probably would be quite attractive to the Soviets, who do not require defenses to be foolproof as a condition of deployment. Soviet ABM defenses that might be only fifty percent effective against a maximum US attack would be good enough to preclude damage from attacks by lesser powers.

Few aspects of Soviet defense policy arouse as much controversy and emotion amongst US defense scholastics as Soviet civil defense each time the US rediscovers it. When even the CIA estimates the cost of replicating Soviet civil defenses in this country at $2 billion

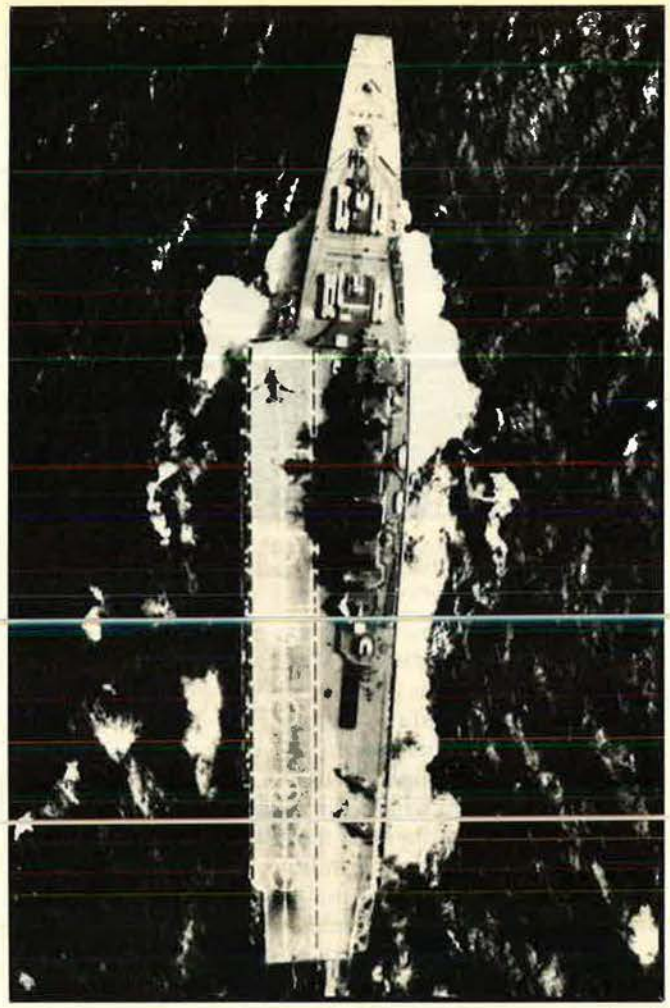
annually, it is time to cease denying that the Soviets have such a program and to try to cope with it.

By the late 1960s, Russian civil defense had the potential to reduce casualties (from prompt effects) to less than ten percent of the population, according to one Soviet civil defense manual. While credible under some assumptions, this claim was, and remains, subject to many uncertainties. It is one thing to evacuate tens of millions of people and build temporary shelters in summer; it is quite another thing in winter, even if the people are hardy Russians. Very likely the Soviets have done more than we realize to reduce the vulnerability of their economy to nuclear attack, but most of it is increasingly concentrated as economic exigencies force more and more investment into expanding and modernizing existing plants, rather than building new facilities in dispersed locations. The uncertainties about Soviet civil defense performance are too great to tempt Soviet leaders to rash actions. On the other hand, these uncertainties cut both ways. The US declaratory policy of "assured destruction," defined as destruction of twenty-five to thirty, sometimes even fifty, percent of the Soviet population, was not "assured" even before it was first announced. And the amount of permanent damage we could inflict on Soviet industry may be less than we usually assume, at least in a number of plausible scenarios.

Although often overlooked, the Red Navy has two strategic defensive missions: defense against enemy carrier aviation and strategic ASW against enemy SSBNs. Here the balance of missions vs. capabilities is very mixed. The combination of SLCMs, attack submarines, Naval Air Force and LRA medium bombers—both being modernized with Backfire—and new missiles, appears to be a match for US and allied carriers. Much would depend on the ECM game. The carriers probably could defend themselves, but Soviet forces also probably could keep the carriers from coming to NATO's aid after the SRF—supplemented by the LRA and FA—had carried out successive strikes on NATO airfields. The Red Navy's strategic ASW mission against US and allied SSBNs, however, suffers from even greater technological deficiencies than PVO Strany's air defenses, despite two decades of effort. Although the primary mission of major open ocean combatants, built or modernized since 1960, is strategic ASW, and two nuclear-powered submarine (SSN) classes evidently have the same mission, the Soviets have made little progress in terms of effective capabilities. Two decades ago, Soviet strategic ASW forces couldn't find a US SSBN, and couldn't kill it if they happened upon it. At present, they still can't find US SSBNs, but could kill some of them if they did.

Soviet naval officers writing in *Military Thought* in the mid-1960s described some of the characteristics of an advanced ASW submarine capable of operating at depths of 600 to 1,200 meters, "the axis of the deep-water sound channel." To operate at such depths an SSN requires a hull of space-age alloys (probably titanium)—obviously an extremely costly program. By process of elimination, the enigmatic Alpha class is the probable result of this effort. More is likely to be heard from this program, or its successor, in the next decade as the Red Navy continues its expensive and persistent effort to acquire strategic ASW capabilities commensurate with its mission.

Finally, there are the Soviet Ground Forces (GF) and



The carrier Kiev, *with others under construction, will improve the USSR's antisubmarine warfare capabilities, but ASW remains a weak spot in Soviet defenses.*

Frontal Aviation (FA), which, supported by Military Transport Aviation, Airborne forces, and the Navy, must consummate operations of strategic forces by defeating the enemy remnants and occupying their territory. Given the preponderance of Soviet strategic forces achieved by the early 1960s in the Eurasian TVDs, the GF has not experienced wide gaps between missions and capabilities. Reequipment programs instituted in the mid-1960s are providing the GF and FA the capabilities to fight *both* a nuclear/chemical and a conventional war with NATO.

Although Soviet paranoia could have it otherwise, Soviet forces along their China border appear to be adequate, at the very least, to defend the USSR's territorial integrity. The Soviets are not likely to have any ambitions to penetrate beyond the Great Wall in a war with China. While China is a threat, Europe is the focus of Soviet ambitions, however indirect the Soviet approach may be at any given moment, because Soviet control of Europe would change the "correlation of forces" overwhelmingly in their favor.

If we were to imagine the NATO TVDs as "decoupled" from the transoceanic TVD, then the Soviets have overwhelming military superiority over their "probable enemies," thanks largely to their strategic missile and air forces. The Soviets should be able to fight

and win a decoupled nuclear war with NATO and seize Europe relatively intact. They have a conventional edge, too, but probably not nearly enough for Soviet comfort. Only US strategic nuclear forces based in the trans-oceanic TVD restore the balance because of the limits of counterforce operations and the remaining gaps in Soviet defenses: air, missile, and ASW.

Budgetary and Manpower Impact

While only the highlights of the impact of Soviet military policy on budgets and manpower can be noted here, it constitutes some of the best evidence we have of how dedicated the political leaders are to achieving military superiority and preparing to fight and win a nuclear war. During the past two decades, the Soviet political leaders have increased their defense spending, as the Soviets reckon constant rubles, at the rate of more than ten percent per annum. Consequently, defense rose from about nine percent of Soviet GNP in 1958 to about fifteen percent in 1975 and probably will reach eighteen percent in 1980. To support such growth in defense expenditures, the top Soviet political leaders decided in 1975 to divert resources from capital investment to defense in the 1976–80 period on a scale that is unprecedented (in peacetime) since Stalin adopted forced industrialization in 1929.

The bite on Soviet manpower also illustrates the leaders' commitment to their military policy objectives. From a post-World War II low of some 2,800,000 men in uniform in 1948, Soviet forces rose to nearly 6,000,000 in 1953–55, declined to something over 3,000,000 in 1962, and then rose to an estimated 4,000,000 today. Because no one in the West knows precisely how many conscripts are inducted each year or how many officers and permanent NCOs there are, estimates of Soviet uniformed military personnel are subject to a wide range of uncertainty. Suffice it to say that the number is large, considering the approaching demographic pinch on the eighteen-year-old group and the relative labor shortage in the domestic economy.

If Brezhnev were serious about not pursuing superiority, he would cut both the budget and number of men on active duty.

Summary Observations

The Soviets do not intend to start a war with the West, but they do design their military posture to fight and win a nuclear war if it occurs. Justification is equally lacking for imputing "surprise-attack" designs to the Soviets, and for dismissing "victory" in a nuclear war as a slogan to keep up the troops' morale. To borrow a phrase from Prof. John Erikson, realistic appreciation of the Soviet threat is ill served by "freakish notions" such as those from both extremes of the analytical spectrum.

Even after several decades of effort, however, Soviet military capabilities are not adequate to achieve their objectives in most scenarios. Unless frustrated by new US missile basing plans, Soviet strategic offensive forces soon will be able to perform all the missions assigned to them, and will be relatively insensitive to the scenario. The crucial remaining gaps between objectives and capabilities are in Soviet strategic defensive forces: air, missile, and strategic ASW. Since SALT began, the Soviets have continued to pour resources into strategic air defense and ASW, and into ABM R&D. As a result, they may be able to narrow the air defense gap in the 1980s and should have the technology to do something about ballistic missile defense in a few years. Strategic ASW, however, requires a technological breakthrough.

Soviets perceive acquisition of war-fighting capabilities to be their best deterrent. By the same token, the more the Soviets approach such capabilities, the more they degrade the US deterrent, which is based on the ability to inflict unacceptable punishment for breaking the peace rather than to prosecute the war after the initial exchange. Soviet damage-limiting policies put less and less at risk while US abstinence from damage-limiting measures puts more and more at risk. This asymmetry in strategic concepts coupled with Soviet progress in building the forces required by their concepts increases stability of deterrence as the Soviets view it, but destabilizes deterrence as the US views it. Reluctance to face this harsh reality leads some to deny that Soviet civil defense exists, or could possibly work, or that a counterforce attack could be executed.

The rationale for Soviet weapons acquisition has been clearly stated in their literature for years, and is not difficult to infer from their observed deployments. Bureaucratic inertia and self-serving interests, politics, and action-reaction all play a role but do not dominate Soviet military policy. Viewed deductively, the forces in the field represent a consistent, persistent effort to achieve the objectives specified by doctrine and strategy, subject only to technological, economic, and other constraints. Viewed inductively, the tenets and objectives of doctrine and strategy can be inferred from the thrust of observed R&D programs and deployments.

The operative aims of Soviet military policy, like those of Soviet foreign policy, are not to stabilize the *status quo* but to change the "correlation of forces" in their favor by achieving as much of a military advantage as possible. The justification for a military advantage is its political utility in peacetime, and the potential to win a nuclear war if deterrence fails for any reason. Thus far, SALT has had no effect on the operative aims of Soviet military policy other than to set certain quantitative limits on about two-thirds of their strategic offensive forces and to remove the specter of US ABM deployments that the Soviets could not match.

We do not know who will replace Brezhnev and Kosygin, or what their policies may be. Nevertheless, basic changes seem to be the least likely possibility. Pursuing their traditional military policies in the 1980s will become increasingly difficult as the rising military burden combines with slow growth in the labor force to reduce economic growth even further. If the present Chinese leaders remain in power and continue their pragmatic policies, taking full technological and economic advantage of their agreement with Japan, US recognition, and access to Western Europe, then in another decade or so Soviet paranoia may have some real Chinese capabilities on which to feed. Despite these and other foreseeable difficulties, however, the USSR probably has some nasty surprises in store for the US in the next decade, not the least of which is the possibility that the USSR may abrogate the ABM treaty in the mid-1980s. ■

SOVIET AEROSPACE ALMANAC

The inherent weaknesses of the Soviet system—particularly in areas of high value to the USSR's leaders—offer unexploited potential leverage for an intelligent Western theory of war and of deterrence. Western strategists need to form a more accurate picture of . . .

Soviet Strategic Vulnerabilities

BY COLIN S. GRAY

IT SEEMS nearly impossible to persuade the US defense community that it needs to debate strategy. Controversy swirls around such issues as trends in the strategic balance, the case for and against maintaining a triad of strategic forces, and whether a particular SALT agreement is, or is not, tolerable. But the debaters, of all persuasions, tend to be standing on very insecure foundations.

What kind of a war do we plan to fight? The character of the Soviet Union, as best we can appraise it, should offer vital clues to US strategic planners in search of intelligent war aims.

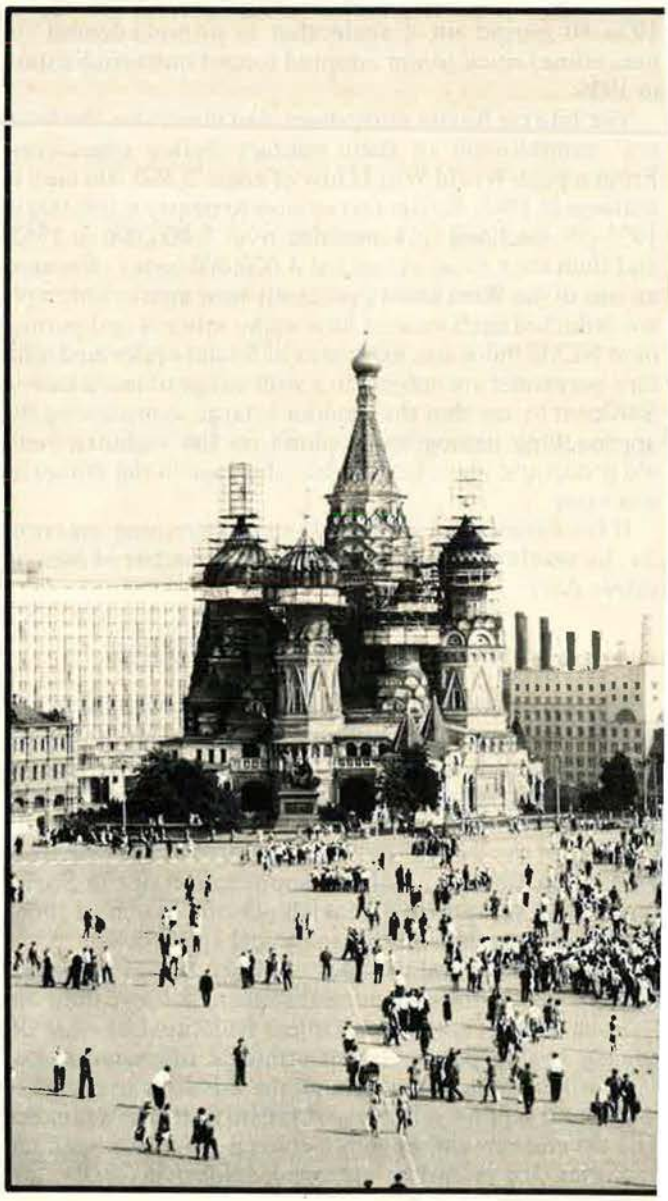
To date, US strategy in the area of hypothetical central war has been grossly deficient in *strategic* reasoning, that is to say, the principles of planned force application have borne only the most tenuous of connections with political purpose. Until the early 1970s, this condition was far less grievous in its possible implications, because of the favorable strategic balance. There is a sense in which a relative wealth of firepower can substitute for strategy.

However, as the central strategic balance moves from marginal US inferiority in the late 1970s to clear (though perhaps only temporary) inferiority in the 1980s, the realm of strategy assumes a position of very great importance. No longer can people take comfort in the thought that even if the US attempts the wrong things in a central war, it will do them on such a large scale that it will all come right.

US strategic forces potentially are relevant to a wide range of acute crisis situations, any one of which could escalate into World War III. It is necessary and legitimate to debate the possibility of fine-tuning strategic nuclear initiatives or responses in an endeavor to manage a process of escalation, but there is no escaping the logic that the credibility and effectiveness of strategic employment at low levels of destructiveness depend critically upon the credibility and anticipated effectiveness of employment at high levels.

Among defense professionals inside and outside of government, it is now almost commonplace to observe that the United States is in need of a theory of victory to inform properly its strategic nuclear planning. This small community has come to appreciate the bankruptcy of the ideas that have passed as *strategic* for several decades. What has been wrong with our central war thinking?

• We have declined to take seriously the view that nuclear war would be a war like other wars, with victors and vanquished, and that the manner of its conduct could be very important. If one believes profoundly that nuclear



veapons have failed in their function (deterring war) if hey are ever used, it is difficult to think rigorously about heir intelligent use.

- We have invented an almost wholly spurious nirror-image of the Soviet adversary. Despite the abundance of evidence available on the character of the USSR, an essentially American adversary has been and continues to be assumed. We have devised threats and planned attacks that speak to American, not to Soviet, reality.
- Overall, we have invented a great divide between prewar deterrence and the actual conduct of war—as if they comprised separate universes. This is both an error in logic and a fallacy that could yield a meaningful victory to the side willing to think through the problems and tasks of nuclear war.

The Problem

The US central war planning problem should not revolve around the question of what is a credible threat (a credible threat need not deter), nor around the search for some approximation of what should constitute unacceptable damage. It should begin rather with the question, what prospective action would be most deterring to Soviet leaders? Such a focus directs one to Soviet phenomena and discourages, though cannot preclude, the projection of Western values. To many people, the suggestion that the United States should have war aims in a thermonuclear war is close to rank heresy—yet that is exactly what is being suggested here.

A recent State Department publication in praise of SALT II offered, without apology, the proposition that it was US strategic policy to be able to inflict "catastrophic retaliation" upon the Soviet Union. Presumably, "catastrophic retaliation" is what one inflicts when prewar deterrence has failed. Precisely, or even very approximately, how the conduct of such a grisly exercise is supposed to serve American interests is shrouded in mystery.

Most Western strategic thinking, and even planning, betrays a basic lack of seriousness about the conduct of war. Those who talk glibly about *retaliation* on a massive scale against Soviet societal assets are simply evading confrontation with the requirements of a sensible action policy. Essentially, our thinking has been focused upon the immoral and irrelevant idea of punishment. Above all else, perhaps, our basic strategic policy is weak in that it sees great deterrent value in threatening, in the last resort, to strike the Soviet system where it is strongest—in its willingness to absorb very high civilian casualty rates, and in its ability to effect economic recovery.

One need only pose the question, what are the Soviet leaders likely to view as the most expendable of their assets? to see that a fundamentally apathetic populace and a replaceable industrial structure (not all of which would be destroyed or damaged) are unlikely to be at the top of the list. However, standard Western deterrent thinking, save among the core group of US defense professionals, continues to believe that the threat of damaging the economy and the largely collocated population constitutes "The Ultimate Deterrent." For reasons outlined below, this belief almost certainly is wrong.

The beginning of wisdom for the US strategic planning community has to be an understanding of the probable enemy. There is only one source for that understanding—Russian and Soviet history. Neither Western arms-control theory nor some believed inherent logic in technology offers substantial guidance concerning aims and methods relevant to coping with the Soviet Union.

At the present time, the US defense and arms control community is convulsed in an argument over whether or not the Soviet Union endorses the idea that nuclear war can be an instrument of policy, and whether or not the Soviets believe that they could achieve victory in a thermonuclear war. This debate, with its quotations and counterquotations from allegedly authoritative Soviet sources, probably is casting as much shadow as it is shedding light.

As best we can discern, the Soviet Union does not want nuclear war and does not favor the idea that nuclear

The architecture and symbols of Red Square epitomize the cultural forces that have formed the Soviet mind: Moscovy, Byzantium, the East, communism, and the West.

war may be a useful instrument of policy. The Soviets anticipate suffering that "catastrophic retaliation" referred to by the State Department authors. Soviet civil defense preparation speaks eloquently to the seriousness with which survival problems are approached, while it is unlikely that the Soviet leadership anticipates suffering anything short of catastrophic loss in the event of war.

These points, however, should not mislead us. Soviet leaders certainly see value in the threat of nuclear war (as do Western leaders), and they have invested in programs that should offer very substantial returns if war were to occur. The Soviets know that nuclear war could happen, and they concur with the evidence—available in the West also, even if it is largely ignored—that suggests that an outcome worth calling victory is possible.

Overall, Soviet leaders give every appearance of adhering to a wholly traditional view of nuclear war. Unlike the Anglo-Saxon countries with their insular geography, Czarist and Communist Russia has been fought over repeatedly and its leaders understand that war with a major adversary can be a very expensive enterprise. Nuclear war looks far more survivable from the perspective of the USSR, Poland, Germany, or Yugoslavia than it does from the vantage point of the US. But this is not to suggest that the Soviet Union takes the prospect of nuclear war lightly or would choose to unleash it in high expectation of political and economic gains following a military victory. All that is suggested here is that the Soviet Union's historical experience, in conjunction with an inherently high-morale official ideology, encourages a willingness to face all aspects of total war.

In short, our past and current targeting emphasis and deterrent philosophy leads directly into Soviet strength. Huge population loss and widespread industrial damage is a problem-set familiar to the Soviet system. Indeed, it is unlikely that a US retaliatory (*second*) strike in the mid-1980s with the forces currently programmed would do as much damage as the Germans achieved in World War II. Admittedly, this damage would be highly concentrated in time and there would be the additional factor of residual radioactivity—but neither of these factors need prove fatal, or even severely embarrassing, to a Soviet recovery effort.

By now it should be obvious that there are significant differences between the Soviet and American approaches to deterrence and to nuclear war. For an effective deterrent in a period of US parity-minus, the West needs to plan to exploit Soviet vulnerabilities, as Soviet leaders see those vulnerabilities, and to advertise judiciously what is planned for the purpose of maximizing prewar deterrent effect.

The above discussion might mislead people into believing that faulty deterrent reasoning, based upon a naïve mirror-imaging of the adversary, is a uniquely Western ailment. This is probably not the case. One may infer from Soviet writings and strategic programs, inexact and problematical though such inferences must be, an intent to deter and, if need be, secure a favorable war outcome against an essentially Soviet-style adversary. Unfortunately, if ever tested in combat the Soviet concept of war is very likely to yield victory—geared as it is (or appears to be) to achieving fairly traditional military aims. It is mildly amusing to note that much that seems startling and even novel about Soviet military doctrine *vis-à-vis* theater and intercontinental war is a source of surprise and revelation in the West only because we have forgotten or disdained the much vilified basic principles of war.

The Soviet System

American strategic planners need an accurate picture of Soviet political life if they are to find clues to Soviet vulnerabilities. Admittedly, the vulnerabilities that we are able to identify may not be so categorized by the Soviets themselves, while they may fear our striking at targets the importance of which we have failed to notice. Also, it is one thing to identify Soviet vulnerabilities; it is quite another to identify means for the high-confidence exploitation of those vulnerabilities. However, if one is in search of an intelligent theory of war against the Soviet Union, the details of strategic treatment should wait upon prior diagnosis of the theoretical opportunities.

What salient facts concerning the Soviet system may suggest leverage points to US strategic planners?

- The Soviet state is superimposed upon either an apathetic or a more or less hostile populace. It is the bearer and interpreter of an alien Western ideology (Marxism), and it has no roots of any significance in Russian society or the other ethnic or national groups within the USSR. Lacking a mandate from heaven, the Soviet state derives its legitimacy essentially from its longevity and from the fact of its monopoly of coercive power. The Soviet state is the only political system known to most Soviet citizens (save for the brief period of German occupation). It is a system feared and respected for its success. And it is a system that has not been challenged seriously from within since the civil war.
- The Soviet state, like its Romanov and earlier predecessors, is a colonial empire. This empire is dominated by Great Russians, who soon will constitute less than half the population of the USSR. Even they have their own brand of nationalist ideology, which is somewhat romantically anti-Western and mystical, and certainly is anti-Marxist.
- The Soviet state is a command-style political system, characterized by extreme centralization of authority and discouragement of initiatives taken at relatively low levels of the system.
- In some ways the Soviet Empire, like British India, is inherently expansionist for defensive reasons. Conquest of, or control or hegemony over, neighbors is essential for securing extant holdings. Just as geopolitical logic impelled the British, off and on, into the political affairs of Afghanistan for nearly a century, so the Soviet empire has a political domain extending to the Elbe in Western Europe—none of which can be permitted to slip the leash, for fear of repercussions in the rest of the system. So fragile is the Soviet political structure that the system is inherently unstable. Eastern Europe is not, any longer, an inessential, though "nice-to-have," forward glacis. It is rather an imperial possession whose loss might bring down the whole domestic house of cards. The Soviets see many advantages in their current political-military dominion over Eastern Europe, but that fact should not be allowed to obscure the further fact that the Soviets have no alternative other than to retain their hold on the region.

In addition to our knowledge of the fundamental character of the Soviet political system, clues to Soviet vulnerabilities reside in Soviet official behavior. The past several years have seen a considerable debate in the United States over the likely effectiveness of Soviet civil defense/war survival programs. However, there is no debate on several aspects of those programs. Everyone agrees that the command apparatus of the Soviet state has made elaborate preparations to ensure its own survival. The first priority, which we have to judge on the basis of Soviet actions, is survival of the USSR's political control structure. Hitler made the cardinal error of (mis-)directing his armies to seize crucial *economic* assets in the European USSR, while leaving the Soviet political control system, centered in Moscow, as a secondary objective at most.

The Soviets learned from World War II that—given the size of the Soviet Union—preserving the essential components of political control is almost everything. So long as the Soviet state survives, recovery is possible and the concept of victory retains its meaning. If the Soviet leadership confronts a not-implausible war outcome wherein *the Soviet state* does not survive (even if the damage to Soviet economic assets is relatively modest), then victory has no meaning; indeed, it is impossible by definition.

It should not be inferred from the above that the Soviet system holds to a very narrow conception of what constitutes "the essential Soviet Union." First and foremost is the senior bureaucratic echelon—party and government—in Moscow. But scarcely less important are the communication links to the provinces and to the widely dispersed instruments of external and domestic coercion, and the command authorities at the provincial levels. To a degree that is almost bizarre by American standards, the essential representatives of the Soviet state—civilian, paramilitary, and military—in Moscow and outside would be bunkered very securely in time of war. In addition, there is very little dispute in the West over the fact of Soviet civil defense preparation relevant to blast and fallout protection of workers in key industries. The Soviet civil defense program appears to be an orderly one, moving historically through phases of providing protection for central, local, and military leadership and their means of communication, to protecting the essential industrial work force while planning comprehensive, though minimal, protection measures for the vast remainder of the population.

Before turning to operational questions for the US defense community, it is probably useful to note the signs of fragility that characterize the relationship between rulers and ruled in the Soviet empire. Whether exaggerated or not, it is a fact that the Soviet leadership focuses upon dissent, rabid or mild, with a near-paranoid intensity. The degree of Soviet confidence in the health of its basic relationship with its Warsaw Pact allies was demonstrated very clearly in 1953 (East Germany), 1956 (Hungary), and 1968 (Czechoslovakia). The Czech experiment in "socialism with a human face" had to be crushed because Soviet leaders (at least a majority in the Politburo) feared, perhaps correctly, that the entire Soviet political control system at home and abroad would face a possibly fatal challenge. At the very least, the Soviets would appear to have reasoned that they could not afford to appear to have been out-faced by the Czechs.

The Soviet state's low degree of trust in its citizens is attested by the operation of the most total police state in world history. Authoritarian government and the widespread use of police informers is not, of course, a uniquely Soviet phenomenon. However, notwithstanding the impressive continuities between Czarist and Soviet Russia, the latter has far exceeded anything dreamt of in the former by way of surveillance and control of the populace. As a political and economic necessity, the Soviet state tolerates the free-enterprise, black market, countereconomy, but it feels unable to tolerate even the breath of political dissension.

"Our central strategic planning idea . . . should be to encourage [the USSR] to destroy itself from within."

US Strategic Planning

In principle at least, there is scant room for doubt as to the maximum deterrent threat that could be posed to the Soviet state—the prospect of its forcible dissolution. Readers would search in vain through US Department of Defense annual posture statements for some American doctrinal recognition of this elementary fact. Indeed, the declared strategic policy of the US seems almost designed to encourage Soviet citizens to identify with the Soviet state. For examples, consider these two gems of political sophistication and *strategic* reasoning, from Robert McNamara's posture statements for 1967 and 1968 respectively: The level of promised destruction should be "say, one-fifth to one-fourth of its population and one-half to two-thirds of its industrial capacity. . . ." We should be secure in the knowledge that we "have the clear and present ability to destroy the attacker as a viable 20th Century nation."

It would appear to have escaped Mr. McNamara's attention that one of the Soviet Union's gravest weaknesses lies in the fact that it is not "a viable . . . nation," or indeed a single nation at all. The entire assured destruction theme, which still reposes, though not with confidence, in US strategic policy, discards *a priori* a potential Western trump card.

It is a political fact of Soviet life that Soviet society and the Soviet state are not one and the same. In practice it may be very difficult to plan to wage war against the latter, while sparing the former. But if we are to secure maximum benefit from our investment in armed forces, we

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should at least investigate rigorously the possibility of doing just that. It would be a tragedy were the United States to wage war essentially against Soviet society on the rationale that this was the only kind of war it was equipped to wage. (Remember RAF Bomber Command's night-bombing campaign against German cities.) If it is immoral and unintelligent to attack Soviet society, it does not become moral and intelligent because of a lack of plausible alternatives.

Our central strategic planning idea *vis-à-vis* the USSR probably should be to encourage that country to destroy itself from within. The United States should disabuse itself as soon as possible of the notion that there is deterrent merit in striking at the Soviet economy. At present, the US government is on record as believing that in the last resort, deterrence is assured by the threat posed to Soviet postwar recovery by the thousands of warheads in the SSBN fleet. There is a primary and a secondary objection to counterrecovery targeting. The primary objection is that such targeting does not serve Western interests, while the secondary objection is that Western defense planners do not know how to target the Soviet recovery economy.

Even on its own logic, the counterrecovery thesis (assuming that we know how to do it) fails. Why should the Soviet Union be deterred by the prospect of a very large recovery task, when that task is set against the glittering prize of global hegemony following a strategic victory over the United States? In such a context, the Soviets presumably would have unrestricted access to, and control over, Middle East oil and the industrial base of Western Europe.

The above argument does not suggest that all "economic" targets in the USSR be spared—far from it. Instead, it suggests that only those "economic" targets of political and military significance for the war should be struck, and not all of those, if overall US strategy might thereby be damaged. For example, in keeping with the concept of attacking the Soviet political control structure, it would be entirely appropriate to strike discretely at Soviet communications targets such as railroads and railroad gauge-change facilities, airfields and bridges—indeed anything that would contribute to paralyzing the Soviet control and enforcement structure.

To defeat the Soviet state, the United States must plan to degrade and destroy its assets. Preeminent among these assets are: the respect of the Soviet peoples; the military forces of the state; the police and paramilitary forces of the state; the civilian command apparatus (party and governmental—at all levels).

It is an unfortunate fact that the United States cannot wage a surgical war against the Communist Party of the Soviet Union and the KGB. Those overlapping organizations can be degraded through very selective targeting of particular facilities and communication links, but a "knockout" blow against the control structure, leaving Soviet society essentially untouched, is simply not feasible, even with new technologies for very precise weapon delivery. The potential target structure is too large, too dispersed, and—in some important cases—not precisely identifiable, geographically. Nonetheless, those parts of the control system that can be targeted should be targeted. Given the extreme centralization of authority in the USSR, a severe blow to the Moscow-based head of the system would have a disproportionately paralyzing and impairing effect upon regional command levels.

However, it would be a grave error to believe that by striking directly at the Soviet political control structure, the United States and NATO could avoid the necessity for blunting and defeating Soviet military power. If the Soviet Union is able to win a theater war in Europe and to counterescalate at the intercontinental level to the point where the United States has exhausted all sensible strategic employment options, then partial damage inflicted on the Soviet political system could rapidly be repaired.

There is, alas, a military prerequisite for the essentially political theory of Western victory outlined here: Soviet arms—and with them the domestic and East European reputation of the Soviet government—have to be discredited. If Soviet arms are able to impose defeat upon the West, then no amount of highly selective and intelligent strategic targeting could suffice to enforce a tolerable war outcome. The non-Great Russian peoples of the Soviet empire have to lose their respect for, and fear of, the Soviet state. They must be induced to believe that the Soviet state permanently has lost its ability to coerce obedience.

As a minimum condition for the centrifugal forces within the Soviet empire to begin to bring that system down from within, the West would have to enforce a protracted stalemate in war. The Soviet and East European peoples would have to appreciate that Soviet arms, if not defeated, were at least far short of being successful. In such a context, the coerced friends and allies of the USSR in Eastern Europe would begin to consider alternatives to their extant security commitments to the Soviet Union.

War-fighting for Deterrence

There should be no distinction between deterrent and war-fighting thinking. This discussion has focused upon ways in which the inherent weaknesses in the Soviet system offer potential leverage for an intelligent Western theory of war. That theory of war is also a theory of deterrence. We cannot know ahead of time exactly what would deter a group of currently unknown Soviet leaders over a particular issue, also currently unknown. But, we can draw prudent conclusions from careful analysis of Soviet reality, and from observation of the value the Soviets place upon their various assets. The principal conclusion of relevance to US strategic planners is that a declared intent to punish Soviet society is likely to be far less deterring a prospect than is a declared intent to encourage the dissolution of the Soviet state. ■

SOVIET AEROSPACE ALMANAC

The Soviet concept of mobilization—which affects strategy, tactics, and arms-control negotiations—is conditioned by bureaucratic centralization and an understanding of war different from that which has been common in the West.

The Soviet Mobilization Base

BY NORMAN FRIEDMAN

PROBABLY the most common Western image of Soviet military production is that of a vast river of tanks, aircraft, and missiles, compared to the trickle of production permitted by US and European governments. If this is the peacetime situation, it would appear that in an emergency matters would soon become incalculably worse. Exactly this argument is often used to justify even an unbalanced SALT agreement: If we do not sign, the Soviets will work harder to pour out strategic weapons; surely even a small percentage increase in their already large production rates will bury us.

Inherent in this argument is the belief that Soviet and Western economies are sufficiently similar that normal emergency expansion rates in the West are also normal in the East. However, the Soviet economy is not similar to Western capitalist economies, and its rigidities make it far less capable of rapid expansion. Consequently, it seems likely that peacetime events such as the failure of SALT will have far less significant effects on production rates in the Soviet Union than in, for example, the United States. The Soviet system of mobilization—and indeed of peacetime production—shows that they are aware of this problem.

The Soviet economy is planned in Five-Year Plan increments, adjusted in detail from year to year. To be successful, such long-range planning, in which some weapons programs may span two or more Plans, requires close to a steady-state national situation. Every change in the Plan must send ripples through the Soviet economy, and the planners have to account for all of those ripples. The closer they can stay to something like a steady state, the happier they will be. On a more detailed level, every Soviet factory manager is rated (and receives bonuses) according to how well his factory fulfills norms built into the national Plan. By now it is well known that the norms tend to be crudely numerical, and tend not to be concerned with quality. Managers who have learned to produce their quotas will be loath to switch to alternative products that may cause them difficulties.

To the extent that planners and factory managers dominate the day-to-day workings of the Soviet economy, the system will do its best to continue producing much the same military products at much the same rates, year in and year out. Average production rates will be decided not by the needs of troop formations, but by the need to maintain the military economy, and, second, by national requirements in an emergency. Initially, emergency production rates would be very much like preemergency rates, at least in part because, unlike the West, the Soviet Union has no vast high-technology civilian sector that can be redirected to military production. High-technology bottlenecks, such as microelectronics, would remain, emergency or no emergency, SALT or no SALT.

Another characterization of this production system is that key decisions are not about total numbers of weapons to be produced (*i.e.*, force levels plus reserves), but rather about *rates* of production (*i.e.*, factory employment and the allocation of labor and raw materials). Such a characterization accords well with known Soviet policies. For example, if a flood of aircraft will be built whether or not existing aircraft are maintained, it is far wiser to build few spares; aircraft can be replaced on a one-for-one basis when they need major maintenance. Such a policy may be very realistic in wartime when damage generally causes aircraft to be written off.

The flood of production, essentially unrelated to day-to-day Soviet military requirements, lends itself to Soviet foreign policy; in terms of special costs to the Soviet economy, arms for export are very nearly free. Moreover, if Soviet practice is to require several spares for each aircraft in use, then Soviet policy will be to export relatively large numbers of aircraft in relation to the needs of even small air forces. A side benefit is great apparent generosity to the Third World client. Moreover if, as in the Arab states, the client tends to expend most of the aircraft early in a war, he has not used any as spares against maintenance requirements, and Soviet production practices have indeed benefited him. Similar considerations apply to tanks.

The Soviet practice of one-for-one replacement from a large stockpile is reflected in Soviet training practice where, for example, large numbers of tanks are stored, while a few special tanks are used in training. In this way operational vehicles *and spares held for replacement* can be maintained in good condition against the outbreak of war. The Western practice of using operational equipment for peacetime training requires frequent repairs and a constant supply of spare parts. On the other hand, in wartime the same Western practice (which may well en-

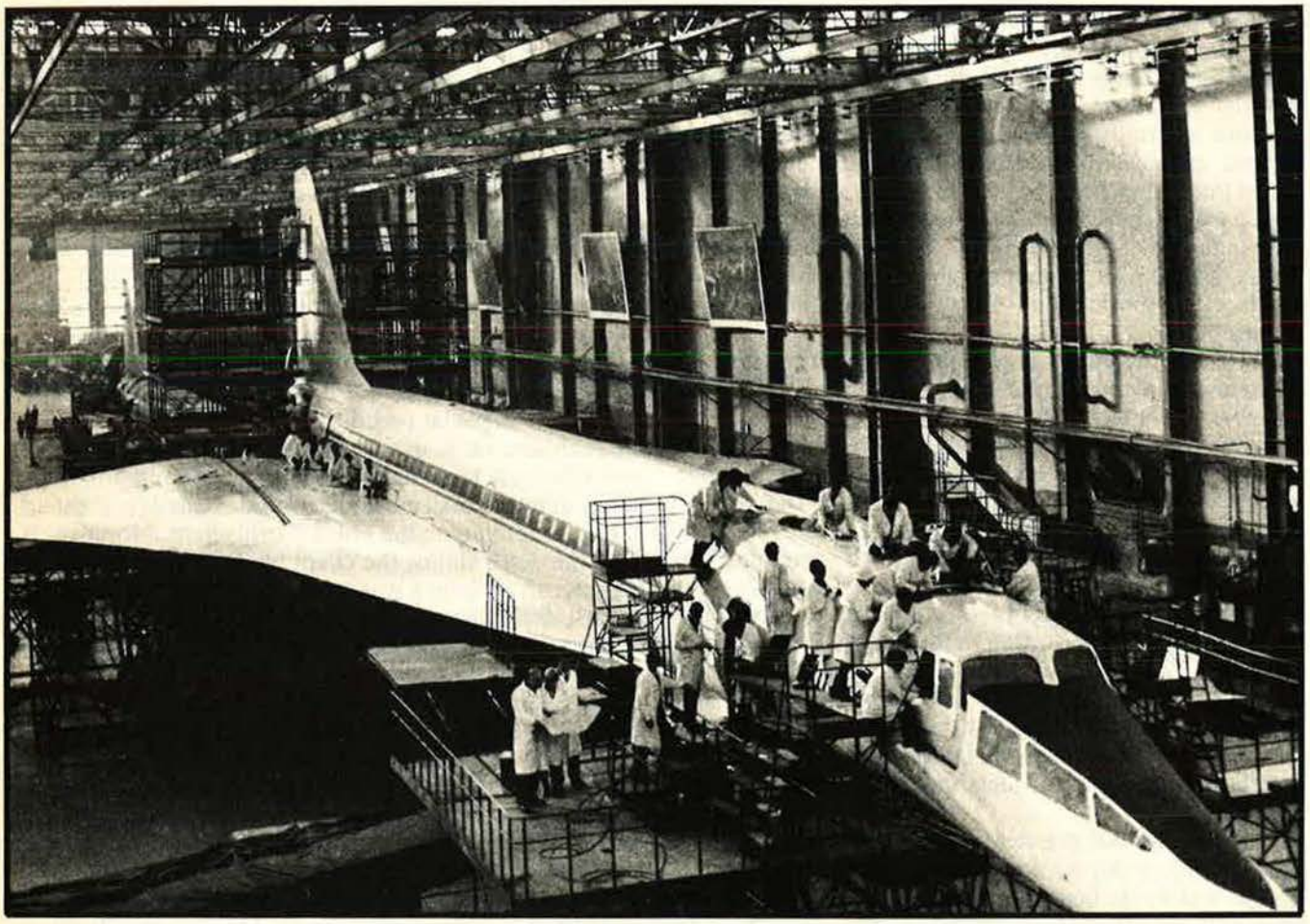
sure a higher level of training) is ineffective if most damage is catastrophic. In the case of missiles, the Soviet requirement to maintain a high production rate against possible wartime usage provides a growing stockpile that makes it practical for the Soviets to expend fairly large numbers in training. Moreover, some types of Soviet tactical missiles, particularly those using storable-liquid propellants, have relatively short shelf lives. They cannot be stockpiled, and must be fired or scrapped. Such short shelf life implies the need for a production rate linked to expected rates of operational use, since the relatively rigid Soviet economy is ill-equipped for sudden peacetime shifts of priorities—especially as those shifts would have to be made during a prewar period of relatively ambiguous warning.

