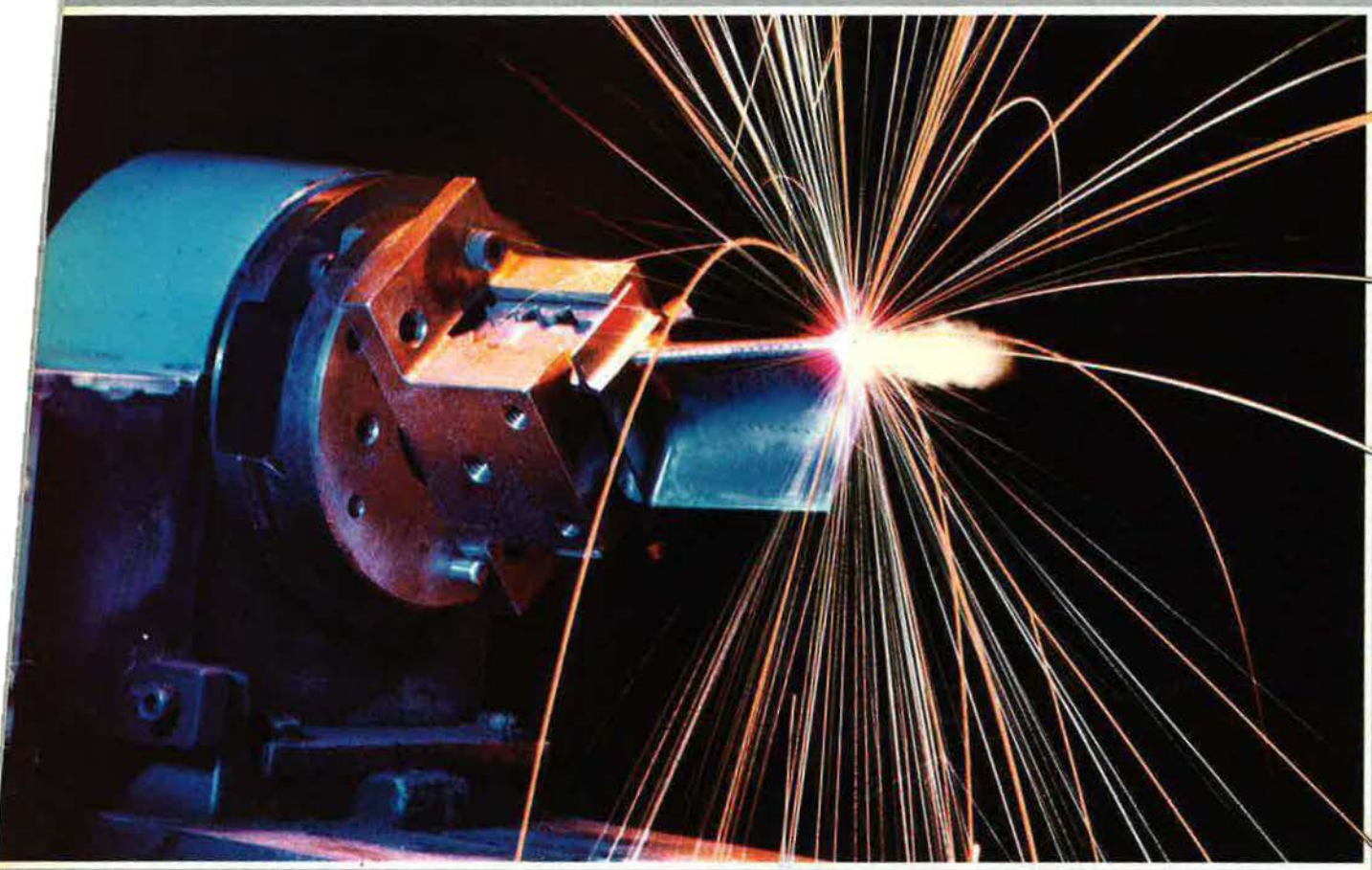
MARCH 1982 / $3

AIR FORCE MAGAZINE

PUBLISHED BY THE AIR FORCE ASSOCIATION

Soviet Aerospace Almanac 1982

Aircraft engine innovations that bring technology to life:



Our precision drill team has seen the light.

Heat. Extreme turbine heat. To cool turbine airfoils in advanced jet engines, more than 100,000 minute holes must be drilled in a complex of turbine blades and vanes. Using standard methods on standard metals, a difficult task. On new super alloys, a near impossibility almost too costly to consider. Electrochemical techniques were used until GE's precision drill team turned to laser light.

With lasers, General Electric has reduced drilling costs 20-90%. And moved our design flexibility light-years ahead. So that our customers can benefit from new turbine airfoils that perform better, longer, and cost less, too.

Laser drilling. Just one of the many technologies harnessed by GE to make our jet engines more fuel efficient, quieter, smokeless, more advanced, easier to own and operate. A record of outstanding performance no one can poke full of holes.

We bring good things to life.

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. . . A tradition of outstanding developments in Flight Control.

At LSI we design impossible dreams . . . then we make them real. And it all began more than 30 years ago.

In 1949 we were awarded the Collier Trophy for development of the very first high-volume production autopilot for jet aircraft. That was the beginning of many innovations, including:

- The first high-volume production autopilot for jet aircraft (F-84 & F-86D)
- The first jet fighter autopilot coupled to an ILS receiver (F-86D)
- The first jet transport autopilot (KC-135)
- The first solid state 3-axis damper (F-104)
- The first control augmentation system with control stick steering (F8U-3)
- The first production two-channel fail passive automatic flight control (A-7)
- The first production fly-by-wire computer and sidestick controller (F-16)
- The first completely programmable mission computer for RPVs (AQM-34U)
- The first Category 3A automatic landing system to be certified concurrent with the airframe (L-1011)

The fact that we've been in the forefront of flight control technology for more than 30 years is proof that we have the imagination, the scientific knowledge and the engineering and manufacturing skills necessary to maintain our leadership.

To us, the future is incredibly exciting. Our dreams are mind-boggling. We are currently developing digital flight controls for a wide range of aircraft.

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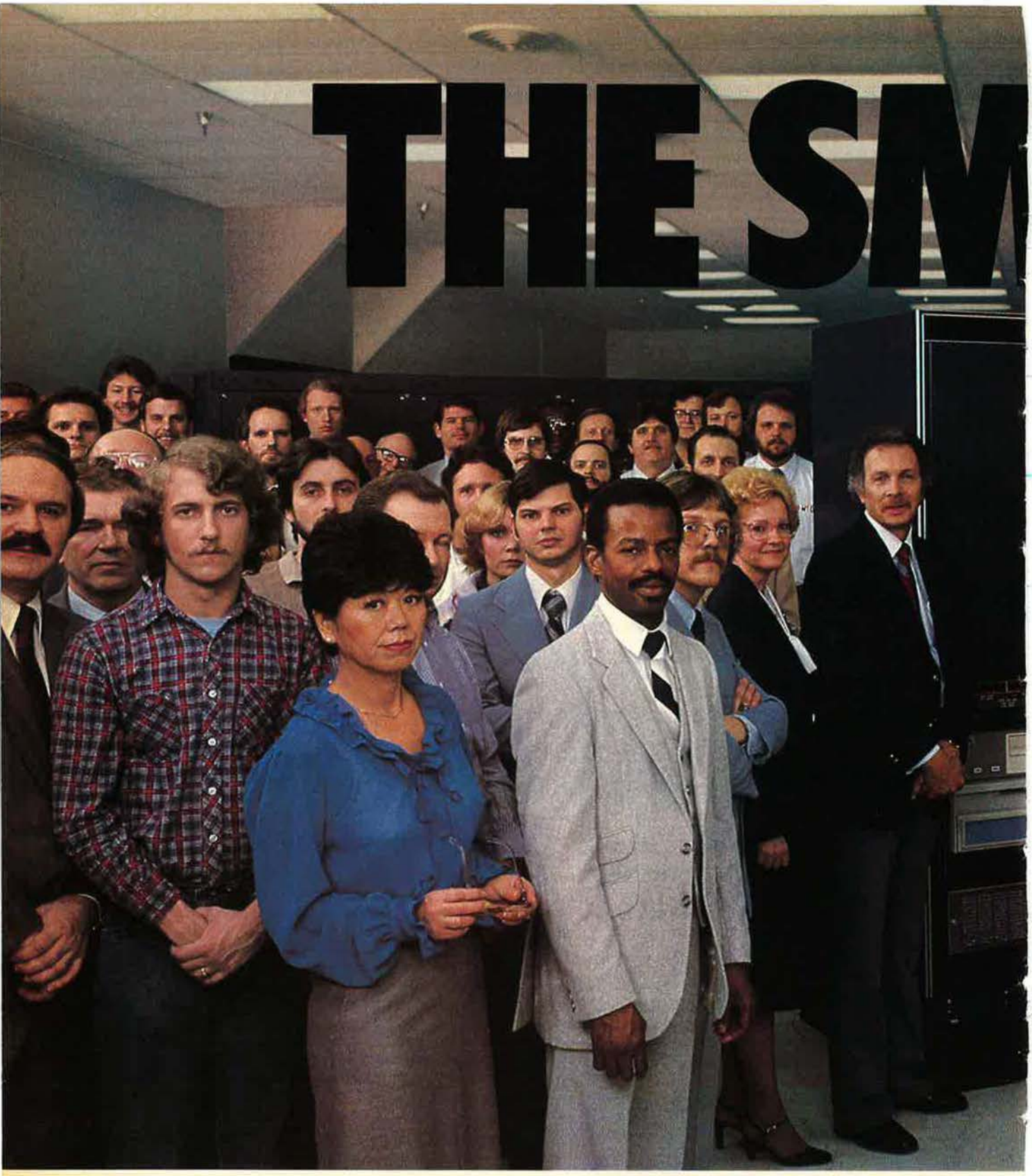

This automated test unit from the AAI Corporation is one very smart set. So, too, is the team of AAI experts responsible for it. At AAI, we've always felt it takes one to know one.

Take this Model 5565 Automatic Test System. It performs automated testing on a myriad of the military's defense electronics at all levels. This $150 million program at AAI includes 40 of these sophisticated systems and more than 6,000 Test Program Sets. These systems are now in service at military electronics maintenance facilities at 30 sites in 10 different countries.

But aside from our global reach and more than 20 years' ATE experience, what sets our hardware and software apart is our team concept of total program management and continuous support.

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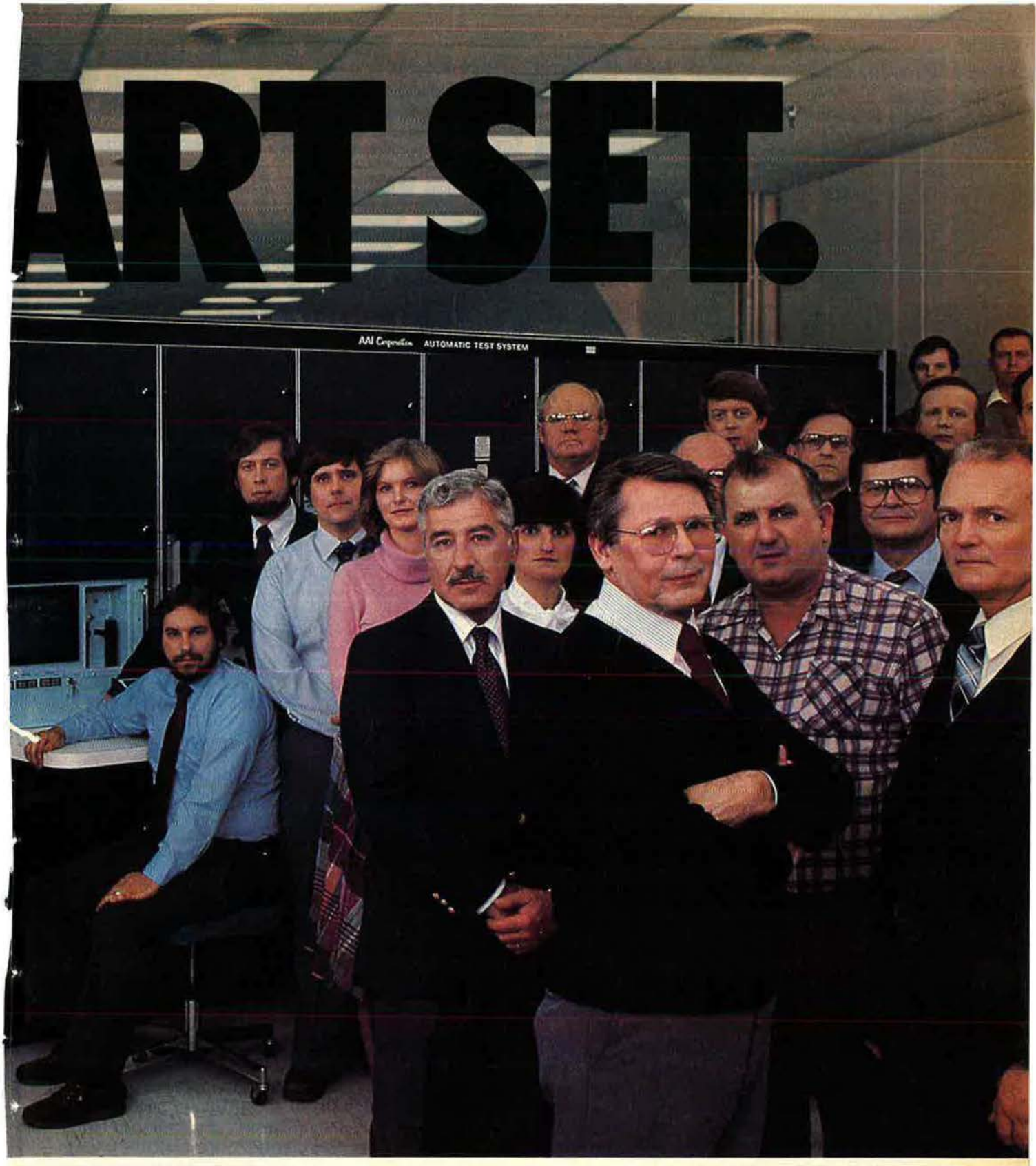
And even long after delivery, that AAI team continues to support its systems, to keep pace with users' new or changing test needs.

To keep pace with evolving

ART SET.



technology and military ATE requirements, AAI stays at the forefront of innovation, applying our mature management capabilities and technical resources. For example, our newest ATE systems address and incorporate the needs for modularity, reconfigurability, transportable software, and BUS-controlled architecture.

As a leading developer and producer of ATE systems, AAI has always believed in providing more than just hardware. And for more than 30 years, we've been applying this same team concept of total program management and support to our other high technology product areas: training and simulation systems, mechanical support equipment, combat vehicles, and ordnance systems.

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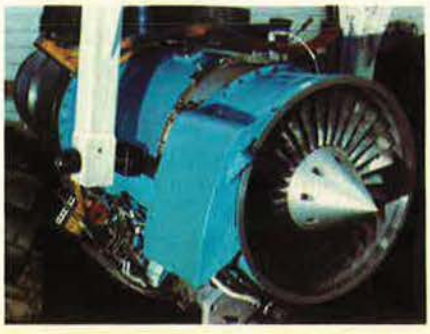
High performance, low risk.

The NOVA Trainer offers dramatic capability improvements for the Air Force's Next Generation Trainer (NGT) competition. Rockwell International's North American Aircraft Operations has assembled an airframe/engine combination that will expand the primary trainer envelope while reducing fuel usage over 50% and required maintenance by a third.

The NOVA design concept has evolved from over four years of study and refinement by Rockwell and the Air Force Air Training Command. The recent successful test of the Garrett TFE 76 engine is the latest major milestone in the NOVA development. The TFE 76 engine run underscores Rockwell's dedication to the lowest risk approach to the NGT.



NOVA. It has Rockwell's technical excellence behind it, and a bright future ahead.

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...where science gets down to business

AIR FORCE MAGAZINE
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This Month

MARCH 1982 • VOLUME 65, NUMBER 3

ABOUT THE COVER

Two Mil Mi-24 Hind-D gunship helicopters—armed with AT-2 Swatter antitank missiles, 57-mm rocket pods, and a four-barrel nose cannon—patrol near the Khyber Pass area in Afghanistan in the cover painting by artist William S. Phillips. The Eighth Annual Soviet Aerospace Almanac begins on p. 38 of this issue.

Departments

AN EDITORIAL

Information—Commodity and Weapon

THE "information explosion" is a phenomenon of the late twentieth century. Whereas it took several thousand years of recorded history for information to double by the time of the Renaissance, the pace accelerated rapidly in the Industrial Revolution and the late nineteenth and early twentieth centuries. Now, in just the three and one-half decades since the end of World War II, information is estimated to be doubling every five years. This creates opportunities and problems. The opportunities are there for persons with early access to information and who can divine what to do with it. The problems are in storage, dissemination, and checking the veracity of the mammoth flood of information.

In the US and other developed nations of the West, dealing with the information flow has created entirely new, robust, and now indispensable industries. Computer technology, originally for number-crunching, has been exploited to spawn a wide range of systems to create, process, transmit, store, or modify information. Word processors, electronic mail, information retrieval systems, and computer-aided design are but a few examples, and the list grows apace. With the advent of home computers, access to the vast information storehouses is magnified manyfold.

Small wonder, then, that information is now a commodity and dealt with as such in the marketplace. A monopoly on certain information can give a person, business, or government a competitive edge. Having the information earlier than competitors, even by minutes, can sharpen the edge.

But defective information can wreak chaos in modern society. It's harder to sort the good from the bad. Rumors or half-truths can now be transmitted faster, farther, and to more people than in the days of word of mouth or sailing ships. Corrections may travel as fast, but never seem to catch up. So, either by chance or design, defective information can discomfort, disrupt, or damage society more readily than before. For confirmation, recall the flurry of rumors and fragmentary reports in the electronic media the day President Reagan was wounded.