Looking ahead five to seven years in formulating a Five-Year Plan, the Soviet government cannot realistically adopt a formula such as the famous British Ten-Year rule that guaranteed against a war within ten years. Nor can it accept (in an already extremely unproductive economy) the leeway required to permit it to increase military production very considerably in a short time. What matters in Soviet economics is that every Ministry be given norms that fully employ it. No Ministry will be willing to accept much less, for then other Ministries would demand (and probably receive) unused resources, and the bureaucratic power of the losing Ministry would suffer severely. Thus, for example, the Soviets find it far easier to maintain a production line than to close it (or, for that matter, to start up another).

Western governments operate on a very different basis. There is only so much tax revenue, and the government wants to achieve its ends at whatever cost to particular companies. Prominent among the interested parties are taxpayers and their representatives, who applaud government economies such as closing production lines but not the opening of new and generally more expensive ones. In the highly bureaucratized Soviet state, on the other hand, the important interest groups are within the government, particularly the planners and the producing Ministries. The main constituency of the Soviet government is not the masses, but the middle-level industrial managers and low-level party cadres. For them, it is never a question of "guns vs. butter" but rather of butter obtained as a consequence of *which* guns or *which* machines are to be produced. Apart from the armed services, which have a strong interest in continued innovation, much of the Soviet political system would probably be happiest if production of existing weapons were to continue forever at steady rates.

The Design Bureaus

The flood of materiel is not the only significant feature of the Soviet military production machine. There is also the constant flow of new models, sometimes only slightly



This Tu-144 supersonic transport on the assembly line at the Voronezh Aviation Factory was designed by the Tupolev Bureau, which also designed most of the USSR's currently operational bombers and several other commercial transports.

better than their immediate predecessors, but very much better over several generations. Western observers note that the Soviets continue to improve their weapons along many fronts, even along lines that in the West seem too unproductive to pursue. This trend, too, can be traced to the makeup of the Soviet economy. Prototypes are not the products of factories, but of independent design teams. Students of Soviet aircraft development who are familiar with the names of independent design bureaus such as Sukhoi and Tupolev will not be surprised to learn that there are design organizations, quite separate from the producing organizations, for most classes of Soviet equipment. Unlike some of the aircraft bureaus, these organizations often are not competitive. It seems unlikely, for example, that there was an alternate design for the aircraft carrier *Kiev*. What is important is that the same principles of bureaucratic survival that ensure the steadiness of Soviet military production also ensure the survival of the design bureaus and hence a steady flow of prototypes.

It is an axiom of bureaucratic warfare that individuals gain prestige and power in proportion to the number of their subordinates. It follows that no Ministry will willingly dismantle any of its design bureaus or any of its production facilities, except under the most severe financial pressure. However, in the Soviet state it is the bureaucrats of the State Planning Agency (Gosplan) who in effect decide the fate of the production Ministries; it seems unlikely that anyone in this system is willing to make waves. For example, to become a high official in a Ministry an individual will have had to establish strong political ties; his particular mentors are unlikely to place economy above the need to repay internal Soviet political favors.

The survival of design organizations whose products have been unsuccessful is quite striking. For example, although Sukhoi produced no aircraft suitable for production between 1943 and about 1955, he was not denied resources, and, in fact, a Sukhoi bureau has produced several of the standard Soviet fighters of the past two decades. In the naval field, the large warship bureau, which under Stalin produced designs for big-gun capital ships, appears never to have been disbanded. During the lean years of the late '50s, it designed large naval auxiliaries, and then the *Moskva* and *Kiev* classes of air-capable ships. It is unlikely that the need for such ships had been perceived when the Soviet big-gun ship program was canceled. However, retaining the design bureau gave the Soviets flexibility when their navy became interested in a new direction.

In effect, the iron laws of bureaucratic survival ensure that the Soviet military will be able to select particularly attractive evolutionary prototypes for production when convenient to the system of Five-Year Plans. What is important is that the flow of prototypes is unaffected by the military's actual needs or by the advance of technology. The prototypes are there to profit from new technology, and accommodate changes in military requirements. In the United States, however, either the requirement or the new development comes first, to be followed by a series of study contracts and hardware contracts. On the other hand, Western governments do not find themselves bound by existing agreements on production rates. They find it easy to accelerate military programs in peacetime, because the dislocations such accelerations cause are little worse than the normal dislocations inherent in an unplanned economy. Stability is a desideratum but not a driving force in the West.

Norman Friedman, a theoretical physicist specializing in naval and military technological problems, is a member of the professional staff of the Hudson Institute, Croton-on-Hudson, N. Y. He holds a doctorate in physics from Columbia University and has written extensively on Soviet and US naval affairs. Dr. Friedman has recently coauthored studies of US and Soviet mobilization potential and of Soviet vulnerabilities to strategic attack.

These theoretical points about Soviet military production can be confirmed by a study of actual Soviet performance. Soviet arms maintenance and arms export practice suggests the correctness of the image of a production flow essentially unrelated to month-to-month or even year-to-year exigencies—a flow in which production bureaucracy is far more important than the demands of a civilian population *or* of the military itself. Unless the Soviet central leadership perceives war as imminent, it is not likely that theoretical requirements of Soviet tactics can win out against practical politics of the needs of plant managers, who in turn have important contacts within the ruling Communist Party of the Soviet Union.

The most significant factor here is the centralization of Soviet leadership. The top Soviet leaders are unable to direct their bureaucracy in any broad way, although they can attempt to concentrate on very detailed goals. Even in those cases, such as the Kama River truck plant, it is not clear that economic leadership at the top has been particularly successful. Although Kama River is now producing trucks, it was not built on schedule or, apparently, within cost guidelines, even though it was a major Soviet project with backing at the very top. There is even good evidence that as requirements from the top multiply, their impact rapidly diminishes to the vanishing point. To restate the problem, the Soviet Union is an extremely centralized state, and the few leaders at the top can concentrate simultaneously on only a very few problems. Their distrust of subordinates requires them to be concerned with what seem to a Westerner relatively trivial questions, such as the censorship of particular books. Every addition to the list of topics they must deal with diminishes their attention span. However, without stimulus from above, Gosplan and the producing Ministries dominate the situation, and their bureaucratic inertia governs all.

The MiG-25 Foxbat is a case in point. It was designed to intercept high-flying supersonic bombers such as the B-70. Although the Foxbat first flew well after cancellation of the B-70, it was put in production, presumably in response to planning decisions made many years earlier, and remained in production as a major Soviet air defense fighter even after the air threat to the Soviet Union shifted decisively towards low-flying attackers. Though relatively ineffective at low altitudes, it appears to have been simpler for the Soviets to refit it with a new radar for the low-flying anticruise-missile mission. Clearly the time window for introduction of a very different aircraft either had passed or was not yet at hand, although the air defense version of the MiG-23 is a candidate. In that

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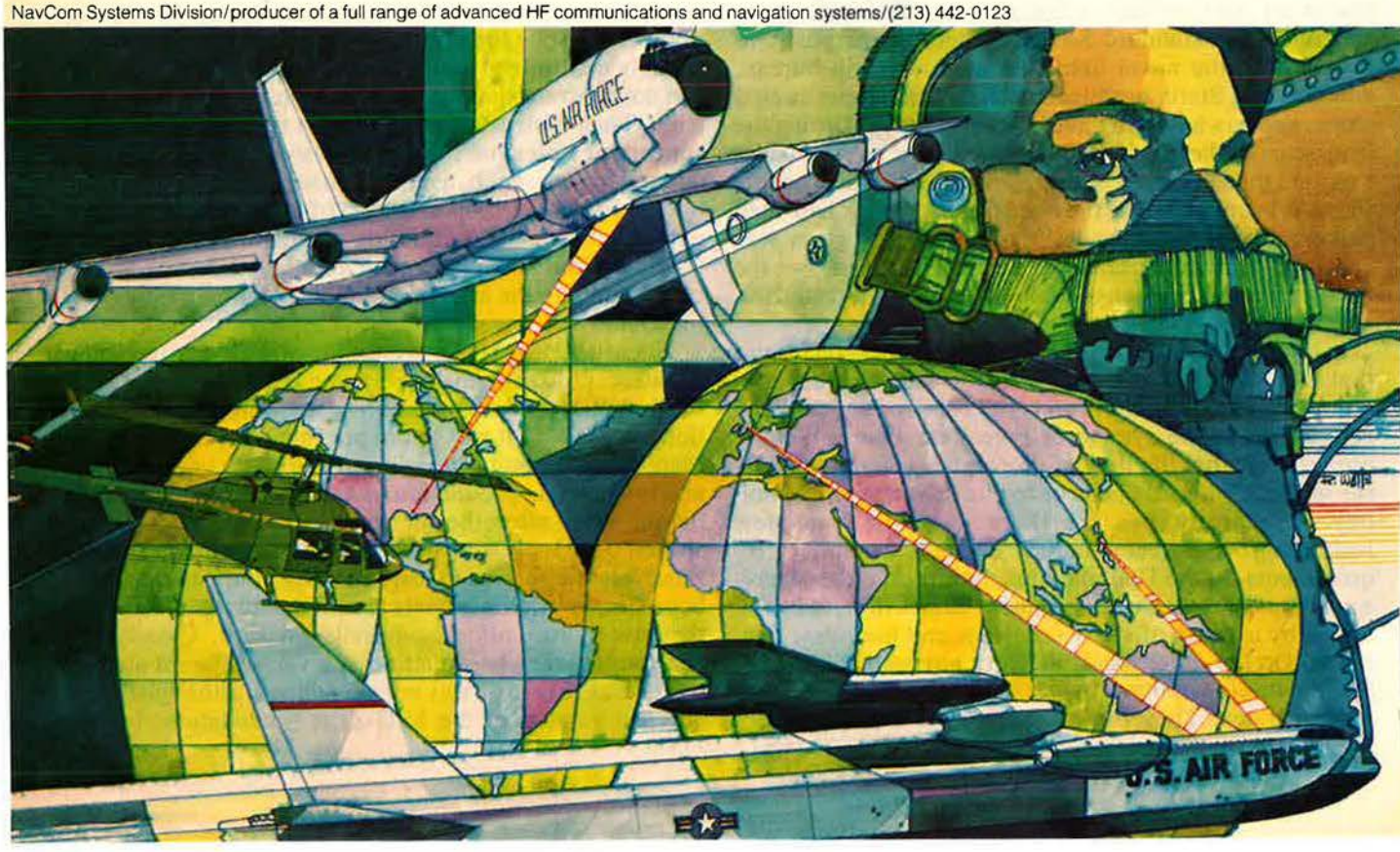

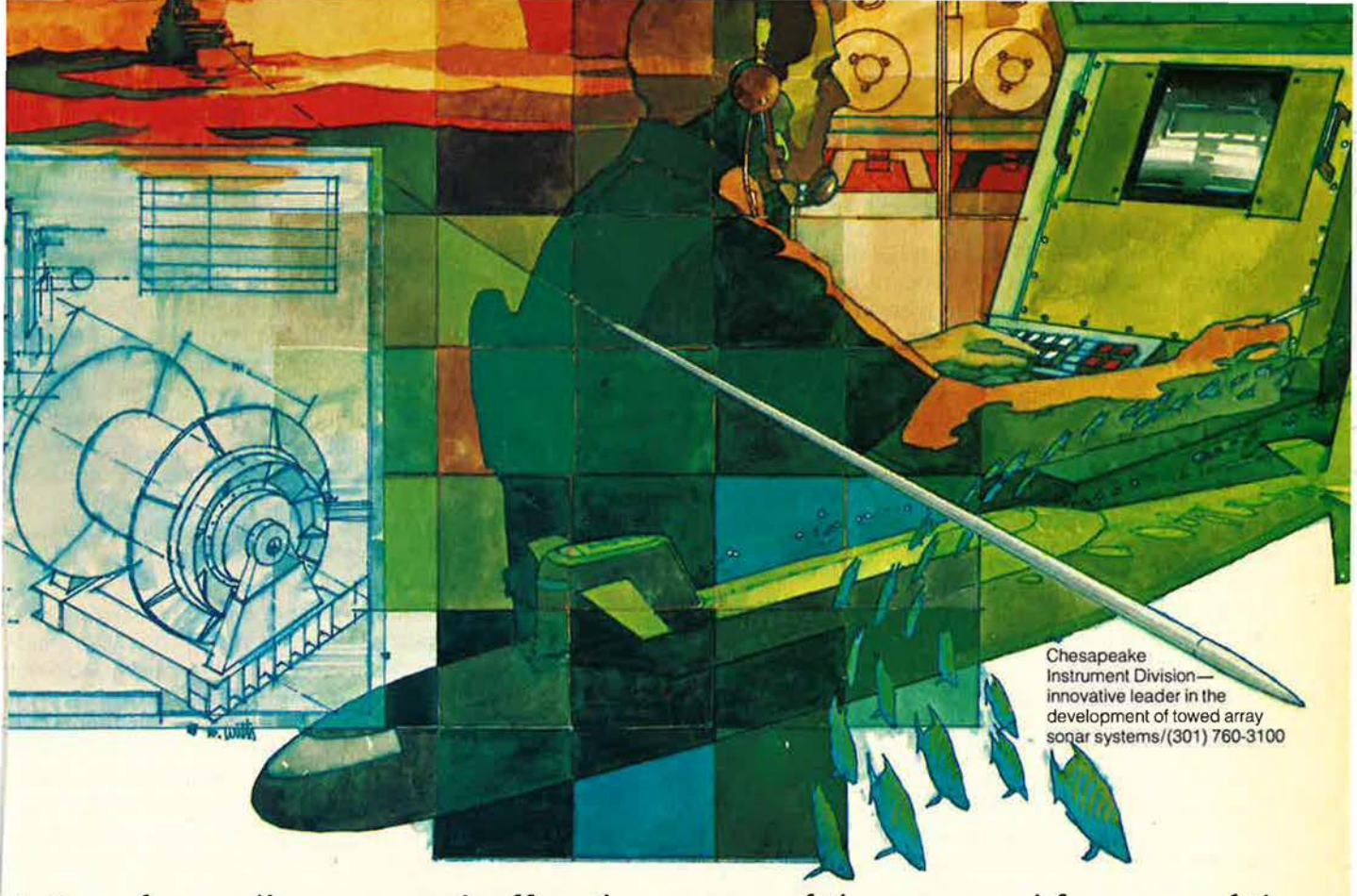

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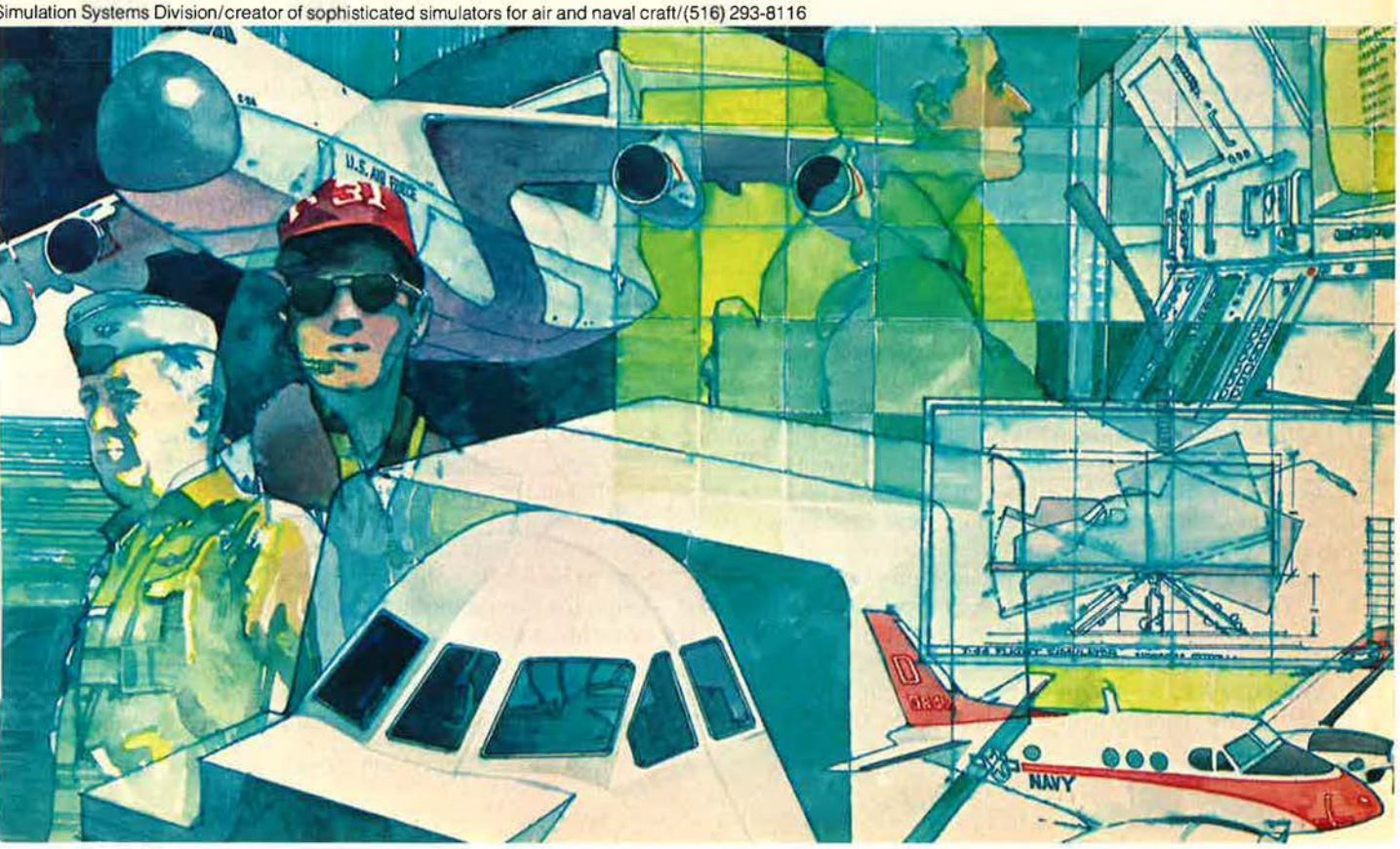


case, it is probably easier for the Soviets to adapt an existing ground-attack (strike) aircraft than to introduce another new one.

Warships are another interesting case. Except for very large ships such as the *Kiev*, the Soviets build their warships on production lines, permitting a shipyard to maintain a constant pool of various skills that can be moved from one hull to the next. Shipboard equipment can be standardized, and each yard can be sure of a long series of deliveries of the same hull. On the other hand, more than any other Soviet service, the Navy has experienced a series of drastic shifts in mission over the past two decades. Thus, it is striking that the *Kashin*-class guided-missile destroyer remained in production for about fifteen years, with deliveries from 1963 through 1973. In retrospect, the torpedo-armed destroyer designed in the late '50s had little relevance either to anticarrier tactics of the early '60s or to the antisubmarine mission that replaced it; yet *Kashins* continued to be built. Their equipment remained almost unchanged, in silent testimony to the power of the Soviet production bureaucracy.

In some ships, platforms for important operational electronic gear (generally ECM) remained empty for some years, once more in silent testimony, in this case to the great failing of the Soviet productive system—its inability to produce in sufficient numbers such precision goods as military electronic systems. Note, however, that the production bureaucracy was not all powerful: *Kashins* ultimately were replaced on naval production lines by ships more appropriate to current Soviet naval missions, such as *Kresta*-class missile cruisers, which also have showed signs of an electronics industry incapable of matching the production of more basic hardware industries.

The problems of Soviet electronics production seem particularly relevant to analysis of Soviet performance in a missile-building race. A modern long-range missile requires large quantities of very precisely built components, both in its guidance system and in its engine and warheads. Large-scale Soviet production has demonstrated convincingly that the Soviets can turn out missile bodies quite rapidly, just as they can turn out tank hulls and turrets and diesel engines; but the bottlenecks in production are likely to involve just those precision components that predominate in the most sophisticated weapons.

It is conceivable that a top-level decision might sacrifice production of most Soviet weapons for some acceleration in strategic missile production, but the main consequence of rigid planning in the Soviet economy is that such a crash program would have disproportionate costs in production rates of other weapons. Moreover, to police such a decision in the bureaucratic jungle of Soviet military production would be far from easy. The Soviet leadership may well be all-powerful, but it can issue only so many commands before each new emergency command comes to lose its impact. There is good reason to believe that this point has already long been passed.

The principal problem in Soviet production is probably inability of the government to apportion responsibility for performance among subordinate Ministries and their components. As anyone well versed in the arts of bureaucratic warfare will readily testify, the chief rule of bureaucracy is to avoid final responsibility. In any one project, which may well cut across Ministry lines, a central planning document delineates the responsibilities of all concerned; however, it cannot be policed because all of those responsible for drawing up the document have left themselves much leeway for the inevitable delays and shortcomings. Even so, in many cases factory managers faced with the choice between fulfilling their norms (hence, earning bonuses) and furthering a new project will choose the former. That the central document has the stamp of the top authorities is irrelevant, for too many such documents have already passed the same way before. Accounts of Soviet weapons development are replete with tales of promising prototypes, the production versions of which failed miserably because subcomponent producers would not meet specifications, and could not really be threatened with serious consequences for their failure to do so.

That is the case with new weapons and new systems. However, it also means that in the case of existing systems, factory managers will resist very strongly any sudden change in their production quotas—short of a Soviet national emergency so severe as to overcome the inertia of the relatively self-serving bureaucracy. The point here is that the failure of SALT negotiations is unlikely to be so viewed. Soviet arms production remained fairly stable even under the rather more severe stimulus of the Vietnam War, nor have production rates been affected by such sudden demands as those of the Arab states that required rearmament in 1967 and again in 1973. Note that a Soviet system directed toward maintaining a fixed level of inventory would have had to react to these large drawdowns. The United States certainly reacted relatively stongly to the drawdowns imposed by its own resupply of Israel in 1973 by more than doubling tank production.

Stockpiling vs. Acceleration

Mobilization is an effort to rapidly achieve a higher level of military capability. In the United States, it usually means a massive increase in military production, because in the past that is an important part of how we have responded to military emergencies. This article suggests strongly that the Soviets do not view industrial mobilization as a useful option, short of the deepest kind of national emergency. Beyond all of the arguments concerning the Soviet social system, it is well to keep in mind that with an economy more dominated by the military in peacetime, the Soviets have less civilian "fat" to draw upon in mobilization.

However, the Soviets still recognize the need for some mobilization strategy. They find themselves, in peacetime, manpower-poor. Although they support a very large standing army, many of its troops are detailed to what in the Third World are called "nation-building" activities, such as road construction. Many divisions are deliberately held at low degrees of readiness, as skeletons to be fleshed out with reservists in the event of war. Thus, the Soviet mobilization base consists not of plants awaiting orders, but rather of stockpiled equipment awaiting the arrival of the horde of reservists generated by a large and continuing Soviet draft.

The habit of stockpiling against wartime emergency

almost certainly extends well beyond tanks and tactical aircraft to strategic missiles. In view of well-known Soviet practices, it is difficult to believe that the number of effective Soviet ballistic missiles is equal to the number of Soviet silos. The Soviets, unlike us, do not believe in wars decided by a single wave of missiles. They have built many of their silos for reuse, and it seems likely that they have built many missiles for that purpose. In any case, such a practice would accord well with a state that found it easier to maintain a production line in operation than to close or reopen it.

The Soviets appear to have taken the concept of mobilization far more seriously than has the United States, where there is a tendency to believe any military resource not available for combat within the first week (at one time, the first day) is unlikely to make any difference. Such reasoning clearly rules out important roles for reservists or for stockpiled equipment. The Soviets see matters differently. They believe that wars never come like bolts from the blue, but rather that the intelligent observer can see them coming from some considerable distance. That they failed in precisely this respect in 1941 appears not to trouble them.

It follows that the Soviet Union can count on some warning time, but probably not enough to reorient its relatively ponderous economy. Soviet mobilization policy—stockpiling and maintaining a large reserve—follows directly. The mobilization policy in turn probably affects some production decisions, such as introducing new weapons that many reservists may not be able to use without retraining. Stockpiling requires maintaining at least some spares for obsolete or obsolescent equipment, which may present some operational problems if it is ever activated. Certainly the United States encountered such difficulties in using ships and aircraft of World War II vintage in Vietnam. However, the Soviets have an important advantage in that the very rigidity of their economic system makes it easier to keep some vital subcomponents in production (as long as they are even minimally satisfactory) rather than introducing new ones simply because they are new. Thus, the older equipment may suffer from fewer problems of incompatibility with current equipment than is the case in the United States.

Above all, the value for an American studying Soviet production and the Soviet approach to mobilization is that he can see the asymmetry between the two countries and their systems. The flood of Soviet equipment in peacetime is only the reflection of a Soviet society so ponderous that it must always exist semimobilized for war. It is not the omen of a far greater flood that can easily be unleashed, because the Soviets are working as hard as they can under nonwar circumstances.

In negotiating arms limitation with the Soviets, we ought to keep such considerations in mind: The consequence of no agreement may well be no more than the continuation of the current rate of Soviet production. Worse, in view of Soviet bureaucratic inertia, the consequence of what seems an attractive limit on Soviet silos may be only that.

The Soviets may almost be compelled by the inner logic of their economy to keep producing missiles at the present rate, so that all we will have gained in the event of war will be a Soviet strike spread over a slightly greater period, using quite as many weapons as we would have faced without SALT.

Nor should an American think that the trickle of equipment his own economy produces in peacetime is a valid indicator of what it can achieve upon mobilization. The proper measure of US capabilities is the total size of our economy, which has an inherent flexibility born of our economic system. We do not plan rigidly, and we accept some considerable inefficiency. But we are far easier to mobilize than are the Soviets, at least partly because we so prize individual initiative. This can be no more than a sketch of the difference; in an important sense, industrial mobilization is a mirror of a nation's social and economic system. Very crudely, our system emphasizes flexibility and opportunity; the Soviet system is more concerned with maintaining order and a secure (but relatively fixed) place for the individual. ■

The Soviets continued to build these Kashin-class destroyers *with equipment that was not relevant to their changing mission, "in silent testimony to the power of the Soviet production bureaucracy."*

SOVIET AEROSPACE ALMANAC

Analyses of US military doctrine and strategy published in the Soviet Union provide a means of determining what kinds of forces the USSR may develop and how they would be used.

Soviet Perceptions of US Strategy

BY WILLIAM F. SCOTT

Col. Oleg Penkovskiy, the Soviet spy who in 1961 tried to warn the West about the Kremlin's plans to achieve strategic nuclear superiority, also warned of the problem of perceptions. He stressed the necessity for Western leaders to know and to understand Soviet military doctrine, and also *to know and to understand the Soviet concept of Western military doctrine*. The Soviet concept of Western doctrine, Penkovskiy had found, *was completely different from what Westerners considered their own doctrine to be*.

It would seem that the Kremlin leadership, with its access to vast amounts of data, should have a clear understanding of United States military forces, capabilities, and intentions. Yet, recent visitors to Moscow have been amazed at the distorted views of the West presented to them by Party Secretary Leonid Brezhnev and Premier Aleksey Kosygin. In the early 1960s, Nikita Khrushchev's assessment of United States resolve and capabilities was a factor in his sending nuclear-armed missiles to Cuba. There is a danger that distorted perceptions may cause Soviet leaders to make comparable miscalculations today.

Soviet interpretations of United States military concepts are expressed in several dozen articles each month, and in scores of books each year. Such writings, however, are seldom read in the West. They generally are regarded as Soviet propaganda, or else as deliberate deceptions. As Penkovskiy warned, Soviet concepts of our forces may be difficult for us to understand. Sometimes they may in fact be propaganda, but in many instances the Soviet leadership appears to take them seriously.

The Soviet understanding of United States armed forces, published during the 1960s in articles appearing in *Military Thought*, the restricted journal of the Soviet General Staff, does not differ in substance from views expressed in the journals intended for Soviet teenagers. The organization, manning, weapon systems, and doctrine of the Soviet armed forces are an indication that the Kremlin leadership believes these perceptions of Western forces to be accurate. Their military force structure is a logical counter to the strategy, concepts, doctrine, and forces of the US and its NATO allies, as interpreted by the Kremlin.

Soviet Perceptions of the Beginning Period of War

Officers at the General Staff Academy in Moscow, as well as the Soviet people, are told that the West has two major strategies for "unleashing" global nuclear war. One would be a surprise, unlimited nuclear attack. The other would be escalation from conventional war to limited use of nuclear weapons, and then to all-out nuclear war.

Soviet Party-military spokesmen say there are a number of possible variants of the two basic Western military strategies, such as a surprise nuclear strike in the course of conventional military actions. Another variant would be a limited nuclear exchange between the United States and the Soviet Union, after which the United States would make a surprise mass nuclear strike.

According to Soviet writings, an attack by the West against the Soviet Union would involve primarily the United States triad—ICBMs, SLBMs, and strategic bombers. In a coordinated triad attack, the ICBMs would strike primarily Soviet military targets, to include Soviet ICBM sites, nuclear stockpiles, and airfields on which long-range bombers might be based. SLBMs would be directed at area targets. These initial missile strikes would weaken Soviet air defenses, thereby aiding the penetration of strategic bombers. B-52 aircraft would attack mobile and small strategic targets that have relatively weak air defenses. (The B-1, according to Soviet writers, was designed to penetrate air defense systems and make nuclear strikes on major targets in the enemy *tyl* [rear areas]. The B-1 also would have had a capability to go after mobile targets, even in well-defended areas, as well as new targets identified by reconnaissance.

William F. Scott, a West Point graduate and World War II bomber pilot, has served as an exchange officer with the State Department and twice as US air attaché in Moscow. Since his retirement from the Air Force in 1972, he has had frequent contacts with leading Soviet theoreticians. He holds a doctorate in Soviet studies and is a professorial lecturer at Georgetown University and a consultant on Soviet affairs. He and his wife, Harriet Fast Scott, are coauthors of The Armed Forces of the USSR, *to be published by Westview Press in April.*

Types of War

The Soviets believe that United States military planners have divided war into three types, "depending on the means used, the scale of waging, and the objectives of destruction." These are:

- Strategic (general) war with the unlimited use of the whole arsenal of nuclear systems;
- War in theaters of military operations, primarily in Europe, in which the opposed sides use chiefly tactical nuclear weapons;
- "Limited" strategic war, in the course of which nuclear strikes would be carried out only on military objectives.

Soviet spokesmen equate limited strategic war to the statement about the possible use of selected nuclear options made by former US Secretary of Defense James Schlesinger in January 1974. Soviet spokesmen have written that such options simply represented a return to the concept of counterforce, which US strategists had abandoned in the early 1960s, when they realized it no longer would work. General V. V. Larionov, a faculty member of the General Staff Academy, saw the "Schlesinger options" as a definite revision of the Pentagon's strategy of "target selection," which would increase the possibility of nuclear weapons being introduced into any NATO-Warsaw Pact conflict.

Marshal A. A. Grechko, then Soviet Minister of Defense, repeated Larionov's view of the Schlesinger options. In his opinion:

> Another strategic concept, the "selected target" strategy, recently emerged in the USA. In essence, it boils down to the following: to use strategic nuclear weapons chiefly against our strategic missiles, nuclear weapon dumps, airfields, troop concentrations and other important military objectives so as to frustrate the Soviet Union's retaliatory attack as well as using them against Soviet cities.

On rare occasions Soviet writers have stated that the United States also considers the possibility of nonnuclear war. There is no discussion, however, of whether this might be one phase of a general nuclear war, or if a nonnuclear war between nuclear powers might be waged on a major scale.

US Aerospace Power in Combined Arms Warfare

Soviet analysts have made extensive studies of the role of the USAF in Southeast Asia. They accurately portrayed the tactical employment of "smart" bombs and the capabilities and design features of aircraft and equipment. USAF units in Europe, according to Soviet writers, would play a critical role regardless of whether the conflict were nuclear or conventional.

Tactical aircraft, in the Soviet view, would be one of NATO's basic methods of delivering nuclear weapons. The F-111, with its low-altitude all-weather capability, is a major Soviet concern. In the event of war, should it begin with the use of nuclear weapons, Soviets write that NATO aircraft first would be used in an attempt to gain "theater nuclear superiority." This would involve NATO aircraft, not only making nuclear strikes against the Warsaw Pact's nuclear capabilities but also against advancing forces. The Soviets believe that NATO aircraft would use both chemical bombs and spray from special devices on board the aircraft. At the same time, NATO fighters would be trying to establish air superiority.

In their analysis of United States fighter aircraft, Soviet spokesmen note that most aerial battles in Korea, Vietnam, and the Near East took place at altitudes of from 5,000 to 9,000 meters and at speeds from Mach 0.4 to 1.4. This required aircraft with extreme maneuverability and the F-5, Soviet readers are told, was designed as a result of Korean War experience. At present the Soviets see the F-16 as being specifically designed for an air-superiority role, with good maneuverability at altitudes of three to twelve kilometers and at speeds of Mach 0.8 to 1.6. Soviet observers note that cannons on United States fighters, discarded in the early 1960s, have now been restored. At the same time they warn Soviet pilots that US air-to-air missiles constantly are being improved.

Judging by their writings, Soviet airmen were impressed by the capabilities of the B-52 both in South and North Vietnam. They believe that this aircraft, or others of its type, would play a significant role in the nonnuclear phase of any future war.

Favorable evaluations of USAF aircraft by Soviet writers have sometimes been an indication that similar Soviet aircraft were in development or production. In the mid-1960s, Chief Marshal of Aviation K. Vershinin, Commander in Chief of the Soviet Air Forces, wrote an article describing the capabilities of the C-141. Not surprisingly, the Soviet Il-76 transport, first flown in the early 1970s, closely resembles the USAF transport that had captured Vershinin's attention. In late 1974, two *Red Star* articles described the C-5 and the USAF's methods of global airlift. These articles anticipated the Soviet wide-body aircraft, the Il-86, which first flew in late 1977 and is given specific mention in the current five-year economic plan.

The Military Use of Space

Throughout the 1960s, Soviet spokesmen asserted that the United States considered space the most suitable medium for global military operations. This notion was presented openly in such publications as Marshal Sokolovskiy's *Military Strategy*, and the restricted Soviet journal, *Military Thought*. In that journal Soviet officers read that although Washington signed a treaty with the Soviet Union prohibiting nuclear weapons in space, the Pentagon intended to violate the treaty at any time on the pretext of "alleged violations" by the Soviet Union. A few months after the treaty was signed, it became evident that the United States was continuing to strive for the creation of armed forces in space, Soviet writers said.

A year later, this same restricted journal reported that United States military planners intended to develop bases on the moon and to initiate a reconnaissance satellite race. USAF leaders were perceived as seeking to move into space because they believed it represented an area where highly effective strategic operations could be conducted. (Soviet military readers then were told that

the Soviet Union was being forced to develop satellites to detect enemy satellites and homing devices to destroy them.)

In the late 1970s, A. Ye. Yefremov, a leading Soviet defense intellectual, wrote that US reconnaissance satellites were capable of radio intercept and of photography that could identify objects on the ground of less than thirty centimeters in diameter. Such satellites, he asserted, were so effective in following the Chinese nuclear program that the Pentagon could determine when China planned its nuclear tests.

While Yefremov may have been reflecting Soviet assessments of US satellite capabilities, he obviously was writing for policy purposes as well. US satellites were so effective, he wrote, that there was no need for on-site verification of a SALT agreement.

In the fall of 1978, the United States press reported that the Soviets had conducted a series of tests of their antisatellite system. No mention of this ever was made in the Soviet press. However, when the tests were over, the Soviet leaders deliberately attempted to create a false impression in the mind of the Soviet public. Tass, the Soviet news agency, announced that the *United States* had conducted antisatellite tests, and it therefore might be necessary for the Soviet Union to develop a similar capability.

"Many ['rules of the game'] are based on our belief in what is logical and rational. Soviet beliefs may be entirely different."

'Rules of the Game'

United States strategic concepts are expressed in terms such as "counterforce," "damage limitation," "escalation," "limited nuclear options," "strategic sufficiency," "realistic deterrence," and the like. Soviet defense intellectuals and military spokesmen understand these concepts very well and analyze them in detail. However, they seldom use them when writing about US military doctrine and strategy. Rather, they consider these terms and the concepts they represent as attempts by Western strategists to establish "rules of warfare" that favor the West. These concepts are perceived as means used by the "imperialists" to hide their true purpose: preparing for a surprise nuclear attack on the Soviet Union.

The United States strategy of counterforce, according to I. Sheydina at the Institute of the USA and Canada, is an attempt to introduce "rules of the game" in order to create an illusion that the American militarists are humane. G. Trofimenko of that Institute wrote that "if war is unleashed by the United States, it will not be fought according to rules of the game outlined by United States strategists, but by Soviet military strategy." According to Dr. Georgiy Arbatov, the Institute's director:

> The idea of introducing "rules of the game" and of artificial limitations "by agreement" is based on an illusion without foundation. It is hard to imagine that nuclear war, if launched, could be held within the framework of the "rules" and not grow into general war.

The *Soviet Military Encyclopedia* commented on United States attempts to establish "rules" of warfare in

an entry under "controlled war":

> . . . Bourgeois military theoreticians are trying to develop some sort of "rules" of waging nuclear war without "total" destruction of the population and objectives in the territory of the belligerent sides and are trying to show the possibility of achieving victory over the enemy with the aid of limited use of means of mass destruction. The concept of "controlled" war, which is counted on to lull the masses, is just as fallacious as the American concept of "limited war," "guided war," and the like.

Writing With a Purpose

The Soviet press has never published a photograph of the Tu-26 Backfire bomber or of the Su-19 Fencer ground-support aircraft. The Soviet leadership has not permitted the release of data about the total size of its armed forces or its current weapon systems. It has divulged very little about its organization. Soviet secrecy about its military forces is so tight that the Kremlin's senior civilian negotiators at SALT and at other arms-control gatherings are not given data about their own military forces.

This secrecy has a significant impact upon Soviet perceptions of United States forces. Books and journals generally can be found in civilian bookstores in the Soviet Union, or even in bookstalls in larger airports and railroad stations, describing the weapon systems, organization, manning, and training of the US armed forces. A monthly Soviet journal, *The Foreign Military Observer,* prints excellent aerial photographs of US military facilities and discusses in detail, with illustrations, such planned US weapon systems as the MX missile. This journal even lists each month the reassignments of senior Western officers. The Soviet Air Forces Museum in Moscow presents the latest advances in missiles, ABM systems, and space vehicles by means of huge posters made from illustrations of US systems found in Western publications.

This mass of information about Western military forces, and of US forces in particular, creates the impression that the Soviet Union is under siege. Knowing nothing, or very little, about the size, weapon systems, and status of their own armed forces, the Soviet populace tends to accept what is said about the "aggressive aims of the imperialists." Soviet citizens often tell foreign visitors that the Soviet Union wants only peace. Why, they ask, does the United States want to deploy new weapons? Conversely, they are unable to understand why the United States should be worried over new Soviet weapons, about which they have not been told.

Actual data about United States military tactics, organization, command structure, and weapon systems presented in the Soviet press generally are factually correct. For example, the range, speed, and altitude of the F-15 or technical details of Minutemen III are seldom distorted. Soviet leaders want to make certain their military personnel understand the weapons and tactics of their ideological enemies.

One purpose of reporting in detail about foreign weapons is, of course, to familiarize Soviet military personnel with contemporary military equipment, while maintaining security about Soviet weaponry. It may also be that Soviet theorists present Western concepts of limited nuclear war, to include employment of weapons and tactics, in order to instruct Soviet personnel in this type of warfare while at the same time denying that their own leaders would consider waging such a war.

Any US military advance in armaments is presented in the Soviet press as another spiral in the arms race and contrary to the spirit of "détente." Major campaigns have been launched by the Kremlin against enhanced radiation weapons (the "neutron bomb"), the cruise missile, and the B-1. Soviet readers are told that the protests of the Soviet people were largely responsible for not deploying the neutron bomb.

The Significance of Soviet Perceptions

Soviet perceptions about a United States surprise nuclear attack are serious. Their highly subjective interpretation of US concepts does much to help explain the purpose of the current family of Soviet ICBMs, which apparently are designed for a first strike against any opponent. In a period of tension the Soviet belief that the United States would launch a surprise first strike could be a major factor in the Kremlin's decision whether to preempt.

The Soviet interpretation of limited nuclear options, or of limited nuclear war, is not the same as that of United States strategists. Launching a limited strike, if Soviet perceptions are understood correctly, probably would result in a Soviet preemptive strike, seeking to "frustrate" or "forestall"—to use Soviet terminology—the launch of additional US weapons.

Soviet knowledge of the characteristics of deployed US weapon systems is fairly accurate. Concern with NATO's air capability is reflected in the constant attention the Soviets give to air defense, both by manned aircraft and surface-to-air missiles.

Descriptions by Soviet writers of the United States space effort may be a reflection of what the Soviets themselves would like to accomplish in space. Whenever the United States is accused of planning a new military space system or mission, such as using Skylab for military purposes, the Soviet program should be carefully reexamined. Their accusations may be a cover for their own plans.

Soviet views of "rules of the game" warrant analysis in the West. Many of these rules are based on our belief in what is logical and rational. Soviet beliefs may be entirely different.

It is important for Western leaders to try to understand Soviet perceptions of Western forces, how the perceptions are expressed, and their possible significance. For Soviet perceptions of United States military doctrine, strategy, and forces determine where and how the Kremlin may attempt to extend its military power, and whether it would negotiate or launch a preemptive strike in a period of crisis. ■

SOVIET AEROSPACE ALMANAC

"The diversity of the threat posed by [Soviet Frontal Aviation] makes continued US and NATO reliance on the comfortable bromide of 'technical superiority' (while conceding numerical superiority to the FA) a less sustainable posture now than it has ever been in the recent past."

Trends in Soviet Frontal Aviation

BY WILLIAM SCHNEIDER, JR.

THE CENTRAL problem of theater warfare from the Soviet perspective is how it shall coordinate its "combined arms" (*organizatsiya nepreryvnogo vzaimodeistviya*), namely its tank/antitank units, mechanized infantry, artillery, and tactical air assets—both fixed wing and helicopters. One cannot fully appreciate the significance of the changes in Soviet tactical aviation ("Frontal Aviation"—*Frontovaya aviatsiya*) in recent years without considering the evolution of Soviet doctrine on combined arms operations and the extensive interaction between its several elements.

This evolution has been particularly rapid since the late 1960s owing to the fortuitous coincidence of technical innovation, a large increase in resources made available to Soviet theater forces in general, and a resolute effort by the Soviet high command to address some of the most conspicuous vulnerabilities of its combined arms forces. This article summarizes some of the most significant developments in Soviet concepts of theater warfare as they pertain to tactical airpower and evaluates the impact of these developments on the future of Soviet tactical aviation.

Soviet Combined Arms Operations

The Soviet concept of combined arms operations has many similarities to its Western counterparts, but with the addition of unique elements reflecting Soviet experience, particularly in World War II, and of their analysis of modern war's requirements. Soviet combined arms forces are the primary instrument of offensive operations on the Eurasian land mass, and include nuclear, chemical, conventional, and irregular forces primarily oriented toward dominating the Eurasian land mass. The core of Soviet diplomatic and military interest for more than three decades has been the European Central Front where Soviet forces are charged with maintaining the capability to thrust military power some 600 kilometers into NATO territory in a period of ten to fourteen days. Soviet operations are envisaged, in orthodox doctrine, as conducting breakthrough operations across eight to ten distinct sectors, establishing four axes of advance. These four principal axes are to devolve into a single major breakthrough sector and one secondary sector.

The Soviet "style" of operations calls for investing considerable resources in the conflict. Superiority ratios ("armament norms," in Soviet parlance) of 5:1 in tanks and 8:1 in artillery in the breakthrough sector are needed to fulfill the Soviet fire plan. Engagement of half the troops assigned to a Front, two-thirds of its artillery, virtually all of its field air defense, and the bulk of its forward logistics capability would be required.

Soviet combined arms doctrine emphasizes surprise achieved through deception. Great stress is placed on traditional passive measures of concealment and deception, but more recently electronic warfare ("radio electronic combat") has emerged as a separate element of combined arms operations. Electronic warfare (EW) is now treated as a weapon. In addition to 380 KGB teams organized for operations against NATO command control and communications (C^3) facilities, a formidable array of EW capability has been deployed with Soviet forces. (EW includes both electronic support measures [ESM] and electronic countermeasures [ECM]. The former provides signal intelligence for command echelons and direction-finding for EW jammers, while the latter falls under Army command.) EW units are organic to the Front, Army, and Division.

EW/ESM operations are integrated with artillery operations to provide target-acquisition support. A Soviet direction-finding (DF) platoon has no fewer than three stations; a signal intelligence unit has five or more very high frequency (VHF) stations. All Soviet divisional reconnaissance battalions have both DF and signal intelligence capabilities. The tendency of the US (and NATO) to depend heavily on sophisticated and centralized command and control arrangements in ground and tactical air operations may be subject to substantial operational degradation if vulnerability to Soviet EW/ESM is not reduced.

The recent evolution of Soviet tactical airpower has been decisively influenced by the maturing capabilities of Soviet ground forces to meet their military doctrinal objectives. To be sure, Soviet forces have not fully reached the level in all categories of equipment required by the Soviet command to maintain the armament norms, as well as allowing for enormous anticipated attrition. For example, the 45,000 tanks in the Soviet inventory are 22,000 tanks short of their armament norms. Nevertheless, the armament norms, particularly in the

European theater, are more favorable to Soviet military operations than they have been at any time since 1945.

Land Warfare Doctrine

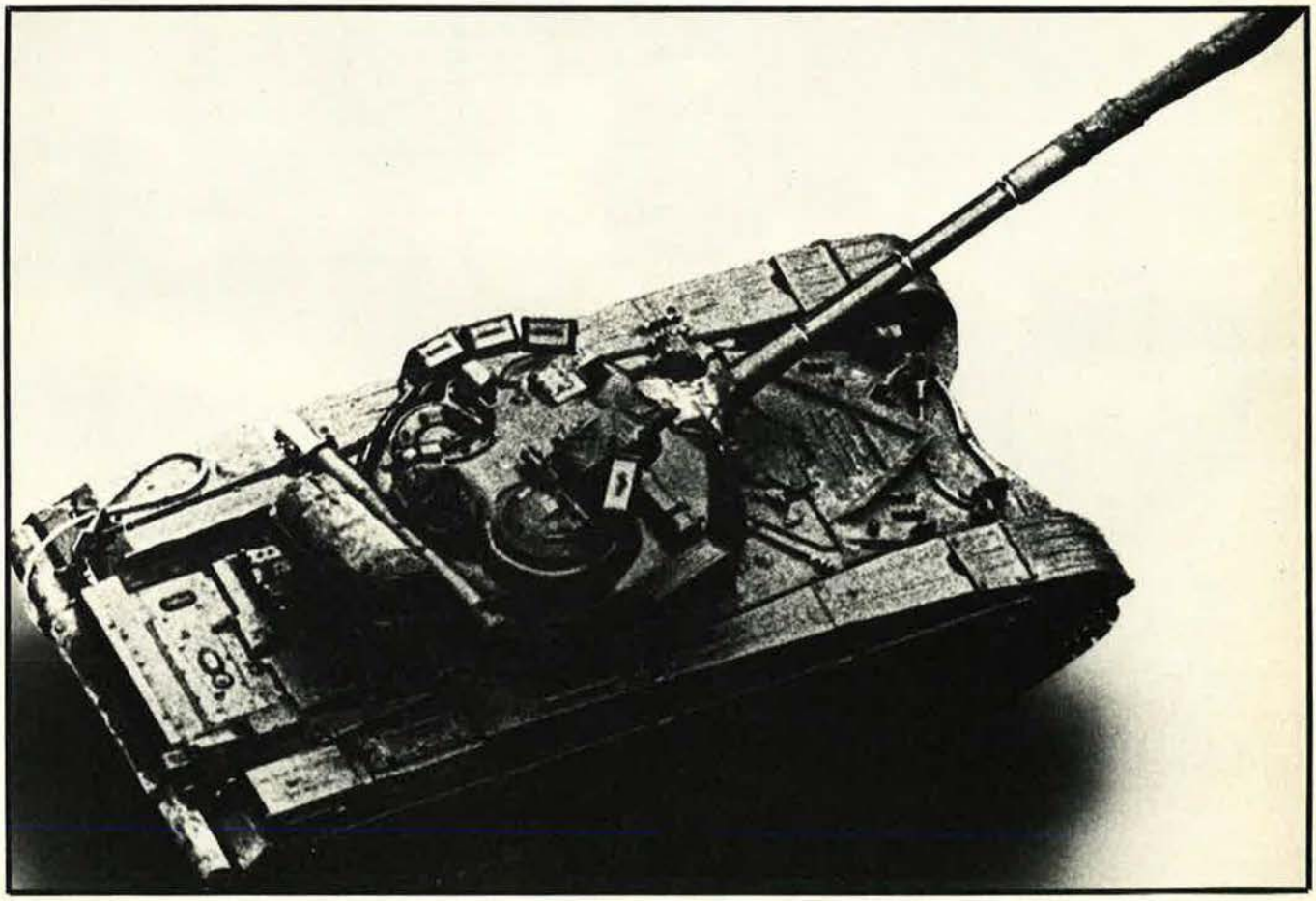
Soviet land warfare doctrine relies heavily on massive artillery terrain fire and saturation MRL rocket launches to suppress prepared defenses and to disrupt the deployment of reserves just behind the forward edge of the battle area (FEBA). Longer-range systems—in the past, missile artillery, and more recently deep-penetration tactical aircraft—engage important rear-area targets. Nuclear delivery systems as well as air bases and storage areas are the highest priority rear-area targets, even in a nonnuclear engagement, closely followed by command centers, antitank artillery, and missile systems.

To assure the prescribed daily rate of advance—twenty to forty kilometers per day in the breakthrough phase (increasing to fifty kilometers if nuclear weapons are employed), and fifty to eighty kilometers per day in the exploitation phase—massive quantities of artillery are called for. US and NATO command posts and direct fire systems are to receive 1,000 rounds per installation. Two hundred rounds are allocated for each mortar platoon, 1,000 rounds for surface-to-surface launchers, and 2,000 rounds for an artillery battery.

The nuclear fire plan includes the use of chemical munitions, particularly against air bases and storage areas. Soviet reserves are organized to follow in successive waves to exploit the breakthrough. The analogy of echeloned piledrivers applies aptly to Soviet combined arms doctrine, if not successfully opposed by US/NATO forces.

Consistent with the notion of a continuous high-speed offensive has been improvement in the off-road performance of Soviet armored fighting vehicles. This has provided an opportunity to accelerate the pace of the offensive, enhancing the benefits of surprise and deception. In particular, the introduction of the T-72 tank and the BMP armored personnel carrier *(Boevaya mashina pekhoty)* has induced a thorough and continuing review of Soviet combined arms operations. The debate may be somewhat crudely summarized in three important and interrelated components pertaining to the evolution of Soviet tactical airpower.

- **The Role of the BMP.** The BMP was designed for the nuclear battlefield to facilitate moving mechanized infantry through a radiologically contaminated area. The BMP is rather less well suited to breakthrough operations on a nonnuclear battlefield, however, due to its vulnerability to antitank weapons. An assault on prepared defenses will almost certainly require the infantry to dismount and attack on foot. Once dismounted, the infantry is vulnerable to artillery and machine-gun fire, and thus limited in its ability to protect the buttoned-up tanks from infiltrating infantry armed with antitank weapons. The Soviet resolution of this dilemma has resulted in significant organizational and tactical changes that (when linked with other elements of the debate discussed below) bear directly on Soviet tactical aviation.

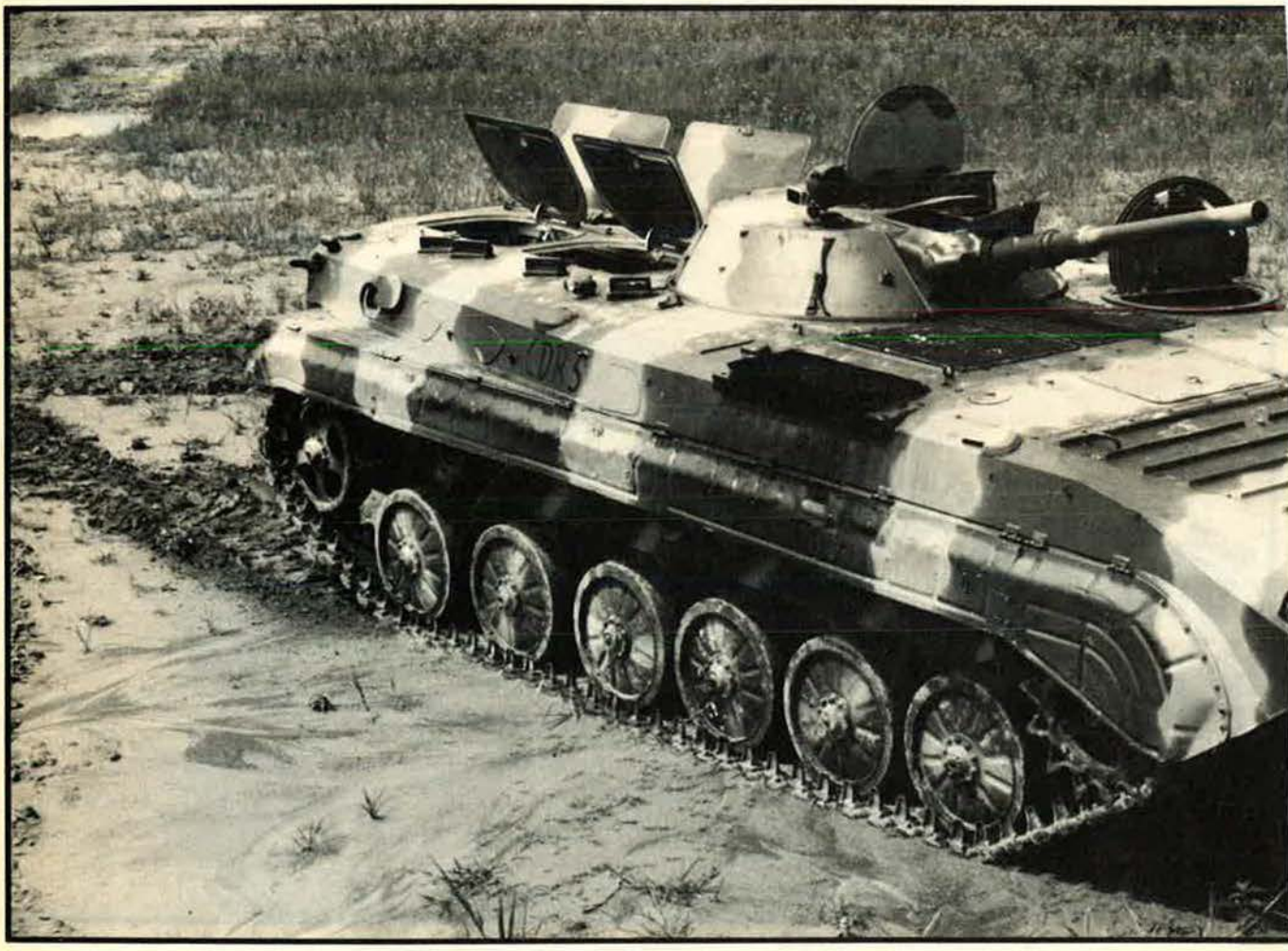


Frontal Aviation's role in combined arms operations has been influenced by improved Soviet tanks, such as this T-72.

• **The Role of Artillery.** The 1973 Arab-Israeli conflict showed conclusively how vulnerable unprotected artillery is to counterbattery fire and air attack. Less than fifteen to twenty percent of Soviet artillery is protected today, either by armor (in self-propelled configurations) or by digging in. Moreover, standard Soviet practice is to deploy towed artillery in a single line 200 meters long to minimize the ballistic adjustment associated with frequent maneuver, and the dispersal of batteries that lack computer fire-control equipment. Ensuring the survivability of Soviet artillery to permit continuous fire has created a dilemma for Soviet tacticians. The dilemma has been intensified by the evolution of Soviet armor tactics from concentration on breakthrough tactics to meeting engagements (discussed below), as a consequence of the BMP debate. To improve the survivability of artillery, as well as to ensure the success of Soviet forces deployed in the nonnuclear phase of a conflict, greater reliance must be placed on self-propelled artillery, an important fraction of which will operate in direct support of Soviet assault formations. Such reliance, however, inhibits Soviet artillery from providing the massive area fire on which the continuous offensive is predicated.

• **Reconnaissance and C³.** As tactical requirements focus on observed targets (rather than area fire for artillery and preplanned targets for tactical aircraft), higher-quality reconnaissance is essential. Soviet EW/ESM sensors may be better suited for target acquisition near the FEBA than for targets well to the rear. Thus, a new generation of reconnaissance systems will have to be developed. Improvements in survivability and mobility have developed a greater capability on the part of military units subordinate to the division—the regiment and the battalion in particular. This has been recognized in the Soviet Motorized Rifle Division (MRD) structure, in which an independent tank battalion adds to the division's flexibility. The highly centralized Soviet command structure will have to evolve new forms of command arrangements to assure that fire and maneuver for both air and ground elements of Soviet combined arms can be effectively coordinated. (There is an important distinction between the Soviet and World War II German "style" of mechanized warfare, often incorrectly considered identical to World War II blitzkrieg. In the latter case, initiative resided at low levels of command, particularly company and battalion commanders, while the Soviets depend on commanders at division level and above to exercise initiative.)

Soviet professional military literature has devoted considerable attention to these problems. Although it is premature to describe the Soviet response as definitive "solutions," a clear trend has been established. There has been a relative shift away from tank-dominated divisions, short on infantry, in favor of Motorized Rifle Divisions. To this end there has been a substantial increase in the artillery of the MRD. To support more extensive independent operations, tanks have been increased from 188 per MRD a decade ago to 269 today.



The current Table of Organization of an MRD includes 720 multiple rocket launcher tubes (up from 192), and each MRD now has one regiment of eighteen self-propelled 122-mm howitzers (replacing six D-30 towed howitzers), as well as eighteen D-30s in each of the two remaining MR regiments.

Soviet assault tactics have been accelerated to take advantage of the higher overland speed of the T-72/BMP. Ideally, the BMPs will follow fifty meters behind a row of tanks. Tanks will then close on the opponent's defensive positions, followed by dismounted infantry. Covering fire for the dismounted infantry will be provided by the BMPs, which will remain 200 meters behind the infantry and 400 meters behind the tanks.

To reduce vulnerability to counterbattery fire and air attack, Soviet artillery will move 200 to 300 meters after each five-minute bombardment. There are indications that towed artillery may be deployed in a 300-by-600-meter rectangular formation with deceptive installations to reduce vulnerability and permit maneuver. Further extensive emphasis on reconnaissance systems and automated C^3 arrangements has been implied in Soviet discussions, but with no clear resolution in sight.

Implications for Soviet Tactical Aviation

The evolution of Soviet land warfare has had a direct effect on Soviet tactical aviation; indeed, *Frontovaya aviatsiya* (FA) has undergone a more fundamental change over the past decade than has any other branch of the Soviet armed forces. The FA is deployed in one Air Army (*Vozdushnaya armiya*—VA) per Military District in the homeland and one per Group of Soviet Forces deployed in other Warsaw Pact countries. The VAs most relevant to a European/Middle East contingency are:

1st VA	Belorussian Military District (MD)
5th VA	Odessa MD
6th VA	Turkestan MD
13th VA	Leningrad MD
16th VA	Group of Soviet Forces in Germany
17th VA	Kiev MD
30th VA	Baltic MD
34th VA	Transcaucasus MD
37th VA	Northern Group of Soviet Forces (Poland)
? VA	Moscow MD
? VA	Central Group of Soviet Forces (Czechoslovakia)
? VA	Southern Group of Soviet Forces (Hungary)
57th VA	Carpathian MD

Normally about 300 aircraft are deployed in each VA, which consists of three to four aviation divisions. (The aviation division is the basic tactical unit.) The air logistic support unit or Aviation Technical Unit (*Aviatsionno-tekhnicheskaya chast'*) attached to each VA supports each of the three regiments (126 aircraft in each fighter/

The Soviet BMP armored personnel carrier (left) is considered, along with the German Marder, to be one of the two best in the world. Unlike earlier Soviet APCs, it is designed to accompany tanks all the way to an objective. Soviet Ground Forces have extensive organic air defenses, including the ZSU-23/4 (above), which free tactical fighters to concentrate on ground support targets.

ground-attack regiment), although it is not organic to the regiment. Each regiment is composed of several squadrons *(eskadril'ya)* of from ten to twenty-four aircraft (depending on type) organized in flights *(zveno)*.

A total of 5,000 FA aircraft is assigned to the VAs, with 3,000 additional aircraft in reserve. The largest VA, the 16th in East Germany, has 1,200 aircraft, and owing to its strategic location has first claim (after the PVO-Strany, the strategic air defense forces) on the most modern types of aircraft. In an operational sense, the strength of the FA is greater than it appears due to the ability of the FA commander to call on other elements of the Soviet Air Force with overlapping functions. For example, Tu-26 Backfires from Long-Range Aviation (*Dal'nyaya aviatsiya*—DA) units can augment the FA's MiG-27s (Flogger-D) and Su-19s (Fencer) in the ground-attack role, while MiG-21s and MiG-25s of the PVO-Strany can increase the air defense capability of the FA. Soviet naval aviation can supply reconnaissance aircraft.

Most significantly, the FA is undergoing a change in its doctrine of theater warfare as a consequence of the changes in Soviet ground forces. Actually, this is not so much a change as it is a reversion to the doctrine of the offensive use of airpower developed in the mid-1930s. The "corrective" measures taken by the Soviet command to reduce ground forces' vulnerabilities have enabled the FA to exploit the capabilities of its new high-performance aircraft. The most conspicuous contributors to these trends are the changing role of artillery in the Soviet ground forces, the growth in the organic air defense capability of the Soviet Army division, and the changing tactical employment of the ground forces from a preoccupation with highly concentrated breakthrough operations to the more flexible and numerous regimental-size meeting engagements on a broader front. This last-named has been made possible by better communications and improved off-road capability of the T-72 tank, and necessary because of the vulnerability of the BMPs. The vulnerability to air attack of Soviet ground forces in column has been diminished by an extraordinarily dense network of mobile and semimobile air defense, including both surface-to-air missiles and tube antiaircraft artillery.

The deemphasis on preplanned area fire missions for Soviet artillery in favor of time-sensitive targets has created a new role for Soviet tactical airpower. In taking over a substantial fraction of the deep interdiction and ground-support strikes formerly carried out by missile and tube artillery, a requirement for new and more capable ground-attack aircraft has been created. Similarly, Soviet ground force tactics have created a combined deep-penetration and antitank role for the helicopter—a partial replacement for artillery and other direct fire weapons. The attention being focused on the meeting engagement (and modifications in the Soviet division structure to support it) rather than the exclusive focus on breakthrough operations has made it necessary for the FA to procure heavy payload/long-range aircraft compatible with this role.

The primary objective of FA aircraft in Europe is to reduce the sortie rate of US/NATO aircraft. With the uninhibited use of nuclear weapons, this task could be carried out by Soviet IRBMs, particularly the highly capable SS-20 and the older generation SS-4s and SS-5s. However, now that Soviet doctrine envisions a (possibly) protracted nonnuclear phase to a future conflict, this role has been left to the FA. The means by which the FA is adjusting its posture to perform that role (a shift away from air defense to ground attack) is the source of the most dangerous increase in Soviet military power since the large-scale introduction of nuclear weapons in the late 1950s.

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Modernization of Soviet Frontal Aviation

Since 1970, the Soviet Union has produced more than 5,000 tactical aircraft—about four times the number produced by the United States—and maintains an annual military aircraft production rate of approximately 1,800. What is important is not merely the quantity of aircraft deployed (although this fact can scarcely be ignored), but the characteristics of the modernization program and its "fit" with the evolution of Soviet theater warfare doctrine. FA has gained a substantial share of new aircraft production; its inventory holdings have increased by one-third since 1970 despite the fact that the aircraft are both more sophisticated and more expensive.

The following major aircraft types have been deployed with the FA since 1970.

MiG-23S (Flogger-B). This interceptor version of the versatile Flogger series is likely to replace the older MiG-21s that are not replaced by the much-improved MiG-21SMT (Fishbed-K). It will supplement the ground-based air defense organic to the Soviet division. Command and control arrangements for this (and other Soviet air defense aircraft) continue to be a major problem that has been addressed by the simple expedient of procedural separation from other FA aircraft. FA interceptors are kept under continuous ground-based radar control, and are required to operate at altitudes above 10,000 feet to avoid being hit by ground-based SAMs.

Soviet doctrine requires local air superiority for the tactical employment of helicopters, a requirement that will be met by the Flogger-B. Under extreme conditions, FA air defense requirements could be augmented by the PVO-Strany's Su-15 (Flagon), particularly the E and F models, which are likely to be equipped with the MiG-25's advanced radar and medium-range AA-7 Apex or short-range (dogfighting) AA-8 Aphid air-to-air missiles.

MiG-27 (Flogger-D). The Flogger-D has provided a major increase in the combat capability of the FA. Its range and payload characteristics far exceed previous Soviet tactical aircraft, and its low-pressure tires (88 psi) allow it to operate from unsurfaced runways. With a maximum takeoff weight of 44,300 pounds (and a normal takeoff weight of 39,500 pounds without wing tanks), it has a combat radius of 500 nm (with a 6,600-pound weapon load and a six-barrel 30-mm gun) at a maximum

peed of Mach 1.4 (compared to Mach 2+ for the MiG-3S). The MiG-27 employs a Tumansky R-29B turbofan ngine capable of generating 25,350 pounds of thrust with fterburner or 17,500 in its normal operating mode. It can eliver nuclear weapons, and is an effective low-altitude enetrating strike aircraft.

The MiG-27 is equipped with the "High Lark" J-band ulse-Doppler radar, the SIRENA 3 360° warning radar, nd internal I-band jammers for both forward and aft emisphere coverage. The new AS-X-9 antiradar missile ill probably be employed to suppress radar-dependent ir defense, while the AS-7 (Kerry) air-to-surface missile ill be used for standoff ground attack. Soviet tactics, hich emphasize lo-lo-lo flight profiles, minimize ECM equirements by only requiring jammer capacity to pre-ent radar lock-on while within the range of radar-con-rolled guns and SAMs. The MiG-27 is also equipped ith a laser designator for its airfield attack munitions, hich are laser guided.

Su-17/20 (Fitter). The Fitter will replace the Su-7 in the lose air support role pending the introduction of a dedi-ated close air support aircraft now in development nder the design bureau designation T-58. The Su-17/20 s a modified version of the Su-7 with substantially im-roved takeoff and landing performance, using the same ngine as the MiG-23S. Its maximum weapon load is ,000 pounds.

Su-19 (Fencer). The Fencer is a variable-geometry air-raft with impressive performance, even though its abil-y to strike the western periphery of NATO territory rom bases in East Germany has been exaggerated. Its ortie time is too limited and the Tu-26 Backfire will be nore effective. About 250 to 300 of the aircraft have al-eady been deployed with two regiments at Königsberg nd one regiment in the Carpathian MD in the western JSSR, adjacent to Poland and Czechoslovakia. It has errain-avoidance radar, a two-man crew, and a combat adius of 500 nm.

MiG-25 (Foxbat). The Foxbat is a high-performance in-rceptor/reconnaissance aircraft that has been deployed several variants. Two reconnaissance versions of the oxbat, the A and B models, have been deployed for veral years. The A model is deployed with four AA-6 r-to-air missiles. A more recent version, the MiG-25RE oxbat-D) uses a side-looking radar. The newest ver-on of the Foxbat, the MiG-25M (Foxbat-E) reportedly tercepted a low-altitude cruise missile. Although the craft has been somewhat denigrated in the West due to "primitive" avionics (vacuum tube technology), it rforms well in the limited roles assigned to each vari-t. From an aerodynamic and propulsion perspective, s an impressive aircraft. Its twin two-stage Tumansky)-31 turbines with a five-stage transonic compressor is mean achievement. Moreover, its on-board com-ter, tied to ground-based radar control via a digital a link, assures its efficient vectoring over most of stern Europe.

MiG-21SMT (Fishbed). The venerable MiG-21, de-yed for more than two decades, has been modified to ance its performance. It will probably serve in the air ense role for the FA for several years.

Mi-24 (Hind). This gunship/transport helicopter has n deployed in considerable numbers. The increasing of helicopters in the FA for both the close air support and antitank role will assure a major role for helicopters for the next several years. At present, the Hind-D uses an infrared sensor for detecting tanks and other vehicles, but that will be replaced by a fire-and-forget weapon, probably employing a TV seeker with a five-mile range. In addition, it is armed with a four-barreled 23-mm gun, a Swatter antitank missile, rocket pods, and bombs. Hind regiments with approximately 150 helicopters have been deployed at Parchim and Stendal in East Germany. They currently have a capability to lift fifteen to twenty battalions. In addition, four battalions of Special Forces/commandos are supported by current Hind deployments.

The modernization of the FA is extensive, embodying new roles as well as new equipment. Other important changes too detailed to discuss in this survey such as pilot servicing of aircraft, gravity refueling systems, built-in engine-starting equipment, and other improvements have been made. The diversity of the threat posed by the FA makes continued US and NATO reliance on the comfortable bromide of "technical superiority" (while conceding numerical superiority to the FA) a less sustainable posture now than it has ever been in the recent past. ■

Most of the Soviet's military helicopters are assigned to Frontal Aviation. FA has several hundred Mi-24 Hinds, many of them D model gunships similar to the ones shown here.

SOVIET AEROSPACE ALMANAC

Again, during the past year, the USSR led the US by a wide margin in space launches and orbited payloads, and by a still wider margin in sensitive military launches. The cumulative Soviet base for increasingly sophisticated space applications was expanded further by . . .

Soviet Space Activities in 1978

BY CHARLES S. SHELDON II

THE YEAR 1978 was one of high-level activity for the Soviet Union. Eighty-eight launches orbited 138 payloads, compared with thirty-two and forty-one respectively for the United States. Another comparison between the two countries would show that civilian and nonsensitive military launches in the Soviet Union for the year totaled twenty-four, compared with twenty-five in the United States. Sensitive military launches in the USSR were sixty-four, compared with seven in the United States.

All such comparisons suffer from not making allowance for the effectiveness of individual flights. Even with due credit for higher productivity of some US flights, the overall comparison is not a comfortable one.

The last US manned flights were those to Skylab in 1973 and the Apollo-Soyuz mission of 1975. The Soviet manned effort has moved ahead, and in 1978 the Salyut-6 station demonstrated a wide range of capabilities. Ten successful rendezvous missions to the station were completed, including overlapping visits by different crews and unmanned resupply flights with consumables and new instruments for additional experiments. The Soviet total man-hours in orbit rose to 27,282:51, 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 624, including sixty-one in 1978. Tyuratam, the site in Kazakhstan, now has a cumulative total of 472, with twenty-six in 1978. These numbers contrast with Vandenberg at 416 and fourteen respectively, and Canaveral at 295 and eighteen. The third Soviet site, Kapustin Yar, on the lower Volga, has had sixty-seven, but only one in 1978.

During 1978, delivery was completed of the four new tracking ships named for dead cosmonauts—the *Volkov*, *Belyayev*, *Dobrovolskiy*, and *Patseyev*—joining the already well-known *Korolev*, *Komarov*, and *Gagarin*.

The standard "A" Soviet launch vehicle, able to orbit as much as 7,500 kilograms, has been used successfully 707 times, including fifty-nine in 1978. The "C" class launch vehicle has now been used 192 times, including twenty-one in 1978. At most it 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 has been used 144 times, but for the first time since its introduction in 1962 carried no 1978 launches. The "F" class vehicle, able to lift about 4,500 kilograms, has flown sixty-five times, including three flights in 1978. The large "D" class launcher, able to lift 20,000 kilograms, has flown fifty-five times, including five in 1978.

These numbers compare with the US leading launch vehicles: Thor at 348 and eleven in 1978; Atlas at 166 and fourteen in 1978; Titan at 117 and six in 1978; and Scout at sixty-eight, including one in 1978.

These counts assume that a new vehicle that first flew from Plesetsk in 1977 probably is a variant of the "F" class vehicle, based on orbital characteristics and continuing analytical work by private space watchers. If they are wrong, the total "F" count would have to be reduced by five, including two in 1978, instead creating an "unknown" category of these magnitudes.

Little new material has come to light during the last year with regard to ground-support facilities. Recent newspaper accounts suggest there may be as many as five major design teams for missile and launch vehicle construction.

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 sufficient time to test all the hypotheses and to be absolutely certain, so that tables have to be revised slightly from time to time as better answers become available.

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Military Observation

These thirty-five flights still make up the largest single part 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 only once during 1978. This extended stay flight may relate to the earlier types as the manned Soyuz does to the earlier Vostok or Voskhod ships. Again in 1978, two of the flights were labeled as earth resources missions, but to Western observers were indistinguishable from other military photographic missions.

Store-Dump Communications

During 1978, there was a sharp increase in the launches of such flights. Four launches of eight satellites each plus three other single launches were made, for a total of thirty-five 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 four Molniya-1 payloads, probably for military use, and two Molniya-3 payloads, which support general domestic communications plus 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. Also during 1978, Raduga-4 was placed in a geostationary orbit over the equator. A brand-new satellite appeared late in the year, named Gorizont-1, in a twenty-four-hour orbit inclined at eleven degrees to the equator and in an eccentric orbit so that it would have a maximum linger time in range of most of the USSR while flying a figure-eight ground trace. For a country as far north as the Soviet Union, such an orbit has advantages over a purely geostationary orbit, but will require a pair of satellites at about the same longitude to give round-the-clock coverage. The Soviet Union also launched Radio-1 and -2, equivalent to the radio amateur experiments of the Oscar series familiar in the United States.

Soviet manned operations continued in 1978, three years after the last US manned flight. Above, Soyuz launch pad.

Navigation and Geodesy

Nine flights in 1978 probably belong in this category, including one almost certainly with a geodetic mission and another that may have been a failure to circularize orbit. Although it has long been known which Soviet flights were navigation satellites from their placement and their use of the same 150- and 400-megacycle stable signals as broadcast by US Navy Transit flights, in 1978 one of these was specifically identified as such by the Russians: Kosmos-1,000. Geoffrey Perry and Christopher Wood in England have identified three different navigation satellite networks operated by the USSR and have been able to read virtually all the coded signals that come from them, including accurate time signals and orbital data that indicate their exact place in the sky.

Earth Orbital Science

Soviet activities in this regard during 1978 were not especially marked. Interkosmos-18 carried the usual array of experiments from Soviet bloc countries. Prognoz-7 made another in this eccentric orbit series, which ranges out halfway to the orbit of the moon. It included French and Swedish experiments along with the Russian. Kosmos-1,065, the only Kapustin Yar launch, using the "C" vehicle, was an unidentified flight, probably scientific, based on comparisons with the past. There were three unidentified piggybacks that could be scientific payloads, usually not revealed until years later in published scientific articles. Finally, the first Czech satellite, Magion, was carried as a piggyback on Interkosmos-18. It measured magnetic fields and ion concentrations, hence its name.

Earth Orbital Man-Related Flights

During 1978 came another mysterious pair, Kosmos-997 and -998, recovered at the end of a single orbit after launch on the big "D" class vehicle, like the Kosmos-881/882 pair of 1976. These suggest reentry tests, and one is tempted to link them to a developing Soviet shuttle, but the evidence is tenuous. Kosmos-1,001 during the year also tantalized with the idea that, since 1974, one or two flights a year constitute tests of a successor to the present Soyuz, perhaps a three-passenger version for suited crew. But if so, why has the test program moved so slowly?

The publicized development of 1978 has been the flights of Progress-1 through -4 to carry on an unmanned, automated basis supplies to the Salyut-6 station. These ships weigh 7,020 kilograms each. They are much like Soyuz ferry craft. The equivalent of the Soyuz Orbital Work Compartment can carry about 1,300 kilograms of packaged supplies, which cosmonauts then carry from the after docked position into the main station. The Soyuz reentry Command Module is replaced by a non-recoverable compartment that carries about 1,000 kilograms of fuel and oxidizer in spherical tanks, for transfer under nitrogen pressure into the Salyut. Progress-2 and -4 were similar to Progress-1, but Progress-3 carried more packaged goods in place of propellant supplies.

Electronic Ferret

There were six payloads put up in regular orbital patterns by either the "A" or the "C" vehicles. Again, these were replacements of earlier flights that previous analysis had established as more likely ferrets than anything else.

Manned Flights

The year 1978 probably can be credited as the most successful for manned operations of any in the Soviet program. In general, Soviet manned stations seem to alternate between predominantly military mission versions and predominantly civilian types. Salyut-6, one of the latter, sent to orbit on September 29, 1977, received Soyuz-26 on December 10, docking at the after end of the station. The crew set a new world endurance record by staying ninety-six days in orbit. Romanenko and Grechko were joined on January 10, 1978, by Dzhanibekov and Makarov in Soyuz-27, who went home six days after launch in Soyuz-26, leaving their own ferry for the long duration crew docked at the forward end. This freed the after docking port for Progress-1 in a re supply mission launched January 20. Later, the long-duration crew was visited by Soyuz-28 on March 2 for an eight-day flight. Gubarev on this flight was accompanied by Remek, the first Czech cosmonaut. The original crew returned to earth on March 16.

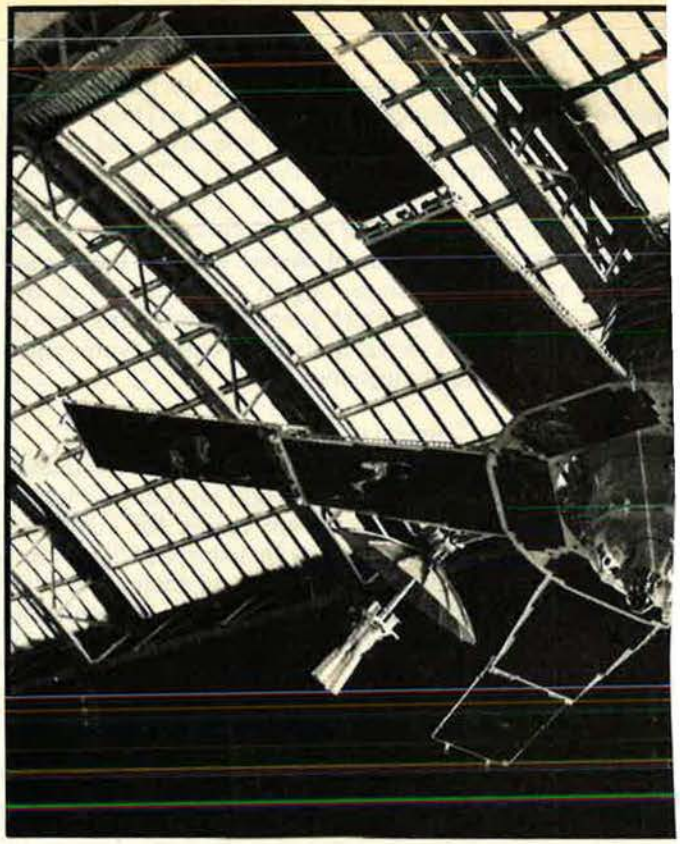
On June 15, 1978, Soyuz-29 went into orbit with Kovalenok and Ivanchenkov to set a new record of 140 days. An eight-day flight of Soyuz-30 brought them visitors, Klimuk and the first Polish cosmonaut, Hermaszewski, launched June 27. Progress-2 was launched July 7 on a successful resupply mission. Progress-3 also made a successful resupply mission starting August 7. On August 26, Soyuz-31 carried Bykovskiy, and the first German Democratic Republic cosmonaut, Jähn, on an eight-day flight. This latter crew traded ferry craft with the long-duration crew. On October 3, Progress-4 was launched in another successful resupply mission. Finally, the original crew came home on November 2.