In a free society, such as the United States enjoys, the marketplace of information usually leads to an informed consensus. The Founding Fathers intended it so, especially in adopting the First Amendment. For AFA members, concerned about aerospace power and national security, accurate information is vital. This is true with regard to both information about potential enemies and US forces.

AIR FORCE Magazine tries to meet this need for AFA members throughout the year. That is especially the case in the March ("Soviet Aerospace Almanac"), May ("US Air Force Almanac"), and December ("Military Balance") issues. Given the information therein, AFA members can draw their own conclusions or debate the issues from an informed base.

Where people can be led astray is with inaccurate or deceptive information. Preparing and distributing such dross is the function of the Soviet disinformation campaign. In its most subtle forms, the information is not really wrong, but is selective enough or enough of a half-truth to be somewhat credible to the uninformed. An AIR FORCE Magazine staff study in this issue (*see p. 85*) covers the disinformation campaign in some detail. Among other efforts, the study cites a document prepared by the USSR Ministry of Defense and distributed in several languages in January 1982. Called *Whence the Threat to Peace*, this latest product of Soviet disinformation is the Russian rebuttal to *Soviet Military Power*, issued by Secretary of Defense Weinberger in September 1981 and extracted in AIR FORCE Magazine in December *(p. 46)*.

A hazard in citing *Whence the Threat to Peace* is that the very citation may lend it undeserved legitimacy. But examine a few of its assertions, and you will see why it should be dismissed out of hand. Take these quotes, for example:

Page 11—"There has never been, and never will be, a single example in history that in the least confirms the fib of 'Soviet export of revolution.' " This will surprise the Nicaraguans, Salvadorans, Angolans, and others.

Page 25—"Military bases in the territory of other states are being used by the United States to exert direct pressure on the governments concerned, keeping them within the mainstream of US policy, to threaten progressive and assist reactionary regimes in the region, and to suppress national liberation movements by armed force." Unlike the Russians, the presence of US forces has been at the invitation of host governments.

Page 72—"The determining line in the Soviet Union's foreign policy activities has always been and still is the struggle for peace and security of nations. . . ." This will be a revelation to the Afghanis.

Also on p. 72—"United States policy is going the other way." The American people and their Congress would disagree with this canard.

There is more of the same, larded with numbers, maps, and distortions of capabilities.

An informed US reader, particularly an AFA member, will spot the shaded meanings. But the primary audience in Europe and uninformed people in the US could fall for this deception.

There's the risk; information can be a weapon potentially as potent as a fighter plane. That's why it is so important for AFA members to educate themselves and other citizens as defense against misuse of this weapon.

—F. CLIFTON BERRY, JR., EDITOR IN CHIEF

High life-cycle cost is the enemy. Fight back with Collins avionics.

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Our credentials? Advanced state-of-the-art design technology coupled with high-volume, low-cost production capability.

Our mission? Develop and produce advanced, *affordable* avionics.

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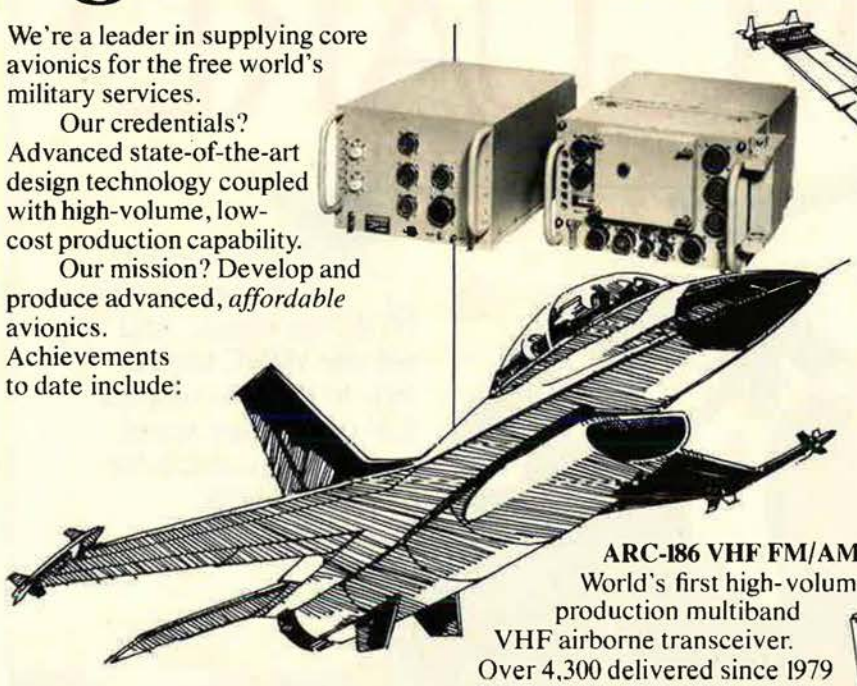

ARC-186 VHF FM/AM. World's first high-volume production multiband VHF airborne transceiver. Over 4,300 delivered since 1979 for U.S. Air Force, Army and international military services.

ARN-118 TACAN and ARN-108 ILS. Solid proof commercial avionics technology can be applied to military systems for outstanding performance, reliability and affordability. These systems are standard equipment on F-15, F-16, A-10 and F-5.

JTIDS. Teamed with Singer-Kearfott for the U.S. Air Force program, we'll soon be producing jam-resistant digital communications terminals for the world's most advanced fighter aircraft.

GPS. Developed for the joint services, Collins GPS user equipment will provide extremely accurate, three-dimensional, jam-resistant navigation.

VOR/ILS/DME. Earmarked for the CF-18 Hornet, our new-generation VOR/ILS integrates multiplex data bus interfacing in the nav receiver. Our ARN-124 DME is U.S. Army standard for rotary and fixed-wing aircraft.

With additional background in radar altimeters, voice recognition, cockpit management systems, multifunction displays and flight controls, we offer a wealth of diversified experience in military avionics. Like to put this in-depth experience to work for you? Contact Collins Government Avionics Division, Rockwell International, Cedar Rapids, IA 52406. (319) 395-4412.

ICS. Collins intercom systems are aboard the F-14, F-4 and E-2. Our latest system, developed for the Coast Guard's HH-65A helicopter, is fully compatible with 1553 data bus control/display systems.

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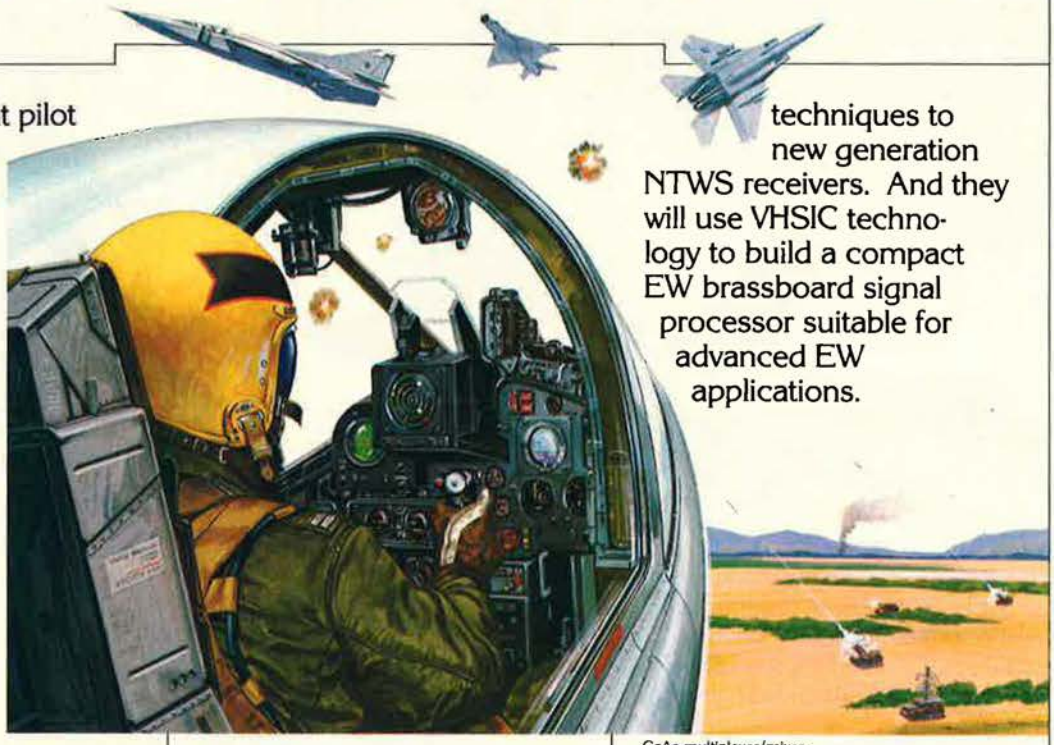
...where science gets down to business

ELECTRONIC BODYGUARD



When a combat pilot enters hostile territory, he is barraged by electronic signals from hundreds of enemy emitters: he needs to instantly identify all air defense radars, surface-to-air missiles, and airborne interceptors posing lethal threats to his mission.

Unfortunately, the signal density of today's EW threat environment has nearly outgrown the warning and threat management capabilities of conventional avionics.

The good news is that TRW has the necessary digital and RF VLSI, plus advanced avionics software to handle the problem.

We're putting it all to work in helping the Air Force and Navy design a new, highly integrated, threat warning system (NTWS).

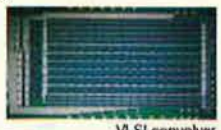
Consisting of broadband receivers, extremely high speed signal processors, and emitter identification software, our NTWS will allow pilots to instantaneously locate and identify emitters across a wide frequency range.

And we'll enhance it with multi-sensor data correlation and ECM management support.

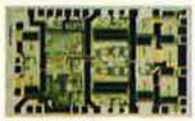
NTWS will provide 10 times the processing capabilities of existing avionic receiver and signal processing systems — in the same available space.

To do the job, TRW engineers are applying mature VLSI and receiver techniques to new generation NTWS receivers. And they will use VHSIC technology to build a compact EW brassboard signal processor suitable for advanced EW applications.

GaAs multiplexer/mixer



VLSI convolver



Silicon RF LSI

For more information on NTWS, please contact:
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San Diego, CA 92121
(714) 450-3836

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TRW

ELECTRONICS AND DEFENSE

AIRMAIL

Thunderbirds Tragedy

How we thrilled to their exploits and skills. The excitement of their precision flying, and then to see them in person. So young, eager, and handsome—all the dreams of America fulfilled. Their faces shiny with dedication, their eyes the windows to see the mysteries and glories of being in space. They died as they would have wished—together, unafraid, quickly, and in perfect formation.

And now the ultimate trip through the stars and heavens. They are mourned and missed, but, in the words of Stephen Spender, they "left the vivid air signed with their honour."

Marilyn Linton
Woodland Hills, Calif.

The Air Force should never apologize for the existence of the Thunderbirds by questioning their worth.

The decision to keep the team flying was quick, sure, and right. More importantly, it reflects leadership with backbone!

Robert L. Gore
Las Vegas, Nev.

Food for Thought

The January '82 issue presented much food for thought. We are behind the power curve. A massive, quick response will be required, and the time is, in fact, late. I have little faith that any one weapon system or program will cure our current weaknesses. General Dougherty *("Deterrence Is Everybody's Business," p. 34)* hit it squarely on the head—it *is* time we upgraded the entire spectrum of defense capability.

Some favor a racetrack concept to reduce ICBM vulnerability, but would not we only be lulling ourselves into a false sense of security behind an expensive Maginot Line? Soviet intelligence could find out the locations of every missile by expending only a little more effort than at present. It would be far more difficult to keep tabs on weapon systems with less restricted locations, *i.e.,* SSBNs and aerospace craft.

Is it not time the Air Force renewed primary emphasis on tactical and strategic bombers, in line with traditional United States military doctrine of firepower and mobility? The last strategic bomber accepted in squadron service in significant numbers became operational about the time our elder daughter was born. Our daughter is now married and has two children. Would not that indicate to nearly any thinking person that the B-52s are ready for replacement?

Accuracy might suffer a little if we returned to manned, airborne strategic deterrents, but we might afford a great deal more defense per dollar. In my squadron-level attitude, I always believed Strategic Air Command's one best reason for accepting the ICBM concept was that it became abundantly clear, even as early as Eisenhower's time, that the ICBM would be the only large, forward-looking system the Air Force could keep in the budget.

B-52s have been fine aircraft, but the only approximations to worthy successors in twenty-five years have been a few FB-111s and SR-71s. The B-1 has been effectively criticized and procrastinated into obsolescence, but its advantage is that it can be built today and become at least a partial, stopgap solution. If we have something better in some carefully guarded "skunk works," we can build that—but whatever is our best, let us build it right away and get it to the operators.

As General Dougherty pointed out clearly, only by getting on the job right now can we solve the personnel, logistical, and operational problems we must overcome to maintain an honorable peace.

Sam H. Andrew
Austin, Tex.

Commissary Comment

Lt. Col. W. D. Russell's letter in the January 1982 issue *("Airmail," p. 8)* taking exception to that portion of the 1981 AFA Policy Paper *(Nov. '81, p. 38)* that "strongly opposes efforts to reduce this benefit through contracting-out of commissary sales stores operations" requires comment.

His well-written letter somewhat arrogantly states: "There is absolutely no basis to assume that contract operations of commissary sales stores would, in any way, reduce the benefit to military customers." Egad, how typical of the superficial thinking that most uninformed people give to this important subject! The tendency is almost always to consider contracting-out only a single store or a particular function, such as the shelf-stocking example which Colonel Russell uses, without recognizing that the commissary systems have worldwide responsibilities—responsibilities wherever military personnel serve! . . .

There is a high risk of losing appropriated fund support for the commissaries under a commercial operation. There have been great pressures from a variety of sources to eliminate that subsidy, but thus far saner heads have prevailed. Would they still prevail if the funds were going to pay civilian contractors?

Gen. Lew Allen, Jr., the Air Force Chief of Staff, recognized this risk in a letter he sent to the other services concerning contracting-out commissaries: "Eventually as contract costs grow, we would be compelled to put commissaries on a 'pay as you go' basis. This would increase the surcharge from the current four percent to roughly fourteen to sixteen percent, creating a decline in patronage and increased prices due to reduced buying volume. By and by the commissary would not be of much benefit to us."

Even the Congress, who may have seen the contractor-operated commissary at Incirlik, Turkey, is upset about the idea. The draft report of the House Armed Services Committee 1982 Defense Authorization Bill stated: "The committee is gravely concerned over current initiatives within the Department of Defense to contract-out the operation of entire military commissary stores. . . . [Commissaries are] the only constant hedge military families have against the ravages of inflation. It is our belief that any effort to contract-out the stores will be perceived by service members and their families as an at-

tempt to reduce and ultimately eliminate the entitlement, undoubtedly impacting severely on retention and readiness."

I could go on with similar arguments *ad nauseam*, but I firmly believe there is a firm basis for the AFA position—I only wish it had been stronger. The service commissaries are doing a fine job and getting better and more cost-effective all the time. However, they are plagued with an almost continuous flow of dumb ideas for changes.

We should leave them alone and let them do what they do best—providing a high level of service to military families, wherever they may be.

Maj. Gen. Daniel L. Burkett,
USAF (Ret.)
Dallas, Tex.

"Ostrich Management"

When I read Lt. Col. Harold R. Alston's letter in the January '82 "Airmail" *(p. 13),* I was amazed. I thought Ostrich Management was reserved for and only applied to enlisted folks. His situation paralleled mine so vividly I could hardly believe it.

I had been at Whiteman AFB, Mo., for nine months when I learned I would be leaving after I had been on station one year. Hq. SAC's Transportation Division saw fit to reduce my E-9 slot to an E-8 level when the Air Force directed realignment of Chief Master Sergeant slots. The irony of this whole situation is that they could have just as easily reduced the E-9 slot at Minot AFB, N. D., that a Master Sergeant has occupied for more than four years.

Had that been their decision I could have stayed in the Air Force longer and there would have been little effect at Minot. Because of Manpower and Personnel Center policy concerning assignment of Chiefs, I could not remain in the E-8 position. I was faced with the decision either to move or retire. I elected to request retirement, effective June 1982.

Much ado is made about pay each year, and it is perceived as the panacea in retaining the experienced force. I place consideration and common sense in dealing with me above money. Maybe if enough people wrote to publications like AIR FORCE Magazine and *Air Force Times* describing how they have been treated, someone would perhaps pay attention and do something about how we are "managed."

CMSgt. Bobby D. White, USAF
Whiteman AFB, Mo.

Launch on Warning?

From TV, newspapers, and other media we have been and are being bombarded with statements by well-meaning officials, analysts, and prominent individuals on the need for some means to secure our ICBMs against enemy nuclear strikes.

Did we not at one time design and build early warning systems to ensure that our missiles and strategic alert aircraft would not be found by the enemy—either in their holes or on their hardstands? The development of a reliable early warning system provided the basis for a pretty sound doctrine.

If we make sure that any enemy missiles will always find only an empty launch site because all of our ICBMs will be on their way, and that every potential enemy knows that will be the result, several advantages are apparent:

- The positive knowledge of certain and immediate retaliation will forestall an enemy attack.
- Follow-on strikes from our submarines and alert aircraft will still be available.
- A huge reduction in our defense budget will result, due to using only unhardened launch sites.
- Costly and divisive domestic controversy concerning site hardening and underground or airborne ICBM security systems will not be necessary.

Such a national policy will require the constant ability for rapid and accurate communications between NORAD, the President, and SAC—and that capability exists.

Col. Roy W. Browne,
USAF (Ret.)
Hartville, Mo.

That December Cover!

I just received my December '81 issue, and I am having real trouble getting past the front cover! A tremendous message in a great piece of art by Jack Pardue.

Please tell me how I can get a copy suitable for framing.

Lt. Col. Billy S. Hockaday,
USAF (Ret.)
Perris, Calif.

The cover of your December '81 issue is magnificent! I am sure you will receive many more requests about this, but I was wondering if it would be possible to get a copy (print, lithograph, etc.) of that painting? Surely the artist, Jack Pardue, realized he had created something that would be of interest to many of your readers and took steps to ensure that others would be able to enjoy his work.