If one keeps straight the many visits to the Salyut station, and the use of the two docking ports, it will be understandable that before Progress-4 could conduct the last refueling mission of 1978, Soyuz-31 was boarded by the long-duration crew, who undocked, rotated the respective ships, and redocked at the forward end of the station, where Soyuz-29 had previously been before it ferried the original Soyuz-31 crew home.

Special efforts were carried out by Soviet doctors to ensure that the long-duration crews would be able to readjust to the stress of reentry and return to normal gravity. Special exercises and negative pressure suits for the legs were among the regular devices used. Even the 140-day crew was back close to normal ten days after landing on earth.

A major focus of the flight effort was on earth resources work. The MKF-6M multispectral German Democratic Republic camera with a resolution of ten meters at the altitude flown provided extensive coverage. Each picture frame covered a 220-by-165-kilometer area, and each film cassette was able to cover ten million square kilometers.

Also on board the station was an astronomical telescope with a 1.5-meter mirror. Cryogenic cooling for low noise made it possible to take very useful infrared pictures of a number of astronomical targets.



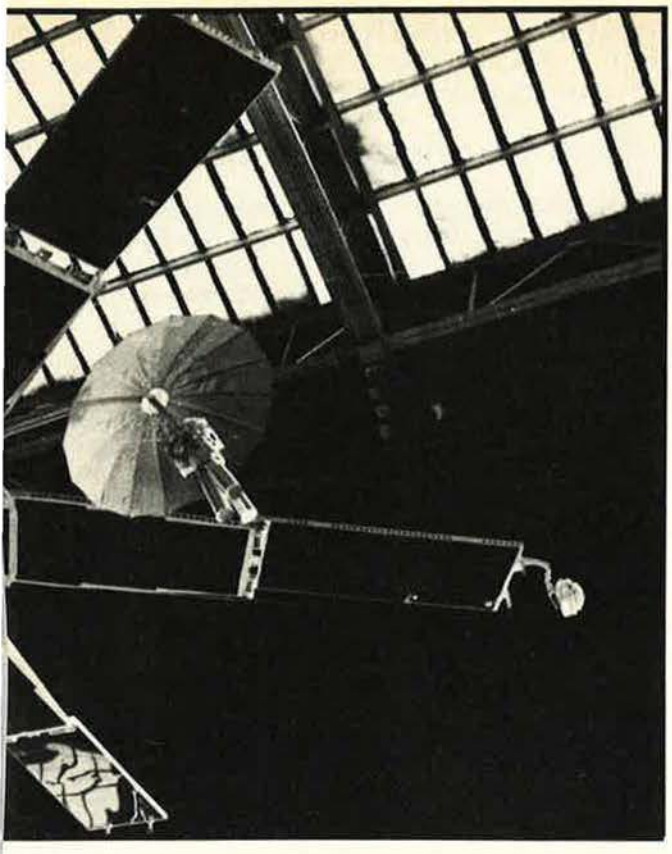
A fourth area of major effort related to various forms of space processing and manufacturing. These included melts in small furnaces to form new alloys, and the growth of very pure crystals.

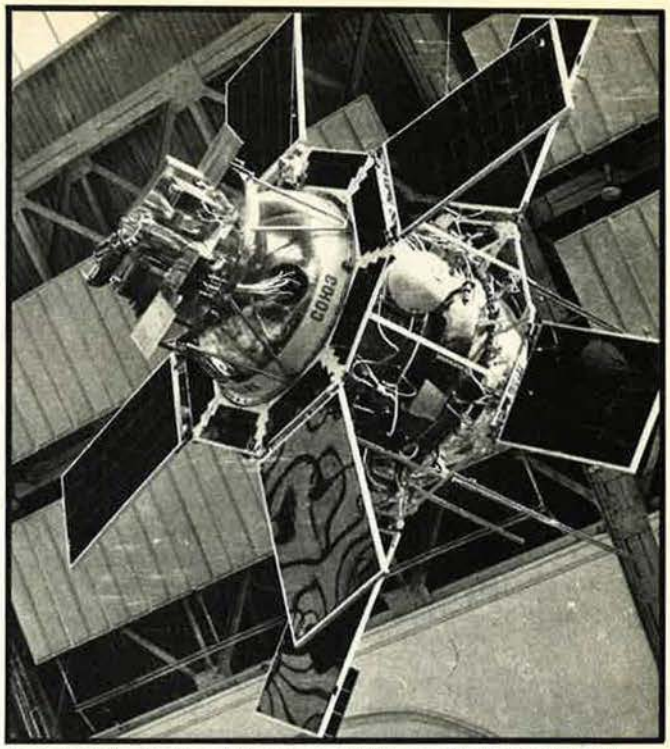
Finally, there also were additional biological experiments on board, similar to those on previous flights.

Both long-duration crews also conducted extravehicular activities (EVA) to check exterior equipment on the station and to place and retrieve experiments. They wore new suits in which it was easier to work than had been true of earlier Soviet models. Every Salyut station has had refinements in its amenities to improve habitability. Another change in the Salyut-6 was the standardization of propellants for both the main propulsion of the station and the small thrusters used for stabilization. These hypergolic propellants replaced the hydrogen peroxide of earlier thrusters. Reuse of waste water was carried further in the improved equipment of Salyut-6 compared with earlier stations.

Deep Space Probes

The United States during the year launched its Venus Pioneer orbiter and probes (549 and 904 kilograms respectively). The Soviet Union waited until well past the minimum energy launch window and in September sent Venera-11 and -12 on their way, each with a probable weight of about 3,940 kilograms. The tradeoffs related to arrival speed at Venus for the size landers planned. Unlike the last Soviet missions to Venus, the buses, instead of being put into orbit, were allowed to fly by at a distance of about 35,000 kilometers, but they still acted as relay points for the landers, which went to the surface on





Early Molniya (left) and Kosmos satellites on display in Moscow. With its present advanced space vehicles, the Soviets are moving toward large space stations, "while others perform paper feasibility studies."

the side away from earth. Surface times of active reporting were extended to 110 minutes for Venera-12 on December 21, and ninety-five minutes for Venera-11 on December 25. Unlike the 1975 flights, which brought back panoramic views of the surface around the landers, this time there were no pictures; whether by choice or by failure is unknown. Emphasis focused on soil analysis, although other data during a part of the atmospheric passage were similar to those obtained a few days earlier by the US probes.

Early Warning

There were two Kosmos flights seeming to replace previous payloads in the Soviet missile launch warning system. These flights are in a path similar to a Molniya, giving a long linger time in the northern hemisphere during each of their twelve-hour orbits.

Ocean Surveillance

It has been hypothesized for several years that the Soviet ocean surveillance system included flights that came in pairs in low circular orbit where an active radar powered by nuclear energy could locate ships day or night in any weather. A second related system in slightly higher circular orbit seemed to use solar power instead of nuclear to conduct ocean electronic ferreting.

The big event of 1978 was the inadvertent reentry of the nuclear-powered Kosmos-954 over Canada, spewing a path of radioactive debris on the ground over a distance of hundreds of kilometers. The event not only absorbed world media attention but fully confirmed the hypotheses about the mode of operation. The vehicle was launched on September 18, 1977, as the second of a pair. By early November, the British Kettering space group could observe that orbital adjustments had ceased and that it had begun to decay through drag. The White House claimed this decay was first noticed by the US government in December. The original decay estimate of April needed sudden revision in January when the steepness of descent increased by reason of some unexplained event.

Normally these flights, on ending their useful life, break the payload into three parts with two allowed to decay. The middle portion is fired from the initial orbit at approximately 225 kilometers to about 1,000 kilometers circular. This is to leave the radioactive nuclear portion in an orbit good for about 600 years. The disclosures related to Kosmos-954, which failed to move to its long-term parking orbit, made clear one obscure point: The system used fissioning U-235 and a heat exchanger, like an earthbound power station—perhaps as much as 100 kilograms of such material—rather than a radioisotope thermal generator as occasionally used by other US and Soviet spacecraft, which provide much smaller amounts of power through a substance like plutonium 238.

After all this furor and talk of banning use of nuclear power sources, it is interesting that the Soviet Union has not made the additional flights in 1978 that may represent a new direction in ocean ferreting. And here the analyst at this early date must really reach, with the possibility of making a quick retreat. So far the "F" class vehicle, which derives from the SS-9 missile, has been used exclusively for military space missions—ocean surveillance, interceptor/destructors, and earlier, fractional orbit bombardment satellites. If the new launch vehicle alluded to earlier in this review is an "F" vehicle in a new form, then the otherwise unexplained new flights of Kosmos-1,025 at about 660 kilometers circular and Kosmos-1,045 at about 1,700 kilometers circular may be new types of ocean ferret missions.

Minor Military Missions

Each year since the early 1960s, there have been a number of undefined military missions launched by the modest "B" and "C" class launch vehicles, to the point that there have been 110 of these to date. The big change in 1978 was that there was only a single such flight, early in the year, and it seemed to be one of that small handful bearing some undefined relation to the ASAT (inspector/destructor) program. The guess is these particular ones serve some diagnostic or calibrating purpose, often just before or just after an ASAT test.

Inspection/Destruction Program

The growing concern in the United States over the variety of Soviet efforts to create a spaceborne means for interfering with satellites had several repercussions. Increasing funds have been put into means for hardening US military satellites and otherwise giving them passive protection. In addition, various contracts were let to US firms for new systems with the capability of neutralizing Soviet satellites, so that the US bargaining position would be strengthened. In addition, approaches between the two governments suggested a willingness on both sides to discuss possible limits on the development, deployment, and use of such ASAT systems.

Questions of definition, verification, and compliance become increasingly complex as one studies the issues more closely. Every sovereign power reserves the right under international law to act when its vital interests are threatened. One can think of situations in which an enemy satellite would constitute a threat of considerable magnitude, such as a hypothetical doomsday weapon. But how easy is it to separate some kinds of technology for peaceful rendezvous from a hostile military capability, even if not overtly exercised in military form? The Russians have even suggested the US reusable Space Shuttle could be a threat to the security of their satellites.

While the year 1977 saw the Soviet launch of three target craft and four interceptors, in 1978 there was only one interceptor sent up against an earlier target. This flight was Kosmos-1,009 on May 19 against Kosmos-967. Such Soviet test flights still have a ceiling of about 2,000 kilometers, effective against observation flights, ferrets, and earlier navigation satellites, but only a tenth the altitude of the new global positioning system, and a twentieth that of the early warning and communications satellites.

Weather Satellites

Since the Soviet program began, the Russians have put up forty-six weather satellites. Strangely, in 1978, there was not a single flight identified as a Meteor, the name they have used for such payloads. Kosmos-1,066, on December 23, 1978, is unique among such flights as being just like a Meteor except in name. Tentatively, it can be classified as a Meteor payload failure until evidence to the contrary becomes available.

Orbital Launch Platforms

The use of a launch platform in earth orbit as the base for firing to much higher orbit or to escape velocity is still the preferred Soviet method, overcoming in part the disadvantage of more northerly launch sites. During 1978, this technique was used thirteen times, and these platforms may be counted either as abandoned debris or as earth orbiting payloads, separate and distinct from the spent rocket stages also left in low circular orbit.

New Developments and Trends

The foregoing review by program areas has touched on most of the new developments in hardware that have actually been flown. Last year, we were wondering at the beginning of the year what the mysterious Kosmos-929, launched July 17, 1977, was up to. We may not know that much more today, but the mission came to an end on February 2, 1978, when the vehicle was commanded to plunge into the Pacific. Some part of the ship, launched by the large "D" vehicle, may have been recovered in August 1977. In mid-December, after minor adjustments had been made over many months, it was commanded from its average altitude of 260 kilometers up to about 450 kilometers, before later moving down again and then reentering. The principal public theories tie it to the space station program and to the possibility of serving as precursor to a manned space tug.

Reference has already been made to the strangely slow-to-come successor or alternate to the present Soyuz. It may appear as a full-blown new vehicle, or it may serve as a testbed for trying out new subsystems.

Rumors continue strong that the Russians are developing a reusable manned space shuttle vehicle. Influenced by the flights of Kosmos-881/882 and -997/998, already described, great interest has been attracted by the report that a deltawing orbiter vehicle like the American Shuttle, but not as large, has been undergoing drop tests from a Tu-95 Bear bomber. Indeed, some expected it to make an orbital flight by December 1978, but this did not come to pass. Nonattributed stories in *Aviation Week* further suggest the orbital vehicle will be ready for interim launch on a rocket booster between now and 1985, with a

Distribution of Soviet Space Payloads By Putative Program 1957–78

Possible Mission	*1978*	*(1957–78) Cumulative*
Military Recoverable Observation	35	430
Communications	45	283
Earth Orbital Science	7	140
Minor Military Mission (which could include some environmental monitoring, radar calibration, or electronic ferreting)	1	110
Navigation and Geodesy	9	72
Electronic Ferreting	6	62
Weather Reporting	1	46
Earth Orbital, Man- or Biology-Related	7	46
Earth Orbital, Manned	5	42
Unmanned Lunar Related	0	34
Venus Related	4	27
Ocean Surveillance	2	21
Fractional Orbital Bombardment	0	18
Mars Related	0	16
Inspector/Destructor	1	16
Targets for Inspection	0	14
Early Warning	2	13
Engineering Test	0	9
Lunar, Man- or Biology-Related	0	8
Orbital Launch Platform	13	174
TOTALS	138	1,581

ully reusable winged booster appearing in the period 985–90. The magazine also reports that the appropriate ong runways are being built at the Tyuratam launch site.

Perhaps the most absorbing new concern of all during 978 has been the continuing debate over the potential of beam weapons, whether surface-based or space-based, and whether using lasers or charged particles. Retired US Air Force Maj. Gen. George Keegan gave the story he initial big push over the facilities at Semipalatinsk he believes use underground nuclear explosions to power he charged particle beams. The story has been jumped on very hard by important spokesmen in the regular scientific establishment. Again, *Aviation Week,* in a major series of six articles, has traced how far US government reactions have carried support of research on a broad front to explore many of the possible uses of beam weapons, in some degree in contrast with the disclaimers to the Keegan accounts. The last word on the subject clearly has yet to be spoken.

Outlook for the Future

On the civilian side, the lagging lunar program may receive a boost from a future Soviet lunar polar orbiter to make a much more detailed reconnaissance of the entire lunar surface for its topography, composition, and special properties. The Russians also continue to talk about plans for bringing to earth a sample of material dug on the little known far side of the moon.

Future Soviet Venus flights are scheduled. One of the more interesting is the 1983 opportunity when French experimenters will prepare instrumentation to remain floating for an extended period in the upper, cooler atmosphere of that planet. This will be a planetary extension of the earlier French experiment that placed balloons in the southern hemisphere of earth to circle the globe several times, with data reported back via a relay satellite.

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
TOTALS	*731	1,163

*US launches include four by Italy for the United States

The Soviet Union rarely announces in advance the specifics of its space plans. However, the requirements of the International Telecommunications Union for allocation of frequencies and for the positioning of geostationary satellites provide a rare glimpse of future Soviet plans in this area. It should be remembered that the geostationary program of the Russians has moved very slowly, as it represents a costly and difficult program for them. The major current element is the Statsionar series, which could have as many as eleven satellites active. Statsionar-T, used for a limited direct broadcast of television, is also known as Ekran, and is in place. Statsionar-1 and -2 have also been put up, with the numbers referring to locations. The payloads carry the name Raduga. Statsionar-3 through -10 are yet to come, but under the plan should all be in place by 1980.

A new military geostationary system is called Gias, with four positions planned, and flights scheduled for 1979.

An out-and-out rival for international plans in the maritime and aeronautical fields are the three Volna satellites for mobile maritime service and four more Volnas for aeronautical services. These are due in 1980.

In 1981, a direct rival to the Intelsat-5 series may be provided by four Loutch satellites for worldwide as well as domestic service.

How the 1978-launched Gorizont-1 relates to any of these is not yet clear.

Based on past experience, further exploitation of the Salyut space station can be expected during 1979. If Salyut-6 continues to function, there should be more long-duration stays, with six months already announced as a goal. Mixed crews, including cosmonauts from Hungary, Bulgaria, Mongolia, Cuba, and Romania, are in training for brief visits to the station.

Based on former patterns, a new Salyut-7 should be of the specialized military variety, and it remains to be seen how its capabilities will have been extended compared with earlier models in this still-evolving program.

Later, by Soviet account, will come still larger stations, presumably assembled from multiple components, and these will provide a larger number of docking ports so that at a given time ten or more cosmonauts might be in such a station. Successful practice in orbital assembly opens the door to future colonies in space, to large-scale space manufacturing, and to the erection of solar power satellites. The Russian approach may well give them direct experience while others perform paper feasibility studies.

It is interesting, with the major Soviet emphasis on practical applications of space technology, whether civil or military, that again in the fall of 1978 Soviet officials renewed the claim that their long stay time experiments are pointed toward achieving a capability for manned flight to Mars. This is many years away, but may still provide a certain focus and goal for supporting activities.

Every sign points toward continuing rivalry in space between the two superpowers even if they find areas of cooperation in some manned endeavors and in future unmanned flights to the planets. The really key question is the extent to which outer space can be preserved as a sanctuary against direct interference, such as has protected the national technical means for policing arms agreements. ■

SOVIET AEROSPACE ALMANAC

A network of resorts, sanatoriums, and hunting lodges is available to Soviet military professionals. Though there are complaints, the quality of military leave facilities is better than that available to the general public.

A Look at Soviet Military Recreation

BY HARRIET FAST SCOTT

It is unlikely that the relative handful of people who rule and administer the Soviet Union could survive for long without the support of the armed forces. In return for that support, the military professionals—the marshals, generals, admirals, officers, warrant officers, and extended service sergeants who number fewer than 1,250,000 of the 4,500,000 to 5,500,000 people in uniform—are granted privileges unknown to the millions of conscripts who make up the bulk of the Soviet armed forces, or to many others in Soviet society. Among those privileges are a generous amount of annual leave and a huge network of recreational facilities.

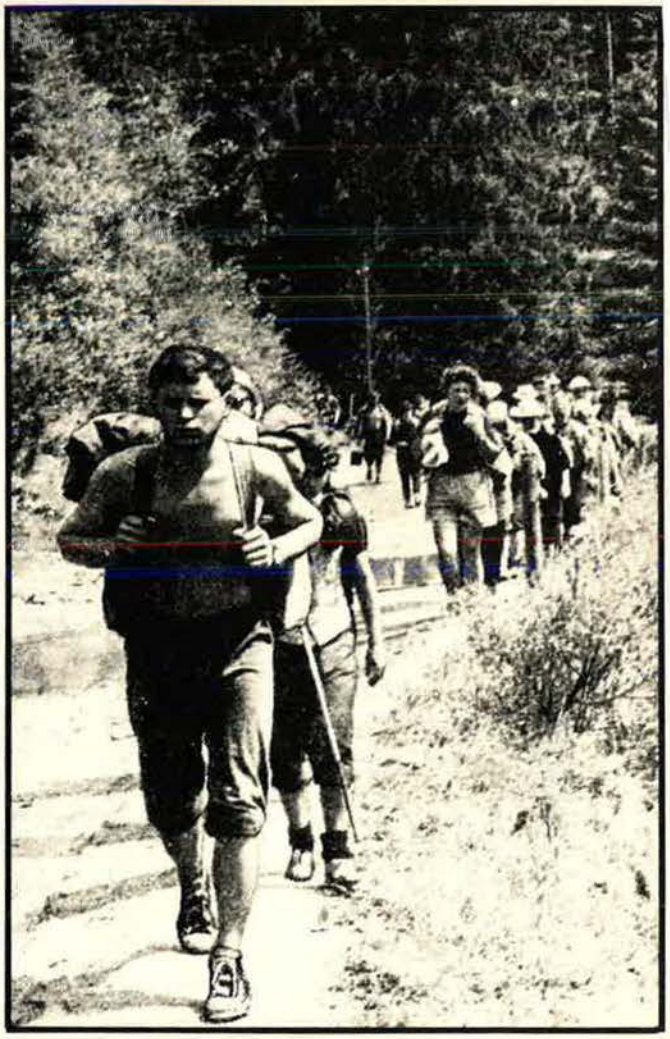
All of the military professionals and many civilians who work for the Ministry of Defense get a minimum of thirty days of leave a year. Flying personnel, submariners, others with hazardous jobs, and those with more than twenty five years of service are allowed forty-five days each year. Marshals, generals, and admirals, for whom there is no compulsory retirement age, are granted sixty days of leave—thirty days of regular leave and thirty more for "rejuvenation." All of this is exclusive of travel time.

The problem for Soviet officers and NCOs is not how to get leave, but how to use it. Many Soviet bases are in the far north or in isolated or desolate places where there may be no roads. That aside, not many officers own automobiles. Those who do may not want to take them through areas completely lacking in paved roads and garage facilities—which includes most of the USSR. Finally, few military families have relatives or friends with living accommodations large enough to put up overnight guests, much less guests with thirty days' leave. Hotels outside the large cities are virtually nonexistent, and those in big cities have long lines of people begging for a room for just one night.

In the absence of so many public facilities that are taken for granted in Western countries, the Soviet armed forces are "taking care of their own" through an extensive complex of military hotels, tourist bureaus, tourbases, hiking and skiing resorts, sanatoriums, and hunting and fishing preserves. In theory, the needs of military people on leave should be well taken care of, but theory and practice sometimes do not coincide, as is true of much in Soviet life.

The problem of getting a room at a military hotel, even when on official business, is illustrated by a recent letter in *Red Star,* the daily newspaper of the Ministry of Defense.

"It is easier for a camel to go through the eye of a needle than for my fellow officers, sent to Moscow on official business, to get a room at the hotel of the Central Officers' Club," Navy Captain D. complained. "I have been coming to Moscow for twenty years, and every time it makes me tremble—I know I will have to stand in this



Soviet tourists in the Carpathian Mountains. Military tourists must participate in hikes, organized activities.

line." He was referring to the line that forms every night at 2100 hours, in the lobby of the hotel run by the Central Club of the Soviet Army (TsDSA), an hour before rooms become available. At 2200, the waiting officers are given papers to fill out. The wait goes on for hours.

Some officers, warrant officers, and Defense civilians long ago developed their own system for bucking the line, however. A *Red Star* investigator found that only half the eighty-five men in line got rooms that night, despite advanced requests for reservations. One-fourth of the rooms had been undergoing remodeling for nearly a year, with the end nowhere in sight. But twenty men got rooms without reservations and without waiting in line. They were given special treatment, the investigators found, as a result of phone calls from "high places." When the director was questioned, he said he could do nothing about the practice.

Local officers' clubs in 1960 were given the job of running tourists' bureaus for their members, in an effort to assist military people on leave. Each officers' club developed recreational facilities within its own military district.

The chief of the Rear Services, a deputy minister of defense, is responsible for taking care of the growing number of military tourists. This responsibility is delegated to the newly formed Department of Tourism, now headed by General Major A. Gashchuk. The General coordinates the work of tourism departments in each of the sixteen military districts, four groups of forces outside the Soviet Union, two air defense districts, and four fleets. General Gashchuk also directs the tourbases (tourist bases) belonging to the districts and the Ministry of Defense.

Tourbases accommodated 600,000 military tourists between 1971 and 1976. During the same five-year period, some 3,000,000 took excursions to museums and places connected with Lenin or past wars. To encourage military tourism, pins are awarded. Some 500,000 have been awarded "Tourist USSR" pins. Another 50,000 have been named "Outstanding Sportsman for Tourism." To win top tourist honors, male candidates must make eleven trips. The requirement for female tourists, ten trips, is less demanding.

Hiking and Skiing Resorts

Not all tourbases measure up to their pictures and descriptions. Recently, *Red Star* carried a bitter complaint from Major P. on the conditions of "Amber Coast," a tourbase located on the Baltic Sea northwest of Kaliningrad. Major P. complained that for a whole week he could not locate his group or their hiking leader. He wrote that the tourbase had no medical personnel so tourists just helped themselves to pills. His other complaints: Food was prepared without adequate sanitary rules. Food lines were slow and long. There were no organized games or evening entertainment. The water of the Baltic Sea was too cold for bathing, and the beach was so choked with weeds that sunbathing was impossible. The boats available were full of holes.

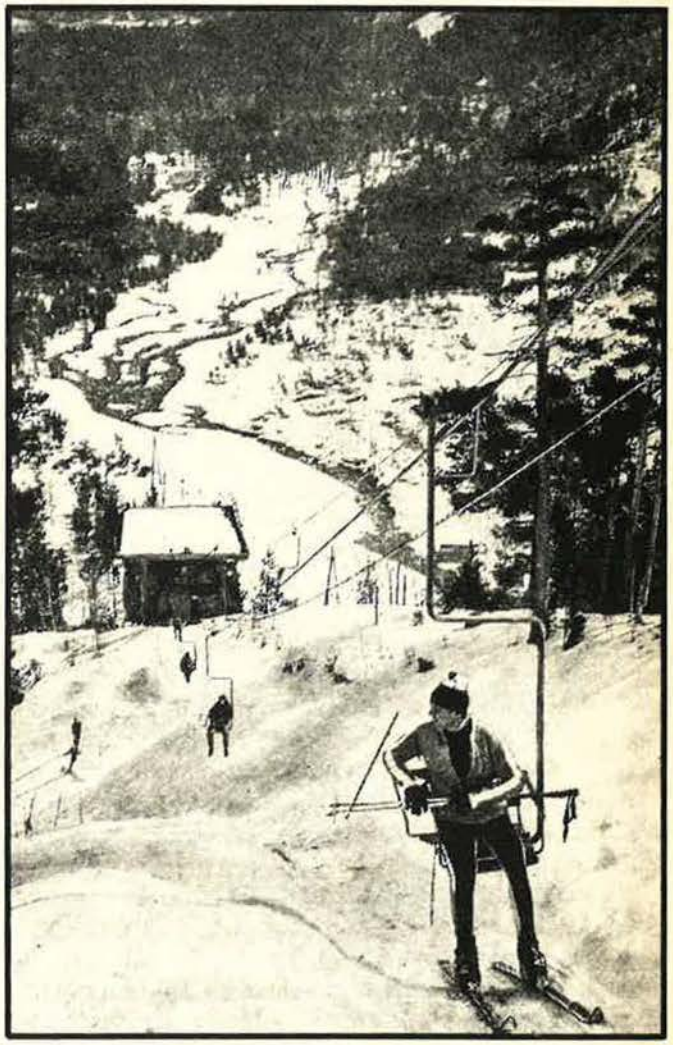
After further investigation, Mezhgorye, Carpathian, Turkestan, and Sokol tourbases also were found to be in poor shape. Soviet publications reported that before the 1978 summer season was over, instructors were available and satisfactory plans for other improvements were drawn up.

There are twenty-seven tourbases located throughout the USSR. Eight are in the central European section, two in the Crimea, nine in the Caucasus-Black Sea coastal area, two in Central Asia, two in the Far East. Four are ships that cruise the Volga and Yenisey rivers. Four new tourbases are under construction: one near Leningrad, one in the Carpathians, another near Lake Baykal, and a fourth northwest of Moscow near Lake Seliger. New clubs and dormitories are being built at other bases.

All military tourists at tourbases must take part in the organized hikes, sports, and early morning physical exercises. Officers, warrant officers, and extended duty servicemen are awakened at 7:00 a.m. and have morning exercises before breakfast. Mornings and afternoons are devoted to hikes and sports. Evenings tourists can relax a bit at concerts, movies, or lectures. Lights out is ordered at 11:00 p.m. Those on overnight hikes rise and retire an hour earlier.

Tents, sleeping bags, rucksacks, wind jackets, ski boots, skis, and camping and mountain climbing equipment may be rented at tourbases.

Children under twelve normally are not permitted at tourbases, but since they often go to summer camps sponsored by the Pioneer Youth organization, this does



Ski lift at Cheget, in the Carpathian Mountains. Pins are awarded to tourists to encourage physical fitness.

Harriet Fast Scott is a Washington consultant on Soviet affairs. She has traveled extensively in Russia and has written several books and many articles on Soviet military affairs. She lived in the USSR for four years while her husband, Col. William F. Scott, was US air attaché in Moscow. She and her husband are authors of The Armed Forces of the USSR, *to be published by Westview Press in April.*

not create a problem. In the last year, however, nine tourbases have opened special centers for officers and their families with children over age seven.

The number of military campsites has grown, from eight in 1968 to more than seventy in 1973. Campsites accommodate tourists traveling by motorcycle or auto, or with organized military tour groups.

The average stay at a tourbase is twenty days. About a dozen tourbases are open all year long. Average stay in winter is fourteen days.

A typical bill for twenty-two days at a tourbase costs an equivalent of about $108 (72 rubles) in the summer and $75 in the winter. A steamship cruise of twenty days costs between $150 and $270.

Bus tours include three meals a day, stops in all large cities, and overnight stays in comfortable hotels. One popular trip is the Golden Circle tour of five Soviet Republics: Belorussia, Lithuania, Latvia, Estonia, and the Russian Federation. Two five-day stops are made at tourbases along the way. Other bus trips go to the Crimea or to the Carpathian regions, with stays of a week or two at various tourbases.

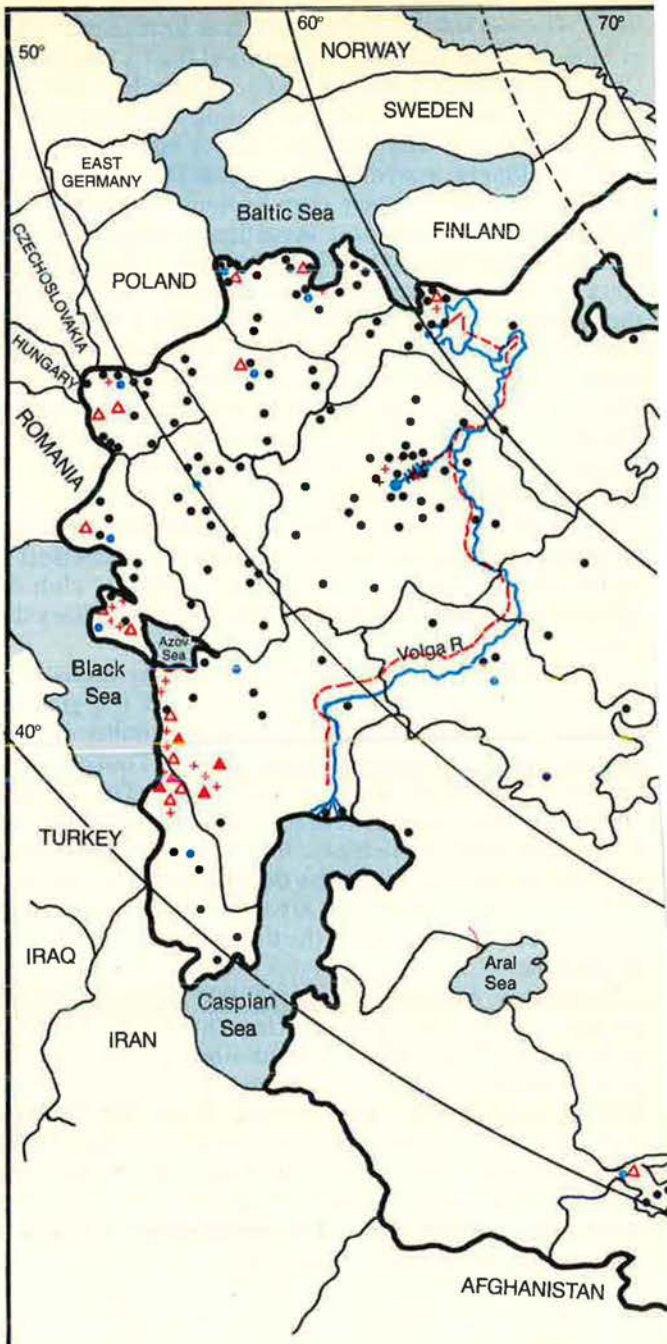
Excursion trips do not always live up to promises. *Red Star* recently published a letter, bearing thirty-three signatures, which told of a busload of vacationers that arrived at Turkestan, the tourbase of the Turkestan Military District. The letter complained of an absence of sports competitions, indifferent food, and a lack of hot water. Promised theater tickets never arrived. The tour group was rushed through two museums in a few hours. An investigation revealed that the four buses the group was assigned had already traveled 300,000 kilometers for the Ministry of Defense tourbase in Moscow, before being sent to Turkestan without the scheduled overhauls. The old dormitory, scheduled to be replaced, was in disrepair.

The most popular tourbases by far are those located in the southern part of the Soviet Union. The Crimea, at the same latitude as Bangor, Me., and Salem, Ore., is a favorite vacation spot for military and civilians.

Because of the popularity of the tourbases, managers play a game of musical chairs with vacationers. A group may spend ten days at one tourbase and ten days at a second.

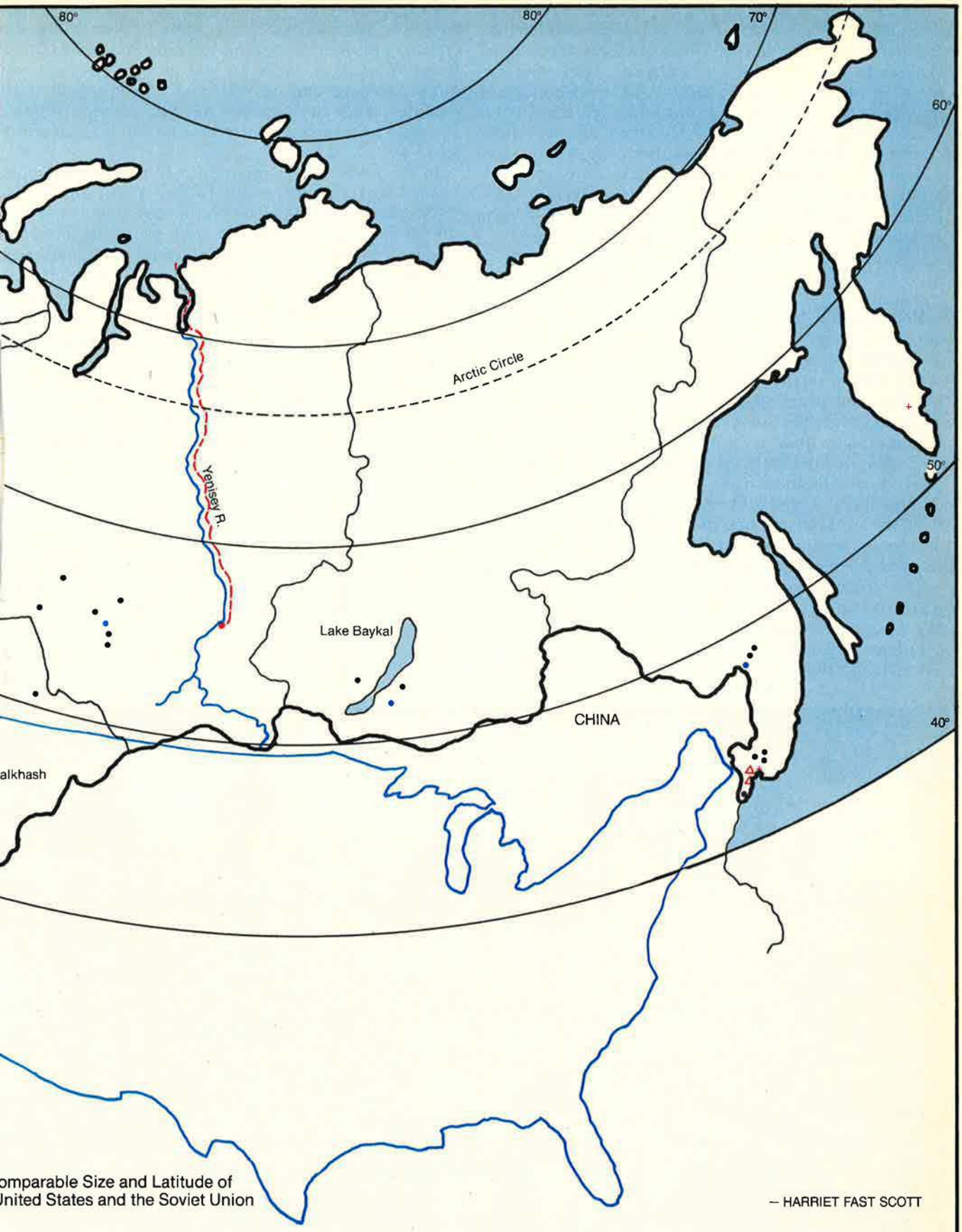
Tourbase managers, by sending tourists out on extended hikes, can accommodate more tourists than the base has rooms. But this juggling of tourists has resulted in problems.

Recently the Salyut Hotel in Baku, run by the Transcaucasus Military District, turned away four officers late one night, although they had reservations. An investigation showed the hotel was nearly empty, although its books showed a profit. The hotel was taking in military tourist groups of thirty or more and charging them for more days than they stayed.



Soviet Ministry of Defense Rest and Recreation Facilities

- Military District Headquarters
- Tourbase, Ministry of Defense
- Tourbase, Military District
- Sanatorium, Ministry of Defense
- Hunting and Fishing Lodge
- Floating Tourbase
- Military District Division



omparable Size and Latitude of
Jnited States and the Soviet Union

– HARRIET FAST SCOTT

An independent group of officers and their wives from the same area can set up a travel schedule, with the permission of tourist authorities. These independent groups can use facilities of military tourbases. They may use rooms in the dormitory if available. Otherwise they are provided space to park their bus and pitch their tents. The tourbase dining room will feed them and rent them equipment. While at the tourbase, however, they are expected to follow the daily schedule the same as any other military tourist. [A complete list of tourbases, sanatoriums, and Military Hunting Society bases has been compiled by the author and is available on request.]

Rejuvenation Leave

Rejuvenation leave usually means several weeks at one of the twenty-five sanatoriums, rest homes, or holiday hotels run by the armed forces medical services in the Crimea or on the Black Sea.

Suites and even "dachas"—comfortable cottages—are reserved for the Soviet military elite, with or without families. Sunbathing in the open air or in solariums, mineral water or mud baths, massages, and special dietetic foods, including fresh fruits and vegetables, are part of the treatment. Soviet officers also can get tickets to take them to world-famous spas in Eastern Europe. These rejuvenating sessions are credited with keeping generals seventy years old and older on active duty.

The sanatoriums have specialties, including cardiological, abdominal, nervous system, tubercular, and psychiatric treatment.

Military regulations determine who may use these resorts, though they are primarily for officers and members of their families and warrant officers. Conscripts are sent to these sanatoriums only under exceptional circumstances. A course of rejuvenation in a sanatorium is twenty-four days. Generals and officers normally pay twenty-five percent of the cost of staying in these facilities, while their families pay fifty percent. If one is assigned to a sanatorium from a hospital, treatment is free.

In the 1960s, it was reported that members of sports teams were using some of the most luxurious sanatoriums. Other persons in no way connected with the Ministry of Defense also were managing to wangle rooms. The scandal resulted in a number of announced changes. Generals and admirals now have to be checked by a commission before getting vouchers, government publications insist. Those in sanatoriums have to follow the prescribed regime and procedures and stay the full length of time.

Flight surgeons are authorized to send jet pilots to special Ministry of Defense sanatoriums whenever necessary. Jet pilots also may go to regular sanatoriums or rest homes for twenty-four days during their authorized forty-five days of annual leave.

Hunting and Fishing

The oldest and most popular form of recreation for the Soviet officer corps is the hunting and fishing provided by the Military Hunting Society (VOO). The society's membership includes generals, officers, warrant officers, extended-duty servicemen, cadets, reservists, retirees, and Defense civilian employees—both white- and blue-collar workers.

A tent camp on the shores of the Sherna River near Moscow. The Military Hunting Society also has organized more than 250 hunting areas with fifty-five lodges and five tourist bases. Tents and sporting equipment can be rented at the lodges.

Some 22,500,000 acres, scattered throughout the USSR, have been given to the Military Hunting Society for its exclusive use. In these game preserves, which together comprise an area larger than Switzerland, the society has organized more than 250 hunting areas with fifty-five lodges and five tourist bases.