I would appreciate any help you can give me in obtaining a copy of that painting. If nothing else, perhaps you could give me the address of Mr. Pardue so that I can write him and express my admiration for his work. Thanks for any help you can give!

Capt. Joseph R. Lesyea, USAF
Holloman AFB, N. M.

• *To Colonel Hockaday, Captain Lesyea, and the many others who wrote requesting copies of the December '81 issue cover: See the ad on p. 18, and the box on p. 31 in the "Aerospace World" section of this issue.*—THE EDITORS

Navy Gold

In reference to your remarks on p. 34 of the December '81 issue, regarding the first Shuttle launch: Those astronaut wings that you saw on Young's and Crippen's chests were Navy gold, not USAF silver.

At the time of the first Shuttle launch John Young was a retired Navy captain, having served as a test pilot for three years and also having served in the Navy's fighter community before reporting to NASA. Robert Crippen, on the other hand, was an *active-duty* Navy captain at the time of the launch, having served in the Navy attack community and as an instructor at the USAF Aerospace Research Pilot School before reporting to NASA in 1969. They were, and are, Naval aviators.

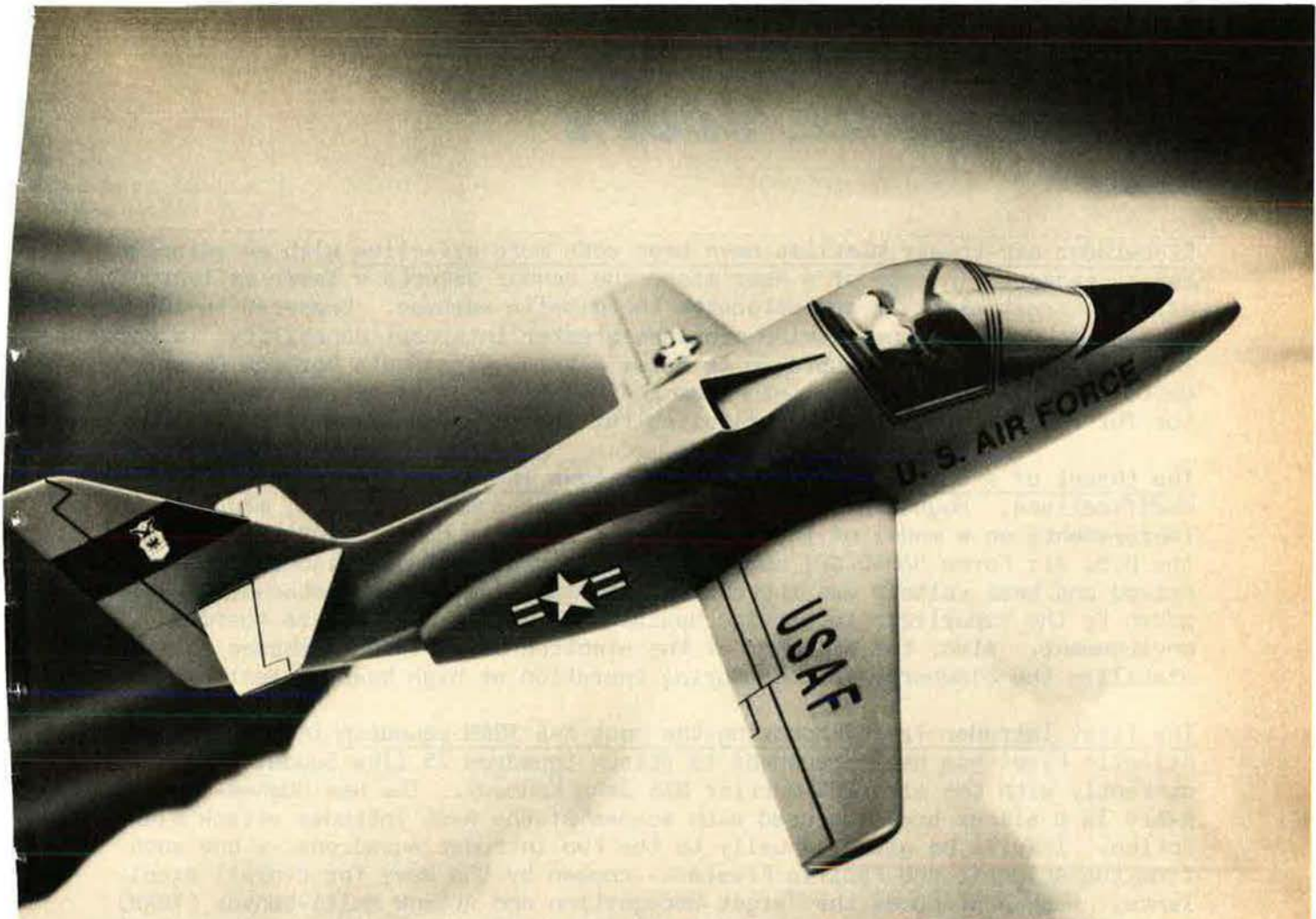
Last, and certainly not least, we would like to remind you that the first American in space, Alan Shepard, was and is a Naval aviator. John Glenn, the first American to orbit the earth, was and is a Naval aviator. And Neil Armstrong, the first man to walk on the moon, received Navy flight training and is one of the few men to wear honorary Navy wings of gold.

Your magazine is one of the finest published, and we enjoy reading it. Keep up the good work.

Steven K. Spragg
Marshall W. Martin, Jr.
Memphis, Tenn.

USAF Museum Aircraft on Loan

The United States Air Force Museum has more than 600 aircraft on loan to other qualified museums in the US, and at a few overseas sites. Most displayed at Air Force bases are well cared for, but we are finding that at times those in the civilian community are not getting the attention that



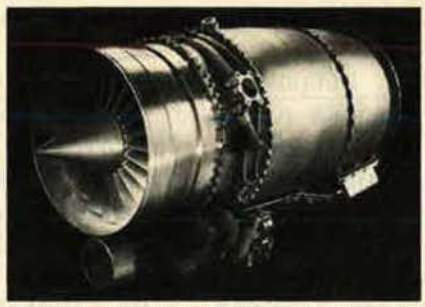
Gulfstream American's Next-Generation Trainer.

Peregrine breaks formation for unique approach to total contractor support program.

As the new-generation trainers head for tomorrow, one has broken from the traditional organic approach to maintenance and support:

The Gulfstream American NGT/Peregrine.

It's teamed up with three well-known performance companies to fight high support costs. E-Systems, a name synonymous with contractor maintenance support; Williams International, for depot-level engine maintenance; and CALSPAN for systems training and syllabi.



The Williams International FJ44 turbofan designed for the Gulfstream NGT/Peregrine.

Together, they project a 51% reduction in maintenance labor costs.

This innovative contractor approach is a powerful weapon for the Air Force Training Command. And that will free up Air Force personnel for weapons systems missions elsewhere.

Gulfstream American's NGT/Peregrine. Innovative contractor support behind it. A bright future ahead. For more information, contact Gulfstream American's Washington Headquarters: (703) 276-9500. Or Peregrine marketing, Bethany, OK: (405) 789-5000, ext. 201.

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CORPORATION

SCIENCE/SCOPE

Sidewinder air-to-air missiles have been made more effective with an advanced target sensor. In case of a near miss, the sensor detects a laser reflection off the target aircraft and detonates the missile warhead. Compared to earlier passive sensors, the new device provides greater intercept capability, is more reliable, and is less vulnerable to false alarms. The Santa Barbara Research Center, a Hughes subsidiary, produces the DSU-21/B active optical target detector for AIM-9B, 9E, 9J, and 9P missiles for the U.S. Air Force.

The thrust of a spacecraft ion engine has been increased fivefold through simple modifications. Hughes scientists, working under a NASA contract, made the improvements on a model of the 8-centimeter thruster built for flight test on the U.S. Air Force SAMSO-601 spacecraft beginning in 1983. Discharge power was raised and beam voltage was increased. Thermally conductive attachments were added to the vaporizers to provide heatsinking in the more severe thermal environment. Also, the diameter of the electron baffle was increased to stabilize the discharge voltage during operation at high beam current.

The first Intruder Trophy honoring the best A-6 TRAM squadron in the U.S. Navy's Atlantic Fleet has been presented to Attack Squadron 75 (The Sunday Punchers), currently with the aircraft carrier USS John Kennedy. The new Hughes-sponsored award is a silver bowl engraved with scenes of the A-6E Intruder attack plane in action. It will be given annually to the two Intruder squadrons -- one each from the Atlantic and Pacific Fleets -- chosen by the Navy for overall excellence. Hughes produces the Target Recognition and Attack Multi-sensor (TRAM) Detecting and Ranging Set, a combination laser and infrared device that enables the A-6E to attack ground targets day or night.

A compact, computerized TV system may prove invaluable as a combination training device and maintenance manual for military and commercial uses. The Hughes Training and Maintenance Information System (TMIS) incorporates a TV screen, keyboard, micro-computer, and video disc player. Using video sequences, text, and graphics, it can teach someone how to operate something as complex as a tactical radar, or help technicians repair complex electromechanical systems. A technician merely enters symptoms into the computer, usually by answering yes-and-no or multiple-choice questions. TMIS then suggests what may be wrong and shows step by step how to make repairs. TMIS can be switched from one function to another by simply replacing one memory disc with another.

Though designed to locate enemy weapons by tracking artillery and mortar rounds in flight, Hughes Firefinder radars also can track friendly counterfire and tell crews what adjustments they need to make. The AN/TPQ-37 and the smaller TPQ-36 each have a flat vertical antenna that sweeps pencil-shaped radar beams along the horizon. If any object breaks through this electronic fence, the radar fires a verification beam. If this beam also detects the object, the radar starts to track the shell and calculates where it was fired from. As it does so the radar still watches for other targets. The Firefinders are in full-scale production for the U.S. Army, U.S. Marine Corps, and selected allied forces.

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the aircraft loan agreements call for.

(The aircraft with which we are specifically concerned are on loan to museums, as opposed to those on loan by other governmental agencies to schools, parks, recreational facilities, posts of the American Legion and VFW, cities, and municipalities. While misuse of these display aircraft should probably also be brought to the attention of the borrower, the Air Force Museum has no jurisdiction over them.)

Our staffing and limited travel dollars do not permit frequent on-site inspection of these loaned aircraft. Maj. Elbert W. Farris, USAF (Ret.), of Tallahassee, Fla., wrote us recently suggesting that we enlist the aid of members of the Air Force Association to keep us informed about our planes around the country.

We thought Major Farris had an excellent idea, and we solicit photographs and information about the condition of our planes wherever readers may happen to view one of them on display in poor condition. Normally they are identified as "On Loan From the USAF Museum." This information helps immensely in our quest to ensure that the planes are being taken care of by the borrowing agency.

Of course, many of the aircraft are very well cared for, and an "attaboy" to the borrower and a note to that effect to the Museum would be equally appreciated.

We greatly appreciate the support of the Air Force Association through the years, and especially enjoyed Capt. Phil Lacombe's recent article about the Museum *("The Air Force Museum: A History Lesson," p. 126, December '81).*

(P. S. Please do not report on the condition of the XC-99 at San Antonio. This is *not* an Air Force Museum aircraft.)

Col. Richard L. Uppstrom, USAF
Director
Air Force Museum
Wright-Patterson AFB, Ohio 45433

• *For more on the plight of the XC-99 at Kelly AFB, Tex., see "Kelly's Durable Relic," by Jennifer Harper, on p. 166 of the September '81 issue.*—THE EDITORS

Beware the Siren Songs

As the Fiscal Year '83 budget works through Congress, a seductive siren song of "defense on the cheap" will be heard. People in and out of Congress will advocate "simple solutions" to airpower requirements. The solutions will be cloaked in apparently accurate reams of data.

Beware the easy solutions. When couched in "Simplicity vs. Complexity" terms, they overlook a basic demand—that the US develop systems to conduct combat operations against a threat, not a dollar target.

For the Air Force, that means being able to win at night and in bad weather, not just daylight.

—THE EDITORS

AIRMAIL

Not Senile

I just finished reading the letter in the January '82 "Airmail" *(p. 13)* by Terence R. St. Louis concerning the September '81 article, "The Bombardier and His Bombsight," by Michael J. Nisos. In his letter, Mr. St. Louis states that his ball turret could rotate 360 degrees in azimuth and from zero to minus ninety degrees in forty-five seconds.

Something is very wrong with either his or my memory.

I operated a top turret of a B-26 Marauder during World War II, and if my turret operated as slowly as Mr. St. Louis said, I might just as well have stayed on the ground. At that speed, it would have been impossible to track and fire on any FW 190s or Me 109s attracted to our formation.

Is Mr. St. Louis correct (backed up by Mr. Nisos), or am I getting senile in my old age?

MSgt. Charles E. Timme, USAF (Ret.)
Chester, S. C.

• *Author Nisos replies: "Contact with the National Air and Space Museum indicates that Sergeant Timme is not 'getting senile in his old age.' He is indeed right that forty-five seconds is just too long a time for a ball turret to traverse from zero to minus ninety degrees. Museum personnel indicate that 0.45 seconds would be more like it. Sergeant Timme, you're right!"*

Meyer Levin

In the "Airmail" section of the January '82 issue there was a letter from Terence R. St. Louis in reference to the September '81 article, "The Bombardier and His Bombsight."

Mr. St. Louis stated that MSgt. Meyer "Mike" Levin was killed in combat on December 10, 1941, while flying with Colin Kelly, Jr.

Mike did fly with Kelly while in the 19th Bomb Group. He earned the nickname of "50-50" because of the number of times that he bailed out due to engine trouble, etc.

Mike was transferred into the 64th Bomb Squadron, 43d Bomb Group, and was killed on a mission. They crashed into the Gulf of Papua on January 6, 1943, in a B-17. (The rest of the crew was picked up.)

Mike was a quiet sort of guy as I remember, and about the only time that you could get him to talk about his missions was when you got him juiced on the local-made "jungle juice." I have a picture from 1943 showing him reading a book in front of his tent.

As far as the best seat in the house is concerned, I'll have to agree with Mr. St. Louis. The ball was it! You could see the bombs drop, explode, and observe the damage. I had thirty-five missions as a ball turret gunner in B-17s and 120 missions as a gunner in B-24s, ending up with 155 missions and 1,000 hours of combat.

One more bit of info: The mission on which Mike was killed would have been his "last," as his orders home had just been received.

"Lucky" Stevens
Mountain Lakes, N. J.

Sweater Affair

In "The Bulletin Board" section of the January '82 issue, there is an error in the article "Your Mother Wears Combat Boots." The statement, "a new blue pullover sweater . . . has been approved, but only for those assigned to Washington, D. C., in joint departmental assignments," is not entirely correct.

The new pullover sweater has been approved, but for all Air Force personnel all over the world. Some military clothing sales stores have already received shipments, and all stores should have sweaters by March 1982.

To prevent confusing those who have already purchased the new pullover sweater, we would appreciate it if you would print a correction.

Capt. Carla M. Stucki, USAF
Secretary to the Air Force
Uniform Board
Washington, D. C

• *We appreciate the updated information provided by Captain Stucki. Our information, which we received from Headquarters at press time, was as indicated in the item. We are glad to learn that eligibility for wear has been extended worldwide. The sweater is a classy item.*—THE EDITORS

Memphis Belle

In an effort to fill a gap in the literature of World War II, we are collecting data and information to be used in a book chronicling the history of the B-17F *Memphis Belle,* which flew with the 91st Bomb Group.

What we are looking for is remembrances or memorabilia, particularly photographs, from individuals who had contact with the plane or its crew any time during its history—from the time it took off as a member of the 91st Bomb Group until it came back to the States and was used as a trainer on up until the present time. Individuals who have particularly interesting stories to tell will be interviewed personally by one or both of the authors.

Any items which are supplied to us on loan will be promptly returned (after being examined and, in the case of photographs, copied). Where material is used, appropriate acknowledgments will be made.

We would appreciate hearing from anyone who has had any contact with the plane or who has information that they think may be useful to us.

Dr. Harry Friedman
5910 Haymarket Rd.
Memphis, Tenn. 38119

Help! I am an avid modeler and wish to be correct in my detailing on the P-51s that escorted the B-17 *Memphis Belle's* unit. So far, I have been unable to determine the fighter squadron(s) that escorted the 91st Bomb Group, 324th BS, to which *Memphis Belle* belonged.

Anyone who belonged to these fighter units, please contact me and describe the cowling colors, fuselage and tail numbers and letters, and paint job of the P-51 escorts. I need also to know the home base.

Please contact me at the address below.

Capt. Suellyn W. Novak, USAF
5703 Chesterfield Dr.
Temple Hills, Md. 20748

F-4 Info

I am doing a book entitled *The McDonnell Douglas F-4 in Combat;* and would very much like to have help from the people involved.

There are some specific needs: (1) combat photos—prelaunch, gun camera, battle damage; (2) support operations—munitions loading, maintenance, etc.; (3) accounts of combat missions; (4) the point of view from both seats, and from the ground support personnel; and (5) other photos of high pictorial appeal.

I will return all material, if desired.

Walter J. Boyne
Assistant Director
National Air and Space Museum
Washington, D. C. 20560

Thor Launch Team

I am compiling a computerized list of the more than 1,500 alumni of the Thor Space Launch Team, which will include all USAF, Royal Air Force, and contractor personnel who have been directly involved with any of the USAF Thor CTL or Space Booster launches from Cape Canaveral, Fla., Vanden-

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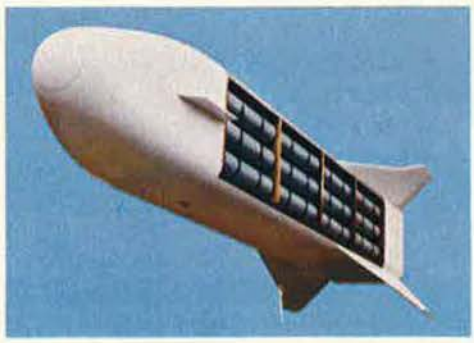

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berg AFB, Calif., or Johnston Island.