The society runs its lodges through the sixteen military districts of the Soviet Union, the two air defense districts, and the four fleets. The central apparatus of the Ministry of Defense also maintains numerous bases for those who work on the General Staff and in the central directorates and establishments of the Ministry of Defense that do not fall under the control of any of the military districts.

To satisfy the demands of its members, the society has a number of plants manufacturing hunting and fishing equipment. Fiberglass fishing rods, reels of various types, tents, rucksacks, rubber boots, and other equipment are sold through military hunting stores located in most cities. In Moscow, the main store is located at 44 Leninskiy Prospect. Much of the equipment comes from their own factories. For example, Military Hunter Factory No. 1 manufactures the KS-130 spinning reel and aluminum tackle boxes that double as seats. Military Hunter tents of various kinds are made in Military Hunter Factory No. 4, located in Leningrad.

General Lieutenant B. K. Yermashkevich, the chairman of the Central Council of the Military Hunting Society of the Ministry of Defense, frequently writes of the need for nature preserves. Preserves produce tons of feed to help wildlife through hard winters. The society reported in 1976 that it had 250 preserves and six fish farms.

The society issues cards which authorize members to hunt in the preserves. Certain game—elk, deer, and wild boar—require an additional license that limits the season and sets game limits. Membership is open to family members over sixteen, fourteen in the Turkmen SSR.

Deficiencies and Luxuries

The number of Soviet military tourbases, hiking and skiing resorts, sanatoriums, and hunting and fishing reservations is impressive. While some of these places may be plagued at times with room shortages, untrained or indifferent staffs, and worn-out equipment, the quality of Soviet military leave facilities is better than that available to the general public.

Letters or information of any kind are not permitted in the Soviet press without a purpose. Press accounts of deficiencies in military leave facilities indicate that the guilty have been identified, and corrective actions are being taken. Publication of such letters lets the authorities inform readers that they are alert and support their needs.

Some aspects of Soviet military leave policies are designed to improve the combat readiness of the Soviet armed forces. Military personnel are not allowed to relax. Rather, personnel on leave are expected to engage in activities that will contribute to physical fitness and outdoor skills. But, even with these goals, the government's allocation of land and other resources for the recreation of career military men is quite lavish when compared to that of the US and other Western nations. ■

Hotel near Mount Elbrus in the Caucasus Mountains, one of twenty-seven tourbases run by the Defense Ministry.

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 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).

Marshall 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 Central Auditing Commission, and from 1 a full Member of the Central Commi CPSU. He was a Deputy of the Supr Soviet 6th through 9th sessions. Atten Frunze Military Academy (1941). Graduat General Staff Academy (1948).

Marshal of Aviation A sandr Ivanovich Koldu Born 1923. Russian. came Commander in Ch Troops of National Air fense (PVO Strany) Deputy Minister of Defe in July 1978. Koldunov one of the ten top Rus fighter aces of World War II, destroying f six enemy aircraft. In the postwar period, dunov commanded fighter aviation unit November 1970, he was named Comma of the Moscow Air Defense District. In cember 1975, Koldunov became First De Commander in Chief of Troops of Nationa Defense. Candidate Member of the Ce Committee from 1971 to 1976. Deputy o Supreme Soviet 9th and 10th sessions. T "Hero of the Soviet Union." Military Academy (1952), Academy of the Gen Staff (1960).

Chief Marshal of Aviat Pavel Stepanovich Ku khov. Born 1914. Russi Commander in Chief of Air Forces and Dep Minister of Defense si March 1969. In World Wa he flew 367 com missions, shooting do fourteen enemy aircraft. Commanded the forces of a military district before becom First Deputy Commander in Chief of the Forces in 1968. Member of the Central Co mittee CPSU since 1971. Deputy of the preme Soviet 8th through 10th sessio "Hero of the Soviet Union." Academy of General Staff (1957). Distinguished Milit Pilot USSR (1966).

Admiral of the Fleet of Soviet Union Serg Georgiyevich Gorshk Born 1910. Russian. He held his present post Commander in Chief of Navy since 1956. Gorsh took an active part in Wo War II landings in the Bl Sea area, and supported fighting in Hung and Yugoslavia. In July 1955, he became F Deputy Commander in Chief, then, in Janu 1956, Commander in Chief of the Navy Deputy Minister of Defense. From 1956, was Candidate, and from 1961, a Membe the Central Committee CPSU. Deputy of Supreme Soviet 4th through 9th sessio Graduate of Frunze Naval School (1931) higher commanders' courses at the Na Academy (1941).

—HARRIET FAST SC

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), 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," even including their Navy.

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. While the SRF is extensively publicized by the Soviet news media, little is known about it 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 '78 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 1978/79.*

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, while closely allied with the Ground Forces, 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 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 fighter-interceptors, SAMs (for example, the SA-3 and SA-5), 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 455,000.

Frontal Aviation is comparable to the USAF's Tactical Air Command. Its 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 both 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 both fixed-wing airlift 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 one aircraft carrier, the *Kiev,* now operational, 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 Fast Scott, and current as of February 1, 1979, show the membership of the top military organization. It is noteworthy that the Minister of Defense, Dmitriy Ustinov, although he holds the rank of Marshal of the Soviet Union, is the first essentially civilian Defense Minister since 1925, when Leon Trotsky was removed. ■

MEMBERS OF THE MAIN MILITARY COUNCIL OF THE MINISTRY OF DEFENSE

Minister of Defense
Marshal of the Soviet Union
D. F. Ustinov, Chairman

1st Deputy Defense Minister and CINC, Warsaw Pact Forces
Marshal of the Soviet Union
V. G. Kulikov

1st Deputy Defense Minister and Chief of General Staff
Marshal of the Soviet Union
N. V. Ogarkov

1st Deputy Defense Minister for [General] Affairs
General of the Army
S. L. Sokolov

Chief of Main Political Administration
General of the Army
A. A. Yepishev

SERVICES OF THE ARMED FORCES
(Headed by Deputy Ministers of Defense)

Strategic Rocket Forces
Commander in Chief
General of the Army
V. F. Tolubko

Ground Forces
Commander in Chief
General of the Army
I. G. Pavlovskiy

National Air Defense
Commander in Chief
Marshal of Aviation
A. I. Koldunov

Air Forces
Commander in Chief
Chief Marshal of Aviation
P. S. Kutakhov

Navy
Commander in Chief
Admiral of the Fleet of the Soviet Union
S. G. Gorshkov

OTHER SECTIONS
(Headed by Deputy Ministers of Defense)

Civil Defense
Chief
General of the Army
A. T. Altunin

[Radioelectronics?]
General Colonel Engineer
V. M. Shabanov

Rear Services
Chief
General of the Army
S. K. Kurkotkin

Inspector General
Marshal of the Soviet Union
K. S. Moskalenko

Armaments
General Colonel Engineer
N. N. Alekseyev

Construction and Billeting Troops
General Colonel Engineer
N. F. Shestopalov

—CHARTS COMPILED BY HARRIET FAST SCOTT

MEMBERS OF THE MILITARY COUNCIL OF COMMAND AND STAFF OF THE STRATEGIC ROCKET FORCES

Commander in Chief
General of the Army
V. F. Tolubko, Chairman

1st Deputy Commander in Chief and Chief of Main Staff
General Colonel
V. M. Vishenkov

1st Deputy Commander in Chief
General Colonel
M. G. Grigoryev

Chief of the Political Administration
General Colonel
P. A. Gorchakov

Deputy Commander in Chief
General Colonel
G. N. Malinovskiy

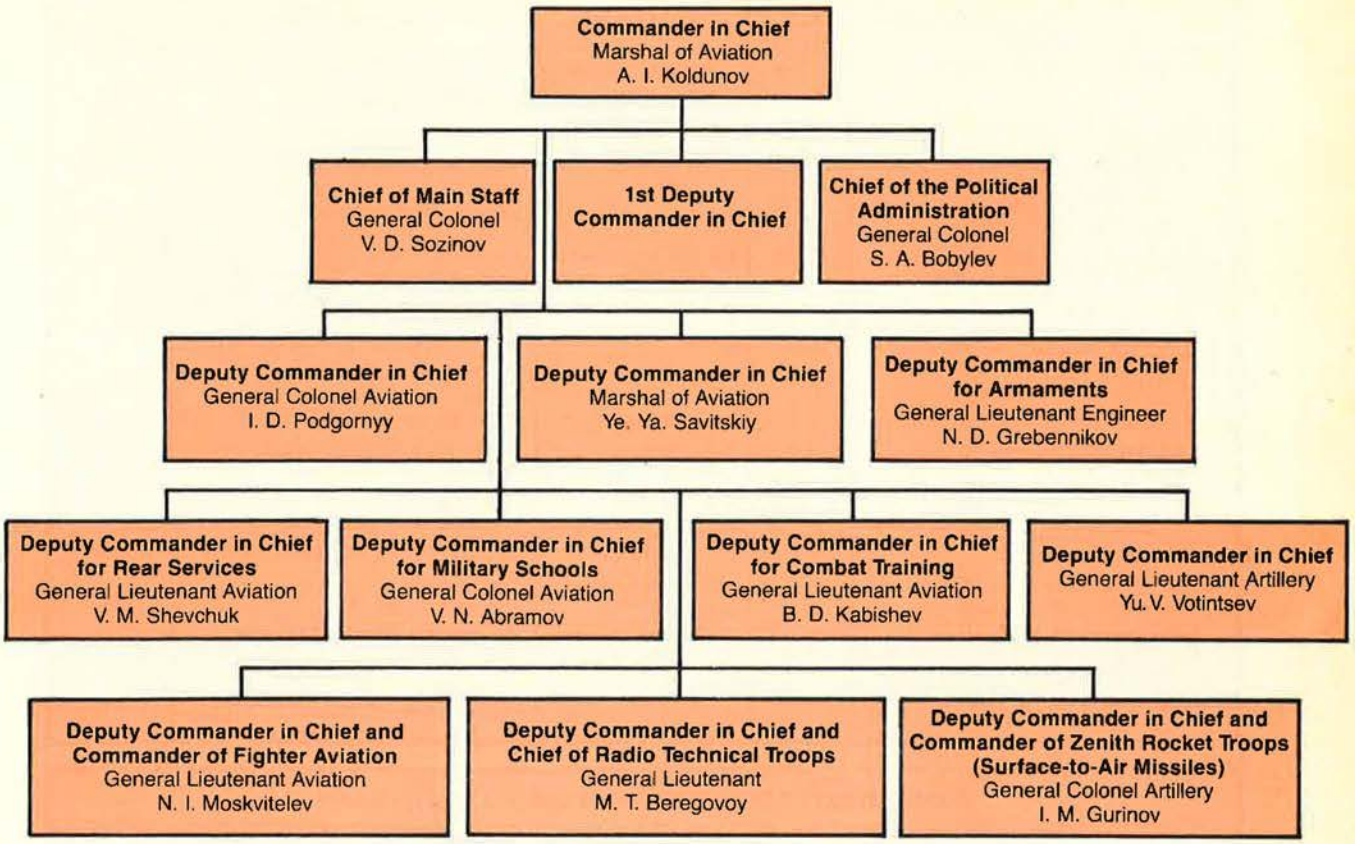
Deputy Commander in Chief
General Lieutenant
N. N. Smirnitskiy

Deputy Commander in Chief for Rear Services
General Lieutenant
S. F. Sulatskov

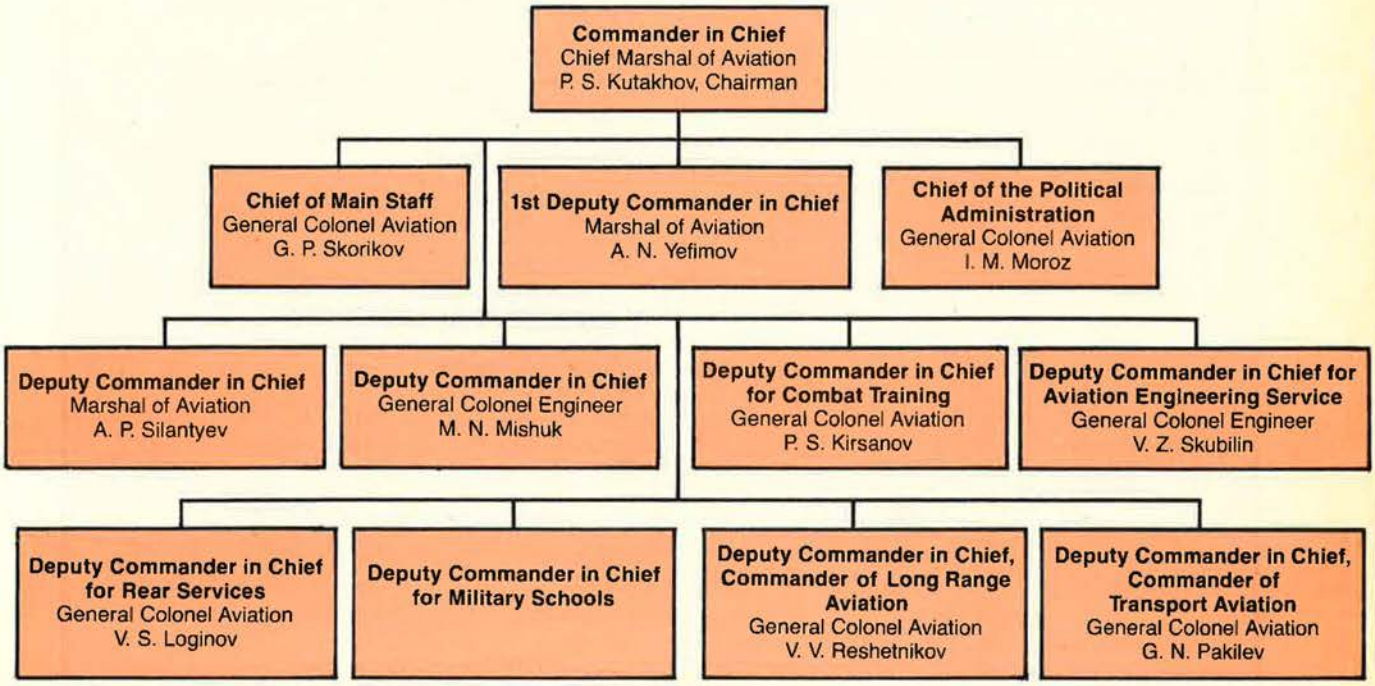
Deputy Commander in Chief
General Colonel
A. D. Melekhin

Assistant to the Commander in Chief for Military Schools
General Colonel
N. G. Ageyev

MEMBERS OF THE MILITARY COUNCIL OF COMMAND AND STAFF OF NATIONAL AEROSPACE DEFENSE FORCES



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



PRINCIPAL US AND SOVIET AEROSPACE SYSTEMS

The information in this table was extracted from several sources, including *The Military Balance 1978/79,* compiled by The International Institute for Strategic Studies, London, and reprinted in the December 1978 issue of AIR FORCE Magazine. Figures from *The Balance* are those available to the Institute on July 1, 1978, in some instances approximations, and may not agree with the figures elsewhere in this issue.

US		CATEGORY	USSR	
TYPE	NUMBER		TYPE	NUMBER
B-52D/F/G/H (316); FB-111 (66)	382	**Strategic Bomber**	Tu-26 (80)*, Tu-95 (100), Mya-4 (35)	215*
	0	**Tactical Bombers**	Tu-16 (585)*, Tu-22, (176)*	761
USAF (including AFRES and ANG) USN/USMC (Includes A-4, RA-5, A-6, A-7, AV-8, A-10; F/RF-4, F/RF-8, F-14, F-15, F-100, RF-101, F-105, F-111; O-2, OV-10; RC-135; SR-71A; U-2C/K.)	3,400 1,464	**Tactical Fighters and Reconnaissance Aircraft**	MiG-17 (40), MiG-21 (1,450), MiG-21 recce (300), MiG-23/27 (1,300), MiG-25 (150); Su-7 (260), Su-17 (560), Su-19 (190); Tu-16 (40); Yak-28 (120), Yak-36 (30), Yak-28 and Il-28 recce (250)	4,690
F-106 (231) (USAF and ANG); and F-4 (40) and F-101B (60) of the ANG	331	**Manned Interceptors**	MiG-17 (80), MiG-19 (170), MiG-23 (200), MiG-25 (300); Su-9/11 (650), Su-15 (850); Tu-28P (150); Yak-28P(320)	2,720
C-130 (505), C-141 (234), C-5 (70), C-9 (17) (USAF, ANG, and AFRES) and C-123 (63) and C-7 (47) of the ANG and AFRES	936	**Transports**	Il-14 (235), Il-18 (15), Il-62 (2), Il-76 (80); An-8 (50), An-12 (735), An-22 (50), An-24/26 (20); Li-2 (100); Tu-104 (10), Tu-134 (8)	1,305
KC-135 (USAF, ANG, and AFRES)	615	**Tankers**	Tu-16 (89)*; Mya-4 (44)	133*
Titan (54); Minuteman II (450); Minuteman III (550)	1,054	**ICBMs**	SS-9 (190); SS-11 (780); SS-13 (60); SS-17 (60); SS-18 (110); SS-19 (200)	1,400
Polaris (160); Poseidon (496)	656	**SLBMs**	SS-N-4 (27); SS-N-5 (54); SS-N-6 (528); SS-N-8 (394); SS-NX-17 (12)	1,015
	0	**M/IRBMs**	SS-4 (500); SS-5 (90); SS-20 (100)	690
ABM and fixed-site surface-to-air missiles	0	**Strategic Defense Missiles**	Galosh (ABM) SA-1, SA-2, SA-3, SA-5	64 10,000
DSP Satellites (3); SPADATS (7); BMEWS (3); DEW Line (31); Pinetree Line (24); 474N (6); PARCS (1); Cobra Dane (1); BUIC (1); SAGE (6); Ground Radar Stations (51)	134	**Aerospace Defense Radars**	Early Warning and Ground Control Intercept Radars	7,200

*Includes Naval Aviation aircraft, but not those dedicated to support missions.

COMPARATIVE MILITARY RANKS — US AND USSR

UNITED STATES		SOVIET UNION	
(no equivalent)		Generalissimus of the Soviet Union*	
General of the Army	Fleet Admiral	Marshal of the Soviet Union	Admiral of the Fleet of the Soviet Union
(no equivalent)		Chief Marshal of Aviation, Armored Forces, Artillery	
General	Admiral	General of the Army, Marshal of Aviation, Marshal of Armored Forces, Artillery, Engineers, Signals, etc.	Admiral of the Fleet
Lieutenant General	Vice Admiral	General Colonel, General Colonel Aviation, General Colonel Armor, Artillery, Engineers, Justice, General Colonel-Engineer, etc.	Admiral, Admiral-Engineer**
Major General	Rear Admiral (Upper Half)	General Lieutenant, General Lieutenant Aviation, Armored Forces, Artillery, Engineers, General Lieutenant-Engineer, etc.	Vice Admiral, Vice Admiral-Engineer
Brigadier General	Rear Admiral (Lower Half)	General Major, General Major Aviation, General Major Armored Forces, Artillery, Engineers, Signals, Supply, Technical Troops, General Major-Engineer, etc.	Rear Admiral, Rear Admiral-Engineer
Colonel	Captain	Colonel (*Polkovnik*)	Captain 1st Rank
Lieutenant Colonel	Commander	Lieutenant Colonel (*Podpolkovnik*)	Captain 2d Rank
Major	Lieutenant Commander	Major	Captain 3d Rank
Captain	Lieutenant	Captain	Captain-Lieutenant
1st Lieutenant	Lieutenant (Jr. Grade)	Senior Lieutenant	Senior Lieutenant
2d Lieutenant	Ensign	Lieutenant	Lieutenant
(no equivalent)		Junior Lieutenant	Junior Lieutenant

*Stalin is the only man who has held this rank; awarded June 1945.

**Soviet Navy officers at and below this level who are assigned to Naval Aviation, Coast Artillery, Naval Infantry, and some support functions have the same rank title as shown for officers of the other services.

SOVIET AEROSPACE ALMANAC

GALLERY OF SOVIET AEROSPACE WEAPONS

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.

BY JOHN W. R. TAYLOR: Editor, ***Jane's All the World's Aircraft***

Bombers and Maritime

New Heavy Bomber

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 consisting of 100 turboprop 'Bears' and 40 'Bisons'. 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." The new bomber has a swing-wing and will fly during 1979.

Beriev M-12 (NATO 'Mail')

About 90 of these twin-turboprop amphibians are operated from shore bases of the Soviet Northern and Black Sea Fleets, for near-zone anti-submarine and maritime reconnaissance duties, out to some 230 miles from the shore. Generally clean lines and the high length-to-beam ratio of the hull, added to efficient new engines, made the M-12 a major advance over its predecessor, the piston-engined Be-6. 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. It can be suggested that absence of competition, except from the much larger Japanese Shin Meiwa PS-1, shows it to be an anachronism in an age of landplanes. Whether or not the Beriev Design Bureau has anything on the drawing board to replace the M-12 (first displayed publicly in the 1961 Aviation Day flypast at Tushino Airport, Moscow) should become apparent soon.

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.

Beriev M-12 (NATO 'Mail') (Tass)

Ilyushin Il-38 (NATO 'May')

Although related closely to the elint aircraft known to NATO as 'Coot-A', the Il-38 represents a more extensive rework of the airframe designed originally as the Il-18 airliner. The lengthened fuselage retains few cabin windows. Added equipment includes a large radome under the forward fuselage and an MAD tail-sting, with an internal weapon/stores bay aft of the radome. To cater for the effect on the CG position of these changes, and equipment inside the cabin, the wing had to be moved forward. With a patrol endurance much the same as that of its US Navy counterpart, the P-3 Orion, the Il-38 has become, with 'Bear-F', the standard open-ocean anti-submarine/maritime patrol aircraft of the Soviet Naval Air Force. About 60 operate regularly over the Atlantic and Mediterranean. First export order was for four, which now equip No. 315 Squadron of the Indian Navy at Dabolim, Goa. Acquisition of a new long-range ASW aircraft by the Soviet Navy is expected to begin by the early eighties.

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')

Myasishchev M-4 (NATO 'Bison')

This Soviet contemporary of USAF's B-52 has outlived its designer, Vladimir M. Myasishchev, who died on Oc-

tober 14, 1978, aged 76. The prototype flew in early 1953, only two years after its design was started. Its range was disappointing and, although developed versions eventually remedied this, the M-4 had by then lost to the Tu-95 its place as the Soviet Union's primary long-range attack/patrol aircraft. About 40 are currently deployed as bombers by Dalnaya Aviatsiya, the long-range air force, with about 45 more configured as in-flight refuelling tankers in support of the 'Bear-Bison' attack force. The internal hose-reel unit for probe-and-drogue refuelling makes these aircraft equally compatible with 'Backfire'. Installation is so simple that reconversion to a bombing role, or modification of the entire 'Bison' force into tankers, is possible at any time. *(Data for 'Bison-A' strategic bomber follow.)*

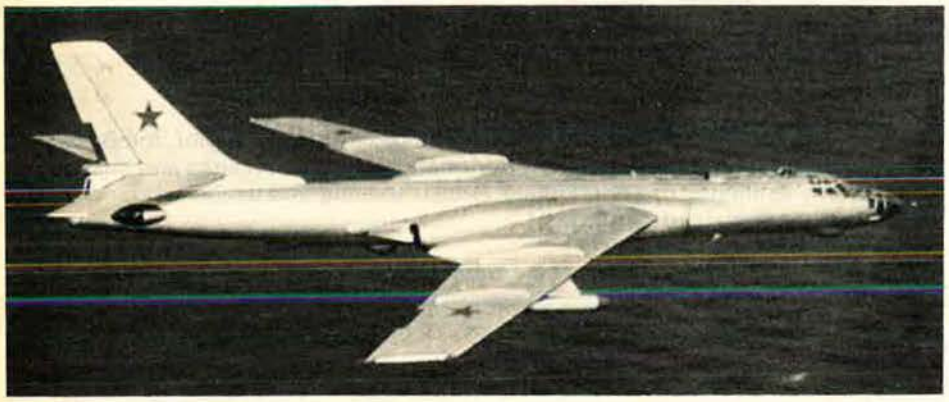
Power Plant: four Mikulin AM-3D turbojet engines; each 19,180 lb st.

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-16 (NATO 'Badger-F') (Royal Navy)

Tupolev Tu-22 (NATO 'Blinder-A') (Swedish Air Force)

Tupolev Tu-16 (NATO 'Badger')

No aircraft illustrates better than the Tu-16 and its larger, turboprop partner, the Tu-95, Soviet competence in adapting a good basic airframe endlessly to meet new requirements and carry new equipment. In the quarter-century since Tu-16s made their first major appearance at the 1954 Aviation Day display, seven major variants have been identified by NATO reporting names, of which six are still operational in 1979. 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 versions equipped for ECM duties and 20 for reconnaissance. The Naval Air Force has about 275 Tu-16s for maritime attack, 90 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 in China.

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 are included in the 25 'Badgers' supplied to Egypt as replacements for aircraft lost in the Yom Kippur War of October 1973. *(Data for 'Badger-A' follow.)*

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

Dimensions: span 110 ft 0 in, length 120 ft 0 in, height 35 ft 6 in, wing area 1,820 sq ft.

Weight: gross 150,000 lb.

Performance: max speed 587 mph at 35,000 ft, servi ceiling 42,650 ft, range 3,975 miles at 480 mph w 6,600 lb of bombs.

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

Tupolev Tu-22 (NATO 'Blinder')

Soviet predilection for minimum airframe cros section has never been demonstrated better than by t Tu-22, which has its turbojets mounted externally each side of the tail-fin and, in its intended primary ro carries a nuclear winged missile externally under t fuselage. Even the main landing gear retracts in typically-Tupolev pods on the wing trailing-edges, d spite the fact that excrescences are normally avoided aircraft designed for supersonic performance. In fact, was the range rather than the speed of the Tu-22 whi proved disappointing. Production was limited to abo 250 aircraft, of which 136 are reported to equip mediur range units of Dalnaya Aviatsiya, plus ten for reconnai sance missions. The Soviet Navy has around 40 f maritime attack, reconnaissance, and ECM dutie based mainly in the Southern Ukraine and Estonia protect the sea approaches to the USSR. Versions ide tified by NATO reporting names are as follows:

Blinder-A. Basic reconnaissance bomber, with ;us lage weapons-bay for free-fall nuclear or convention bombs, first shown in 1961 Aviation Day display, Mc cow. Operational in USSR; 12 supplied to Libyan A Force and 12 to Iraq.

Blinder-B. Similar to 'Blinder-A' but able to carry a to-surface missile (NATO 'Kitchen') semi-recessed underfuselage. Larger radar and partially-retracta flight refuelling probe on nose.

Blinder-C. Maritime reconnaissance version, with camera windows in weapons-bay doors. New dielect panels, modifications to nosecone, etc., on some aircr suggest added equipment for ECM and electronic int ligence roles.

Blinder-D. Training version. Cockpit for instructor raised position aft of standard flight deck, wi stepped-up canopy.

Power Plant: two unidentified turbojet engines in poc above rear fuselage, on each side of tail-fin; each est mated at 27,000 lb st with afterburning. Lip of each ir take is extended forward for take-off, creating annula slot through which additional air is ingested.

Dimensions: span 90 ft 10½ in, length 132 ft 11½ in height 17 ft 0 in.

Weight: gross 185,000 lb.

Performance: max speed Mach 1.4 at 40,000 ft, servic ceiling 60,000 ft, range 1,400 miles.

Accommodation: three crew, in tandem.

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

Tupolev Tu-26 (NATO 'Backfire')

More detailed study of the configuration and potentia of this medium-range supersonic bomber has been pos sible since June 1978, when the pilot of a Swedish Ai Force Draken interceptor was able to take a series of ex cellent close-up photographs of the current 'Backfire-B production version over the Baltic. Controversy over the aircraft's range continues *(see "Jane's Supplement" in the February '79 AIR FORCE Magazine)*. The extent of its future threat depends on whether or not it is included in a SALT II agreement. Whatever the outcome, it will remain a primary strategic and tactical offensive weapon di rected at NATO in Europe, and against maritime rein forcement 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, coor dinate attacks with air, surface, or submarine-launched missiles and use new technology to find our fleet units, jam our defenses, and screen their approach." These remarks were illustrated by a chart showing those por tions of the oceans that could be reached at high altitude by 'Backfire'.

Development of 'Backfire', which DoD refers to as the Tu-26, probably started when the inadequate range of the Tu-22 became apparent. A prototype of the initial version was observed on the ground near the manufac turing plant at Kazan, in Central Asia, in July 1970; up to twelve pre-production models were tested sub sequently. One of them remained airborne for a further ten hours after an in-flight refuelling. Two versions have been identified by non-classified NATO reporting names:

Backfire-A. Initial version, with large landing gear fair ing 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 fo shallow underwing fairings, no longer protruding be

yond the trailing-edge. Main wheels retract inward into bottom of intake trunks. Well over 100 delivered to Air Force and Navy, with production continuing at rate of about 36 per year, towards anticipated eventual total of 250–400 aircraft. *(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 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.

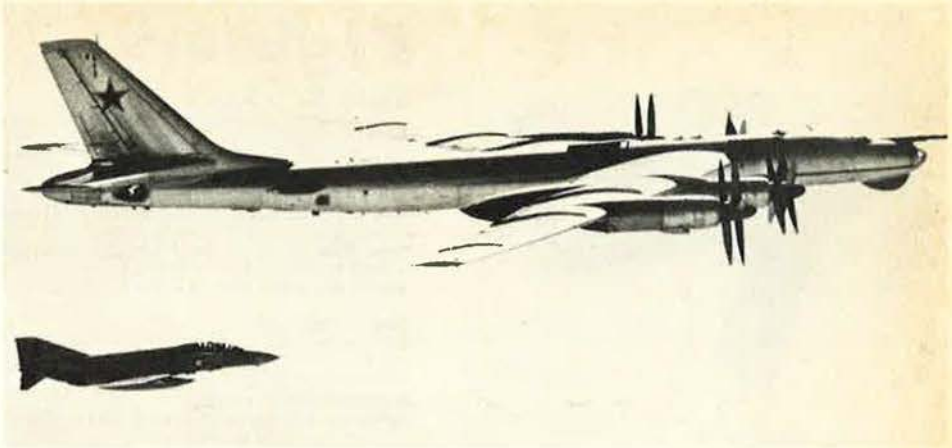
Tupolev Tu-95 (NATO 'Bear')

The 100 Tu-95s of Dalnaya Aviatsiya represent the heart of the present Soviet long-range bombing force. Far more of a threat to NATO are the similar aircraft deployed by the Soviet Naval Air Force. 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 these huge four-turboprop aircraft in first-line service for nearly 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:

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.

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. About 100 'Bear-As' and 'Bs' remain in service with the long-range bomber force. 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.



US Navy Phantom takes a look at Tupolev Tu-95 (NATO 'Bear-D') with modified tail

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 25 operational in early 1979. *(Data for 'Bear-A' follow.)*

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

Dimensions: span 159 ft 0 in, length 155 ft 10 in, height 39 ft 9 in.

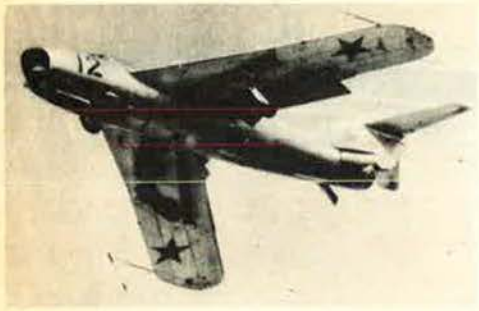
Weight: gross 340,000 lb.

Performance: max speed 500 mph at 41,000 ft, range 7,800 miles with 25,000 lb of bombs.

Armament: six 23 mm guns in pairs in remotely-controlled forward dorsal and rear ventral turrets, and manned tail turret.

Tupolev Tu-26 (NATO 'Backfire-B')

Fighters



MiG-17 (NATO 'Fresco')

MiG-17 (NATO 'Fresco')

Although this fighter from the early 1950s continues to fly with nearly 30 air forces throughout the world, a mere handful remain operational in the Soviet Union. About 40 MiG-17F ('Fresco-C') day fighter-bombers equipped Frontovaya Aviatsiya tactical support units stationed in areas of little strategic significance during the closing months of 1978. *(Data for MiG-17F follow.)*

Power Plant: one Klimov VK-1A turbojet engine, based on the Rolls-Royce Nene; 5,990 lb st with afterburning.

Dimensions: span 31 ft 0 in, length 36 ft 4 in, height 11 ft 0 in.

Weight: gross 14,750 lb.

Performance: max speed 700 mph at sea level, service ceiling 57,500 ft, combat radius 360 miles with two 550 lb bombs and two drop-tanks.

Accommodation: pilot only.

Armament: three 23 mm NR-23 guns. Four eight-rocket pods or two 550 lb bombs.

MiG-21MF (NATO 'Fishbed-J')

MiG-21 (NATO 'Fishbed')

This diminutive aircraft can provide all the facts and figures needed for a debate on the merits and demerits of lightweight fighters. Its ease of production and handling are such that it has been acquired by more than 30 air forces, making it the most widely-used combat aircraft in the world. On the other hand, its combat record in the Far East and Middle East has not been inspiring when it has been matched against more sophisticated Western fighters.

The late Colonel-General Artem Mikoyan designed the original version 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. The resulting E-5 prototype of 1955 met the requirements; but the initial production model (NATO 'Fishbed-A') proved woefully short on range, search capability, and punch, and reflected the unimpressive Soviet constructional standards of the time. Subsequent development concentrated mainly on overcoming these deficiencies 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-8) we may never know. However, about 1,750 of the 4,600 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-2 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 14 ft 9 in, wing area 247 sq ft.

Weight: gross 20,725 lb.

Performance: max speed Mach 2.1 above 36,000 ft, Mach 1.06 at low altitude, 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, and F')

The MiG-23/27 'Flogger' family of variable-geometry combat aircraft typifies the immense technological advances that make the present Soviet Air Force so much more formidable than its counterpart of the early 1970s. The prototype was demonstrated at the 1967 Aviation Day display at Domodedovo Airport, Moscow, but the subsequent entry into service of one or two development squadrons of similar 'Flogger-As' has gone unreported until now. Experience with these aircraft dictated almost total redesign of the major production versions, which may now outnumber any other type in Soviet first-line use. Five versions identified to date are MiG-23s, with large splitter plate forward of each variable-geometry engine air intake. The interdictor variant flown by Soviet units has fixed intakes, a different engine, and other significant changes, leading to redesignation as the MiG-27, and is described separately. A total of more than 1,300 MiG-23s and 27s are serving with Soviet tactical air forces, including squadrons based in East Germany since 1973/74. At least 200 more equip units of the PVO Strany home defence force, and Czechoslovakia has become the first of the other Warsaw Pact nations to receive 'Floggers'. Export models, with a lower equipment standard, operate with the air forces of Cuba, Egypt, Iraq, Libya, and Syria. Variants of the MiG-23 identified by unclassified NATO reporting names are as follows:

MiG-23 ('Flogger-A'). Prototype and initial pre-production series delivered to service development units in 1970.

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 MiG-23S 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.

MiG-23- ('Flogger-F'). Export counterpart of Soviet Air Forces' MiG-27 ('Flogger-D') ground attack/interdictor. Has the nose shape, 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-23- ('Flogger-G'). Unconfirmed designation for 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 Soviet AF MiG-23S follow.)*

Power Plant: one unidentified turbojet engine; thrust estimated at 20,500 lb with 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 59,000 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')

As expected, the past year has brought growing evidence that 'Foxbat' has acquired much improved effectiveness since Lt. Viktor Belenko defected to Japan in a 1973 production model, on September 6, 1976. In particular, tests against low-flying targets have revealed better 'look-down, shoot-down' radar/missile capability which will not have been overlooked by US cruise missile advocates. Performance-wise, the MiG-25 remains the world's fastest and highest-climbing weapon-carrying aircraft. Under the alternative Soviet designation E-266, a prototype set a speed record of 1,441.5 mph around a 1,000 km closed circuit, carrying a two-ton payload, as long ago as April 1965. Many subsequent records include a still-current speed of 1,852.61 mph around a 500 km circuit, and the absolute height record of 123,524 ft.

Examination of Lt. Belenko's aircraft showed that the airframe was constructed mainly of steel, with titanium only in places subject to extreme heating, such as the wing leading-edges. The ejection seat was similar to that fitted to later versions of the MiG-21. The radar was the most powerful fitted to any interceptor of the period but used vacuum tubes rather than modern circuitry, with emphasis on antijamming capability rather than range. ECM/ECCM standards were high, and US technicians admitted that much could be learned from the MiG's structural fuel tanks and system of ground-controlled interception.

Five versions of the MiG-25 may be identified by NATO reporting names:

MiG-25 ('Foxbat-A'). Basic interceptor, with large radar (NATO 'Fox Fire') in nose, and armed with four air-to-air missiles on underwing pylons. Slightly reduced wing sweep fowards tips. Wingtip anti-flutter bodies house CW target-illuminating radar.

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 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. Electrically-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.

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 a more powerful turbojet engine than the MiG-23, 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: one unidentified turbojet engine; thrust estimated at 24,250 lb st with afterburning. Internal fuel capacity 1,420 gallons.

Dimensions: As for MiG-23.

Weights: max weapon load 4,200 lb, gross 39,130 lb.

Performance: max ferry range (3 external tanks) 1,550 miles.

Accommodation: pilot only.

Armament: one six-barrel 23 mm Gatling-type gun; five pylons for unidentified external stores, known to include 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 about 25% 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.

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.

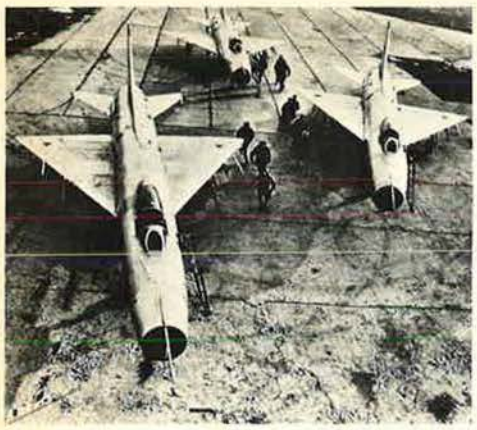
Dimensions: span 27 ft 8 in, length 55 ft 0 in.

Armament: no guns; four 'Alkali' air-to-air missiles under wings.

MiG-23 (NATO 'Flogger-B/G') (L. Klomp)

MiG-25R (NATO 'Foxbat-B') reconnaissance version

MiG-27 (NATO 'Flogger-D') (Tass)



Sukhoi Su-9s (NATO 'Fishpot-B')

Sukhoi Su-15 (NATO 'Flagon-E')

Tupolev Tu-28P (NATO 'Fiddler')

Yakovlev Yak-28P (NATO 'Firebar') (Flug Revue)

Yakovlev Yak-36 (NATO 'Forger')

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, 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')

At least 850 single-seat Su-15s are deployed with PVO-Strany, 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 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')

There continues to be considerable controversy concerning the Soviet designations of Tupolev aircraft (thereby underlining the wisdom of using NATO reporting names). Some reference sources insist that the 'Bear' turboprop bomber is really the Tu-20 and that the DoD-preferred Tu-95 is the number allocated to the design by the Tupolev Bureau. Similarly, the DoD refers to 'Fiddler' as the Tu-128, whereas most other sources give Tu-28P. Whatever the correct designation may be, 'Fiddler' is certainly the largest purpose-designed fighter ever put into squadron service. 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, and unconfirmed reports suggest that these are being replaced by an interceptor version of the Tu-22.

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 13 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')

It would be logical to include this Soviet counterpart to the British Harrier among attack or reconnaissance types, as the Soviet Navy will undoubtedly expect it to perform these roles. Soviet sources have, however, tended to associate the Yak-36 with provision of air cover for naval task forces. As its equipment for such a task appears to be limited to radar ranging and an infra-red sensor, the proposed targets must be equally limited to unarmed long-range maritime reconnaissance aircraft in the class of the Orion, Viking, Nimrod, and Atlantic. In making such an assertion, one must bear in mind that the aircraft observed on the carrier/cruiser *Kiev* during its maiden voyage through the Mediterranean and North Atlantic, in July 1976, 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. More extensive refinement of the design, and enhancement of operational capability, can be expected by the time the last of *Kiev's* sister-ships enters service.

First operational fixed-wing VTOL combat aircraft revealed by the Soviet Union, 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*. 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.

At no time were the *Kiev's* aircraft seen to fly with external weapons under their wings, although gun packs and rockets were observed on those parked on deck. At least one example of the rather crude-looking two-seat training version of the Yak-36 was also in evidence. NATO reporting names given to these two variants are:

Forger-A. Basic single-seater. At least nine appear to be carried by the *Kiev*, in addition to Kamov Ka-25 helicopters.

Forger-B. Two-seat trainer. Second cockpit forward of

ormal cockpit, with blister canopy at lower level. Rear uselage lengthened to compensate for longer nose. No anging radar or weapon pylons. Overall length about 58 0 in.

ower Plant: one unidentified turbojet, without afterburner, based possibly on the Lyulka AL-21; thrust estimated at 17,500 lb. Two Kolesov 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.

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-7 (NATO 'Fitter-A')

Replacement of this veteran single-seat ground attack ighter continues; no more than 250 are now deployed vith units of the Soviet tactical air forces. Poland and Czechoslovakia were the first Warsaw Pact allies to re-:eive newer, longer-range aircraft, but still operate some 3u-7s, as do a dozen other air forces worldwide. The de-sign goes back to the early fifties, as the prototype Su-7 was first seen in company with the prototype of the Su-9 nterceptor at the 1956 Aviation Day display. Study of the :wo types revealed that their airframes were almost iden-ical, except for the use of swept and delta wings respec-:ively; they also proved to have the same Lyulka engine. Formations of up to 21 aircraft were operational in time :o participate in the 1961 Aviation Day flypast. Su-7s were subsequently used in action by India, against Pakistan, and by Arab air forces in the Middle East. Standard ver-sions are the Su-7B and Su-7BM, the latter with a low-)ressure nosewheel tyre, necessitating bulged doors to nclose 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 '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. More than 500 are now deployed by Soviet tactical air forces, including the ground attack regiment based at Finsterwalde in East Germany, and by Soviet Naval aviation units assigned to anti-shipping strike and amphibious support roles in the Baltic Sea area. Operators of the export versions include the Polish, Egyptian, and Peruvian air forces. Differences between the various versions are as follows:

Su-17 ('Fitter-C'). Original Soviet AF model, with Lyulka AL-21F-3 turbojet, rated at 25,000 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 centre-body 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 centre-body.

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.

Su-22 ('Fitter-C'). Variant of Su-20, delivered to Peru in 1977. 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 41,887 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, including the air-to-surface AS-7 (NATO 'Kerry').

Sukhoi Su-7 (NATO 'Fitter-A')

Sukhoi Su-19 (NATO 'Fencer')

The importance attached to this aircraft by the Soviet Union is indicated by the fact that, contrary to previous reports, no Su-19 has yet been based outside the USSR or allowed to fly beyond the eastern Baltic during exercises. While protecting the aircraft from prying cameramen in NATO or Swedish aircraft, such a policy must restrict the operational readiness of the aircrew. Nonetheless, the Su-19 must be rated one of the best combat aircraft yet produced in the East. When it entered service in December 1974, it was the first modern Soviet fighter designed specifically for ground attack, and the first to carry a weapon systems officer. RAF assessment suggested 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. At least 250 now 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 only photographs of the Su-19 that have been published were taken over such great distances that they reveal no more than general configuration; drawings appearing in *Jane's* must therefore be regarded as provisional. They suggest that, except for the side-by-side two-seat cockpit, the overall lines of the fuselage, air intake trunks, and vertical tail surfaces have much in common with those of the Su-15. Wing sweep seems to be about 23° in the fully spread position, and 70° fully swept. The outer panels are fitted with the first pivoting pylons seen on a Soviet variable-geometry aircraft.

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.

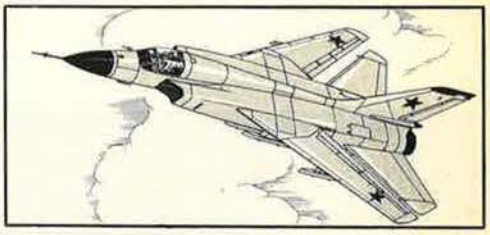
Performance: max speed above Mach 2 at height, combat radius (lo-lo-lo) over 200 miles.

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')

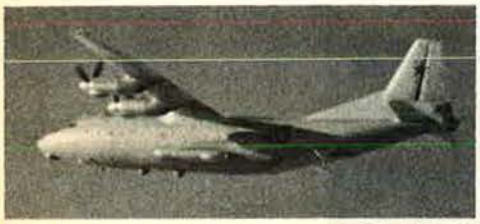
A small number of two-seat tactical attack Yak-28s remain in service with Soviet units in secondary areas. Most have been switched to support roles, as described under the *Reconnaissance, ECM, and Early Warning Aircraft* heading.

Close-up of landing Sukhoi Su-17 (NATO 'Fitter-C') (Flug Revue)

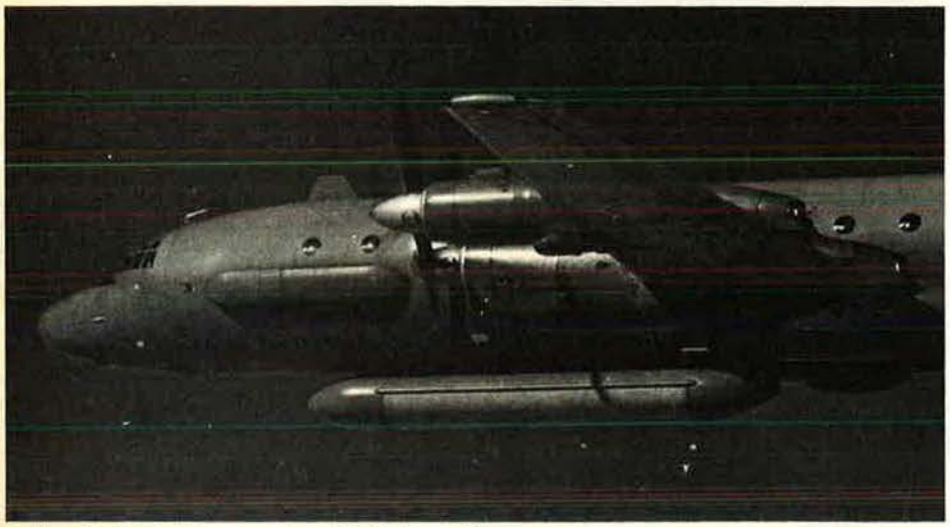


Artist's impression of Sukhoi Su-19 (NATO 'Fencer') (Michael A. Badrocke)

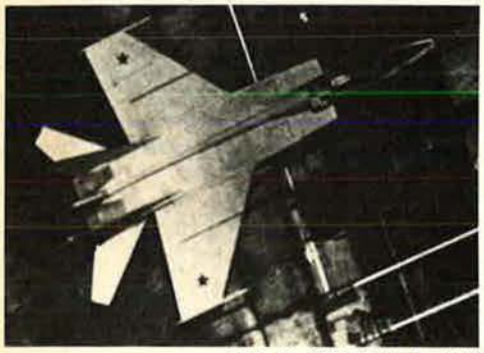
Reconnaissance, ECM, and Early Warning Aircraft



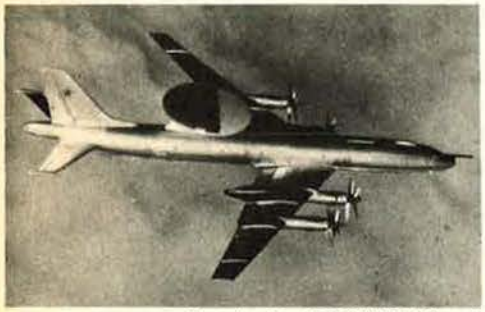
Antonov An-12 elint version (NATO 'Cub-B')
(Swedish Air Force)



Ilyushin Il-18 elint conversion (NATO 'Coot-A')
(Royal Air Force)



MiG-25 (NATO 'Foxbat-B')



Tupolev Tu-126 (NATO 'Moss')

Antonov An-12 (NATO 'Cub-B and C')

It is now possible to identify two special variants of the An-12 turboprop transport, following release of a photograph of 'Cub-B' taken over international waters by the pilot of a Swedish combat aircraft:

'Cub-B'. Conversion of 'Cub-A' transport for electronic intelligence (elint) duties. Example illustrated has four additional blister fairings under 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. Photographed in Egyptian markings before Soviet departure from Egypt.

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')

First illustrated in close-up in the 1978–79 *Jane's*, 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 underfuselage 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.

Ilyushin Il-86 (NATO 'Camber')

It has been reported that this wide-bodied four-turbofan airliner (see under *Transports* heading) is being developed as an AWACS (Airborne Warning and Control System) aircraft to supersede the Tu-126. Main external change would be the addition of the familiar type of over-fuselage rotating 'saucer' radome.

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 i wingtip fairings.

MiG-21RF ('Fishbed-H'). Generally similar to MiG-21P but based on MiG-21MF. Total of 300 'Fishbed-Hs' c both models estimated in service with Soviet tactical ai forces.

MiG-25 (NATO 'Foxbat-B and D')

Although generally similar to the basic MiG-25 inter ceptor, the reconnaissance variants have a modifie wing and, carrying no external weapons, are not limite to Mach 2.8. Two versions have been identified in ser vice, as follows:

MiG-25R ('Foxbat-B'). Basic reconnaissance version with five camera windows and various flush dielectri panels forward of cockpit. Small dielectric nosecap fo radar. Equipment believed to include Doppler navigatio system, and side looking airborne radar (SLAR). No ar mament. Slightly reduced span. Wing leading-edg sweep constant from root to tip.

MiG-25R ('Foxbat-D'). Similar to 'Foxbat-B', but wit larger SLAR dielectric panel, further aft on starboar side of nose, and no cameras. Total of about 1 'Foxbat-Bs and Ds' estimated in service.

Dimensions: span 44 ft 0 in.

Weights ('Foxbat-B'): basic operating 43,200 lb, gros 73,635 lb.

Performance: max speed Mach 3.2 at height.

Mil Mi-4 (NATO 'Hound-C')

Superseded by turbine-powered helicopters in thei original transport and anti-submarine roles, Mi-4s con tinue in service with support units. A version first iden tified in 1977 is known to NATO as 'Hound-C'. The multi ple antennae projecting from the front and rear of the cabin, on each side, are communications jammers.

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. One was reportedly based a the aerodrome of Chandigarh during the Indo-Parkistan War, to direct Indian Air Force Canberra and Su-7 strike aircraft.

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

Dimensions: span 168 ft 0 in, length 181 ft 1 in.

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 the most important Yak-28s now operational are probably 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

ıntonov An-8 (NATO 'Camp')

Nearly half of the 100 An-8s built in the second half of ıe fifties are thought to remain in service with the Soviet ıilitary air transport force. Used for support duties, such s paratroop training and monitoring of radioactive ıllout, they are seldom photographed, being completely vershadowed by the scaled-up, four-engined An-12 hich followed them on the production line.

ower Plant: two Ivchenko AI-20V turboprop engines; each 4,000 ehp.

imensions (approx): span 98 ft 5 in, length 85 ft 3½ in.

/eights: max payload 19,840 lb, gross 83,775 lb.

erformance: max speed 373 mph, range 2,175 miles at 298 mph.

ıccommodation: designed to carry 42–48 passengers.

.rmament: provision for one 23 mm NR-23 gun in manned tail position.

ıntonov An-12BP (NATO 'Cub')

About 85% of the 700 aircraft equipping the VTA (Military Transport Aviation) are still An-12BPs, although replacement with Il-76s began in 1974. Others are operated ıy nine foreign air forces and four civil airlines, notably ıeroflot.

Layout of the basic transport version ('Cub-A' to ATO) is conventional for a freighter, with access to the old via a ramp-door which forms the bottom of the upwept rear fuselage when closed. This ramp-door is ade in two longitudinal halves, which can be hinged ɔward inside the cabin to permit direct loading from ucks on the ground, or air-dropping of supplies and quipment. A full load of 100 paratroops can be desatched via this exit in under one minute. The 'Cub-B nd C' elint and ECM versions are described separately.

ower Plant: four Ivchenko AI-20K turboprop engines, each 4,000 ehp.

imensions: span 124 ft 8 in, length 108 ft 7¼ in, height 34 ft 6½ in.

Veights: empty 61,730 lb, gross 134,480 lb.

Performance: max speed 482 mph, service ceiling 33,500 ft, range 2,236 miles with max payload.

Accommodation: crew of six; 44,090 lb of freight, vehicles, or 100 parachute troops. Built-in freight handling gantry with capacity of 5,070 lb.

Armament: two 23 mm NR-23 guns in manned tail turret.

Antonov An-22 (NATO 'Cock')

Although Oleg K. Antonov has continued to develop urboprop transports to the present time, the An-22 remains unique as the giant among propeller-driven reighters. The prototype flew on February 27, 1965, and estimates of the number delivered subsequently to the military air transport force vary from 30 to 50. 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 ank. 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')

Of the 1,100 An-24s known to have been built, the majority are flown by Aeroflot and fourteen other airlines. At least fifteen air forces have acquired the type, usually in small numbers, and up to 200 serve with the Soviet air force (including An-26s, described separately). The **An-24T** freighter differs from the basic passenger-carrying **An-24V** in having a belly freight door at the rear, nstead of the port-side passenger door, and two ventral ins instead of one. The belly door can be opened in flight or air-dropping payload or parachutists. The **An-24RV** and **An-24RT** versions differ in having a 1,985 lb st RU 9-300 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-22 (NATO 'Cock')

Antonov An-26 (NATO 'Curl')

The five An-26s which staged through London's Gatwick Airport in December 1978, en route to Cuba, sported Aeroflot airline markings. Nobody expects them to make the return trip, and it is likely that Cuba's Air Force has joined a growing number of others now operating this much improved freight version of the An-24. It is basically an An-24T with more powerful engines and a completely redesigned rear fuselage. The latter embodies a large loading ramp, which forms the underside of the rear fuselage when retracted, and 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 air-dropped. 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-32 (NATO 'Cline')

This special "hot and high" variant of the basic An-26 is known to have been evaluated by India as a C-47 replacement, but its current status is unknown. Announced in May 1977, and exhibited at the Paris Air Show at the end of that month, the An-32 has the basic airframe of the An-26, fitted with two uprated versions of the engines fitted to the An-12, and with a slotted tailplane and enlarged ventral fins. It 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.

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-40

The Antonov design bureau is reported to be working on a new, very large, turbofan-powered transport in the class of the USAF's Lockheed C-5 Galaxy. Designated An-40, it is said to be intended as a replacement for the turboprop-powered An-22 strategic freighter.

Antonov An-26 transports en route to Cuba
(British Airports Authority, Gatwick)

Antonov An-32 (NATO 'Cline')

Antonov An-72 (Tass)

Ilyushin Il-76 (NATO 'Candid')

Ilyushin Il-86 passenger transport (NATO 'Camber') (Denis J. Calvert)

Antonov An-72

Interest in this new twin-turbofan light transport was heightened by the fact that its configuration resembles closely that of the much larger Boeing YC-14 advanced medium STOL transport (AMST), developed under USAF contract as a C-130 replacement. By coincidence, its first flight, on December 22, 1977, came at much the same time as America's decision to discontinue funding the AMST programme. The Soviet news agency *Tass* describes the An-72 as a STOL replacement for the twin-turboprop An-26 operated by Aeroflot and other airlines. Its military potential is obvious, particularly in support of VTOL combat aircraft like the Yak-36. Its low-pressure tyres and bogie landing gear are well suited to off-runway operations, and the high-set engines should avoid problems caused by foreign object ingestion. Primary purpose of this YC-14 style installation is to eject the jet efflux over the wing upper surface and down over large double-slotted flaps to provide a major increase in lift for STOL operation.

Power Plant: two high bypass ratio turbofans, believed to be related to the Lotarev D-36s used in the Yak-42 (each 14,200 lb st).
Dimensions: not released.
Weights: max payload 14,330 lb, gross weight 63,935 lb.
Performance: cruising speed 373–435 mph, range 620 miles with 11,023 lb payload.
Accommodation: expected to be similar to that of An-26.
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 fewer than twenty 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 fewer than 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, too, has Il-76s, for use particularly 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 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.

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 double-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 landing gear. The nose unit is fitted with two pairs of wheels, side by side. Each main unit comprises four pairs of wheels in two rows, and retracts in such a way that the wheels remain vertical but at 90° to the direction of flight. Four long fairings are required to enclose the wheels and actuating gear on each side. 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 include 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')

Aero L-29 Delfin (NATO 'Maya')

By purchasing second-line aircraft, such as trainers, agricultural sprayer/dusters, light helicopters, and sailplanes, from Czechoslovakia and Poland, the Soviet Union helps to maintain large and efficient aviation industries in those countries. Thus, the L-29 two-seat basic and advanced jet trainer was designed and manufactured in Czechoslovakia, and was selected as standard equipment throughout the air forces of all Warsaw Pact nations except Poland, which preferred its own TS-11 Iskra. More than 3,000 L-29s were built between 1963 and 1974, and continue to fly with about a dozen 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

For no logical reason, this excellent Czech-built trainer lacks a NATO reporting name, although many hundreds have been delivered to the air forces of the Soviet Union, four other Warsaw Pact nations, Iraq, and Afghanistan, usually as replacements for L-29s. The first prototype of the basic and advanced jet training version flew on November 4, 1968. Other versions are the L-39Z weapons trainer, and L-39D single-seat ground attack aircraft.
Power Plant: one Ivchenko AI-25-TL turbofan engine;

3,792 lb st.
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 528 miles on internal fuel.
Accommodation: crew of two, in tandem.
Armament (L-39D): 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 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 0⅞ in, length 32 ft 11¼ 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** 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 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 103.)

MiG-25U (NATO 'Foxbat-C')

(See page 103.)

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 104.)

Tupolev Tu-22U (NATO 'Blinder-D')

(See page 100.)

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.

Aero L-39 (J.M.G. Gradidge)

MiG-15UTI (NATO 'Midget') in Indonesian markings

Yakovlev Yak-28U (NATO 'Maestro')

Although the operational Yak-28P ('Firebar') is a tandem two-seater, it was not possible to adapt the existing rear cockpit in order to produce a dual-control training version. Instead, the Yakovlev bureau had to design a completely new front fuselage for the Yak-28U. This has two individual single-seat cockpits in tandem, each with its own blister canopy. The front canopy is sideways hinged, to starboard. The higher rear canopy is rearward-sliding. A very large conical probe projects forward of the nosecone.

Yakovlev Yak-36 trainer (NATO 'Forger-B')

(See page 104.)

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 expected to be manufactured 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.
Weights: empty 2,202 lb, gross 2,840 lb.
Performance: max speed 177 mph, service ceiling 19,750 ft, max range 329 miles.
Armament: none.

Sukhoi Su-7U (NATO 'Moujik') (Flight International)

Yakovlev Yak-11 (Air Portraits)

Yakovlev Yak-50 (Tass)

Helicopters

Kamov Ka-25 (NATO 'Hormone-A') (US Navy)

Mil (WSK-PZL-Swidnik) Mi-2s at a Soviet base in East Germany

Mil Mi-6 (NATO 'Hook')

Mil Mi-8 (NATO 'Hip-C')

Kamov Ka-25 (NATO 'Hormone')

For nearly 15 years, this crude-looking military helicopter has given outstanding service, meeting a variety of demands despite its fairly modest size. With the Yak-36 VTOL combat aircraft, it operates from the Soviet Navy's new class of carrier/cruisers. In modified form it acquires targets for anti-shipping missiles launched from Soviet cruisers on which it is based. Other tasks cannot yet be discussed, and the only variants that may yet 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 tail-fin; 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. ASW Ka-25s fly from cruisers of the *Kara* and *Kresta* classes, the carrier/cruiser *Kiev*, and from the helicopter cruisers *Moskva* and *Leningrad*, each of which accommodates about 18 aircraft. 'Hormone' and 'Haze' *(see pp. 110–111)* have largely replaced piston-engined Mi-4s in the Soviet Navy's ship and shore based force of around 250 helicopters. Other Ka-25s have been supplied to India, Syria, and Yugoslavia.

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. Production of the Ka-25 is said to have totalled about 460 aircraft, in 1966–75. *(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 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 and the most-heavily armed types in the world; and a total of at least 3,750 are deployed with first-line units of the Soviet tactical forces. Only type not built in the USSR is the small Mi of which manufacture was transferred to the WSK-PZ Swidnik in Poland in 1964. Several thousand have be delivered for military and commercial service, with t air forces of Bulgaria, Czechoslovakia, Hungary, Polar Romania, and the Soviet Union among known operato

Power Plant: two Isotov GTD-350P turboshaft engin each 400 or 450 shp.
Dimensions: rotor diameter 47 ft 6¾ in, length of fus lage 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, servi ceiling 13,125 ft, range 360 miles with max fuel, 1 miles with max payload.
Accommodation: pilot on flight deck; eight passenge 1,543 lb of freight, or four litters and medical attenda in cabin.
Armament: provision for air-to-surface rocket pod, two 'Sagger' air-to-surface missiles, on each side cabin.

Mil Mi-6 (NATO 'Hook')

When announced in the Autumn of 1957, the Mi-6 w the world's largest helicopter. It was also the first Sov production helicopter fitted with small fixed wings offload the main rotor in cruising flight. These wings normally removed when the aircraft operates in a fly crane role, carrying external freight. More than production Mi-6s are believed to have been delivered commercial and military service, the latter with the forces of the Soviet Union (500 currently operating w the tactical air forces), Algeria, Bulgaria, Egypt, Ethiop Iraq, Peru, Syria, and Vietnam.

Power Plant: two Soloviev D-25V turboshaft engin each 5,500 shp.
Dimensions: rotor diameter 114 ft 10 in, length of fu lage 108 ft 10½ in, height 32 ft 4 in.
Weights: empty 60,055 lb, gross 93,700 lb.
Performance: max speed 186 mph, service ceili 14,750 ft, range 404 miles with 13,228 lb payload.
Accommodation: crew of five; up to 65 passenge 26,450 lb of freight; or 41 litters and two medical atte dants.
Armament: some aircraft have a gun of unknown calib in the nose.

Mil Mi-8 (NATO 'Hip')

The importance of this twin-turbine general-purpos helicopter can be gauged from the fact that productio had reached an estimated total of 4,900 by last year, ar was continuing at the rate of about 750 a year. Large operator by far is the Soviet AF, which utilises th helicopter as an assault transport, heavily armed wi rockets and supported by the formidable Mi-24. At lea 27 other air forces also operate Mi-8s.

Power Plant: two Isotov TV2-117A turboshaft engine each 1,500 shp.
Dimensions: rotor diameter 69 ft 10¼ in, length of fus lage 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, servi ceiling 14,760 ft, range 264 miles as passenger tran port.
Accommodation: crew of two or three; up to 3 passengers, 8,820 lb of freight, 12 litters and attendar
Armament: a wide variety of external stores can be ca ried on a twin rack on each side of fuselage, includir bombs and pods each containing sixteen 57 mm roc ets.

Mil Mi-10 (NATO 'Harke')

So impressive have been the achievements of Sovi flying crane helicopters in combat areas such as th Ogaden region of Ethiopia that the Mi-10 was reinstat in production after a six-year break. Even now, produ tion is probably secondary to that of the Mi-6, which more versatile, but at least 60 Mi-10s are thought to ha been delivered. Each embodies the power plant, rot system, transmission, gearboxes, and most equipme of the Mi-6. The depth of the fuselage is reduced consi erably, and the tail-boom is deepened so that the fl tened undersurface extends unbroken to the tail. T Mi-10 also lacks the wings of the standard Mi-6. Payloa can be carried by sling or cable, clasped under the bel or on interchangeable wheeled platforms slung betwe the legs of the wide-track, stalky landing gear. Furth freight, or up to 28 passengers on tip-up seats, can accommodated in the main cabin.

Dimensions: rotor diameter 114 ft 10 in, length of fus lage 107 ft 9¾ in, height 32 ft 2 in.
Weights: empty 60,185 lb, gross 96,340 lb, max paylo including platform 33,070 lb.
Performance: max speed 124 mph, service ceiling 9,8 ft, range 155 miles with 26,455 lb platform payload.

Mil Mi-10 (NATO 'Harke')

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')

A new dimension was added to the mobility and hitting power of Warsaw Pact forces in eastern Europe in early 1974, when it became known that at least two units, of approximately squadron strength, in East Germany had been equipped with Mi-24 assault helicopters. In much the same class as the US Army's Sikorsky UH-60A Black Hawk, now in initial production, each of the first series of Mi-24s accommodated a squad of eight combat-equipped troops, and also carried heavy armament to clear the drop zone of enemy troops and vehicles. Design features new to Soviet rotorcraft included a fully retractable landing gear.

More recently, the Mi-24 has developed in two complementary forms, one configured for optimum efficiency as an assault transport, while retaining heavy armament; the other as an advanced gunship with secondary transport capability. Deliveries of all models are believed to exceed 800, with an increasing proportion of the latest variants. Full regiments of Mi-24s are based at Parchim and Stendal, northwest and west of Berlin, near the border with West Germany. The four variants of which details may be published are known by the following NATO reporting names:

Hind-A. Armed assault transport, with large enclosed flight deck for crew of four. The auxiliary wings of this version have considerable anhedral and each carry three weapon stations for heavy armament, supplemented by large-calibre machine-gun in nose. 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.

Soviet women pilots have set seven helicopter records in an aircraft identified as a Mil A-10, with two 1,500 shp Isotov TV2-117A turboshafts, as fitted in the Mi-8. They include a speed of 212.105 mph over a 15/25 km course and climb to 6,000 m (19,685 ft) in 7 min 43 sec, representing performance capability that might be expected from an aircraft in the class of the Mi-24. *(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. Entering service on the Mi-24 is a new 'fire and forget' anti-tank missile.

New Mil heavy-lift helicopter

Although the Mi-10 has gone back into production, it is expected that a new heavy-lift helicopter will appear soon, to replace the now-abandoned Mi-12 (V-12) which lifted loads of up to 88,636 lb during record attempts.

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-14 (NATO 'Haze')

Mil Mi-24 (NATO 'Hind-A')

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. Numbers deployed may be reduced as more SS-20s become available.

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 690-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')

This three-stage liquid-propellant missile was the heavyweight of the Soviet ICBM force at the time the SALT I agreement was signed, in May 1972. There were then 288 operational SS-9s, with 25 new silos under construction in SS-9 complexes. It was assumed that all 313 launchers would eventually carry new SS-18 missiles, and by the summer of last year the number of SS-9s in service had been reduced to 190. Those versions remain significant, identified by the US Department of Defense as follows:

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.

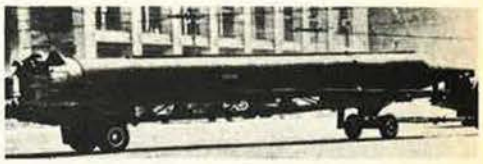
SS-9 Mod 2. This version constitutes the bulk of the SS-9 force. Single re-entry vehicle, with the largest yield of any known ICBM prior to the new SS-18.

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 *(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 about 750 missiles by Summer 1978. No pho-



SS-4 (NATO 'Sandal')

SS-5 (NATO 'Skean')

SS-9 (NATO 'Scarp')

tograph 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. As Mod 1 has been tested over both intercontinental and reduced ranges, the displaced missiles may be adapted for an IRBM role, unrestricted by SALT I.

SS-11 Mod 2. Similar to Mod 1, but fitted with penetration aids. Included in Mod 1 totals.

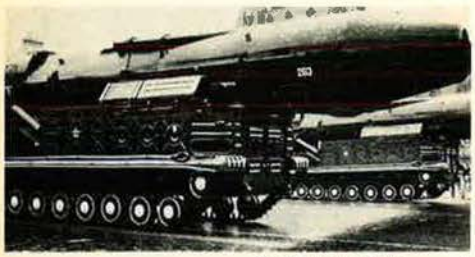
SS-11 Mod 3. First operational Soviet missile with MRVs (three 300 kiloton). Tests began in 1969, and greater targeting flexibility and accuracy led to rapid deployment; more than 60 emplaced. Range about 6,200 miles.

SS-13 (NATO 'Savage')

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. It is anticipated that the SS-13 will be replaced by the SS-16.

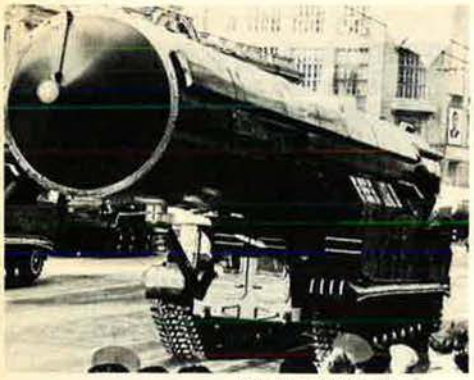
Power Plant: three-stage solid-propellant.
Guidance: inertial, offering CEP of 2 km (1¼ miles).
Warhead: nuclear (1 megaton).
Dimensions: length 68 ft 0 in, max diameter 6 ft 6 in (first-stage skirt).
Performance: range 5,000 miles.



SS-14 (NATO 'Scamp')

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-15 (NATO 'Scrooge')

SS-15 (NATO 'Scrooge')

This mobile ballistic missile system employs the same basic JS III transport/erector/launch vehicle as the SS-14, with a different missile. Nothing is known of the latter, except that it is fired from its launch-tube, which is raised to a vertical position for firing. The launch-tube is about 62 ft long, with a diameter of 6 ft 6 in, suggesting that the missile might have a range of up to 3,500 miles.

SS-X-16

Deployment of the SS-X-16, only solid propellant missile among the four new Soviet ICBMs, has been delayed longer than anticipated in the west. Nonetheless, it 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 about 5,000 miles.

SS-17

The FY 1979 Defense Department Report commented that the deployment of fourth-generation Soviet ICBMs—the SS-17, SS-18, and SS-19—continues at a rate of approximately 125 a year. The SS-17 and 18 are designed for cold launch, the SS-19 for hot launch. In a cold launch, the missile 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 60 SS-17s are operational, with conversion of other silos under way. Missiles deployed to date each have four MIRVs, shaped for high-speed atmospheric re-entry to ensure greater accuracy, and may achieve capability against hard targets by the early 1980s. Tests with a single large re-entry vehicle were initiated in February 1976. The Department of Defense believes that some of the silos modified for fourth-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 5 m (0.3 mile).

SS-18

The number of SS-9 launch groups being converted SS-18 configuration has increased annually for the p five years, and about 110 of the new two-stage liqu propellant missiles were operational by Summer 197 is expected that all SS-9 silos will be converted even ally, giving a force of 300 SS-18s, each with a grea throw-weight capability than any US ICBM. Three v sions have been identified:

SS-18 Mod 1. Initial operational type, with single megaton warhead.

SS-18 Mod 2. Operational with eight to ten relativ large (1–2 megaton) MIRVs dispensed by a post-bo vehicle (PBV) similar to that employed on the US M uteman III and Poseidon missiles. Expected to be t most widely deployed variant.

SS-18 Mod 3. Longer-range version, with single entry vehicle lighter and more accurate than that of M 1, which it may ultimately replace. Crew traini launches began in February 1976. CEP better than 59 achieved in trials.

Dimensions: length 118 ft 0 in, max diameter 10 ft 0 i
Performance: range 7,450 miles.

SS-19

A year ago, the US Department of Defense believe that, because of the SS-19's combination of accura and yield, though with fewer re-entry vehicles than t SS-18 Mod 2, it was then the most capable of Russi fourth-generation ICBMs. Testing had begun in ea 1974, proving so successful that more than 200 had be deployed by early 1978, with additional SS-11 silos un conversion. Each of the initial series carries a MIR payload of six re-entry vehicles, twice as many as M uteman III carries and described as being twice as lar A version with a single re-entry vehicle is under te However, as with the SS-17, all SS-19 silos would co as MIRVed missile launchers under US SALT II propos since they have been tested in a MIRV mode. The h launched SS-19 is thought to have a range of more th 6,300 miles and to be longer than the SS-11 and SS- requiring more extensive modification to any existi silos in which it is emplaced.

SS-20

This mobile solid-propellant IRBM, which consists the first two stages of the SS-X-16 ICBM, represents th most formidable Soviet threat to Western Europe. February 1978, the US Department of Defense estimate that it has a range of at least 1,875 miles, carrying thre MIRVs. Since then, the range has been revised to mo than 3,000 miles (keeping the missile outside SALT lin itations), and more than 100 are already operational. as expected, SS-20s eventually replace all of the o SS-4s and SS-5s on a one-for-one basis, they will treb the number of warheads provided by the earli weapons, *and* add a multiple refire capability from the tracked carrier/launchers. CEP is reported to be abou 2,500 ft when fired from the mobile launcher at a pr surveyed site. Of special significance is that the SS-2 could be given a range conforming to the SALT defin tion of ICBM range (5,500 km; 3,420 miles) either by th addition of a third stage or by offloading MIRVs.

Fifth-generation ICBMs

The FY 1979 DoD Report stated: "The Soviets have fifth generation of ICBMs in development, estimated t consist of four missiles. Flight testing of one or two these missiles could begin at any time, with the other following by the early 1980s."

AS-3 (NATO 'Kangaroo')

When comparing the range of Soviet air-to-surfac and submarine-launched cruise missiles with their U counterparts, it is important to remember that the Sovi requirement for long range is minimal. Fifty-five impo tant US cities with some 74,000,000 inhabitants a within 530 miles (850 km) of the 100 fathoms depth curv in the Atlantic and Pacific Oceans. Only six of the maj cities in the Soviet Union, with some 2,200,000 peopl are located within a similar distance of the 100 fathom depth curve. There is, however, no doubt about Sovi capability to develop a strategic cruise missile if it we required. Largest current Soviet air-to-surface missile the AS-3, which resembles a sweptwing jet fighter in siz and configuration, and was displayed for the first tim under its Tu-95 carrier aircraft on Aviation Day 1961. It known still to be operational in large numbers with a nu clear warhead on Tu-95 'Bear-B' and 'C' bombers.

Guidance: radio command.
Dimensions: span 30 ft 0 in, length 48 ft 11 in.
Weight: 24,250 lb.
Performance: max speed Mach 2, range 400 miles.

AS-4 (NATO 'Kitchen')

Developed as a stand-off weapon for the Tu-95 an Tu-22 strategic bombers, and now carried also by th

wing-wing Tu-26, the AS-4 was first seen on a single u-22 ('Blinder-B') in 1961. Most of the 22 Tu-22s which articipated in the 1967 Aviation Day display at omodedovo carried an AS-4, semi-submerged in the uselage, and production by 1976 was stated by the UK efence Minister to be around 1,000. The missile, which as been seen in more than one form, has an aeroplane onfiguration, with stubby delta wings and cruciform tail urfaces. Propulsion is believed to be by liquid-ropellant rocket motor; a nuclear warhead can be as-umed.

imensions: span 8 ft 0 in, length 37 ft 0 in.
/eight: 13,225 lb.
erformance: max speed above Mach 2, range 185 miles at low altitude.

AS-6 (NATO 'Kingfish')

First sighting of this new 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 Tu-26 ('Backfire').

Dimensions: span 8 ft 2½ in, length 34 ft 6 in.
Performance: max speed Mach 3, range 135 miles at low altitude.

'Kingfish' air-to-surface missile under the port wing of a Tu-16 (JASDF)

Airborne and Tactical Defence Missiles

Helicopter missile (NATO 'Swatter')

No photograph has yet shown the type of interim anti-tank missile carried on the four wingtip launchers of the Hind-A and D' versions of the Mil Mi-24 assault helicopter, pending availability of the AS-8. However, the weapon carriers appear to have no provision for wire guidance, and 'Swatter' is the only one of three standard Soviet anti-tank missiles known to operate without wires. It is steered in flight via elevons on the trailing-edges of its rear-mounted cruciform wings. Its blunt nose suggests the likelihood of a terminal homing system, with control by means of the small foreplanes.

Dimensions: span 2 ft 2 in, length 2 ft 11½ in.
Weight: 55 lb.
Performance: cruising speed 335 mph, range 985–7,220 ft.

AS-2 (NATO 'Kipper')

First seen under a Tu-16 ('Badger-C') at the 1961 Aviation Day display, this aeroplane-configuration missile was described by the commentator at Tushino as an anti-shipping weapon. The underslung power plant is almost certainly a turbojet. Radar is carried in the nose of the Tu-16 'Badger' carrier aircraft, and guidance is believed to be radio command with active terminal homing.

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 rocket propulsion eliminated the need for a ram air intake, and permitted the use of a larger radar inside the hemispherical nose fairing.

Dimensions: span 15 ft 0 in, length 31 ft 0 in.
Performance: range 100 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

AS-8 is reported to be the designation given in the west to the "fire and forget" tactical missile that has been developed for the Mi-24 ('Hind-A and D') helicopter, and will also arm a new Soviet lightweight attack helicopter now under development. Similar in concept to the US Hellfire, it is believed to have a max range of 5 miles in its initial form, as delivered to Mi-24 units in 1977.

AS-X-9

A reported anti-radiation missile, with a range of 50–56 miles, to arm the Su-19 ('Fencer').

AS-X-10

Described as an electro-optical homing air-to-surface missile with a range of about 6.2 miles. A similar weapon, but with a range of about 25 miles, is referred to in the US as the Soviet Advanced TASM (tactical air-to-surface missile) and is probably at a comparable stage of development.

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-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 latest 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 at present 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.

'Anab' air-to-air missiles on a Yak-28P interceptor (Flug Revue)

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.

Surface-to-Air Missiles

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')

Unlike the SA-1, this missile has been supplied to most of the Soviet Union's allies and friends, and 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-4 (NATO 'Ganef') (Camera Press)

SA-6 (NATO 'Gainful') (Rex Features)

SA-8 (NATO 'Gecko') (Novosti)

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. When first displayed publicly in Moscow, in 1963, it was said to have anti-missile capability. This must be limited, even if the warhead section separates after second-stage burnout and is able to use an inbuilt rocket motor during the final stages of interception.

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, it empty casing becomes a ramjet combustion chambe for ram air mixed with the exhaust from a solid propellant gas generator.
Guidance: radio command; semi-active radar termina 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, ef fective ceiling 59,000 ft.

SA-7 (NATO 'Grail')

This Soviet counterpart of the US shoulder-fired heat-seeking Redeye first proved its effectiveness i Vietnam against slower, low-flying aircraft and helicop ters. It repeated the process during the 1973 Arab-Israel war, despite countermeasures, including the use o decoy flares, and deflecting upward the exhaust o helicopters. In addition to its use by infantry, the SA-7 i carried by vehicles, including ships, in batteries of four six, and eight, for both offensive and defensive employ ment, with radar aiming. An uprated version has a mor powerful motor, giving higher speed and an effectiv ceiling of about 14,000 ft. *(Data for basic version.)*

Power Plant: solid-propellant booster/sustainer.
Guidance: infra-red homing with filter to screen o 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 2.2 miles, effective ceiling 5,000 ft.

SA-8 (NATO 'Gecko')

First displayed publicly during the parade throug Moscow's Red Square on November 7, 1975, this short range, all-weather surface-to-air weapon system ha much in common with the European Roland. Missil configuration is conventional, with canard foreplane control surfaces and fixed tail-fins. Fire control equip ment 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 o 18 miles, folds down behind the launcher, enabling the weapon system to be airlifted by Soviet transport air craft. The tracking radar is of the pulsed type, with an estimated range of 12–15 miles. The SA-8 may use the same missile as the well-established but enigmatic naval SA-N-4 system. Each vehicle is believed to carry a total of 8 missiles.

Power Plant: probably dual-thrust solid-propellant.
Guidance: command guidance by proportional naviga tion. 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 amphibious vehicle, carrying two quadruple box launchers for missiles described as uprated SA-7 'Grails'. The launchers rest 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 this year to the mid-1980s.