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Please send a SASE to me for a data input questionnaire. A reunion of all members of this unique group of space launch pioneers is tentatively planned for December 1983—the twenty-fifth anniversary of the first launch of a missile (a Thor!) from Vandenberg AFB, Calif.

Eric G. Lemmon
4416 Titan Ave.
Lompoc, Calif. 93436

F-80 History

I am preparing a detailed photographic and unit history on the Lockheed F-80 Shooting Star aircraft in the ANG and Reserve. I would appreciate the loan of photos and slides of the F-80 and RF-80. All material will be returned promptly, and I will reimburse for postage and processing costs.

I would also like to hear about personal experiences in flying and maintaining the aircraft. My long-range goal is to publish a series of articles covering the entire operational history of the F-80; therefore, all information is welcome.

Robert J. Esposito
409 Orchard Ave.
Somerdale, N. J. 08083

AIRMAIL

Observation Aircraft in Vietnam

I am attempting to gather information, pictures, and personal experiences of men who flew observation aircraft (Cessna L-19s) in Vietnam for a research project.

I would appreciate any information readers could send. All material will be promptly returned and credited. Please contact me at the address below.

Keith L. Carter
7655 W. 67th Ave.
Apt. 104
Arvada, Colo. 80004

Lincoln Airport

I am trying to compile historical information on the Lincoln Municipal Airport in Lincoln, Calif.

The airport was constructed during World War II as an auxiliary training field for Mather AFB in Sacramento.

We would like to hear from anyone who used the field during World War II and up to January 1947. Dates, type of aircraft flown, and type of training are the items of particular interest. Please contact me with any information at the address below.

L. Mencarini
Airport Manager
Lincoln Airport
P. O. Box 426
Lincoln, Calif. 95648

Hospitals in Vietnam

I would appreciate hearing from anyone who was assigned to the 483d USAF Hospital at Cam Ranh Bay, Vietnam, or the 377th USAF Hospital at Tan Son Nhut, Vietnam, during 1971 and 1972.

I was assigned to those bases during that time and have two reasons for wanting to hear from former members: first, to locate friends, and second, to gather information for a study I am conducting.

Robert A. Cornell
Chairman
Veterans Advisory Council
Box 316
Fort Madison, Iowa 52627

AIRMAIL

Vietnam Material Wanted

I am looking for material on the Vietnam War from all points of view: fiction, poetry, memoirs, drama, diaries, songs, sketches, letters, etc. If approved, submissions will be included in a major anthology presently under contract (your copyright will be protected).

Please contact me at the address below.

John Clark Pratt
3409 Canadian Parkway
Fort Collins, Colo. 80524

7th Aerial Port Squadron

I would like to hear from anyone associated with the 7th Aerial Port Squadron of the Far East Air Force or PACAF.

The purpose of this request is to gather material and information for an article, and also to compile a current address list in order to plan a reunion.

Maj. Heyward B. Roberts, Jr., USAF (Ret.)
87 Bethel Pl.
Washington, W. Va. 26181

Lockheed Hudsons

A former member of the RAF who flew in Lockheed Hudsons during World War II is seeking information about US squadrons equipped with this type of aircraft. There is much history about RAF squadrons equipped with the aforementioned aircraft, but very little so far about US squadrons.

Any anecdotes or other accounts will be very gratefully received.

A. Hendrie
Sandy Ridge
Amberley Road
Storrington, West Sussex
RH20 4JE England

Clark Field

I would like to express my sincere appreciation to Thirteenth Air Force at Clark AB, the Philippines, for the professional courtesy and hospitality extended to my wife and me during our visits there in the summers of 1979 and 1981. We are particularly indebted to our host, Dr. William T. T. Ward, Chief of the History Section, for taking the time to give us a tour of the base. . . .

To those former airmen who once served at Clark Field: Dr. Ward is seeking photos of various activities at the base to add to his archival collection. He would appreciate borrowing these pictures in order to make copies. (Clark AB is APO San Francisco 96274.)

Harry Stokes
Rolling Meadows, Ill.

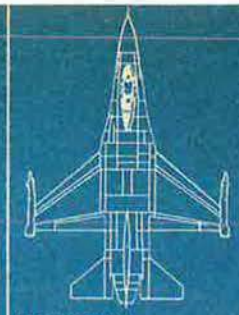
337th FIS

I am seeking information on commanders of the 337th Fighter-Interceptor Squadron (and their dates of tenure) from July 8, 1954, to July 8, 1960.

The 337th Tactical Fighter Squadron will be activated at Seymour Johnson AFB in April 1982, and our historical coverage of the 337th's role in the air defense mission during the late 1950s is sketchy, at best. If photos or memorabilia are available, they would add life to a new squadron about to become part of the 4th Tactical Fighter Wing.

Frederick D. Claypool
Historian
4th TFW/HO
Seymour Johnson AFB,
N. C. 27531

(Continued on p. 133)



Length: 47.64 ft.
Wing span: 31 ft.
Wing area: 300 sq. ft.
Weight empty: 15,200 lb.
Max. takeoff weight: 35,400 lb.

F-16 Fighting Falcon
Combat radius: 500+ nautical miles
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Load capacity: 15,200 lb.
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F-16 Fighting Falcon. High Performance. Outstanding reliability. Flexible multimission capability. Now in operation with the 388th Tactical Fighter Wing, Hill AFB, the 55th Tactical Fighter Wing, MacDill AFB, the 474th Tactical Fighter Wing, Nellis AFB, and the 8th Tactical Fighter Wing, Kunsan AB, South Korea.

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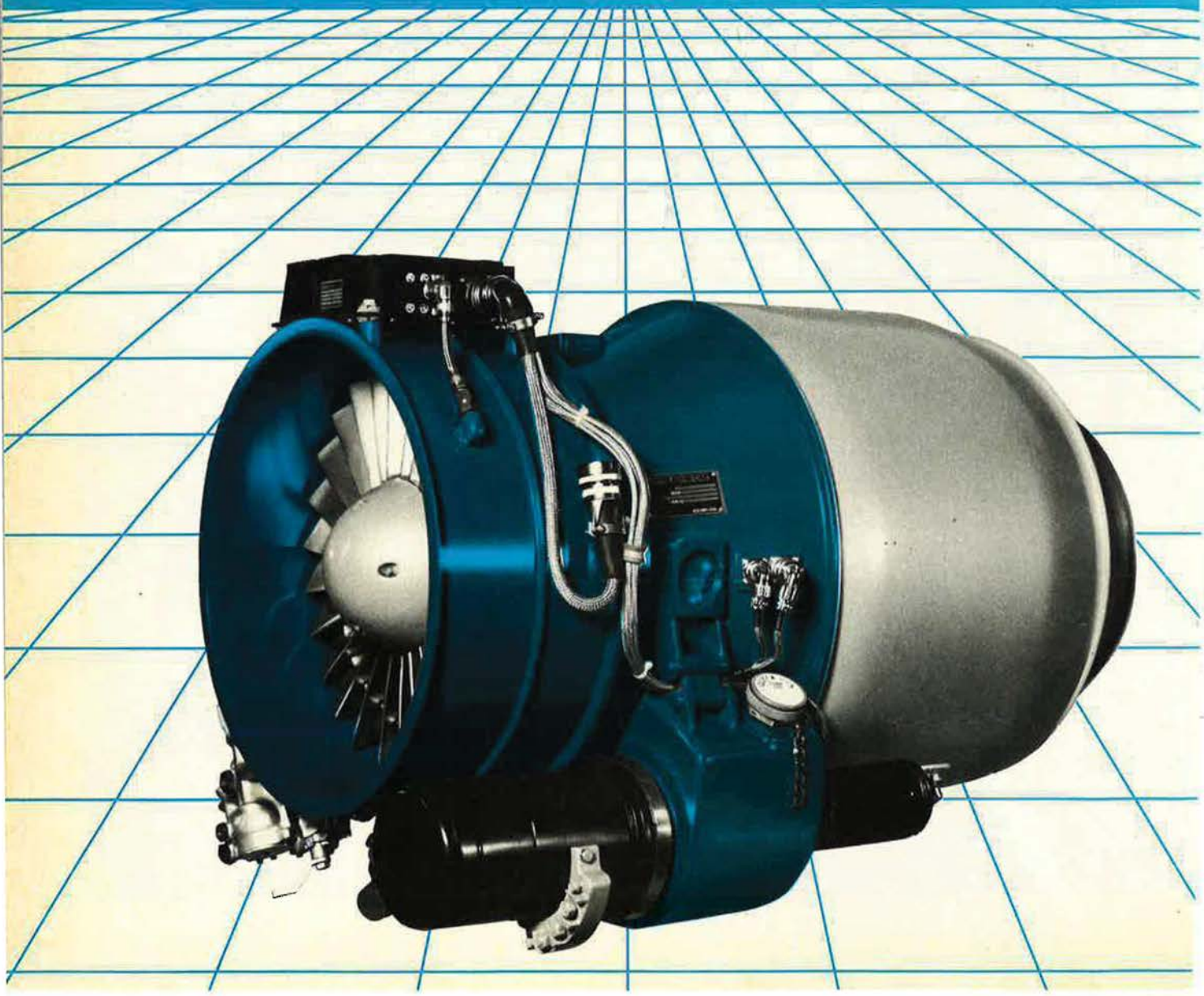


IN FOCUS...

By Edgar Ulsamer, SENIOR EDITOR (POLICY & TECHNOLOGY)

Washington, D. C., Jan. 27

Ups and Downs of MX Basing

On the very last day of 1981, the Defense Department backed off from an interim basing mode for MX—involving "superhardened" fixed silos—presumably in recognition of insurmountable congressional opposition and because of the questionable survivability gains this approach offers. The decision to forego temporary MX deployment in this mode would, even over the long term, seem to spell the end of this ill-starred concept that the Office of the Secretary of Defense (OSD) "invented" last October without benefit of Air Force consultation or concurrence.

Rather than rebuilding existing ICBM silos, the Defense Department now plans to deploy "at least forty" MX missiles in existing Minuteman silos. The first unit of ten missiles is to achieve operational status late in 1986. This spring, the Defense Department will decide which of the existing six Minuteman wings is to house MX. The intent is to deploy all MX missiles in one field to minimize command control and communications problems and thereby lower costs.

The Defense Department opted for deploying MX in Minuteman rather than in Titan silos because of greater compatibility with potential ballistic missile defenses, higher operational effectiveness, and lower cost. This commitment to an interimistic basing scheme has no effect on long-term basing options. These options include ballistic missile defense of silo-based or deceptively based MX missiles, deep basing of MX in underground citadels, and an airmobile MX using a continuous patrol aircraft.

Congress requested that the Defense Department select a long-term basing mode by July of next year. The latest Defense Department estimate is that to produce 226 MX missiles and to deploy at least forty of them in existing Minuteman silos will cost between $18 and $19 billion in constant FY '82 dollars. Procurement of this number of missiles, according to the Defense Department, "will allow for ultimate deployment of 100 in both near- and long-term basing modes as well as operational assets and spares."

While the most crucial decision on MX—determination of the system's long-term basing mode—is yet to be made, the Defense Department decided recently on the type of warheads the new missile is to deploy. Rather than arming the missile with either the current or an improved version of the Mk 12A as preferred by the Air Force, DoD decided in favor of the so-called ABRV (Advanced Ballistic Reentry Vehicle) in down-rated form. The ABRV, as originally developed by the Department of Energy's weapons laboratories, was to have had a yield of about 500 kilotons. The version that the Defense Department requested for MX, however, will produce less yield than even the standard Mk 12A (also known as W78, nominally rated at 330 kilotons).

Rather than arming the missile with either the current or an improved version of the Mk 12A as preferred by the Air Force, DoD decided in favor of the so-called ABRV (Advanced Ballistic Reentry Vehicle) in down-rated form.

The reason for scaling back yield is to reduce use of scarce special nuclear materials (SNM—various fissile elements, such as plutonium or more sophisticated materials that in concert with high explosives form the primary stage of a thermonuclear weapon that provides the neutron flux needed to "trigger" the secondary or fusion stage). The yield of a thermonuclear weapon is the product of the primary as well as secondary stage, with the fission part contributing usually between a quarter to half of the force generated by the weapon. By reducing the ABRV's SNM content, the yield of this warhead falls below that of the Mk 12A, even though it weighs more and is bulkier than the latter. As a result, MX will carry fewer warheads than otherwise possible (nine or less, compared to ten—or twelve if not constrained by SALT II) and cost more.

Equipping MX with reduced-yield ABRVs rather than with Mk 12As will cause a cost increase to the Air Force of almost $1 billion and degrade the missile's operational effectiveness. It is possible to argue, however, that the option to change over eventually to high-yield ABRVs—in excess of 500 kilotons—may be worth the price of admission. By way of a benchmark, the Multiple Independently Targetable RVs (MIRVs) of modern Soviet ICBMs consist mainly of two types, one with a yield of about 600 kilotons and the other one weighing in at about 1.2 megatons.

Congressional experts look askance at the Administration's decision to saddle the MX with reduced-yield ABRVs because of the concomitant cost growth and performance decline as well as the fact that yet another RV is being brought into the inventory that has not been tested.

Because the US abides by the terms of a bilateral accord with the Soviets that severely limits underground nuclear testing (the so-called Threshold Test Ban Treaty of 1974, which, although never ratified by the US Senate, precludes this country from conducting underground tests with an anticipated yield of more than 150 kilotons), the ABRV in either version has not undergone full-up testing. Even though this is true also for the Mk 12A, the latter uses components that were tested and hence is less likely to malfunction or produce inadequate yields than is the case with ABRV.

In light of this concern, some Administration officials and influential congressional quarters favor ending US adherence to the Threshold Test Ban to assure the effectiveness and reliability of the nation's strategic deterrent. *(See p. 17 of the January '82 issue.)* There have been past in-

stances when untested operational designs were subsequently found to be flawed, either in terms of yield or malfunctioning.

The Air Force, meanwhile, is refining but is not yet ready to categorically recommend a deceptive basing concept known as Modular Array Basing (MAB), which appears to offer good survivability yet draws on existing technology and recent research and development findings. Initial Capitol Hill reaction to this proposed basing concept, which involves the deployment of up to 200 MX ICBMs at or very close to existing military bases, has been favorable. Between ten and thirty would be deployed deceptively in vertical capsules hardened to withstand overpressures of up to 2,000 psi (pounds per square inch). The individual capsules would be spaced one-half to two miles apart, either on a military base or on small parcels of land close to existing facilities.

Among the military facilities that have been identified as candidates for MAB are Edwards AFB, Calif.; the Naval Weapons Center at China Lake, Calif.; Webb AFB, Tex.; Reese AFB, Tex.; Dyess AFB, Tex.; the Navajo Army Depot, Ariz.; Williams AFB, Ariz.; Nellis AFB, Nev.; Cannon AFB, N. M.; Altus AFB, Okla.; Fort Sill, Okla.; and several bases supporting existing ICBM deployments.

In order to maintain deception, the missiles would be moved among a number of capsules in shell-game fashion at intervals corresponding to essential maintenance cycles, or about twice a year. The MAB concept also envisions use of decoys, masking signals, and countermeasures to thwart detection of the missiles' location by Soviet spy satellites or agents on the ground.

One or two sites would function as central operating bases where the missile's first three stages would be assembled for shipment via air or train to the deployment bases. There the missiles would be mated with the fourth stage and the RVs and placed into a canister/launcher. The missile, inside its canister, would then be moved from the deployment base to a vertical capsule in transporter/erector vehicles. These transporters would be similar to those used for Minuteman ICBMs. While there may be the need to build new or improve existing roads, the MAB concept seeks to utilize existing roads wherever possible.

If the threat posed by Soviet ballistic missiles were to reach levels in excess of what the system can safely tolerate, MAB's survivability can be boosted by the incremental addition of Ballistic Missile Defense systems to protect individual capsules, an entire deployment base, or both. Apparently only one control center will be needed per deployment base. In case of MX deployments at Minuteman complexes, the existing control centers probably can be modified to accommodate the new, large missile. Airborne command and control aircraft as well as satellite relays can be used to provide MAB with survivable command control and communications and direct linkage with the National Command Authorities. In case an attacker manages to put essential satellite command and control links out of commission, airborne control and other mobile, survivable networks can provide longer-term, enduring command and control.

There is the option to keep some of the MAB force on full alert, ready to launch within seconds on receipt of specific orders to strike targets requiring rapid response while assigning others to a reserve force. The latter category of weapons can be kept dormant to provide protracted warfighting capabilities. Basic security arrangements of the Minuteman force can be applied to MAB. Remote sensors can be used to detect attempts that penetrate the vertical capsules. Special security teams would be available to respond to alarms in the same manner as under the Minuteman arrangement.

Several other deployment schemes are under consideration by the Air Force at this time, including concepts involving a mix of basing modes.

IN FOCUS...