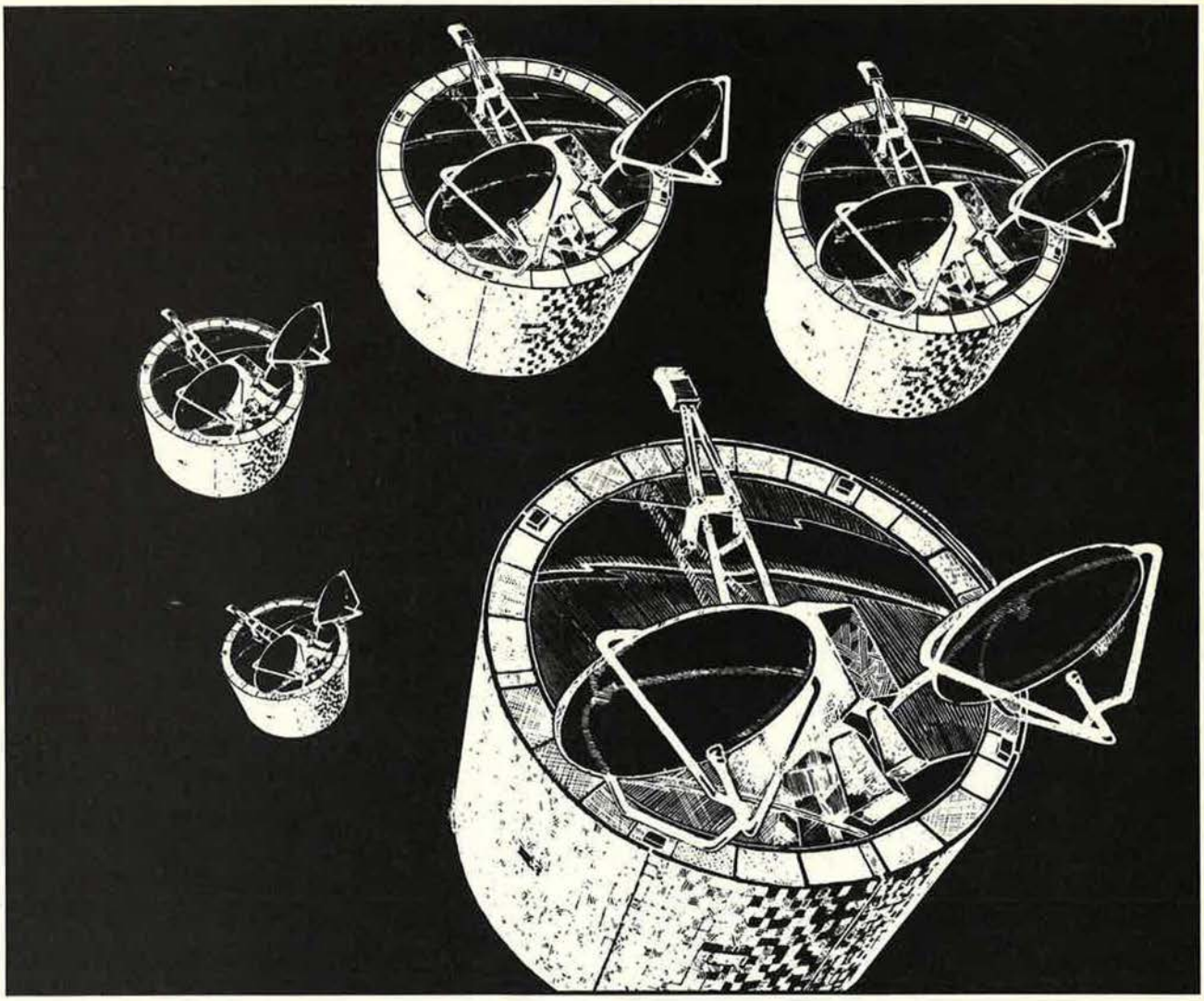
SA-N-3 (NATO 'Goblet')

The twin-round surface-to-air missile launchers fitted to many of the latest Soviet naval vessels, including the carrier/cruiser *Kiev*, 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 used in the land-based mobile SA-8 system.

TWO MORE PARTNERS IN NATIONAL DEFENSE



Two more spacecraft in the Defense Satellite Communications System (DSCS II) were successfully placed in orbit December 13, 1978. Joining those already in space, these TRW-built telecommunications satellites form the first high capacity, worldwide, military space communications system for command and control.

DSCS II greatly improves our capacity for keeping our worldwide forces in close touch with strategic commanders throughout the Department of Defense. DSCS II is being acquired by the U.S. Air Force Space and Missile Systems Organization for the Defense Communications Agency.

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TRW is the nation's leader in military and government telecommunications satellites.

TWO MORE SUCCESSFUL SPACECRAFT

from a company called **TRW**

The Bulletin Board

By James A. McDonnell, Jr., MILITARY RELATIONS EDITOR

DoD Budget Highlights

The President's FY '80 military budget calls for a decrease of 4,000 in USAF active-duty strength to a total of 559,000, and slight increases in Air Guard and Air Force Reserve manpower. The budget also provides for another military-Civil Service pay cap—probably 5.5 percent again. The exact amount won't be determined until this summer.

Defense Secretary Harold Brown, in briefing the press on the new budget, was asked how the Administration could keep military and Defense civilian employee morale and productivity up by holding pay raises below the inflation rate. Dr. Brown replied that "government employees have to be compensated fairly" and that the planned pay increase "does that."

Military and Civil Service retirees, meantime, will receive a 3.9 percent pay hike effective March 1, covering the past six months. This assures them a nine percent annual rate boost. Defense is forecasting 38,000 more military retirees, to total 1,320,000 by the end of FY '80. Military retirement pay outlays are expected to hit $10.3 billion this fiscal year and $11.4 billion in FY '80.

The principal new compensation item proposed in the budget is $40 million to increase PCS mileage allowances. Certain programs the Pentagon previously advanced but Congress rejected are included again. They include DOPMA, which carries a first-year price tag of $23 million, a family separation allowance, and a military trailer allowance. The latter would allow trailer owners to be reimbursed for their expenses on PCS moves.

Defense also wants to save an estimated $30 million by eliminating "dual compensation" for Reserv

AFA Believes . . .

A Military Career: Not Just Another Job

AFA believes that a recent address by Air Force DCS/Manpower and Personnel, Lt. Gen. Bennie L. Davis, before AFA's Pease Chapter, at Pease AFB, N. H., deserves to be brought to our readers' attention. Excerpts from this candid and hard-hitting presentation follow:

I am particularly pleased to be able to take part in a meeting sponsored by the Air Force Association. In the past four and a half years, I've observed at close range the effectiveness of the AFA as an advocate . . . for aerospace power and for people throughout the Air Force. But just as the real strength of the Air Force is found at our bases, I think the real strength of the AFA is found in its local chapters. . . .

For five years now, we have made the all-volunteer philosophy work. In the Air Force, with the exception of physicians and some moderate reserve shortfalls, we have consistently met our numerical goals and kept our quality standards high. But the fact that we succeeded does not mean the job has been easy. To the contrary, it's been tough and is steadily getting tougher. Last month [December], for the first time, we fell short of our enlisted recruiting objectives. . . .

In general, I see encouraging signs of renewed *public* support for a strong national defense, and this attitude is reflected in the support most of our programs are receiving in Congress. Certainly we are *not* receiving rubber-stamp approval . . . but we *are* getting a fair and reasonable chance to present our requirements, and a favorable reception for many improvements in our people programs.

Yet, at the same time that *external* support is growing, there are surface signals of discontent and dissatisfaction from *within* the force. What's causing this apparent dichotomy? How serious is it? What can and should we as leaders and concerned members of the Air Force community do about it? . . .

Certainly, as members of our society, we should be aware of its trends and changes. We should examine new ideas, and, when appropriate, adopt or adapt to them. But we need not . . . must not . . . bend with every change in the wind. I recognize and indeed I am very familiar with such terms and concepts as self-actualization, self-realization, "doing one's own thing."

A free society can accommodate these concepts . . . but somewhere in that society there must be people whose so-called "own thing" can be defined by such values as discipline, duty, and dedication. . . . The day we accept the premise that the Air Force is nothing more than another occupation, or even *primarily* an occupation, this country is in grave danger.

Quality of life is important. I've fought for it in the budget process. I've argued for it as a witness at congressional hearings. I intend to keep on doing so. But I will not, cannot, let my concern for the comfort of Air Force people override my concern for the well-being of the country we serve, and the successful accomplishment of the mission we have been assigned. I have a tremendous respect for our young people. . . . It takes . . . courage and independence today to stay in the military, to make it a lifelong career, despite its frustrations and uncertainties. . . .

I am not convinced that our people look at their pay checks as the most important evidence that what they're doing is valuable and worthwhile. And I am most certainly not convinced that we should lend credence to the naysayers by saying we ascribe to their premises.

sts and Guardsmen who work for the government. Reserve Forces administrative duty pay would also go by the boards under the new budget. Both these changes were turned down by Congress last year and could suffer the same fate this year.

Air Guard and Air Force Reserve strengths inch up under the new budget, to 93,460 and 57,181, respectively.

Secretary Brown and his aides made these other points on the new budget:

- No new money is requested for additional family housing. All construction money will go into the operation and maintenance of the government's 388,100 existing housing units.
- Congress again is being asked to approve an overhaul in the wage board (blue-collar) pay schedule that would cut $161 million in costs in FY '80 alone.
- Civilian employment Defense-wide should continue to drop as the Pentagon tightens the hiring screws. Total employment by the end of this year should hit 994,000, some 27,000 below the FY '77 level. By end-FY '81, the figure should be down to 979,000.

New Recruit Lure: More Stripes

Stung by its December 1978 recruiting shortfall, the first month in years it has not filled its quota, the Air Force has approved new enlistment incentives for all Junior ROTC graduates and other quality prospects. The moves underscore USAF's determination to maintain manpower excellence even though the recruiting market has deteriorated from poor to grim. Here are the new lures:

- Air Force JROTC graduates and Civil Air Patrol members who earned the Billy Mitchell Award will, on enlistment, receive A1C (E-3) stripes and pay. They'll draw $485.40 a month basic pay, $66 more than regular airmen basics (E-1).
- Youths who enlist for six-year hitches will be promoted to E-3 on completion of basic training at Lackland AFB, Tex. Four years remains the normal enlistment term.
- Youths who enlist to fill critical skills will enter as E-2s.

AFA officials are gratified over the recognition finally being given JROTC graduates. The Association has long endorsed E-3 entry for them. Army JROTC grads have enjoyed automatic E-3 on enlistment for many years.

The Air Force Recruiting Service fell about 700 recruits short of its 5,450 nonprior-service enlistment goal for December 1978. The first such shortfall in recent memory, it has triggered concern throughout USAF. The extra-stripes-on-enlistment lures constitute one reaction. Other sweeteners are expected, although probably not soon enough for immediate help.

The other services enjoy much larger recruiting budgets and reenlistment bonus funds than does the Air Force.

A military career is not just another job. It calls for self-sacrifice, not self-interest. It calls for self-discipline, not self-indulgence. To bring those concepts down to more concrete terms, it calls for SAC alerts, TAC deployments, and MAC worldwide airlift missions. National defense is not a business that opens its doors at 8:00 a.m. Monday and shuts off its lights at 5:00 p.m. Friday.

National defense is not an enterprise whose only branch offices are located in the sunshine belt of the continental United States.

National defense calls for a special kind of dedication, and a motivation to serve and excel. . . .

I am not saying that the old ways are the only ways to run the Air Force, or that we should consider all our traditions and values as sacred beyond the need for periodic reexamination. But I am saying that in our search for improvements, we must not confuse change with progress, and we must not lose sight of who we are and why we are.

On the positive side, I've also received various forms of communication from our young members that they want bigger jobs, more responsibility, more freedom of action to make their own decisions and live with the results. This, I firmly believe, is more representative of the true feelings of the majority of the men and women of the Air Force. I have not lost confidence in the coming generation of leaders. . . .

Certainly there are some things that are wrong with the Air Force. They need to be fixed. But *I* am not going to fix them; *we* are going to fix them. We are not going to do that by listening to the voices of gloom and doom, or by throwing our hands up in despair, or by standing around waiting for somebody else to find the solutions for us. We are going to do it the same way we've always found successful—hard, steady work.

It's not a case of "The System" vs. the individual, or the field vs. the headquarters, or even military priorities vs. civilian priorities. If there's a problem anywhere along the line, we can't look at it as "*their*" problem—it's *our* problem, and *we* need to take an active, constructive part in working out a solution.

We need organizations such as the Air Force Association and individuals such as our retired members telling our story in their communities. We need people on active duty doing their part to make sure we continue to have a good story to tell. We need policies and legislation that promote equity and stability and predictability. We need people who are capable and committed, willing to take the risks and responsibilities of national defense. . . .

Because we need to hold the line on costs where we can, and get the highest productivity possible from the resources we do have, our people can expect longer tours, less frequent moves, and, for the rated force, few transfers between weapon systems. Rated supplement jobs will become scarcer, with pilots and navigators spending a somewhat greater proportion of their careers on crew duty.

Personnel costs will continue to be a concern—to the services, the Congress, and the public. I am convinced that military people represent one of the nation's best investments and biggest bargains. Unfortunately, that feeling is not universally held throughout our society. Here, especially, is where organizations such as AFA can help us build and maintain public awareness.

We will see extensive debate on military compensation and retirement as the OSD legislative proposals take shape and congressional deliberations get under way . . . and most likely some changes from our current systems. However, I do expect "grandfather" provisions to protect the interests of those already on active duty; and because of the complexity and significance of the issues, I expect Congress to scrutinize the proposals very carefully before enacting any changes to the current compensation system.

Finally, I see continued emphasis on quality—quality people, performance, and programs.

For all the changes of the past decade, and those yet to come, there are some things that I *don't* see changing . . . and those include the demand for able, dedicated military professionals, and the tradition of the Air Force of responding to that demand.

That tradition will stand the test of time because you—we—will make *sure* that it does. ■

The Bulletin Board

In related manpower developments, Headquarters recently reported a forty-one percent first-term reenlistment rate for 1978, the highest ever. However, only 29,000 first-termers were eligible for reupping, so the high rate meant only 11,900 shipovers. That's about 2,600 fewer than were needed, though supplemental prior-service enlistments reduced the deficit. The Air Force hopes to reenlist nearly 15,000 first-termers this year.

Second-term and career reenlistment rates continue to meet needs. In FY '78, nearly 11,000 second-termers, or sixty-five percent of the eligibles, reupped. Some 26,500 careerists, or ninety-three percent of the eligibles, also reenlisted.

S&E Officers Urgently Needed

The Recruiting Service's advertising department is trying to get the word to science and engineering (S&E) students around the country that USAF has excellent job opportunities awaiting. But there's little advertising money. The FY '79 military budget gives the Army ten times the recruitment advertising funds it provides the Air Force. Even the tiny Marine Corps has a bigger budget. So the Recruiting Service is eyeing other ways "to reach the market." It urges current S&E blue-suiters to write articles with a USAF flavor, then buck them to the Secretary of the Air Force's Magazine and Book Branch, which will offer the material to civilian S&E-type publications.

DOPMA Again in Spotlight

The services and the Defense Department once again are giving the Defense Officer Personnel Management Act (DOPMA) the old college try. They want full congressional approval without further delay, and officials say, "Success is near—1979 is the year." But they're tempering their enthusiasm, realizing they may have to accept certain changes they don't relish.

The DOPMA they want is the one the House approved last year, but which the Senate Armed Services manpower subcommittee shelved. Now the subcommittee, headed by Sen. Sam Nunn (D-Ga.), has promised early hearings on the measure. But Pentagon officials fear the senators will consider and perhaps insist on major changes, including:

- Reducing officer grade ceilings, O-4 through O-6, by ten to fifteen percent—maybe even more to O-6. This would slow promotions, hurt retention, and damage morale, the Pentagon holds.
- Including general officer strength tables, with slight reductions from the current 1,119-level Defense-wide, in the bill. The Air Force and the other services hold that DOPMA is complicated enough without cranking in flag authorizations and associated promotion rules. The Pentagon, furthermore, has promised to address the star grade billet issue in separate legislation after DOPMA is enacted.
- Selective retention of O-3s passed over for O-4 and continuation of other deferred officers in different grades.

The Air Force remains foursquare behind the up-or-out concept, but is bending a bit on the controversial issue. As reported in last month's "Bulletin Board," promotions to

Ed Gates . . . Speaking of People

How Personnel Management Evolved

—Regulations published in 1812 required that the four lieutenants in each Army company had to wait for a captain to be promoted, retire, or die before one of the quartet could advance to replace him.

—Just prior to the Mexican War "promotion was so slow that a lieutenant had little hope of ever becoming a captain."

—Before the Civil War, Lt. Ulysses S. Grant wrote of his regimental colonel: ". . . a most estimable . . . old gentleman . . . he decided that with war imminent he should conduct battalion drill, which he had not done in many years; after two or three evolutions he fell dead."

—In the Seminole wars, a first lieutenant, a West Point graduate with eighteen years of service, commanded a garrison of 250 men in the heart of enemy territory. He received only $54 per month ("exclusive of a servant to take charge of his tent"). He was unhappy that, under the existing system of separate service pay rates, a Naval officer of equivalent service and grade who was not in combat got three times as much pay.

—"When the first Naval [appointment] lists were being compiled by Congress, it took no eagle eye to discern the markings of nepotism and sectional influence. The commander in chief of the fleet was Esek Hopkins of Rhode Island, a brother of the chairman of the Naval Committee."

—"Naval officers before the Civil War could look forward, at best, to only two promotions in a career, and the final one he could seldom reach until he was in his seventies."

—Even in the early 1900s, schemes to invoke "plucking" and create attrition, and thereby vitalize the Navy's officer corps, had not worked out. "In 1906, the youngest captain in the US Navy was still some twenty years older than his British or European counterpart."

These and other examples of management's failure to establish reasonable promotion, retirement, and other personnel policies and stick to them show up in a new study prepared for USAF by the Rand Corp. The full title: "The Evolution of Military Officer Personnel Management Policies: A Preliminary Study with Parallels from Industry."

The report, which is not nearly as formidable as that label might suggest, is better known as Project AIR FORCE. Its appearance comes at an appropriate time, as the Pentagon moves with renewed vigor to secure Senate approval of DOPMA, the long-pending legislation designed to give today's military leaders improved tools for managing the officer corps.

As the Rand study makes clear, the US government throughout much of the nation's existence did little to manage military and naval officers. The result was promotion stagnation, little or no in-service training or education, few workable plans for weeding out the aged and disabled, inequitable pay scales, and other shortcomings. Project AIR FORCE reviews these personnel management issues from colonial times to the present.

Air Force authorities consider publication of the report timely because of the close attention the services and Congress are giving the up-or-out system, military retirement and other current personnel issues. "The historical perspective in this report provides valuable insights into how and

mporary captain have been vitched from a "best qualified" to "fully qualified" system. This eans an almost 100 percent selec-on rate instead of ninety-seven ercent. Perhaps 200–250 additional omotions will mean fewer pass-ers. Similar switches are contem-ated for other promotion boards.

• Commissioning all new officers itially as Reserves, and withhold-g Regular status until completion a two- to three-year probationary eriod. Future Air Force Academy aduates, who are presently auto-atically given Regular berths, ould be hit as well. The services ly the high costs, stiff competi-on, and intense training at the ademies amply justify the present ocedure.

• Increasing mandatory time-in-ade prior to retirement. Some of-ers retire six months after promo-on, so Uncle Sam doesn't get uch of a return on them. The pe-od could be increased.

• Allowing Reserve officers to re-ain on active duty after the elev-nth year of service. The Pentagon ants to establish, under DOPMA, n all-Regular force starting at the leventh year, claiming it will solve the problems long associated with Reserve officers pursuing twenty-year careers but being treated as second-class citizens in the process.

DOPMA as passed by the House last year raises officer severance pay from $15,000 to up to $30,000.

Some DOPMA supporters feel differences on the disputed issues can be compromised and that the officer management package, complete with USAF's permanent grade ceiling tables, will be enacted before next September 30. That's when the present temporary tables expire.

Instructor Jobs Open

For years the Air Force has filled basic training instructor jobs with highly qualified NCO volunteers. The rationale: The way new recruits initially are trained and handled impacts heavily on their level of performance thereafter. But few candidates are volunteering, and the service is threatening to assign non-volunteers to the jobs, all at Lackland AFB, Tex. In a last-ditch attempt to avoid that, Hq. USAF is urging commanders to nudge likely E-4s, E-5s, and E-6s. It wants applications by the middle of this month. The jobs carry special-duty assignment proficiency pay of $50 to $100 a month.

Reserves Embrace SBP

Thousands of Air Force Reservists and Guardsmen are signing up for the broadened Survivor Benefits Plan, for which they became eligible last October. That's the word from the Air Reserve Personnel Center in Denver, which is handling the project.

Center spokesmen told AIR FORCE Magazine that as of late January, approximately 8,000—of the estimated 47,000—eligible Reservists (those with twenty-year retirement letters but who are not yet sixty) had signed up. More than half wanted immediate coverage.

Many of the other eligibles, the Center said, were waiting for actuarial cost data that the Defense Department and Congress had delayed getting out. Once this appears, the Center is to pass it along to all eligibles. Officials said they expect thousands more to sign up at that time.

There should be no problem because the deadline for joining the

hy many officer management policies have evolved into eir present form," Maj. Gen. Harry A. Morris told AIR ORCE Magazine. As the Hq. USAF Director of Personnel ans, he and his aides are deeply involved in these matters. While the military's management of its officer corps was x to nonexistent during the nation's earlier years, more ecent times have brought definite improvement. Project IR FORCE finds it today "as good as personnel manage-ent in the giant firms of industry and . . . better than that the middle and small-sized firms." Indeed, much of the port explains how facets of personnel management in the ilitary excel those in industry.

In the earlier days, Rand points out, there was a constant ush by Congress and the public to eliminate the armed ervices altogether. Even up to the start of World War I, here was widespread favoritism and nepotism in the granting commissions; the atmosphere was hardly conducive to reating efficiency and sound personnel principles.

But these and other irritants and inconsistencies were radually overcome, and the study gives the services good arks for leading the way over industry in numerous in-ances. Examples:

• **Force-out for age, unfitness.** The military instituted is idea long before the private sector did, even though ndustry's "superannuated presidents prevented advancement younger men." Many firms collapsed "because manage-ent was too old to meet the physical demands of new com-etition." Rand cites the Ford Motor Co. as a good example how a company "survived because a son was able to ake over from a father in time to repair the damage which ad been done." At Scott Paper, "The chief executive stayed n so long that eleven vice presidents were retired before ey could become president."

• **Training.** Again, long before industry realized the need r a stream of trained managers to take over from older anagement, the military understood that to keep going under crisis and combat a flow of trained officers was essential to replace those who became casualties. This led to what Project AIR FORCE calls the "excellent system of military schools, maneuvers, map exercises, correspondence courses, and on-the-job training."

• **Promotions.** The military's system of impartial boards, elimination of politics from the selection process, and other factors, "have resulted in a system which has been gradually adopted in industry." One omission in the Rand study: no discussion of the military's promotion bonanza during World War II.

• **Staff.** The military in 1815 first realized the necessity of a personnel management section—in effect, a "staff" to handle the problems associated with the management of its managers (though little was done to implement the concept until early in the 20th century). However, the first recognition in industry that "the manager needed to be managed" wasn't even published until 1918.

The report goes on to label as a "misconception" the idea that industry retention rates of its managers are higher than those in the military. Actually, Rand says, they leave at about the same frequency as military officers, and this includes newcomers in the first five years of their jobs as prospective managers.

A "second misconception . . . is that industry is more ruthless in cleaning out its deadwood than is the military." Not so, the report finds, declaring that "except for a very few cases for cause, managers who are marginally satisfactory are kept on by the firm or 'shelved' somewhere doing unimportant jobs. Any change is caused by a reversal in the firm's business fortunes. If business falls off dramatically either because of a depression or competition, then the firm will clean out its deadwood."

But "in contradistinction to this haphazard process, the military system is extremely formal, legalized by congressional legislation, and is a case of up-or-out."

The Bulletin Board

SBP's new program is September 30. Those who receive their twenty-year letters after June 30 will have ninety days to sign up. Already there have been some "deathbed cases" where claims were filed shortly after passage of the new law. Payment will begin when the actuarial cost data becomes available, say officials.

The ARPC toll-free number for queries on the plan is (800) 525-1391.

The new measure provides annuities for Reserve/Guard widows whose husbands completed twenty years for Reserve/Guard retirement but who hadn't reached age sixty. Up to fifty-five percent of their retired pay can be continued to their beneficiaries.

Sen. Strom Thurmond (R-S. C.), meanwhile, has introduced a bill to (1) reduce from 100 to fifty percent the Social Security offset based on the retiree's active military service; and (2) reduce the cost of the Survivor Benefits Plan to long-time participants. They now pay about $15 more per month than Civil Service retirees pay for the same annuity. These provisions, which AFA strongly supports, were stripped from last fall's SBP improvement measure following disclosure of differing cost figures between the Pentagon and Congress.

Vet Budget, Programs Up

The President's record $21 billion Veterans Administration budget for FY '80 focuses special attention on Vietnam-era vets. But it also contains a 7.8 percent raise in disability compensation for the 2,700,000 service-connected veterans of all wars.

The latter received a 7.3 percent compensation boost last October, and many also have received additional "dependent" compensation payments. Congress is expected to go along with the new request.

Under the VA's new budget, the Administration is seeking a new psychological readjustment counseling program for Viet-era veterans and their families. It also wants a two-year extension of GI Bill eligibility for "educationally disadvantaged" Viet-era vets—those lacking a high school diploma. The Administration is not seeking larger GI Bill payments, though several congressmen have already introduced bills that would raise the payments.

Cornelius V. Whitney, a founder of Pan American World Airways, recently received Embry-Riddle University's doctoral degree in aviation management. Listening to Mr. Whitney's acceptance remarks are (from left) Maj. Gen. William Spruance, ANG (Ret.), Chairman of the Daytona Beach, Fla., school's board and a member of AFA's board; William Motzer and Jack Hunt, president of Embry-Riddle

The counseling measure got quick congressional attention when the Senate Veterans Affairs Committee held late January hearings on it and other special programs for Viet-era veterans. The committee, besides the counseling item, is also weighing a five-year test program of preventive health care for veterans with service-connected disabilities. It's also talking about expanding the use of community services for VA's alcohol and drug treatment and rehabilitation services.

VA Administrator Max Cleland briefed reporters on the agency's new budget, which is about half a billion over the budget for the present year. He said the new budget provides funds for (1) improving rehabilitation programs for service-disabled veterans; (2) increases in the vocational rehabilitation student loan limit from $200 to $400; and (3) treatment on a contract basis of certain psychiatric and alcohol- and drug-dependent veterans in community programs.

He noted that, contrary to what some critics have declared, VA's medical care funds are not being cut. The new budget, Cleland said, provides a record $5.6 billion for VA medical care in 1980, a net increase of $185.8 million over the current year. The budget also contains an added $20.5 million to pay for increased burial allowances voted survivors last year, the VA chief added.

Cleland, amplifying what he said are VA concerns for young veterans, noted that sixteen percent of the agency's employees are Vietnam-era veterans.

Chief Faults Air Force

Air Force Chief of Staff Gen. Le Allen, Jr., in a recent address Arizona newsmen, examined th reasons officer retention is hurtin He then delivered this statement:

"We have compounded the prob lem ourselves with sometimes poorl focused management efforts an pressure to compensate for forc reductions and to support increase readiness by working longer hours We've pushed our people hard. T some extent, we may have lost th vital balance between concer about the task and concern abou the individual. We are now payin closer attention to this balance— and making improvements. . . ."

Pilots Favored for Promotions

A pilot's rating and an advance degree played major roles in recen promotion selection to brigadie general and colonel.

Air Force named fifty-three colo nels for temporary BG, of whon forty are pilots, five are navigators and only four are nonrated. Thei educational statistics show tw holding doctorates, thirty-nine wit MAs, six with bachelor's degree and only two without degrees. Tw of the seventeen service academ graduates on the list, Robert C Oaks and Robert D. Beckel, ar Air Force Academy alumni. Th lone woman chosen for a star i Sarah P. Wells, head nurse for th Systems Command.

The new colonels list will elevat 708 lieutenant colonels. Forty-on percent of the first-time eligibl

ilots were selected, compared to venty-three percent of the naviga- ›rs and thirty-six percent of the onrateds.

Of the 451 first-time eligible line Cs chosen for O-6, twenty-nine old doctorates, 303 own MAs, and 10 have at least a BA. Only nine ack a degree. Nearly all of the line electees (622 of 645) presented op box "1" as their most recent ontrolled OER.

Short Bursts

The first bill introduced in the new Congress to beef up the **all but defunct Selective Service** system is sponsored by Rep. Charles E. Bennett (D-Fla.). It would provide for peacetime military registrations and for comprehensive assessments of mobilization capability, aimed especially at solving Reserve manning problems. Bennett's bill would put Selective Service planning under the Defense Department, rather than continuing it as a separate agency.

Two recomputation bills are among the measures introduced in the early days of the 96th Congress. The identical bills, sponsored by Rep. Jack Edwards (R-Ala.), and Rep. C. W. Young (R-Fla.) would recompute at age sixty the pay of all retirees presently computed on pay scales that were in effect before January 1, 1972. ■

Senior Staff Changes

PROMOTIONS: To Major General: Joseph B. **Dobbs.**

To AFRES Major General: Bruce M. **Davidson;** Walter R. **Longanecker,** Jr.; George W. **Miller** III; Dalton S. **Oliver;** John E. **Taylor,** Jr.

To Brigadier General: Clarence A. **Autery;** Leon W. **Babcock,** Jr.; Robert D. **Beckel;** Kenneth H. **Bell;** Harry H. **Bendorf;** Charles E. **Bishop;** John A. **Brashear;** Donald D. **Brown;** Stanford E. **Brown;** Lyman E. **Buzard;** John E. **Catlin,** Jr.; Robert D. **Caudry;** William M. **Charles,** Jr.; Neil L. **Eddins;** James D. **Gormley;** James T. **Granger;** Jack I. **Gregory;** John J. **Halki;** Monroe W. **Hatch,** Jr.; Delbert H. **Jacobs;** Ralph H. **Jacobson;** Albert J. **Kaehn,** Jr.; William L. **Kirk;** Stanley C. **Kolodny;** Donald P. **Litke;** Reno E. **Lueker;** William J. **Mall,** Jr.; Charles **McCausland;** Horace W. **Miller;** Joseph D. **Moore;** Richard D. **Murray;** Robert C. **Oaks;** Peter W. **Odgers;** Norris W. **Overton;** David L. **Patton;** Attilio **Pedroli;** John L. **Pickitt;** Eugene M. **Poe,** Jr.; Gerald L. **Prather;** Raymond C. **Preston,** Jr.; Richard W. **Pryor;** Robert H. **Reed;** Albert G. **Rogers;** Carl R. **Smith;** Perry M. **Smith;** James P. **Smothermon;** John H. **Storrie;** Thomas S. **Swalm;** Chester D. **Taylor,** Jr.; Donald A. **Vogt;** Rudolph F. **Wacker;** Sarah P. **Wells;** Harold J. M. **Williams.**

To AFRES Brigadier General: Ronald R. **Blalack;** William L. **Copeland;** Charles M. **Duke,** Jr.; Wayne E. **Garrett;** Arthur **Gerwin;** Vincent P. **Luchsinger,** Jr.; Milton **Matter,** Jr.; John A. **Paterson;** John D. **Roper;** Alan G. **Sharp;** Jerome N. **Waldor;** Charles T. **Yarington,** Jr.

RETIREMENTS: L/G Andrew B. **Anderson,** Jr.; L/G John J. **Burns;** M/G William C. **Burrows;** B/G Claire M. **Garrecht;** L/G James A. **Knight,** Jr.; M/G Walter R. **Tkach.**

CHANGES: B/G James P. Albritton, from Dep. Dir., Concepts & Analyses, DCS/P&E, Hq. USAF, Washington, D. C., to Dep. Dir. for Long Range Plans, DCS/OP&R, Hq. USAF, Washington, D. C. . . . **Col. (B/G selectee) Charles E. Bishop,** from Cmdr., 64th FTW, ATC, Reese AFB, Tex., to Cmdr., Tac. Tng-Holloman, TAC, Holloman AFB, N. M. . . . **Col. (B/G selectee) Donald D. Brown,** from Cmdr., 62d MAW, MAC, McChord AFB, Wash., to Asst. DCS/Ops., Hq. MAC, Scott AFB, Ill. . . . **M/G Charles G. Cleveland,** from Dir., Pers. Prgms., DCS/M&P, Hq. USAF, Washington, D. C., to V/C, Hq. ATC, Randolph AFB, Tex., replacing M/G (L/G selectee) Evan W. Rosencrans.

B/G (M/G selectee) Herbert L. Emanuel, from Dep. Asst. DCS/Manpwr. & Pers. for Mil. Pers. & V/C, AFMPC, Randolph AFB, Tex., to Dir., Pers. Prgms., DCS/M&P, Hq. USAF, Washington, D. C., replacing M/G Charles G. Cleveland . . . **L/G Charles A. Gabriel,** from C/S, Combined Forces Command, Dep. Cmdr., US Forces Korea, & Dep. CINC, UN Comd. Korea, to DCS/OP&R, Hq. USAF, Washington, D. C., replacing retiring L/G Andrew B. Anderson, Jr. . . . **Col. (B/G selectee) Ralph H. Jacobson,** from Cmdr., AF Satellite Control Facility, AFSC, Sunnyvale, Calif., to Asst. DCS for Space Shuttle Development & Operation, DCS/RD&A, Hq. USAF, Washington, D. C. . . . **Col. (B/G selectee) Donald P. Litke,** from Dir. of Materiel Mgmt., Warner Robins ALC, AFLC, Robins AFB, Ga., to V/C, Oklahoma City ALC, AFLC, Tinker AFB, Okla.

Col. (B/G selectee) William J. Mall, Jr., from Cmdr., 436th MAW, MAC, Dover AFB, Del., to Asst. DCS/Pers., Hq. MAC, Scott AFB, Ill. . . . **L/G Robert C. Mathis,** from V/C, Hq. AFSC, Andrews AFB, Md., to V/C, Hq. TAC, Langley AFB, Va., replacing retiring L/G James A. Knight, Jr. . . . **M/G Thomas H. McMullen,** from DCS/Rqmts., Hq. TAC, Langley AFB, Va., to DCS/Systems, Hq. AFSC, Andrews AFB, Md., replacing M/G (L/G selectee) Lawrence A. Skantze. . . . **M/G (L/G selectee) Charles C. Pattillo,** from Vice CINC, Hq. PACAF, Hickam AFB, Hawaii, to Dep. CINC, US Readiness Command, MacDill AFB, Fla., replacing retiring L/G John J. Burns . . . **M/G (L/G selectee) Evan W. Rosencrans,** from V/C, Hq. ATC, Randolph AFB, Tex., to C/S, Combined Forces Comd., Dep. Cmdr., US Forces Korea, & Dep. CINC, UN Comd. Korea, replacing L/G Charles A. Gabriel.

M/G (L/G selectee) Lawrence A. Skantze, from DCS/Systems, Hq. AFSC, Andrews AFB, Md., to Cmdr., ASD, AFSC, Wright-Patterson AFB Ohio, replacing L/G George H. Sylvester . . . **Col. (B/G selectee) Thomas S. Swalm,** from Cmdr., 3d TFW, PACAF, Clark AB, Republic of the Philippines, to Cmdr., 57th TTW, & Cmdr., USAF Ftr. Wpns. Sch., TAC, Nellis AFB, Nev. . . . **L/G George H. Sylvester,** from Cmdr., ASD, AFSC, Wright-Patterson AFB, Ohio, to V/C, Hq. AFSC, Andrews AFB, Md., replacing L/G Robert C. Mathis . . . **Col. (B/G selectee) Sarah P. Wells,** from Command Nurse, Hq. AFSC, Andrews AFB, Md., to Chief, AF Nurse Corps, OTSG, Hq. USAF, Bolling AFB, D. C., replacing retiring B/G Claire M. Garrecht. ■

Airman's Bookshelf

Life and Career of MacArthur

American Caesar: Douglas MacArthur 1880–1064, by William Manchester. Little Brown and Co., Boston, Mass., 1978. 793 pages, with maps, photographs, index. $15.

William Manchester's biography of Douglas MacArthur is undoubtedly the most complete three-dimensional portrait of the five-star hero of the Pacific to date. Manchester's book is brilliantly written, penetrating in its insights, massively researched, objective, and believable. His opening chapter, titled "Reveille," is a nine-page description, unsurpassed anywhere, of America's most complex soldier. The remaining 700 pages convincingly support Manchester's picture of his multifaceted subject.

The author has no predetermined thesis. When MacArthur acted intelligently, Manchester says so, and when he was foolish, the author tells us; when he was honest, the biographer relates it, and when he lied, Manchester exposes him; when MacArthur was eloquent, the author quotes him, and when he was orotund, Manchester cites him. In so many treatments in the past MacArthur's human dimension has been absent, but not here.

To develop that humanity, Manchester carefully describes MacArthur's family history, because it weighed heavily on the General's shoulders. Manchester devotes proper attention to MacArthur's schooling, pre-World War I combat in Mexico, and battle experience in the Great War, indicating how the General earned his reputation for extraordinary bravery. He probably earned more decorations for heroism than any other man in American history, and could still be found among the bullets and the dying in the closing days of World War II and Korea. He won his last decoration for bravery for personally rallying a sagging formation of American infantry on Luzon when he was sixty-four years old. And although Manchester cites defects in MacArthur's personality, especially his "mendacity," the General's "manifest self-regard, his complete lack of humility . . . lay like a deep fissure at his very core," and eventually proved his undoing.

Manchester finds MacArthur to be the "most gifted man-at-arms this nation has produced," and then demonstrates the negative aspects of the General's complexion that were the darker side of his genius. In addition to his legendary bravery, MacArthur was keenly intelligent, had a deep understanding of military history, knew his battlefield enemies well, and demonstrated a strategical and tactical flexibility bordering on the sublime.

He also possessed an ambition that often surpassed these qualities, finding outlet in sycophancy. During the Mexican campaign, Captain MacArthur wrote to Maj. Gen. Leonard Wood, Army Chief of Staff, regarding the accomplishments of MacArthur's superior in the 1914 expedition:

> General Funston is handling things well and there is little room for criticism, but I miss the inspiration, my dear general, of your own clear-cut, decisive methods. I hope sincerely that affairs will shape themselves so that you will shortly take the field for the campaign which, if death does not call you, can have but one ending—the White House.

The book's bulk is on the decade from 1941 to 1951 when MacArthur's military brilliance was at its height. One might add that, considering his profound reversal of more than a thousand years of Japanese histor in six short years of occupatio MacArthur had political genius, to

Consider the military record. I his battles from Australia to th Philippines, his forces made eight seven amphibious landings, all them successful, and in those mo than two years of combat his c sualties were less than forty perce those of the Anzio campaign. Ma Arthur certainly was the best of th World War II generals of any natio ality and belongs in the same pa theon as Alexander, Hannibal, Gu tavus, and Napoleon.

The pity of MacArthur's caree however, is its end in dismissa Manchester's treatment of th Korean War is as worthy as the re of the narrative. He is aware of t political nature of the conflict a controversy with President Trum and is balanced in his apportic ment of the responsibility for t Truman-MacArthur rupture.

One of the hallmarks of this fi work, and especially true of his co erage of the Korean War, is Ma chester's awareness of the wa domestic and international politi intruded on military strategy an even tactics. MacArthur had bee sought for the Republican nomina tion for the Presidency by conserva tive Republicans in both 1944 an 1948 (entering two primaries each year and even winning on and this affected both Frankl Roosevelt and Harry Truman.

MacArthur yearned to be Pres dent, and that fact was well know by politicians. Manchester deta the ambivalences and ambiguities the Truman policy that appeared give MacArthur the latitude he b lieved he needed to fight the Nor Koreans and later the Chinese Co munists, and yet the biographer h a firm grasp of the deficiencies MacArthur's arguments and a cle understanding of the civil/milita issues involved. Manchester's cha ter on MacArthur's removal is solid contribution to the literatur

For all of its acuteness, howeve a few errors, such as the range the P-38, find their way into t manuscript, and there are ra lapses into awkward or purp prose. These are simply blemish that highlight the generally hi value of this outstanding portrait an exceedingly complex and par doxical military genius.

—Reviewed by Lt. Col. Al Gropman, Hq. USAF.

The Doctor Who Headed the Army

Armed Progressive, General Leonard Wood, by Jack C. Lane. Presidio Press, San Rafael, Calif., 1978. 330 pages with footnotes and index. $16.95.