B-1 Is Formally Resurrected

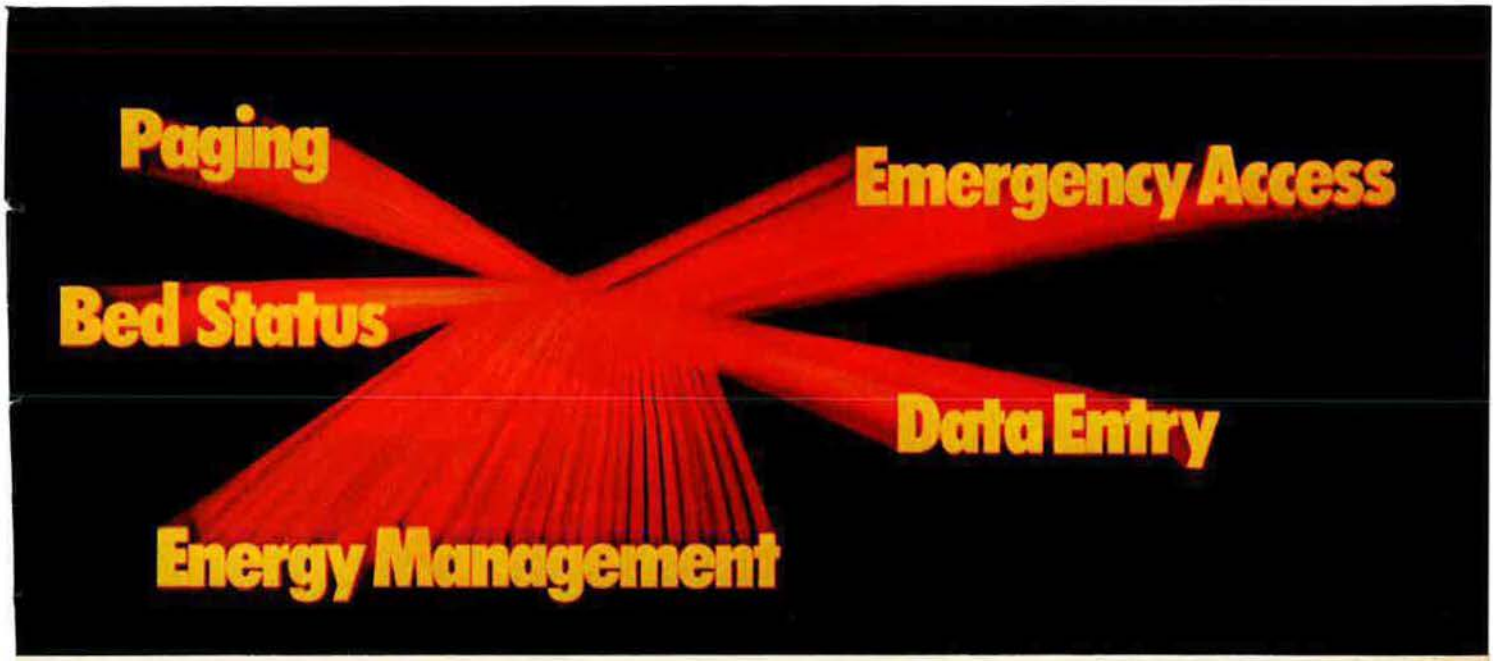
The Air Force's new long-range combat aircraft, a modernized model of the B-1 known as the B-1B, became a legal entity on January 20 of this year with the signing of contracts for its full-scale development and production go-ahead. The initial contracts with Rockwell International, the B-1B's prime contractor, are worth about $2.2 billion but could grow to $20.5 billion (in 1981 dollars) if the full complement of 100 aircraft envisioned by the Administration is purchased. This figure does not include the $6 billion spent on the original B-1A program, which was canceled in 1977 by the previous Administration. Of the $20.5 billion earmarked for the development and acquisition of 100 aircraft, $2.4 billion will go to research, development, test, and evaluation (RDT&E), according to Rockwell International executives.

The ultimate scope of the B-1B program, in the perception of the Administration and Congress, is tied to how fast the Air Force and its contractor team headed by Northrop can bring the Advanced Technology Bomber, known popularly as "Stealth," into the operational inventory and how well that system performs. In case Stealth technology and production progress faster than anticipated—initial operating capability (IOC) is set tentatively for the early 1990s—the B-1B buy might be cut short below the programmed total of 100 aircraft. Conversely, if the Advanced Technology Bomber program—which is to entail 132 aircraft—does not pan out as advertised by its advocates, the B-1B production run could exceed 100 units by a wide margin. In that case, Rockwell International's chairman and chief executive officer Robert Anderson told this writer, the cost of additional B-1Bs would drop down to between $60 million and $70 million per additional aircraft, expressed in current dollars, because of the "sunk" or amortized R&D and facilities costs.

The Air Force, as reported earlier in this space, is applying special safeguards to ensure that the B-1B program won't exceed its cost ceiling of $20.5 billion for 100 aircraft. The White House formally pledged to Congress that this ceiling won't be exceeded. Any changes in the aircraft's design—whether sought by the Air Force or Rockwell—will have to be approved by the Secretary of Defense. Both Congress and the Administration will be monitoring the program's cost profile on a continuous basis.

Some 3,000 companies and about 58,000 people will be working on the B-1B program at its peak. First flight of the new aircraft is envisioned early in 1985, and delivery of the first fifteen aircraft to the Strategic Air Command is expected about eighteen months later. The aircraft is being credited by intelligence estimates with about ninety percent of the penetration capability of the Stealth bomber and expected to get through even the most sophisticated Soviet terminal defenses until at least the mid-1990s.

With a maximum takeoff gross weight and unrefueled range almost identical to that of the B-52H—yet generally greater payload capacity—the B-1B can carry up to 142 conventional weapons when used in the



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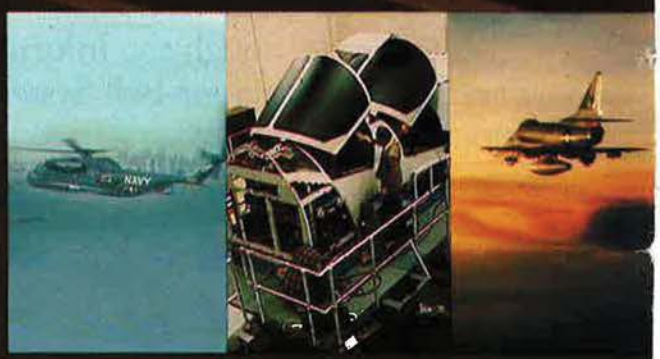

SPERRY

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force-projection role or up to twenty-two ALCMs when assigned to the cruise-missile-launcher mission. The B-1B weighs more and carries a significantly larger payload over greater distances than the original B-1 design.

A host of modifications make the B-1B a far more survivable and versatile aircraft than its progenitor. The single most important enhancement of the B-1B is probably a radar cross section (RCS) markedly smaller—up to fifty times so under the most crucial azimuth angles—than that of the original design.

Among the more promising ECM techniques from which low-flying B-1Bs incorporating low observable traits benefit is a system that spoofs radar homing missiles.

Because of significant recent advances, the B-1B's RCS reduction—although falling short of making it the "invisible" airplane the ATB is expected to be—could result in vastly improved survivability and increased ability to penetrate. The main reason here is the synergism that results from combining new electromagnetic countermeasures (ECM) technology with low radar cross section. This synergism stems in part from the fact that the amount of power needed to drive ECM drops sharply as the aircraft's radar cross section is reduced to the one square meter range or below.

The other fact that makes RCS reductions of this magnitude so worthwhile is that ECM techniques that are ineffective—and hence not applicable—when the bomber presents a cross section in the 100 square meter range become highly effective in the one square meter or lower category. Among the more promising ECM techniques from which low-flying B-1Bs incorporating low observable traits benefit is a system that spoofs radar homing missiles.

While the details of this technique are classified, the fundamental principle involved in this so-called terrain-bounce technique hinges on causing homing missiles from such Soviet weapons as SA-10 surface-to-air missiles (SAMs) and new Soviet look-down/shoot-down systems to home on a "mirage" of the penetrating bomber on the ground rather than where the aircraft actually is.

IN FOCUS...

The B-1B drastically reduces RCS essentially by two means: the use of special radar-absorbing materials at selected surface locations and by engine-inlet shaping.

Other changes from the original B-1 to the new variant include both improved offensive and defensive avionics. Since the radar systems of the B-1 are no longer being produced, it became attractive from the point of view of economics and performance to shift to substitutes that are more advanced and in production. The choice was an upgraded version of the F-16's radar. Included here is the option for multirole radar, which could provide greater flexibility and the ability to deliver terminally guided conventional munitions.

At the same time, the capabilities of the aircraft's defensive avionics can be bolstered by widening the range of their receiver and transmitter frequencies, thereby increasing their effectiveness against netted defenses and look-down/shoot-down interceptors. Because of the twenty percent increase in maximum gross weight, the B-1B requires a beefed-up landing gear. Other changes of the new design include the ability of one engine to start the others. This is accomplished by cross bleed.

All B-1B aircraft will include hardpoints for optional ALCM carriage. The new B-1 variant has a maximum takeoff and in-flight weight of 477,000 pounds, compared to a takeoff weight of 395,000 pounds and in-flight weight of 421,000 pounds of the B-1A. Powered by four General Electric F101-GE-102 turbofan engines in the 30,000-pound class range, the B-1B's maximum speed is in the low supersonic range at altitude and in the high subsonic range during low-altitude penetration. The aircraft's crew consists of a pilot, copilot, and two systems operators, one for offensive and the other for defensive systems. If the entire complement of 100 B-1Bs is to be procured, the Air Force plans to acquire the last ninety aircraft under multiyear procurement arrangements.

Washington Observations

★ Sometime this summer, the Air Force System Command's Space Division will launch the first of several user-funded Inertial Upper Stages (IUS) on a Titan 34D booster. The IUS is being developed by the Air Force on behalf of DoD for use on the Space Shuttle to deliver space systems to higher orbital altitudes and inclinations than is possible with the Shuttle alone.

In the waning days of the Carter Administration, NASA dropped out of the IUS program and instead opted for development of its own IUS, a derivative of the Centaur space rocket. The Reagan Administration healed this rift between the Defense Department and NASA and encouraged both agencies to develop jointly a high-energy upper stage capable of delivering payloads in the 8,000- to 10,000-pound range to synchronous equatorial orbits. The IUS's payload is in the 5,000–6,000-pound class.

The high-energy upper stage, which is now in program definition, will almost certainly use the Centaur's proven and efficient RL-10 engine. Whether the vehicle itself will be derived from Centaur or some other design is to be decided by the Air Force and NASA in the near future. This high-energy upper stage, which will burn liquid hydrogen and oxygen, rather than solid propellants or hypergolic fuels, is to reach operational status by the end of this decade when the Air Force expects that military spacecraft will be larger and heavier than those the IUS can accommodate.

The IUS's development—initially somewhat stormy because of substantial cost growth—now is proceeding "well," and the cost problems plaguing the system's full-scale development phase are "behind us," according to senior Air Force officials. Cost of the initial IUS production contract is yet to be negotiated with Boeing, the prime contractor, but "we hope to come up with a reasonable price," these officials point out.

★ The Air Force, along with other elements of the Defense Department as well as NASA, is taking a serious look at the potential development of a new space booster with a payload capability in the 150,000-pound range. Such a booster would use Space Shuttle components whenever possible. Meanwhile, the Administration's attempts to formulate an updated, comprehensive space policy are being slowed by interagency wrangling. The intelligence community, especially, is resisting efforts toward some commonality in program management and other ways for a variety of reasons, not the least of which is the specialized nature of intelligence systems. ■

AEROSPACE WORLD
News, Views & Comments

By William P. Schlitz, SENIOR EDITOR

Washington, D. C., Feb. 2

★ In January, the Air Force awarded Rockwell International's North American Aircraft Operations two contracts totaling more than $2.2 billion.

The contracts are for full-scale development and a production B-1B bomber. The development contract requires Rockwell to finalize the B-1B design, modify two of the original B-1A aircraft currently in storage at Edwards AFB, Calif., and conduct a flight-test program.

The second contract calls for the production of the first B-1B and ordering such crucial long-lead-time items as strategic metals and electronic components.

According to officials, the B-1B, though smaller in size than the B-52, will carry considerably more payload because of improved engine performance and advanced aerodynamic technology. Further, low-radar observability and the latest electronic jamming systems will allow the aircraft to penetrate Soviet defenses well into the 1990s.

An accelerated production program calls for engineering design review of the first B-1B a scant four months after program start. Final design review should take place a year later with initial flight of the first production aircraft early in 1985. A flight-test program of that aircraft is to run concurrently with production deliveries and last about sixteen months.

The first operational aircraft is expected to be delivered to Strategic Air Command late in 1985, with a full squadron formed a year after that.

According to officials, special safeguards have been implemented to assure that costs for the B-1B program do not exceed the $20.5 billion (FY '81 dollars) ceiling established by the Congress. A management plan to achieve cost and schedule objectives includes biweekly reports to the Secretary of Defense, with any changes requiring his approval. *(For additional details, see p. 22.)*

★ In another important acquisition decision, USAF in late January announced it will request about $11 billion over the next five years to purchase fifty upgraded versions of the C-5 transport and forty-four KC-10 tankers to double airlift capacity by 1990.

According to Lt. Gen. Kelly H. Burke, DCS for Research, Development and Acquisition, the Lockheed-Georgia transport is being bought because of earlier delivery, rather than the proposed McDonnell Douglas C-17. The C-17 won a competition last summer to become USAF's next-generation transport.

General Burke said that he didn't consider the C-17 a dead issue and hoped money could be appropriated to continue development of it.

Following trials in the eastern Atlantic, the Air Force's shipborne phased-array radar COBRA JUDY is now slated for a test session in the Pacific. Operating out of its home port of Pearl Harbor, Hawaii, the radar station aboard the USNS Observation Island *will accumulate data on ballistic-missile flights. The largest such sensor system afloat, COBRA JUDY stands four stories tall and weighs 250 tons. It was developed by Raytheon Co. for AFSC's Electronic Systems Division.*

★ The Air Force leadership is midwa through its landmark study calle "Project Air Force 2000." The purpos is "to chart the Air Force of the fu ture," in the words of Chief of Sta Gen. Lew Allen, Jr., who is directing i Stimulus for the study is a desire to improve USAF long-term planning, both by the Air Staff and in the major commands. USAF seeks to develop a clear vision "of the Air Force we will need in the year 2000 and how we intend to acquire this force."

Responsible for the study is the Assistant Deputy Chief of Staff, Operations and Plans, who is chairing the study group. The charter for the study requires examination of the probable world in the year 2000. That includes economic, technological, and demographic issues. Its primary focus will be Air Force roles and missions, force employment concepts, force structure, and investment strategies. In charging the group with the study, top Air Force leadership directed that it be kept realistic and affordable.

There are a number of reasons why the study will be different from earlier ones. First, it will look at more than technology, as mentioned above. Second, it is intended to be succinct instead of voluminous. Finally, the Air Force leadership intends that "Air Force 2000" be written for the public audience as well as for the Air Force.

As this issue was printed, the original draft of "Air Force 2000" had been evaluated by a group of retired Air Force leaders, and the final product

was in preparation. The complete report is expected for public release in mid- to late May.

★ A long-range research program has been initiated at NASA's Lewis Research Center, Cleveland, Ohio, designed to help reduce the nation's dependence on foreign sources of essential, high-performance metals.

The objective is to provide alternative materials and concepts to reduce substantially the aerospace industry's consumption of cobalt, columbium, chromium, and tantalum. These metals contribute to the superior performance of today's aircraft gas-turbine engines in high-temperature, high-stress, and highly corrosive environments.

A combination of worldwide inflation, geopolitics, and instability in countries where the metals are mined has caused marked fluctuations in availability and price in recent years. For example, cobalt—one of the most crucial strategic elements—rose 800 percent in price from $5.50 per pound in 1977 to more than $50 per pound in 1980. The price currently is about $15 per pound. In 1972–80, the cost of columbium rose 1,300 percent; tantalum, 1,480 percent.

Such trends could seriously affect the US position in international aviation markets, national defense, and domestic inflation, NASA officials said.

Latest in a series of Sikorsky helicopters being built for the Navy and Marine Corps, the CH/MH-53E is a preproduction prototype designed primarily to tow magnetic or electronic gear in a minesweeping role. The triple-turbine, heavy-lift Super Stallion, the free world's largest helicopter, is also equipped for in-flight refueling for long-range, long-duration missions.

A typical gas-turbine engine that powers US commercial and military jet aircraft—and many foreign jets—requires ninety pounds of cobalt, 1,600 pounds of chromium, and 170 pounds of columbium. The raw material cost alone for one jet engine is more than $30,000.

As an example of US vulnerability in the market, this nation imports ninety-seven percent of its cobalt—mostly from Zaire and Zambia in Africa.

The new research is to be executed in three concurrent technological thrusts, officials said. The first involves basic metallurgical research to reduce the amounts of the metals used in alloys and to find substitutes for them without compromising performance.

The second thrust calls for the redesign of jet engine components to use superalloys only where needed.

The third thrust will be to search for entirely new classes of more accessible, less-expensive metallic materials that can meet the performance standards.

Several universities and industrial firms will participate in the program.

★ USAF in December awarded a $421 million-plus fixed-price contract to Hughes Aircraft Co.'s Missile Systems Group, Canoga Park, Calif., for full-scale development of the radar-guided Advanced Medium-Range Air-to-Air Missile (AMRAAM).

The contract also contains prepriced options for 924 operational missiles and future options for developing second-source or follow-on missile production.

The award initially obligated about $99 million to undertake the development program to include production of ninety-four test missiles.

AMRAAM is to replace the AIM-7 Sparrow missile currently in use. It is designed to provide an "all-environ-

Thunderbirds Memorial Service

More than 3,000 people gathered in the Thunderbirds hangar at Nellis AFB in Nevada at a memorial service for the four members of the aerial demonstration team killed in January's tragedy.

Some 140 former Thunderbirds joined the families and friends of the four pilots as well as thousands of base personnel in the tribute, which was described as a "very, very moving ceremony."

The one-hour service was concluded with a "missing man" flyby of F-4 Phantom fighters.

The four were returned to their respective states for burial.

The Thunderbirds' Leader was Maj. Norman L. Lowry III, who was commissioned in 1967 and flew 264 combat missions in Southeast Asia. A graduate of the Fighter Weapons School, he had logged 3,300 hours in jet aircraft. He leaves behind his wife, Linda, and two sons, Jason and Matthew.

Capt. Willie Mays was commissioned in 1971 and went on to become an F-4 instructor pilot. Also a graduate of the Fighter Weapons School, he had logged some 2,000 hours in fighters. Captain Mays is survived by his wife, Sara Ann, and son, Todd.

Capt. Joseph "Pete" Peterson was commissioned in 1971. His first flying assignment was as an instructor pilot in T-38s. He later transitioned to the F-4 and had logged more than 3,300 hours in jet aircraft. He is survived by his wife, Cecilia, and daughters, Kristian and Kimberly.

Capt. Mark E. Melancon was commissioned in 1972 and flew various versions of the F-4 for eight years before coming to the Thunderbirds. He had logged more than 1,800 hours in jet aircraft. Captain Melancon is survived by his wife, Carol Jean, and daughter, Jennifer Lynn.

The University of Nevada has set up full scholarships for the wives and children of the four pilots and those of two other members of the precision flying team who died last year: Lt. Col. David L. Smith and Capt. David "Nick" Hauck.

(For a tribute to the Thunderbirds and to the concept of the aerial demonstration team, see General Milton's column, p. 123.)

ment" capability for Air Force F-15 and F-16 fighters and USN's F-14s and F/A-18s. The missile is expected to enter the inventory in 1986.

The Hughes subsidiary edged out Raytheon Co.'s Missile Systems Division after a series of live firings of prototype missiles at White Sands Missile Range, N. M., and Point Mugu NAS, Calif.

Flights of the Hughes full-scale development missiles are scheduled to take place at those sites and at Eglin AFB, Fla., beginning early in 1984.

★ The Air Force Armament Laboratory, Eglin AFB, Fla., is testing a new experimental warhead for air-to-air missile applications that generates its own "bullets."

The munition, dubbed the Air Target Defeat Warhead, creates the bullets from a dimpled steel case that employs "advanced self-forging fragment technology," officials said.

On detonation, the dimples collapse to create high-velocity fragments that are particularly lethal to air targets. The fragments are projected radially outward from the cylindrical warhead and cover a full 360-degree circle.

In charge of assessing the warhead effects on various targets is Capt. Patrick H. Crotty, who said that the warhead is in its third design phase and the number of fragments and lethality have improved with each modification.

Testing is to continue with a final design expected by late September.

★ MAC's Airlift Communications Division will face the first test of its ability to provide satellite communications for deployed military airlift units during Exercise Team Spirit 82.

Four four-member ACD teams will be on hand to enhance the command and control of MAC airlift forces during the exercise, scheduled from February 13 through the end of April.

The ACD members will operate, monitor, and maintain portable WSC-3 satellite communications terminals over which the on-site MAC commander may speak over a secure voice network directly to the Twenty-second Air Force Operations Center at Travis AFB, Calif.

The ACD teams, three from the 1901st Communications Group at Travis and one from the 1998th CG at McGuire AFB, N. J., are members of the twenty-six-person contingency support elements located at each base. These elements, or segments of them, are ready to deploy worldwide on twelve hours' notice.

Airlift Communications Division, activated in June 1981, is an intermediate headquarters of Air Force Communications Command. The division commander is MAC deputy chief of staff for communications and air-traffic services in support of military airlift.

Team Spirit is to involve Army, Navy, Air Force, and Marine Corps units joining their counterparts in the Republic of Korea for joint/combined maneuvers. The exercise will involve forces stationed in Korea, other sites in the Pacific, and from CONUS.

★ South Korea and Pakistan recently became the latest nations to order the General Dynamics Corp. F-16.

"Flying Yankees" of Connecticut ANG's 103d Tactical Fighter Group at Bradley IAP, Windsor Locks, practice rapid "Integrated Combat Turn" on a unit A-10, during which the aircraft is refueled and rearmed simultaneously. All actions—including the pilot's intelligence or flight-plan briefing—are conducted at the revetment.

AEROSPACE WORLD

Korea's buy is for thirty-six aircraft, with deliveries starting in February 1986 at a rate of one a month. Included in the $931 million program are thirty single-seat and six two-seat F-16s with related spare parts, training, technical assistance, and support items.

The Pakistanis have agreed to purchase forty F-16s, with six to be delivered by next December. The remainder will be delivered beginning in early 1984.

It has been announced that Venezuela is also interested in acquiring the high-performance fighter.

★ British Aerospace has been given the green light from the European Space Agency to build L-SAT, the first of a new class of large satellites.

BAe, through its Space and Communications Division, will act as prime contractor in the $345 million project, with six other member countries and Canada involved as co-contractors and subcontractors. The six are Austria, Belgium, Denmark, Italy, the Netherlands, and Spain.

L-SAT will beam television broadcasts direct to private homes and business communications between small earth stations installed on commercial premises. The L-SAT project is expected to lead to the development of a new communications market that could require more than 150 satellites of the L-SAT class by the year 2000 and with a market value of $10 billion at today's prices, officials said.

The satellite is to weigh about 5,100 pounds (2,313 kg) when launched via Ariane rocket from French Guiana in 1986 and will carry an array of solar cells capable of developing more than 3,500 watts—or about three times the power of current communications satellites. The ultimate goal is 7,000 watts in subsequent commercial versions, officials said.

★ The Air Force's air-launched cruise missile test program achieved another milestone in January during the sixteenth of a planned twenty test flights.

The four-hour mission began over the Pacific Ocean, moved inland over unpopulated areas of California and Nevada, and "terminated precisely over the target on the Utah Test and Training Range," officials reported.

The flight demonstrated the capacity of the ALCM navigation system to transition from an over-water to overland flight and also reconfirmed that the new B-52 offensive avionics system could align, target, and launch the missile.

Launched from a B-52G over the

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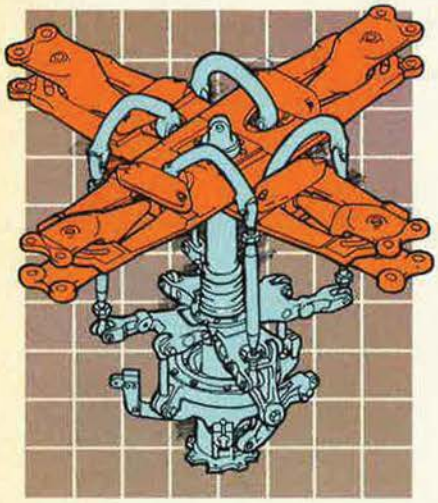

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Pacific Missile Test Range off Point Mugu, the Boeing-built missile's inertial navigation system guided it to the coast where the terrain contour matching system came into play to steer the preplotted course.

Over the Utah range, the twenty-one-foot (6.2 m) missile popped up, deployed a parachute, and was recovered in midair by a helicopter from the 6514th Test Squadron from Edwards AFB, Calif.

December Issue Cover Reprints

AIR FORCE Magazine's December cover, painted by Washington artist Jack Pardue, created so much interest and demand for copies that the artist is producing quality prints suitable for framing. The printing process is under way. The prints will be twenty by twenty-seven inches, on heavy stock. Price is $18 each, or $23 if signed by the artist. They may be ordered from Tuxedo Prints, 5141 Frolich Lane, Tuxedo, Md. 20781.

The first operational ALCMs were deployed to Griffiss AFB, N. Y., last September.

★ The very advances in data processing have begun to create their own problems. For example, data displays in the cockpits of fighter aircraft are providing pilots with more information than they can absorb.

To get a handle on the problem, USAF has given Boeing Military Airplane Co., Seattle, Wash., the green light to "design and test advanced pictorial displays for flight control mission management and subsystem status, thus lessening the complexity of a pilot's job," officials said.

For example, computer-generated imagery might include graphic display of an aircraft's munitions, simplifying the pilot's selection and control during weapons delivery. Or he may be able to view a complete battle scenario through a picture format with color-coded images of enemy aircraft or missile sites, friendly forces, targets, and the like.

Thus, color-coded pictures would replace the jumble of numbers and letters on dials, gauges, and cathode-ray tubes with integrated pictorial information covering a flight situation, officials said.

To accomplish this it will be necessary to develop mathematical algorithms to create the drawings and to define software requirements for picture displays.

AEROSPACE WORLD

The Boeing study is to continue spadework accomplished earlier by McDonnell Douglas Corp. and will consider such practical and operational factors as computer and software size. One effort would be to do away with "display formats characteristic of older electro/mechanical instruments," officials declared.

More than seventy-two hours of pilot-in-the-loop simulation time will be used in evaluation of the new formats, with Air Force and Navy aircrews participating.

Sponsored by ASD's Flight Dynamics Laboratory, Wright-Patterson AFB, Ohio, the sixteen-month program will also be supported by the Naval Air Development Center, Warminster, Pa., and the Air Force Armament Laboratory, Eglin AFB, Fla. FAA has also expressed interest.

★ The Air National Guard reports that its 1981 flying accident rate was the lowest ever recorded. Last year, the ANG had seven major accidents in which four lives were lost and seven aircraft destroyed.

This equates to 1.7 accidents for every 100,000 flying hours. In contrast, in 1980 the rate was 3.3 accidents per 100,000 hours.

The ANG's ninety-one flying units are equipped with more than 1,600 aircraft.

Four ANG units have achieved more than 100,000 accident-free flying hours: the 137th Tactical Airlift Wing, Oklahoma City; the 138th Tactical Fighter Group, Tulsa, Okla.; the 172d Tactical Airlift Group, Jackson, Miss.; and the 145th TAG, Charlotte, N. C. One Air Guard unit—the 170th Air Refueling Group, McGuire AFB, N. J.—has never had a flying accident.

"The goal we in the Guard keep striving for, and which is difficult to achieve, is zero accidents for a calendar year," said Maj. Gen. John B. Conway, Director of the Air Guard, in praising the conscientious manner in which Air Guard members approach flying safety.

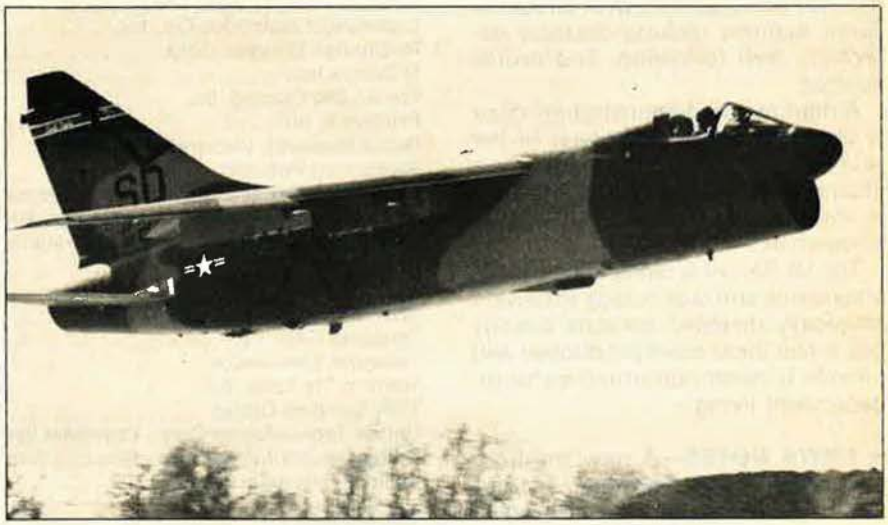
★ A small group of people isolated for long duration in cramped quarters in a gravity-free environment.

The scenario sounds familiar, and there has been considerable experience with it since the beginning of the space age. But how people interact and work in such a setting is of continuing concern to those planning for life aboard spacecraft.

It would be of particular moment to crews aboard a NASA Space Operations Center, visualized as a permanently manned orbital station designed to support seven-to-nine-person missions of from three- to six-month duration.

Besides data derived from previous US and Soviet manned missions, researchers are also studying life aboard submarines, in undersea research labs, at Antarctic scientific outposts, and during specially designed simulations.

According to General Georgi Beregovoi, chief of crew training for the Salyut missions, all crews developed signs of interpersonal hostility.



A South Dakota ANG A-7 is typical of the aircraft equipping the Air Guard that helped achieve in 1981 the lowest flying accident rate ever recorded—1.7 accidents per 100,000 flying hours. See item above.

Personality tests, given prior to isolation, fail to predict accurately emotional stability, social compatibility, or overall performance, according to Dr. Elizabeth J. Bluth, professor of sociology at California State University/ Northridge. Dr. Bluth suggests emphasizing in-depth preparatory ground training rather than preselection of SOC crew members.

Although the physical discomfort caused by weightlessness is a problem, hostilities are also the result of sleep disorders, lack of privacy, lack of control over the environment, and boredom.

Relaxation methods distinct from sleep may be one answer, suggests Dr. Bluth. And "Skylab astronauts would have liked" larger sleeping quarters that were further apart, said Dr. Bluth.

Personalization of living quarters and such amenities as windows to view the varied spacescape as entertainment may also increase crew comfort and efficiency, Dr. Bluth said in January's *Mechanical Engineering*, a professional journal.

★ A Veterans Administration rehabilitation engineering researcher has been instrumental in the development of a "smart wheelchair" that could greatly increase the mobility of quadriplegics.

David L. Jaffe, with the VA's Palo Alto, Calif., Rehabilitative Engineering Research and Development Center, supervised the VA-funded project designed by five graduate mechanical engineering students at Stanford University.

The chair uses Polaroid ultrasonic sensor technology as a sort of radar to triangulate distances. Information from the sensors is then used to control the chair's movement or direction. Other features include obstacle detection, wall following, and cruise control.

A marketable demonstration chair is expected to be ready later in the year. Its sponsors hope to produce a chair that will not add more than $500 to the cost of a conventional electric wheelchair.

The VA Center is using state-of-the-art science and technology to benefit physically disabled persons directly and make them more productive and provide broader opportunities for independent living.

★ **NEWS NOTES**—A new publication—*The USAF Academy Assignment Opportunities Handbook—Project Falcon*—is now available **to introduce officers to USAFA**—its living and working environment, mission, job positions, and rewards of a tour there. Besides listing qualifications, the handbook details Academy history, facilities, services, and the nearby Colorado Springs area. Application instructions are included. Consolidated Base Personnel Offices should have the booklet available for those interested in a USAFA tour.

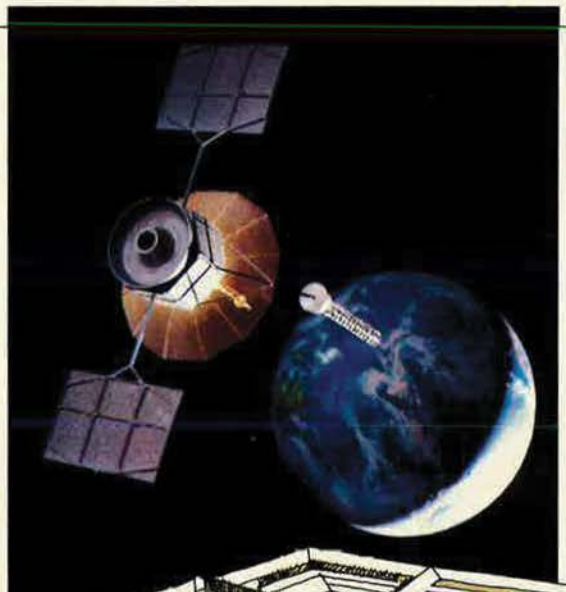
A civil engineering professor retired from Clemson University in South Carolina was the 50,000,000th visitor at the National Air and Space Museum. Presented with museum souvenirs, **Joseph P. Roston** said, "This is an honor I couldn't have planned on."

Died: Col. Charles H. "Carl" Dolan, USAF (Ret.), the **last surviving pilot of the Lafayette Escadrille** of World War I fame, of unreported causes in Honolulu in December. He was eighty-six. Colonel Dolan was one of seven Americans of the original thirty-eight in the Escadrille who lived to see the Armistice. He later served during World War II and in the Korean conflict. Colonel Dolan capped a civilian career as advisor to the US Senate and retired in 1969.

Died: Irving Stone, long-time **West Coast Editor** for AIR FORCE Magazine, of a heart attack in Los Angeles, Calif., in January. He was seventy-nine. ■

INDEX TO ADVERTISERS

Reliable Worldwide COMMUNICATIONS



The constellation of four FleetSatCom satellites has provided uninterrupted global communications for Air Force and Navy users since 1981. Since first launch, all of these spacecraft have performed superbly.

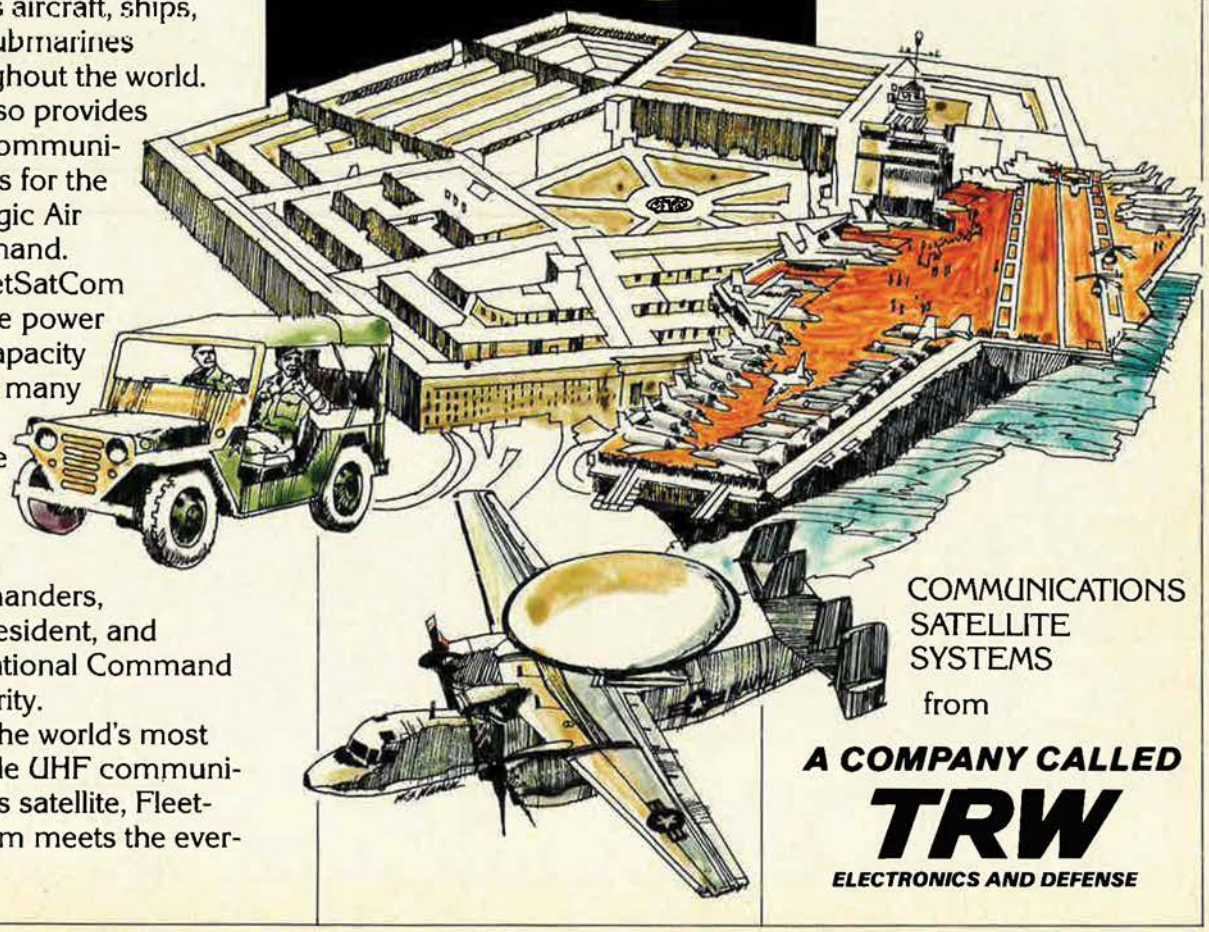
The system provides continuous high-priority communications for military ground units as well as aircraft, ships, and submarines throughout the world.