The US military forces are not keeping up with other countries in preparedness, and the President is more interested in making peace speeches than arming against potential enemies. What does a military officer do? General Wood, who started his military career as a contract doctor, campaigned vigorously and publicly for preparedness, set up summer military camps at colleges, and challenged civilian authority at almost every opportunity.

Appointed Chief of Staff by President Taft, a Republican, Wood found himself in hot water from the moment President Wilson, a Democrat, took office. His decision to speak out on preparedness precipitated a series of assignments that led him from any meaningful command, but generated a political career that nearly sent him to the White House.

The outbreak of war in Europe in 1914 proved to be a critical point in the long and controversial career of General Wood. Until then, only military officers and a handful of civilian supporters had concerned themselves seriously with the weakness of America's military posture. The conflict in Europe gave the advocates of preparedness a specific contingency to prepare for, and attracted a large following. Wood was the point man in the preparedness campaign, helping to found a number of preparedness organizations, including the American Legion.

The sinking of the *Lusitania* on May 7, 1915, gave strength to Wood's arguments. Many who had earlier followed President Wilson's policy of neutrality later espoused preparedness.

But while Wood may have been right, he was not loved by the powerful people he was contradicting. Wilson ignored Wood, the senior officer on active duty at the time, and chose instead Gen. John Pershing, an older but junior officer, as the man who would be the commander of the American Expeditionary Force to Europe.

Such was Wood's dynamism and natural political abilities, however, that he became a leader of the Roosevelt wing of the Republican Party, was considered a candidate at the 1916 Republican Convention, and at the 1920 Republican Convention led in the early voting.

Wood's preparedness speech and articles branded him a political general too dangerous for rivals to appoint to high command. But his campaign helped to prepare the US military for its role in World War I and its subsequent prominence around the world.

—Reviewed by Bonner Day, Senior Editor.

Recent and of Interest

Afrika Korps at War, The Long Road Back, by George Forty, Charles Scribner's Sons, New York, N. Y., 1978. 128 pages. $14.95. Picture book with narrative.

Analyzing Soviet Strategic Arms Decisions, by Karl F. Spielmann, Westview Press, Boulder, Colo., 1978. 184 pages. $16. An analysis of Soviet decision-making by a staff member of the Institute for Defense Analyses.

Armed Struggle in Palestine: A Political-Military Analysis, by Bard E. O'Neill, Westview Press, Boulder, Colo., 1979. 184 pages. $20. The author, an Air Force officer, is director of Middle East Studies at the National War College.

B-29 Superfortress at War, by David A. Anderton, Charles Scribner's Sons, New York, N. Y., 1978. 176 pages. $14.95. Picture book with narrative.

Congress and Arms Control, edited by Alan Pratt and Lawrence D. Weiler, Westview Press, Boulder, Colo., 1978. 227 pages. $18.50. A collection of articles by Sen. Alan Cranston (D-Calif.), Rep. Les Aspin (D-Wis.), and others.

Helicopters of the World, by Michael J. H. Taylor and John W. R. Taylor, Charles Scribner's Sons, New York, N. Y., 1978. 112 pages. $8.95. Second edition of illustrated reference book.

The Papers of Dwight David Eisenhower, Volumes VI–IX, edited by Louis Galambos, Johns Hopkins University Press, Baltimore, Md., 1978. $75. Continuation of series. Vol. VI covers 1945, and subsequent volumes cover period General Eisenhower served as Chief of Staff.

Patton's Third Army at War, by George Forty, Charles Scribner's

Airman's Bookshelf

Sons, New York, N. Y., 1978. 182 pages. $14.95. Picture book with narrative.

Quantitative Approaches to Political Intelligence: The CIA Experience, edited by Richard J. Heuer, Jr., Westview Press, Boulder, Colo., 1978. 181 pages. $16.50. Case studies of intelligence.

Rommel in Normandy, by Friedrich Ruge, Presidio Press, San Rafael, Calif., 1979. 255 pages. $12.95. Ruge served under Rommel, assisting him on his tours of the French coasts.

United States Women in Aviation Through World War I, by Claudia M. Oakes, Superintendent of Documents, US Government Printing Office, Washington, D. C. 20402, 1978. 44 pages. $2.50. Number two of the Smithsonian Studies in Air and Space series.

New Books in Brief

Airwar, by Edward Jablonski. Here in one volume are the four highly acclaimed books in the Airwar series. With 800 photographs, the book provides a comprehensive, illustrated history of aerial warfare from 1939–45. The first book, *Terror from the Sky,* recounts revolutionary aerial tactics introduced early in the war; *Tragic Victories* describes America's participation in the war from Pearl Harbor through Midway, Ploesti, and Schweinfurt; *Outraged Skies* details the early air battles in the Pacific; and *Wings of the Fire* chronicles the last days of the Third Reich and the collapse of the Japanese Empire. The author, a noted aviation historian, portrays the terror and pain as well as the courage and glory that marked World War II. Index, bibliography. Doubleday & Co., Inc., New York, N. Y., 1979. 655 pages. $15.

America in Vietnam, by Guenter Lewy. A professor of political science at the University of Massachusetts, Amherst, has based this analysis of the Vietnam War on classified records of the US Army, Air Force, and Marine Corps. While documenting strategic and tactical failures of the military, he concludes that the charges of officially condoned illegal and immoral conduct are without substance and that a national sense of guilt is unwarranted. Tables, charts, maps, notes, and index. Oxford University Press, New York, N. Y., 1978. 540 pages. $19.95.

Crisis Resolution: Presidential Decision Making in the Mayaguez and Korean Confrontations, by Richard G. Head, Frisco W. Short, and Robert C. McFarlane. The authors, senior military officers and distinguished scholars, examine two crises that occurred during the Ford Administration and the communications and coordination tools used by the President, the Joint Chiefs, and the Department of State. Appendices include the War Powers Resolution and how it has been applied. Index, selected bibliography, notes. Westview Press, Boulder, Colo., 1979. 323 pages. $20.

The Duel of the Giants, by Drew Middleton. The author, a military correspondent for the New York *Times,* was conducted on an official tour of military facilities in China as preparation for this primer on Asian military trends. His interviews of Chinese leaders provide some valuable insights into the people who today are ruling the world's most populous country. He concludes that China is concerned about modernizing principally so that its armed forces will be strong enough to stand up to the Soviet Union. Charles Scribner's Sons, New York, N. Y., 1978. 241 pages. $10.95.

"Enterprise on the Enterprise," Vol. 7, No. 3, *Journal of Contemporary Business,* edited by Russel L. Barsh. Thirteen noted authors representing government, industry, and business scholarship take a look at the Space Shuttle and its business potential. Boeing and Rockwell International executives discuss their part in the project while NASA officials define the Shuttle pricing policy. Sen. Adlai Stevenson looks at the legislative climate for future space funding. Other articles examine the political process that led to the decision to build the Shuttle and the economic basis on which NASA made its funding decisions. Office of Publications, Graduate School of Business Administration, University of Washington DJ-10, Seattle, Wash. 9819 1978. 199 pages. $4.

Gyro! The Life and Times of Lawrence Sperry, by William Wya Davenport. The automatic pilot, th turn-and-bank indicator, the pac parachute, retractable landing gea aerial torpedoes, and midair con munications were a few of the pio neering inventions perfected b Lawrence Sperry. Here is his ama ing story, complete with humorou aspects of his private life, that mad the man a legend. Photos, list patents, index. Charles Scribner Sons, New York, N. Y., 1978. $12.9

Photographs by the Wright Brothers, Library of Congress. This pa phlet lists photos the Wrig brothers took between 1898 a 1911 that are now available to t public. The Library of Congress r ceived 303 negative plates from t Wright estate in 1949, providing excellent pictorial record of t Wright experiments. Superintende of Documents, US Governme Printing Office, Washington, D. 20402 (Stock No. 030-014-00003-1 1979. 20 pages. $4.

Pressure Cooker: The Story of the Men and Women Who Control Air Traffic, by Don Biggs. Th author, a pilot, former air traff controller, and newsman, describe the work of air traffic controlle who must live with their fallibili in a job that leaves no room for The author spent six months wit controllers at the world's thir busiest terminal, Los Angeles Inte national Airport. W. W. Norton Co., Inc., New York, N. Y., 1979. 24 pages. $9.95.

Soviet Dynamics—Political, Economic, Military, World Affairs Cou cil of Pittsburgh. Here are the fin ings of three distinguished pane of internationally recognized Ame ican and British scholars wh analyze the global, political, ec nomic, and military capabilities the USSR and their implications f US foreign policy. The findings we presented at the 17th World Affai Forum in June 1978, sponsored b the Council. World Affairs Coun of Pittsburgh, 400 Fifth Ave., Pitt burgh, Pa. 15219, 1978. 97 page $5.

—Reviewed by Robin Whitt

Industrial Associates of the Air Force Association

"Partners in Aerospace Power"

Listed below are the Industrial Associates of the Air Force Association. Through this affiliation, these companies support the objectives of AFA as they relate to the responsible use of aerospace technology for the betterment of society, and the maintenance of adequate aerospace power as a requisite of national security and international amity.

Aerojet ElectroSystems Co.
Aerojet-General Corp.
Aerojet Services Co.*
Aerospace Corp.
AIL, Div. of Cutler-Hammer
Allegheny Ludlum Industries, Inc.
American Telephone & Telegraph Co.
AT&T Long Lines Department
Analytic Services Inc. (ANSER)
Applied Technology, Div. of Itek Corp.
Armed Forces Relief & Benefit Assn.
AVCO Corp.
Battelle Memorial Institute
BDM Corp., The
Beech Aircraft Corp.
Bell Aerospace Textron
Bell Helicopter Textron
Bell & Howell Co.
Bendix Corp.
Benham-Blair & Affiliates, Inc.
Boeing Co.
Brunswick Corp., Defense Div.
Brush Wellman, Inc.
Burroughs Corp.
CAI, Div. of Bourns, Inc.
Calspan Corporation, Advanced Technology Center*
Canadian Marconi Co.
Cessna Aircraft Co.
Chamberlain Manufacturing Corp.
Cincinnati Electronics Corp.
Clearprint Paper Co., Inc.
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* *New affiliation*

As 1978 drew to a close, the Annual Air Force Ball in California continued the pattern of success for this charity fund-raiser. It was . . .

AFA's Seventh Annual Air Force Ball

—Official US Air Force Photos

AFA President Gerald Hasler (center) meets with Marty Ostrow, former AFA President and Chairman of the Board (left), and this year's SCAMP recipients, from left to right: Martha Davis, Lori Pietsch, Michele Bonnarens, Diana Sylvestre, and Mickey Olmstead.

ALMOST 1,200 guests filled the Los Angeles Ballroom of the Century Plaza Hotel on the occasion of the Air Force Association's Seventh Annual Air Force Ball.

Scholarships for Children of American Military Personnel (SCAMP) and AFA's education affiliate, the Aerospace Education Foundation (AEF), again shared in the proceeds of this $125-a-plate function. SCAMP awards four-year scholarships to deserving children of US servicemen from all the military services who were killed in action, missing in action, or prisoners of war in Southeast Asia. SCAMP has committed some $104,000 in scholarship funds.

AEF, the other recipient, uses its share of proceeds in adapting USAF developed occupational courses for use in high schools and community colleges throughout the country. Sen. Barry Goldwater, AEF Board Chairman, has called the results of the Foundation's work ". . . a positive enhancement of the image of the Air Force and a definite double return on the taxpayer's dollar."

The accompanying pictures tell the story of the 1978 Ball. This year's Ball will take place October 26 at the Century Plaza Hotel in Los Angeles.

—JAMES A. McDONNELL, JR.

Charlton Heston with some of the Air Force enlisted people who attended the Ball as guests of the California AFA and its chapters. Left to right: Ed Stearn, AFA National Director and President of California State AFA; MSgt. William Nichter, 1st Sergeant of the 6510th Civil Engineering Sqdn., Edwards AFB, Calif; Mrs. Prossor; Charlton Heston; Mrs. Nichter; CMSgt. Sean Prosser, Senior Enlisted Advisor at SAMSO, Los Angeles, Calif.

This year's Air Force Ball General Chairman, Robert R. Dockson, and Mrs. Dockson with Lt. Gen. and Mrs. James H. Doolittle.

ecretary of the Air Force John C. Stetson (center) visits with r Force Chief of Staff Gen. Lew Allen and Mrs. Allen and Gen. Richard Henry, Commander, SAMSO (co-host of this ar's Military Ball), and Mrs. Henry.

Winners of this year's SCAMP scholarships meet with their AFA chaperons prior to the Ball. From left to right: SCAMP winners Martha Davis, Michele Bonnarens, chaperons Mr. and Mrs. Robert Lawson, Lori Pietsch, Mickey Olmstead, and Diana Sylvestre.

ior to the Grand March, some dignitaries gather. Left to right: r Force Chief of Staff Gen. Lew Allen and Mrs. Allen; esident of the Air Force Association Gerald Hasler and Mrs. asler; Mrs. Doolittle and Honorary Ball Chairman Jimmy olittle; and Mrs. Stetson and Secretary of the Air Force hn C. Stetson.

Gloria Loring sings the National Anthem to open the Ball. In the background is the Fifteenth Air Force Band, which, under the leadership of SMSgt. Chuck Murray, provided music for the gala event.

orne Greene, star of the TV series "Battlestar Galactica," erved as the master of ceremonies at this year's Ball. He is hown here with the March AFB Color Guard. Other Hollywood elebrities attending included Buddy Ebsen, Vince Edwards, inda Foster, William Jordan, Cesar Romero, and araine Stephens.

During the Air Force Ball, attended by top leaders from all services in the Los Angeles area, Commander, Naval Air Force Pacific Fleet, Vice Adm. Robert P. Coogan (left) visits with AFA Chairman of the Board George Douglas (center) and General Doolittle.

Recognition of the PRC was inevitable, but in the process Taiwan's future has been bargained away and the US still must face up to hard decisions regarding its old ally.

Taiwan, Self-Determination, and Human Rights

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

ONE Sunday afternoon a few years ago, the Chief of the Nationalist Chinese forces called on me in Brussels. He was on a swing through Europe, or at least that circumscribed part of Europe that still recognized the existence of his government. The purpose of his call, ostensibly to see an old acquaintance, really lay in the anxiety underlying his careful remarks. President Nixon had recently been to Peking, and the unasked question had to do with how much longer we would be friends and allies. While neither of us was frank, or honest, enough to say it, we both suspected the answer.

In the six years since that Sunday afternoon, there has been a slow but steady move toward normalizing our relations with what we used to call, accurately enough, Red China. Even so, the abruptness with which we abandoned our close friends on Taiwan has been a hard thing to swallow. The Peking asking price for this diplomatic accord stipulated a Taiwan sellout, and we sold out.

Well, on reflection, that is not quite the way to put it. The old men in Peking insist that Taiwan is part of China. If we acknowledge that to be so, then Taiwan goes along in the deal. There is only one China, they say, and Taiwan is part of it. It is the same position the old men in Taipei have taken for the thirty years they have ruled that subtropical island. During those years, the Republic of China has behaved as a government in exile, complete with nominal representatives of all the provinces on the mainland. Taipei was just a temporary capital, so the official line went. One day the seat of government would move back to Peiping, the Northern City, which would then, and only then, once more become Peking, the Northern Capital.

Back in the late fifties and early sixties, when our ties with Chiang Kai-shek's Republic were at their strongest, it was almost possible to believe this Kuomintang Apostle's Creed. It was especially easy to believe it on Double Ten Day, when there was the most splendid parade imaginable. On that occasion, as the old Generalissimo reviewed an almost endless procession of disciplined modern forces all shouting allegiance, and, as the Chinese Air Force jets thundered overhead, anything seemed possible. It was easy to forget that the native population of Taiwan had no desire to go back to a mainland they had never seen, nor had ever been a part of. They were, and are, Taiwanese—people of Chinese descent whose island has been variously controlled by Chinese dynasties, the Dutch, and for fifty years ending in 1945, by the Japanese.

The thirty years that Taiwan has been under Nationalist Chinese control have been, in many ways, the most significant in the island's history. In those thirty years, Taiwan has blossomed, from a comfortable but backward agrarian economy into one of the industrial powers of Asia, a prize exhibit for the free-enterprise system. The whole capitalist world has been attracted, it seems, to a place where an educated, hardworking, and highly skilled population is looking for things to do. Trading the good life for the oppressive sterility of the People's Republic would not appear to be an attractive proposition to the average and, by Asian standards, prosperous citizen on Taiwan. Aside from the nostalgic desires of the aging mainlanders to see their ancestral homes once more, there is probably no great feeling anywhere on the island of Taiwan for a reunion with the tough Communists who run China. Even back in the sixties, when such thoughts verged on treason, there was a sizable faction in the Nationalist officer corps who believed the return to the mainland credo was nonsense. Taiwan's future, they felt, lay in its independence.

Chiang Kai-shek, along with most of the principal figures who struggled ashore with him in 1949, is gone. His widow, the Madame, who lent a truly regal air to the goings-on in Taipei, and who, even more than the Generalissimo himself, fostered the credo of back to the mainland, lives a reclusive life on Long Island. Her stepson, Chiang Ching Kuo, is certainly the last of the family who will function as President of the Republic of China on Taiwan or anywhere else.

In establishing diplomatic relations with Peking we have only done what almost everyone else in the world has done long since. Beyond that, there is a certain logic in becoming friendly with a nation that shares a common enemy. All in all, this recognition of the People's Republic has been an inevitable event since the first Nixon visit, as my Chinese general friend and I tacitly admitted that Sunday afternoon in Brussels.

That still leaves Taiwan, as distinct from the now presumably defunct Republic of China, to be dealt with. If we are to exercise the same concern for self-determination as we do in, for instance, Africa, then our consciences should begin nagging us very shortly. There, on Taiwan, are seventeen million free souls. They live under a government that is downright permissive by Communist standards. The population on Taiwan is ninety-three percent literate. Their currency is sound, and they have disciplined military forces capable of defending their country. Taiwan, in short, has everything a country could wish for to guarantee a bright future—save one. Their future has been bargained away. The One-China gospel, acccording to Mao on the one hand and Chiang on the other, now affects the future of seventeen million people who, by and large, had nothing to do with it.

All of which leads simply to a simple question. Whatever happened to self-determination, not to mention human rights?

Finally, there is this question we must face up to whether we like the answer or not. If our new friends in Peking decide to attack our old and faithful friends on Taiwan, do we sit by and watch on the legalistic grounds that, being an internal Chinese affair, it is none of our business, or do we lend the old friends a hand? ■

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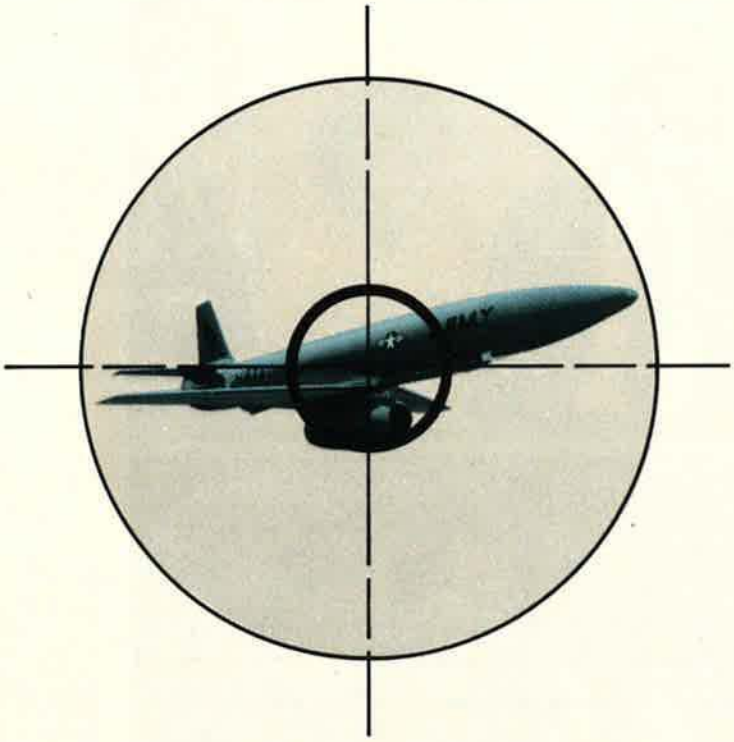

AFA News

By Don Steele, AFA AFFAIRS EDITOR

The Fresno, Calif., Chapter's recent fourteenth annual Air Force Honors Night Banquet and Awards Ceremony was the highlight of the Chapter-sponsored Air Force Week. Head-table guests and AFA leaders included, from left, Honors Night Chairman S. Samuel Boghosian; AFA National Director Liston "Zack" Taylor, the master of ceremonies; Col. (B/G selectee) John A. Brashear, 93d BW Commander, Castle AFB; Brig. Gen. James S. Creedon, 26th Air Division/NORAD Region Commander, Luke AFB; California AFA President Edward A. Stearn; Fresno Chapter President Melvin E. Kilner; and Lt. Col. Robert H. Boehringer, 194th FIS Commander, Fresno ANGB. Military host of the event was Brig. Gen. James A. Kilpatrick, 144th FIW Commander and the Fresno Chapter's "Man of the Year," who presented (photo at right) ANG SSgt. Edward B. Rogers the Airman's Medal for the rescue of five people from a burning plane at the risk of his own life.

At a recent joint banquet of AFA's Las Vegas, Nev., Chapter and the Silver State Club of the Association of Old Crows, the first of what is planned as an annual event to honor those contributing to US aerospace power, were, from left, AFA Chapter President Sheldon Past; guest speaker Gen. T. R. Milton, USAF (Ret.), who is admiring a Solo Flight Certificate awarded by the Chapter to CAP Cadet John Orr; Cadet Orr; and USAF Lt. Col. Harry North, local CAP squadron commander.

Among those at a meeting of the provisional AFA Chapter to be established at the University of Notre Dame, Ind., were, from left, Dr. John J. Martin, Assistant Secretary of the Air Force for Research, Development, and Logistics, the guest speaker; Ms. Mina Costin, former USAF IO and currently Director of Development for St. Mary's College; Col. Norman E. Muller, USAF (Ret.), provisional Chapter President; and SSgt. James M. Ikuss, AFROTC Det. 225.

chapter and state photo gallery

Attending the Great Lakes Regional AFA meeting in Kokomo, Ind., in November were the Region's State Presidents. From left, Charles W. Marotske, Wisconsin; Howard C. Strand, Michigan; Regional Vice President A. C. Field, Jr.; guest speaker Col. Don Ellis, Commander of the Recruiting Squadron at Chanute AFB, Ill.; Roy P. Whitton, Indiana; C. W. Scott, Illinois; and Robert J. Puglisi, Ohio

The Tenth Annual AFA Benefit Golf Tournament, sponsored by AFA's Charleston, S. C., Chapter and held at the Charleston AFB golf course, raised $9,000 for youth activities in the area. At presentation ceremonies, from left, tournament chairman Maj. Gen. C. T. Ireland, USAF (Ret.); Chapter President John Huguley; Boy Scout Coastal Council President Henry Lee; Mrs. Carol Wilson, Girl Scout Low Country Council President; and Brig. Gen. Burt Powers, 437th MAW Commander, who accepted a check for the Charleston AFB Youth Center.

COMING EVENTS

Iron Gate Chapter's Sixteenth National Air Force Salute, New York Hilton Hotel, New York City, March 24 . . . **Florida State AFA Convention,** Cape Coral, April 28 . . . **Washington State AFA Convention,** Seattle, May 4–6 . . . **Connecticut State AFA Convention,** Howard Johnson's Red Coach Conference Center, Windsor Locks, May 5 . . . **Tennessee State AFA Convention,** Airport Hilton Hotel, Nashville, May 11–12 . . . **Utah State AFA Convention,** Snowbird, May 11–13 . . . **Ohio State AFA Convention,** Rickenbacker AFB, May 12 . . . **New Jersey State AFA Convention,** Golden Eagle, Cape May, May 18–20 . . . **AFA Golf and Tennis Tournaments,** The Broadmoor, Colorado Springs, Colo., May 25 . . . **AFA Nominating Committee and Board of Directors Meetings,** The Broadmoor, Colorado Springs, Colo., May 26 . . . **Twentieth Annual Dinner Honoring the Air Force Academy's Outstanding Squadron,** The Broadmoor's International Center, Colorado Springs, Colo., May 26 . . . **Michigan State AFA Convention,** June 9 . . . **New Hampshire State AFA Convention,** Pease AFB, June 9 . . . **Pennsylvania State AFA Convention,** Viking Motor Inn, Pittsburgh, June 29–30 . . . **New York State AFA Convention,** Dutch Inn, Islip, Long Island, July 13–15 . . . **AFA's 33d Annual National Convention,** Sheraton-Park Hotel, Washington, D. C., September 16–19 . . . **AFA's Aerospace Development Briefings and Displays,** Sheraton-Park Hotel, Washington, D. C., September 18–20.

At the Abilene, Tex., Chapter quarterly meeting in December were, from left, Col. Richard B. Houghton, 96th Bombardment Wing Commander, Dyess AFB; Abilene AFA Chapter President William G. Zavatson; the guest speaker, former Vice Chief of Staff and now an AFA National Director Gen. William V McBride, USAF (Ret.); and Col. Doyle Brown, 463d TAW Commander, Dyess AFB.

AFA News photo gallery

An AFA plaque was presented to mark the opening of the new ADCOM NCO Academy facility at Tyndall AFB, Fla. From left, Brig. Gen. Earl Brown, Air Defense Weapons Center Commander; AFA Panama City, Fla., Chapter President Bill Sullivan; NORAD Commander in Chief Gen. James E. Hill; and NCO Academy Commandant Maj. Wilson Counts.

Eighth Air Force Commander Lt. Gen. Edgar S. Harris, Jr., left, presents New England Regional AFA "Man of the Year" Citation for 1978 to Col. Larry S. DeVall. As Commander of the 42d Bomb Wing, Loring AFB, Me., Colonel DeVall was instrumental in the wing's exceeding its AFA membership quota for the fifth consecutive year.

Honored "for his outstanding contributions in the field of aerospace education" at a recent dinner sponsored by a coalition of aviation organizations in San Diego, Calif., was aviation historian Dr. Alvin D. Coox, left, an internationally recognized authority on the Imperial Japanese air forces. Making the presentation is AFA San Diego Chapter President Charles A. Rainey.

These three received Los Angeles Area Chamber of Commerce 1978 Kitty Hawk "Sands of Time" Awards at the Sixteenth Annual Wright Brothers Banquet in December. From left, Edward Heinemann, military aircraft designer for more than forty years; Janet Lynn Helton, who soloed thirty-six different aircraft on her sixteenth birthday; and Lt. Gen. Thomas P. Stafford, former astronaut and currently Deputy Chief of Staff, Research, Development and Acquisition, Hq. USAF. Not shown award winner Robert F. Six, chief executive officer of Continental Airlines.

Maj. Colin P. Kelly III, Episcopalian chaplain at West Point, was the distinguished visitor and guest speaker at a December 7 dinner held by AFA's Colin P. Kelly Chapter, Rome, N. Y. The Chapter is named for Major Kelly's father, a bomber pilot who was killed in action in the Philippines a few days after the Japanese attack on Pearl Harbor. From left, Col. Richard J. Kiefer, 416th Bomb Wing Commander, Griffiss AFB; Simon "Bud" DiMaggio, Rome Chapter President; Major Kelly; and Brig. Gen. Charles Jiggetts, Northern Communications Area Commander, Griffiss AFB.

Members of the AFA Olmsted (Harrisburg, Pa.) Chapter joined CAP and the Silver Wings Fraternity at a reception and dinner in December to celebrate the seventy-fifth anniversary of the Wrights' first powered flight. Shown with a collection of World War II numbered Air Force patches are, from left, Lt. Col. Robert Miller, USAF (Ret.), Olmsted Chapter President; Amos L. Chalif, Vice President for AFA's Northeast Region; CAP National Commander Brig. Gen. Paul E. Gardner; and Maj. H. M. Eaton, seventy-fifth anniversary celebration chairman and Olmsted Chapter Past President.

This Is AFA

The Air Force Association is an independent, nonprofit, aerospace organization serving no personal, political, or commercial interests; established January 26, 1946; incorporated February 4, 1946.

OBJECTIVES

The Association provides an organization ough 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 to all mankind.

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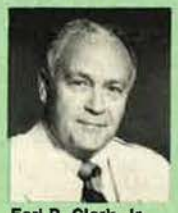

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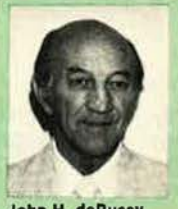

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Effective Date of Your Coverage. All certificates are dated and take effect on the last day of the month in which your application for coverage is approved, and coverage runs concurrently with AFA membership. AFA Military Group Life Insurance is written in conformity with the insurance regulations of the State of Minnesota. The insurance will be provided under the group insurance policy issued by United of Omaha to the First National Bank of Minnesota as trustees of the Air Force Association Group Insurance Trust.

EXCEPTIONS: There are a few logical exceptions to this coverage. They are:

Group Life Insurance: Benefits for suicide or death from injuries intentionally self-inflicted while sane or insane will not be effective until your coverage has been in force for 12 months.

The Accidental Death Benefit and Aviation Death Benefit shall not be effective if death results: (1) From injuries intentionally self-inflicted while sane or insane, or (2) From injuries sustained while committing a felony, or (3) Either directly or indirectly from bodily or mental infirmity, poisoning or asphyxiation from carbon monoxide, or (4) During any period a member's coverage is being continued under the waiver of premium provision, or (5) From an aviation accident, either military or civilian, in which the insured was acting as pilot or crew member of the aircraft involved, except as provided under AVIATION DEATH BENEFIT.

Eligibility

All active duty personnel of the Armed Forces of the United States and members of the Ready Reserve* and National Guard* (under age 60), Armed Forces Academy cadets*, and college or university ROTC cadets* are eligible to apply for this coverage provided they are now, or become, members of the Air Force Association.

*Because of restrictions on the issuance of group insurance coverage, applications for coverage under the group program cannot be accepted from cadets or Reserve or Guard personnel residing in Florida, New York, Ohio or Texas. Members in these states may request special application forms from AFA for individual policies which provide coverage quite similar to the group program.

Please Retain This Medical Bureau Prenotification For Your Records

Information regarding your insurability will be treated as confidential. United Benefit Life Insurance Company may, however, make a brief report thereon to the Medical Information Bureau, a nonprofit membership organization of life insurance companies, which operates an information exchange on behalf of its members. If you apply to another bureau member company for life or health insurance coverage, or a claim for benefits is submitted to such a company, the Bureau, upon request, will supply such company with the information in its file.

Upon receipt of a request from you, the Bureau will arrange disclosure of any information it may have in your file. (Medical information will be disclosed only to your attending physician.) If you question the accuracy of information in the Bureau's file, you may contact the Bureau and seek a correction in accordance with the procedures set forth in the federal Fair Credit Reporting Act. The address of the Bureau's information office is P.O. Box 105, Essex Station, Boston, Mass. 02112. Phone (617) 426-3660.

United Benefit Life Insurance Company may also release information in its file to other life insurance companies to whom you may apply for life or health insurance, or to whom a claim for benefits may be submitted.

CURRENT BENEFIT TABLES

AFA STANDARD PLAN

PREMIUM: $10 per month

Insured's Attained Age	Basic Benefit*	Extra Accidental Death Benefit*	Total Benefit
20-29	$85,000	$12,500	$97,500
30-34	65,000	12,500	77,500
35-39	50,000	12,500	62,500
40-44	35,000	12,500	47,500
45-49	20,000	12,500	32,500
50-54	12,500	12,500	25,000
55-59	10,000	12,500	22,500
60-64	7,500	12,500	20,000
65-69	4,000	12,500	16,500
70-74	2,500	12,500	15,000

Aviation Death Benefit:*

Non-war related	$25,000
War related	$15,000

AFA HIGH OPTION PLAN

PREMIUM: $15 per month

Insured's Attained Age	Basic Benefit*	Extra Accidental Death Benefit*	Total Benefit
20-29	$127,500	$12,500	$140,000
30-34	97,500	12,500	110,000
35-39	75,000	12,500	87,500
40-44	52,500	12,500	65,000
45-49	30,000	12,500	42,500
50-54	18,750	12,500	31,250
55-59	15,000	12,500	27,500
60-64	11,250	12,500	23,750
65-69	6,000	12,500	18,500
70-74	3,750	12,500	16,250

Aviation Death Benefit:*

Non-war related	$37,500
War related	$22,500

*The Extra Accidental Death Benefit is payable in the event an accidental death occurs within 13 weeks of the accident, except as noted under **Aviation Death Benefit** (below).

***AVIATION DEATH BENEFIT:** The coverage provided under the Aviation Death Benefit is paid for death which is caused by an aviation accident in which the insured is serving as pilot or crew member of the aircraft involved. Under this condition, the Aviation Death Benefit is paid in lieu of all other benefits of this coverage. Furthermore the non-war related benefit will be paid in all cases where the death does not result from war or an act of war, whether declared or undeclared.

OPTIONAL FAMILY COVERAGE

(may be added to either Standard or High Option Plan)
PREMIUM: $2.50 per month

Insured's Attained Age	Life Insurance Coverage for Spouse	Life Insurance Coverage for each Child*
20-39	$10,000	$2,000
40-44	7,500	2,000
45-49	5,000	2,000
50-54	4,000	2,000
55-59	3,000	2,000
60-64	2,500	2,000
65-69	1,500	2,000
70-74	750	2,000

*Between the ages of six months and 21 years, each child is provided $2,000 coverage. Children under 6 months are provided with $250 coverage once they are 15 days old and discharged from hospital.

Association Military Group life Insurance

$27,500 HIGH OPTION PLAN

APPLICATION FOR AFA MILITARY GROUP LIFE INSURANCE

United of Omaha

Group Policy GLG-2625
United Benefit Life Insurance Company
Home Office Omaha Nebraska

Full name of member _____
Rank Last First Middle

Address _____
Number and Street City State ZIP Code

Date of birth Mo. Day Yr.	Height Weight	Social Security Number

Please indicate category of eligibility and branch of service.

- ☐ Extended Active Duty
- ☐ Ready Reserve or National Guard
- ☐ Air Force
- ☐ Other _____ (Branch of service)
- ☐ Air Force Academy
- ☐ _____ Academy
- ☐ ROTC Cadet _____ Name of college or university

Name and relationship of primary beneficiary

Name and relationship of contingent beneficiary

This insurance is available only to AFA members

- ☐ I enclose $13 for annual AFA membership dues (includes subscription ($9) to AIR FORCE Magazine).
- ☐ I am an AFA member.

Please indicate below the Mode of Payment and the Plan you elect.

HIGH OPTION PLAN		Mode of Payment	STANDARD PLAN	
Members Only	Members and Dependents		Members Only	Members and Dependents
☐ $ 15.00	☐ $ 17.50	**Monthly** government allotment. I enclose 2 months' premium to cover the period necessary for my allotment (payable to Air Force Association) to be established.	☐ $ 10.00	☐ $ 12.50
☐ $ 45.00	☐ $ 52.50	**Quarterly.** I enclose amount checked.	☐ $ 30.00	☐ $ 37.50
☐ $ 90.00	☐ $105.00	**Semiannually.** I enclose amount checked.	☐ $ 60.00	☐ $ 75.00
☐ $180.00	☐ $210.00	**Annually.** I enclose amount checked.	☐ $120.00	☐ $150.00

Names of Dependents To Be Insured	Relationship to Member	Dates of Birth Mo Day Yr	Height	Weight

Have you or any dependents for whom you are requesting insurance ever had or received advice or treatment for: kidney disease, cancer, diabetes, respiratory disease, epilepsy, arteriosclerosis, high blood pressure, heart disease or disorder, stroke, venereal disease or tuberculosis? Yes ☐ No ☐

Have you or any dependents for whom you are requesting insurance been confined to any hospital, sanitarium, asylum or similar institution in the past 5 years? Yes ☐ No ☐

Have you or any dependents for whom you are requesting insurance received medical attention or surgical advice or treatment in the past 5 years or are now under treatment or using medications for any disease or disorder? Yes ☐ No ☐

IF YOU ANSWERED "YES" TO ANY OF THE ABOVE QUESTIONS, EXPLAIN FULLY including date, name, degree of recovery and name and address of doctor. (Use additional sheet of paper if necessary.)

I apply to United Benefit Life Insurance Company for insurance under the group plan issued to the First National Bank of Minneapolis as Trustee of the Air Force Association Group Insurance Trust. Information in this application, a copy of which shall be attached to and made a part of my certificate when issued, is given to obtain the plan requested and is true and complete to the best of my knowledge and belief. I agree that no insurance will be effective until a certificate has been issued and the initial premium paid.

I hereby authorize any licensed physician, medical practitioner, hospital, clinic or other medical or medically related facility, insurance company, the Medical Information Bureau or other organization, institution or person, that has any records or knowledge of me or my health, to give to the United Benefit Life Insurance Company any such information. A photographic copy of this authorization shall be as valid as the original. I hereby acknowledge that I have a copy of the Medical Information Bureau's prenotification information.

Date _____, 19 ____ _____
Member's Signature

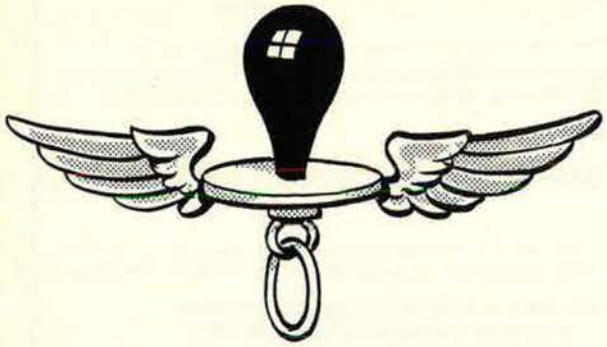
3/79
Form 3676GL App

Application must be accompanied by check or money order. Send remittance to: Insurance Division, AFA, 1750 Pennsylvania Avenue, NW, Washington, D.C. 20006

Bob Stevens'

"There I was..."

THE LAST TIME WE DREW A SEQUENCE ON WINGS (NAVIGATOR: JULY 1974) IT STARTED A REAL FLAP AT THE RISK OF LAUNCHING ANOTHER RHUBARB, THIS MONTH WE ASK THE QUESTION: "JUST SUPPOSE THEY DECIDED TO MAKE THE WINGS REFLECT THE JOB?"



NEWLY-MINTED COPILOT

AIR LIFTER

STAND BOARD

HELICOPTER

FIGHTER PILOT

HEADQUARTERS

IDEA FROM CAPT. MIKE BYERS - AF ACADEMY

Bob Stevens

Whose navigation aid can't mislead a pilot?

Key safety features are engineered into every E-Systems VOR/DME navigation aid. To insure that it will never send misleading information to a pilot, the system can automatically monitor its own performance, switch to a standby, or shut itself down in the unlikely event of a malfunction.

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This total involvement in advanced technology systems is a major reason why E-Systems has more than doubled sales in just five years as an independent business organization. For more information on E-Systems capabilities, write: E-Systems, Inc., P.O. Box 226030, Dallas, Texas 75266

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E-SYSTEMS

Remember when he was President?

If you do, then you probably remember when the F-106 was the "hottest new interceptor" in the U.S. defense arsenal. The aircraft for Air Defense. Well, much has changed since then, but one thing hasn't —we still have to depend on the F-106 for continental defense. But can we?

Right now we are trying to protect the United States of the 1980's with aircraft of the 1950's. Quite frankly, they are not the best choice. The aircraft are old, slower than newer models, radar-limited, armament-limited and expensive to maintain. They haven't the range required for adequate protection against the foreign bomber threat.

Then what's the answer to strategic defense? The McDonnell Douglas F-15 Eagle. America's air superiority ace. It can outfly and outfight anything else in the air. The F-15 is an all-weather aircraft ideally suited to strategic defense.

Advanced radar provides superior tracking and coverage of huge blocks of airspace. Versatile armament gives pilots the all-weather capability they need to get the job done. The F-15 Eagle. It's the best interceptor in the sky. It's in the inventory today doing the important tactical air superiority job.

Now the Air Force needs more F-15s for the vital task of strategic defense. And it needs them soon.

logical choice

The F-15 Eagle

MCDONNELL DOUGLAS