It also provides vital communications for the Strategic Air Command.

FleetSatCom has the power and capacity to link many small, mobile terminals with commanders, the President, and the National Command Authority.

As the world's most capable UHF communications satellite, FleetSatCom meets the ever-increasing demand for virtually real-time military communications.

Two other worldwide communications satellite systems also come from TRW: the operational Defense Satellite Communications System Phase II and the upcoming Tracking and Data Relay Satellite System and its ground station.



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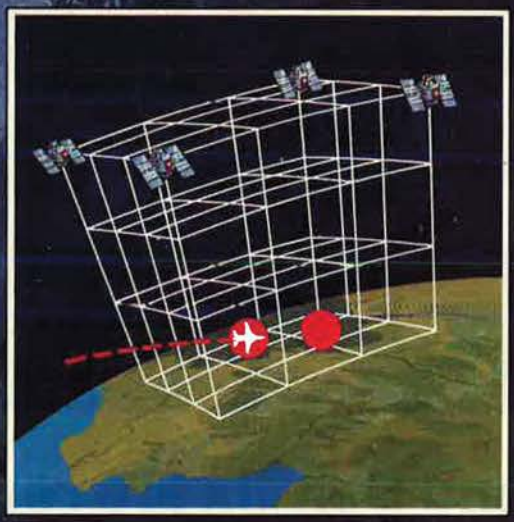
Anytime Anywhere Any weather



When it comes to increasing force effectiveness, Navstar GPS is right on target. How? Navstar GPS provides three-dimensional accuracies to 16 meters, velocity to 0.1 ft/sec, and time to billionths of a second. Weapons delivery and navigation accuracy are enhanced dramatically; recent blind bombing tests prove it. Six deliveries were made at 10,000-; 5,000-; and 2,000-ft altitudes and at 300-kts IAS. Five impacted within ten meters of the target; one within 30 meters.

The procedure is simple: An operator enters target coordinates into a Navstar computer. The computer generates steering and weapons release data based on information from an inertial unit and Navstar receiver. The pilot's steering display provides azimuth steering corrections and "time to go." The computer generates automatic release pulse when correct solution is reached.

Program completion will mean a whole new set of advantages; better target acquistion, search and rescue and close air support, to name just a few.

Important, too: U.S. and NATO commanders will be linked into a common worldwide reference grid.

Results? Increased force effectiveness.

DoD's Navstar Global Positioning System (GPS). More accurate target acquisition at a lot less cost. Navstar delivers Space Operations/Integration and Satellite Systems Division, North American Space Operations—builders of the Navstar GPS satellites.

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CAPITOL HILL

By Kathleen G. McAuliffe, AFA DIRECTOR OF LEGISLATIVE RESEARCH

Washington, D. C., Jan. 27

Budget Expectations

Although the President does not formally send the FY '83 budget to Congress until February 8, battle lines are already being drawn on how large a slice of the pie DoD should get.

A recent meeting of Republicans on the Senate Budget Committee resulted in ten of the twelve GOP members telling the President that they want a *quid pro quo*. These Republicans want some reductions in the Defense budget, reported to reflect a seven percent real increase over FY '82, with about $257 billion in budget authority and $215 billion in outlays, before it is submitted to Congress.

In return they will support the President's program in aggregate—including politically sensitive cuts in popular domestic programs. The Senate may also propose entitlement cuts beyond the Administration proposals, according to Budget Committee sources. This pressure is expected to lead to a substitute budget with a $10 billion reduction in Defense budget authority and a $4 billion reduction in outlays.

Meanwhile, the initial mood in the overwhelmingly Democratic House also is to make Defense cuts. But, as one Budget Committee staffer said, the Pentagon should not be "misled" by this. The onus is on DoD to take the offensive and make Congress look beyond the general aspects to the needs behind individual programs.

DoD probably will have to fend for itself in Congress this year with little direct help from the White House. With Congress looking to the November elections, few will again be willing to stick with the Administration Defense figures based on faith alone. It will be up to the Pentagon to put congressional budget cutters on the defensive and make them point to specific programs for reduction.

C-17 Canceled

Sens. John Danforth (R-Mo.) and Thomas Eagleton (D-Mo.) are trying to revive the recently canceled C-17, which earlier was chosen by the Air Force as the winner of the CX competition. The C-17 contractor, McDonnell Douglas, is headquartered in St. Louis. In a joint statement, the Senators questioned the "legality of setting up a competition among different potential suppliers, choosing a winner of the competition, and then arbitrarily awarding the contract on a 'sole source' basis to the loser. . . ."

They further expressed concern for modernization of airlift forces since "existing wide-body aircraft like the C-5 cannot meet the needs of the Air Force, the Army, and the Marines in deploying forces to remote trouble spots."

DoD decided to drop the C-17 in favor of buying fifty modified C-5s (C-5Ns) and forty-four KC-10s. The program is expected to double current airlift capability and cost about $11 billion over a five-year period. The Air Force believes the C-5N will be available three years earlier than the C-17 would have been, at approximately the same cost.

In response to the legality question raised by the two Missouri Senators, one senior Air Force officer said, "We believe what we have done is legal, moral, and in the best interest of the country."

CRAF To Be Dropped

Word from the Pentagon is that plans are in the works to cancel the Civil Reserve Air Fleet (CRAF) cargo program. CRAF, which was appropriated some $140 million between FY '78 and FY '82, proved to be less than a success, with only one new aircraft committed for modification, according to a congressional report. The latest reasoning for killing the program, along with the CX change, is the unfavorable bids from the airlines for participation. This year, Congress adjusted the program to include modification of aircraft already in the airlines' inventories.

One USAF spokesman said the Air Force will probably make a request to reprogram the still-unobligated CRAF funds to purchase additional KC-10 cargo/tankers. The KC-10 program was targeted for extinction by the Administration in a budget-cutting move last fall. The funds remaining in the CRAF account could buy two more KC-10s, for a total of six in FY '82, if approved by Congress.

Behind the B-1B Cut

The final FY '82 Defense Appropriations bill cut B-1B R&D funds by $179 million. It originated in the House where the reduction was attributed to unobligated funds remaining in the FY '81 account for the long-range combat aircraft. Retention of the cut by conferees, according to Appropriations Committee staff sources, came at the insistence of Rep. Joseph Addabbo (D-N. Y.), chairman of the Defense Appropriations panel, who has consistently voted against the B-1B.

Previously in conference, the House committee staff yielded to the Senate position on full funding for B-1B R&D. However, since Representative Addabbo and his Senate counterpart, Sen. Ted Stevens (R-Alaska), had agreed to keep the bill total between $199 billion and $200 billion, the cut resurfaced when all line items in contention were reconciled with only minor exceptions. The New York Congressman then insisted on adding $250 million for Advanced Technology Bomber (ATB) program acceleration. Unless the big cut came from B-1B, the overall total would have exceeded the previously agreed limit. Senator Stevens yielded only when Representative Addabbo threatened no Defense bill until the new year.

The B-1B R&D cut will necessitate a reprogramming of funds from other aircraft procurement accounts to keep the needed B-1B funding at the level requested. This action, already okayed by the DoD Comptroller and sent to the Deputy Secretary of Defense for signature, requires the concurrence of the two Armed Services and Appropriations Committees. The reprogramming is needed to prevent a slippage of the aircraft's Initial Operating Capability (IOC) by six to nine months. Also, it will preserve, at the President's insistence, the overall cost of $20.5 billion for the B-1B. ■

The quantitative growth in Soviet military capabilities of the past two decades is being augmented and magnified by major recent advances in technological and organizational effectiveness, many of them "borrowed" from the US.

MILITARY POWER IS THE ROOT OF SOVIET EXPANSIONISM

BY EDGAR ULSAMER, SENIOR EDITOR (POLICY & TECHNOLOGY)

Spawned by force and international intrigue during the October Revolution—fostered and abetted by the German General Staff in one of history's most egregious miscalculations—the Soviet Union today, sixty-five years later, clearly ranks as the world's foremost practitioner of force in overt and covert "laundered form." The Soviet Union's bristling strategic arsenal packs a nuclear punch of cosmic magnitude—and keeps on growing. Its conventional forces outnumber and outgun those of the free world by an alarming, widening margin. Its foreign policy, an insidious amalgam of deception, coercion, and intrigue, serves—albeit not always successfully—to solidify and extend the Soviet sphere of influence in lockstep with and as an extension of its military power.

There is nothing hypothetical about the Soviet military machine, as Secretary of Defense Caspar W. Weinberger so trenchantly observed: "Its expansion, modernization, and contribution to projection of power beyond Soviet borders are obvious." There is also nothing hypothetical about the totality with which the Soviets approach potential conflict. In a remarkably candid description of Soviet politico-military policy, an official Soviet treatise entitled "Marxism-Leninism on War and Army" makes this point: "With the outbreak of war, all means of policy-making are directed toward victory, toward achieving the political aims of the war. They are not achieved by the armed forces alone. Economic and ideological struggle, open and secret diplomacy, and other forms of struggle are used not only to further the armed struggle but also to supplement it, and in combination they are able to break the will of the enemy to resist, and thus secure victory." Geopolitical struggle, waged under the guise of the "correlation of forces" principle, is seemingly seen by the Soviets as a permanent condition.

As the recent clean sweep in Poland demonstrated, the Soviets are capable of breaking the "will of the enemy" with political virtuosity by using a vassal's—rather than their own—military forces. The other side of the coin, of course, is Afghanistan, where subjugation of the population indeed requires continued use of Soviet troops, including possibly intensifying application of chemical warfare (CW). The possibility of stepped-up Soviet CW operations in that country is more than hypothetical. Not only is there substantial evidence of past use of chemical weapons by Soviet occupation troops, but new intelligence findings suggest that the some 5,000 additional Soviet troops recently brought to Afghanistan are equipped with advanced CW weapons and consist mainly of chemical warfare specialists.

Understandably, the Soviet preference is for global power projection by means of coercion and subversion, rather than the more costly and drastic application of military power. For that purpose the Soviets have built up an "infrastructure of influence," a highly effective structure combining unconventional warfare forces;

Not only is there substantial evidence of past use of chemical weapons by Soviet occupation troops, but new intelligence findings suggest that the some 5,000 additional Soviet troops recently brought to Afghanistan are equipped with advanced CW weapons and consist mainly of chemical warfare specialists.

diplomats; traditional state-to-state activities; military advisors; military aid; treaties and legal ties; support for terrorists and pro-Soviet guerrilla groups; economic aid; cultural, media, and educational diplomacy; and the use of what the Soviets call active measures, such as propaganda, blackmail, and forgery *(see p. 43, March '81 issue, and p. 85 of this issue).*

Possibly the greatest triumph scored recently by this infrastructure of disinformation and divisive gambits is Western Europe's present state of mind. As Dr. Henry Kissinger so aptly put it, "it is an amazing phenomenon, less than two years after Afghanistan, less than four years after Cuban troops under a Soviet general appeared in Ethiopia, six years after the same thing happened in Angola, and while thirty-plus Soviet divisions are constantly bringing pressure on Poland, that at this moment there should be mass demonstrations all over Europe—affirming what? The desirability of peace and implying that it is the United States which is the obstacle."

The behind-the-scenes influencing of public opinion in Western Europe by the Soviets and their unwitting allies—combined with the Polish "experience" that resistance to the Soviet juggernaut is futile—creates a condition of double jeopardy for the West. The consequence is not only alienation between the US and the European NATO members. The bigger danger, as Britain's *Economist* warned, lies perhaps in America herself: "Public opinion in the United States may before long weary of Europeans who chant anti-American slogans, who shrug about Poland, while relying on American protection—and cheekier still, relying on America to make sure they can get their oil from the Gulf."

With similar clarity, *The Economist,* in a recent assessment of the state of East-West relations, diagnosed the intrinsically aggressive dynamics of the USSR, an externally powerful and internally hollow dictatorship. The Soviet Union, the British publication finds, "has increasingly seemed to be presiding over a frightened and therefore dangerous system of imperial power. As the challenges to the system build up, Russia's great and growing military strength is deployed both to extend the system's frontiers and to save it from internal disintegration."

Examples of Soviet global dynamics abound. Northern, Southern, and Central Africa, the Middle East and Asia, and South America and the Caribbean all became recent targets of Soviet-sponsored efforts at destabilization and takeover. As a senior State Department official pointed out recently, the functional scope of Soviet expansionism is widening in synchrony with its expanding geographic horizons: sea lanes, strategic minerals, space, and culture have become the target of Soviet ambitions. The expanding geographic focus of the Soviets, in the view of highly placed US analysts, now takes in all the littoral of the Gulf of Mexico, with special emphasis on Mexico itself. The latter probably is seen as America's "soft underbelly" and, owing to waxing Cuban and waning US influence in juxtaposition with internal political and economic problems, indeed could become vulnerable to "destabilization" by Moscow and its surrogates.

In Europe, the Soviets, emboldened by their success in Poland, can be expected to start flexing their politico-military muscle in the direction of post-Tito Yugoslavia, according to US Sovietologists. In Southeast Asia, the Soviet Union's principal surrogate, Vietnam, seems to move systematically—aided and abetted by the Kremlin—toward creation of a new "Greater Indo-China." This would solidify and extend Soviet hegemony over a strategically important part of the globe as well as boost Soviet leverage against the People's Republic of China.

In practical terms, the prospects in the dangerous decade ahead were captured concisely by this Pentagon analysis: "As the military power of the Soviet Union has grown, so has the propensity of the Soviets to interfere directly, or indirectly through surrogates, in the affairs of other nations. By reducing the ability of the US and its allies to cope with Soviet and Soviet-supported initiatives, the Soviet Union has laid the foundation for an assertive foreign policy. A growing capability to project military power beyond the periphery of the USSR is a reflection of this Soviet drive to exert influence worldwide."

. . . Moscow's creed is that revolutionary activism and insurgency are moral requirements, rather than interference by an external power, as long as these acts are perpetrated by the USSR and its surrogates, and not by Western powers.

Soviet leaders continue to see no inconsistency between the struggle to shift the correlation of forces in their favor and détente with the United States. They reject the "linkage concept," no doubt buttressed by the demonstrably short memory of the United States concerning past Soviet transgressions and the fact that such transgressions at worst had short-lived impact on US-Soviet relations. Further, Moscow's creed is that revolutionary activism and insurgency are moral requirements, rather than interference by an external power, as long as these acts are perpetrated by the USSR and its surrogates, and not by Western powers. Article 28 of the 1977 Soviet Constitution cloaks this policy in legitimacy by committing the USSR to supporting wars of "national liberation."

The Soviet Union clearly has a lot to offer to and possesses a unique tool for ingratiating itself with autocratic governments of Third World countries, even without having to resort to wars of liberation. The Soviet Union's eagerness to export the KGB's expertise in keeping governments in power that are not supported by the will of the people has endeared the Soviet Union to

many of the dictators of the Third World. Governments of any type like to think of themselves in perpetuity and, in the case of left-leaning dictatorships, the Kremlin is obviously a nonpareil instructor in how to secure longevity against all odds. From Moscow's point of view, this form of export probably is far more cost-effective than the some $50 billion in military assistance the Soviet Union has provided to non-Communist nations over the past twenty-five years.

In an organizational context, orchestration of subversive operations abroad is the responsibility of the Central Committee's International Department, which coordinates and implements the export of revolution as well as support of radical, anti-Western regimes. This Department maintains contact with scores of Communist and radical parties and groups, allocating funds, providing training, and devising takeover strategies. This body, according to US intelligence assessments, plans, coordinates, and oversees the work of various Soviet party, state, and military organs involved in foreign operations, as well as the KGB, front organizations, friendship societies, insurgent groups, and other elements engaged in illegal, subversive, and clandestine operations. This highly centralized, omnipotent apparatus is the USSR's principal instrument for international expansionism and is without counterpart in the West.

The Changing Soviet Scene

If life expectancy statistics have any validity, a massive turnover of Soviet Russia's aging leadership is bound to occur in the next few years. Specific forecasts about who will succeed whom in the secretive, predatory world that is the Politburo probably are as perishable as they are risky. For the time being, Western analysts continue to be amazed by the fact that President Leonid I. Brezhnev, who is seventy-five years old and reportedly has serious health problems, continues to consolidate his power base zealously and effectively. As a consequence there is no evidence of a successor being groomed and little inclination to engage in speculation, informed or otherwise, as to who might pick up the reins. There is, however, less aversion among Sovietologists to suggest basic trends that are likely to emerge during the eventual transition.

Two points can be safely made in this context. In the absence of an "heir apparent," the transition almost certainly will entail an interregnum during which power will be exercised by a small group—possibly in the form of past troikas—from which ultimately a supreme leader will emerge. Further, US analysts tend to believe that in the "shakeout" process future Soviet leaders will have to win their spurs through new initiatives in order to gain the support of the Communist Party's infrastructure. Lastly, in terms of chronology, it would seem foreordained that the next generation of Soviet leaders will include people too young to have been traumatized by World War II in a personal way and perhaps less aware of the might of the United States under full mobilization.

The current leaders—with few exceptions—had firsthand World War II experience and thus may be chary of acts that deliberately provoke global war and thereby could inflict on Russia the kind of agony they remember so well. Lacking this restraining memory, the next generation of Soviet leaders, according to this school of thought, will probably be more likely to take risks and engage in politico-military gambles that might lead to nuclear war than is the case with the present occupants of the Kremlin. This potential propensity for risk-taking will presumably be compounded by the USSR's increasing military superiority over the West.

The American Example

Soviet ingenuity and lack of scruples in terms of pirating US technology suitable to military application are reaching new heights, especially in the field of electronic circuitry. The latest and at this time still incipient trends suggest that the Soviets don't shy away from "mirror-imaging," if that is beneficial, in such areas as weapon systems concepts and technology management. In the latter case, US analysts find convincing evidence that some US management approaches are being substituted for the rigid, wasteful, totally centralized Soviet methods of the past. Instead of carrying forward to a high level in the development (if not production) stage almost every design that is being pursued by individual military design bureaus, the Soviets now seem to be borrowing US competitive techniques, especially the emphasis on technological innovation. The results are improved procurement strategies and ominous growth in high technology.

While the regime, for obvious ideological reasons, can't afford to jettison central planning as the underlying tenet of its weapons development and procurement approach, there is evidence of newfound flexibility and greater latitude for scientists in this field. At the same time, US intelligence experts find evidence of sharp increases in activities supporting and strengthening the technology base, meaning basic and applied research coupled with proof-of-concept testing.

If imitation is indeed the sincerest form of flattery, the US Air Force could find much to crow about in the way the Soviets are copying its aircraft in a doctrinal as well as technological sense. The USSR is testing and can be expected to bring into its operational inventory an aircraft that is the equivalent of the A-10. The MiG-27 may not be as good as the F-15, but seems to replicate the latter with all the fidelity the Soviets can muster. The same is true for the MiG-24 Fencer, which copies the F-111, and the new Soviet bomber prototype that is patterned after the B-1.

While the ancestry of the continuing revamping of the Soviet military structure (first reported publicly in this space a year ago) is hard to trace and may not be patterned after US or other Western models, the end result, nevertheless, is the "purple suit" quality of this country's unified and specified commands, only more so.

At the heart of the Soviet combat doctrine is the concept of combined arms operation, which subordinates the various services under a Combined Arms Commander within the area under his jurisdiction. Recent changes and refinements in the Soviet Command structure and the makeup of the Soviet Theaters of Military Operations, the Combined Arms Formations, and Fronts are not yet clearly understood by Western

intelligence analysts. What is clear already, however, is that the reorganization of the Army that is in process appears to bolster the role of that service while the Soviet tactical air forces seem to be losing ground in an hierarchical sense.

Impelling the organizational modernization of the Red Army is the apparent goal of converting Soviet combat forces from a balanced offensive-defensive structure to one geared to fast-paced offensive operations. This change is basically oriented toward theater operations. The broad central strategy of the Soviet Union seems immutably keyed to a wartime management structure that provides a unified system of command capable of exerting centralized direction, but designed to permit decentralization of functions to lower levels as necessary.

What is clear already . . . is that the reorganization of the Army that is in process appears to bolster the role of that service while the Soviet tactical air forces seem to be losing ground in an hierarchical sense.

Strategic Developments and Trends

At the core of that strategy, as a recently issued US government assessment entitled "Soviet Military Power" points out, is the creation of "an infrastructure of facilities and procedures that is geared to the survival of the means of control for the Communist Party of the Soviet Union during even the worst of conflict situations—a nuclear war. Alternative locations have been established for virtually the entire structure of the Soviet leadership—political, military, security, and industrial—from the highest to the lowest levels. Many of these are bunkered facilities and certain levels of leadership are provided with mobile equipment as well."

The question of whether technological opportunity or political constructs shape Soviet strategic nuclear capabilities is unanswerable and probably unimportant. What is important is that the makeup of these forces and pertinent Soviet military texts leave little doubt about the Soviet strategic rationale: It is, as USAF analysts point out, keyed to damage limitation and war-winning. In turn, the objective is to make war short, to be able to destroy the adversary's military power in being, to have the option of regenerating or rebuilding the USSR's military power, and to develop the national stamina to fight such a war on a protracted basis, if that becomes necessary.

By extension, the Soviet goal in strategic nuclear war with the US is to make the conflict short, to eradicate this country's strategic nuclear as well as general-purpose war-waging capabilities as quickly and fully as possible, to annihilate industrial and other resources needed by this country to fight on a protracted basis, and to destroy the US command and control apparatus, including those capabilities underlying continuity of government.

One of the more telltale traits of the Soviet strategic logic is the carefully drawn distinction between mobilization reserves and strategic reserves. The former are what the Soviets would use to fight and win a short war. The latter category provides a fall-back position in case Moscow fails to prevail in a short war and has to fight on a protracted basis.

Strategic reserves, under Soviet doctrine, should be unknown to the enemy both in terms of location and quantity to provide a trump card after the mobilization reserves have been exhausted through use or attrition, according to USAF analysts. It is in the context of mobilization reserves that the large number of spare ICBMs and reloadable silos take on grave and broad importance. (The Soviets, according to some US intelligence estimates, may have between 2,000 and 3,000 more ICBMs than they have silos and engage in exercises that aim at reconstitution of their ICBM force.)

The practical benefit of this capability is major. For one, the magnitude of a Soviet ICBM attack on the US might well be greater and permit more flexibility than the US expects. Also, the reload feature creates imponderable factors for the US targeteer who must assume that silos from which an ICBM already has been launched will be refilled and therefore must be destroyed. The result is a large number of decoy targets that provide an important "sink" for US warheads to draw down US strategic force.

It is ironic that at a time when Soviet strategic nuclear war-fighting capabilities are at a peak—encompassing both counterforce and countervailing arsenals, in line with Moscow's precept that nuclear war is total—the USSR is in the midst of a "disinformation" campaign meant to convey to the West the notion that Moscow never had a first-strike strategy, that strategic superiority is meaningless, and that the minimum assured destruction catechism of Western détentists is valid. In this context, it is noteworthy that after consistent espousal of preemptive strike postures and war-fighting strategies over almost two decades, public Soviet party and military literature, beginning in the mid-1970s, was purged of all references of this type and now propounds the notion that nuclear war is "unthinkable."

Even a thumbnail sketch of Soviet strategic forces is awe-inspiring: The Soviet strategic arsenal includes 7,000 nuclear warheads; 1,398 ICBM launchers counted under SALT II, plus an uncertain but large number of spare missiles; 950 SLBM launchers; and some 300 long-range bombers, of which about 150 are modern Backfire bombers. Augmenting this force are some 270 SS-20 intermediate-range ballistic missiles—highly mobile systems, each of which is fitted with three highly accurate warheads and each capable of refire—that by addition of a third stage can be converted to SS-16 ICBMs as well as an uncertain number of submarine-launchable cruise missiles.

In marked difference to the US ICBM force—some of whose missiles are beyond their projected service life—the Soviet ICBMs as well as the silos housing them are being modernized at a rapid rate. The Soviet ICBM arsenal is being converted to exclusively "Fourth-Generation" weapons, meaning SS-17s, SS-18s, and SS-19s. These very large and sophisticated missiles (the SS-18 is about double the size and has twice the throw-weight of the proposed MX) are, by and large, as accurate as the best US ICBMs. Because of this high accuracy and the fact that they are fitted with high-yield warheads, these modern ICBMs have a high P_k (probability of kill), even when deployed against extremely hard targets.

On top of this highly visible modernization program are subtle, evolutionary upgrade efforts that are bound to widen the Soviet ICBM lead over the US even further. Some US analysts have taken solace in the fact that "Fifth-Generation" ICBMs, known to be under development in the USSR, have as yet not been brought into the inventory. To read a slowdown in the Soviet ICBM program into this development would be a mistake. Some of the most recent "mods," or modifications, of "Fourth-Generation" ICBMs don't alter their appearance in a significant manner; they do lead to marked performance improvement and justify the assertion that the result is a "fourth-and-a-half" generation.

Two other factors can be cited in this context. The latest Soviet ICBMs achieve operationally all that they need to do, and for the time being there appear to be no technological breakthroughs in sight that would have major practical value. Secondly—and overlooked by those who see delays in the Fifth-Generation ICBMs coming into the inventory as evidence of Soviet moderation—the SALT II accord permits the development of only one "new" ICBM while restricting "modification" of existing weapons only in terms of missile size (but without curbs on changes in componentry, including shift to solid fuel systems considered essential for mobile deployment of ICBMs).

In tandem with Soviet ICBM modernization is an equally dramatic SLBM modernization program, including development and deployment of the Typhoon, the world's largest SSBN and of the SS-N-20, the world's largest submarine-launched ballistic missile, which is the same size as the MX *(see p. 47, December '81 issue).*

Soviet Militarization of Space

The Soviet military space program dwarfs that of the US in a numerical sense. The Soviet launch rate is about five times that of the US, while the military payload weight placed in orbit by the USSR is about ten times that of this country. Military R&D experiments are performed on board Soviet manned space stations, the Soviets continue to develop and test an ASAT antisatellite coorbital interceptor, and there is evidence that a new, improved ASAT is under development. There is other evidence, largely in the form of ground facilities, that the Soviets are developing a large space booster similar in performance to the Apollo program's Saturn V. This booster, according to Pentagon analysts, could have six to seven times the launch weight capability of the US Space Shuttle.

The projected new Soviet booster is expected to be capable of putting very large, permanently manned space stations in orbit. The Soviet goal behind this effort, according to Pentagon experts, is support of both defensive and offensive space weapons with man in the loop for target selection, repairs, adjustments, and positive command and control. Some US analysts see rudimentary evidence of the Soviets developing a "space fighter," which, supported by large orbiting docking stations, would provide the Soviet Union with a manned space weapon in a manner similar to that envisioned by USAF's aborted Dyna-Soar program of the '60s.

There is little or no evidence that the Soviets are developing a Space Shuttle, an omission that is understandable for a variety of reasons. Military space utilization by means of large, permanent docking stations lessens the need for a reusable system whose survivability under wartime conditions is, at best, marginal. Also, largely because they lack the autonomous space robotics technology of the US, Soviet emphasis on manned space platforms and weapons makes sense. Soviet military progress in space, as on land, in the air, and at sea, is relentless.

Some US analysts see rudimentary evidence of the Soviets developing a "space fighter," which, supported by large orbiting docking stations, would provide the Soviet Union with a manned space weapon in a manner similar to that envisioned by USAF's aborted Dyna-Soar program of the '60s.

As the Joint Chiefs of Staff FY '82 Posture Statement so aptly pointed out, military power is the Soviet Union's most effective instrument for advancing its interests: "Its economy is stagnating, its political institutions are showing increasing strain, and around the world its ideology is frequently rejected. Only its armed forces command universal attention and concern. By matching the United States in some military categories, and by surpassing it in others, the Soviet Union is steadily increasing its international influence and expanding its capacity for direct action outside its borders. These trends in military balance embolden the USSR to take aggressive political and military initiatives, undermine the resolve of other nations to resist Soviet pressures, and reduce the likelihood of meaningful progress on arms control and other issues of great concern to US and allied security." ■

Recent changes in Soviet military organization are the most significant since those that took place in the 1950s, when the Soviets decided to seek superiority in nuclear-rocket weapons. It may not yet be possible to evaluate fully the changes of the '80s, but here's a report on some of what's going on in the USSR.

CONTINUITY AND CHANGE IN SOVIET MILITARY ORGANIZATION AND CONCEPTS

BY COL. WILLIAM F. SCOTT, USAF (RET.)

SIGNIFICANT changes are taking place in the structure of the Soviet Armed Forces at the beginning of the 1980s. First, the entire Soviet air defense system has been reorganized. Second, a "Commander in Chief [*Glavnokomanduyushchiy*] of the Troops of the Far East," commanding either a theater of military operations (TVD) or a strategic sector, has been announced. Third, the long-range aviation component of the Soviet Air Forces has undergone a shift, the details of which are unclear at present.

A basic reexamination of Soviet military concepts also appears under way. Publication of a new "Officer's Library" series of books, intended for self-study by Soviet officers, has started. In the past, a new series of this type has followed major changes in Soviet military thought.

Soviet secrecy is such that only occasional glimpses are given of what is happening in the Kremlin's military establishment. The picture is fuzzy—a few officer reassignments, references emphasizing the value of certain organizations, a new headquarters structure. But when added up, a different pattern takes shape.

The Changed Pattern of Air Defense

The United States, following its policy of mutual assured destruction and deterrence, pays little attention to aerospace defense. This is not the case in the Soviet

An SA-2 surface-to-air missile, NATO code name Guideline, on its mobile transporter-launcher. The SA-2 is a medium-range (40–50 km), radio-controlled air defense missile in service in the USSR and some twenty other nations.

Union, where more than a half million men in uniform serve in air defense duties. Within the past two years, major changes have taken place in the air defense structure. Two air defense forces—the Troops of National Air Defense and the troops of air defense of the Ground Forces—have been merged to form the Troops of Air Defense.

The first of these, the Troops of National Air Defense *(Voyska Protivovozdushnoy Oborony Strany)*, frequently referred to as Troops of PVO-Strany, was formed in 1948. In 1954 this service was upgraded to have a commander in chief who also was a deputy minister of defense, which put the new service on a par with the Soviet Ground Forces, Air Forces, and Navy. Billions of rubles were spent in developing air defense weapon systems, such as the SA-1, SA-2, and later generations of surface-to-air missiles. Equivalent attention was given to interceptor aircraft, such as the MiG-25 (Foxbat) and to radars. Two new components—antimissile defense *(protivoraketnaya oborona)* and antispace defense *(protivokosmicheskaya oborona)* were added to PVO-Strany in the 1960s.

The Soviet press recently has revealed that General of the Army . . . V. L. Govorov is the "commander in chief . . . of the Troops of the Far East." This is the first time since the 1947–53 period that such a group has been specifically identified in the Far East.

The Soviet Ground Forces formed their own troops of air defense in 1958, at a time when the Soviet leadership was concentrating on strategic air defense systems. This branch was on the same level as the tank troops, rocket troops and artillery, and motorized rifle troops. Money spent for air defense purposes in the Ground Forces exceeded by far that allocated for similar weapon systems in the United States Army.

In the late 1970s, the troops of air defense of the Ground Forces was one of the most rapidly growing branches of that service. The Military Academy of Air Defense of the Ground Forces was established in 1977 to provide advanced professional training for officers. Junior officers were prepared and educated in five air defense schools, with four- to five-year courses.

Reorganization of Air Defense Resources

The Soviets seldom openly announce changes in military organizations, or provide information about their own weapons. Occasional notices in the Soviet press in the late 1970s, such as officer awards, indicated that something was happening in the air defense structure. By January 1981, accumulated evidence disclosed that the troops of air defense of the Ground Forces had been merged with the Troops of National Air Defense, and that they had been redesignated as the Troops of Air Defense.

Red Star's routine announcement about military schools in 1981 showed that all of the air defense schools previously under the Ground Forces, as well as the Military Academy of Air Defense, had been transferred to the Troops of Air Defense. The head of the troops of air defense of the Ground Forces, General Colonel of Artillery P. G. Levchenko, was apparently reassigned to the Troops of Air Defense as well.

Previously, Troops of National Air Defense had eleven schools for training cadets in command, surface-to-air missiles, and radar duties, plus three flying training schools for pilots. The redesignated Troops of Air Defense kept the eleven schools, gained five more schools from the Ground Forces, but lost two flying training schools to the Air Forces.

The merger of air defense organizations has changed the method by which command and control were exercised. In the past, the Commander in Chief, Troops of National Air Defense, exercised direct command over his units. Now units of Troops of PVO are assigned to military districts and to groups of forces abroad. The Baku Air Defense District has been downgraded and seems to have become part of the Transcaucasus Military District.

Weapon systems of the former troops of air defense of the Ground Forces had included antiaircraft artillery, mobile surface-to-air (Zenith) missiles, and the necessary support radars. The 1973 Mideast War, in which Soviet air defense weapons for ground forces were operated by Egyptian soldiers, demonstrated the effectiveness of this Soviet equipment. It now appears that most of these weapons, along with personnel, are assigned to the Troops of Air Defense.

Thus, a newly reconstituted major service, second only to the Ground Forces in size, has responsibilities for:

- Strategic aerospace defense of the USSR, charged with protection against attack by manned bombers, ballistic missiles, space vehicles, and cruise missiles.
- Providing air defense to combined-arms commanders at all levels, to include theaters of military operation (TVDs), strategic sectors, military districts, fronts, armies, and below.

Dr. William F. Scott retired from the Air Force in 1972 as a colonel. He served as senior air and defense attaché at the US Embassy in Moscow for two tours during the 1960s and 1970s. Since then, he and his wife, Harriet Fast Scott, have made several trips across the Soviet Union, meeting with scholars both in the USSR and China. Their book The Armed Forces of the USSR *is used as a text at a number of universities and war colleges. The Scotts are regular contributors to this magazine. Dr. Scott is presently a lecturer at Georgetown University; his wife is a consultant to a number of research institutes.*

This merger of Soviet air defense resources has great significance for USAF. In examining how the new air defense structure might function in combat conditions, the establishment and purpose of Soviet theaters of military operation and strategic sectors are of crucial importance.

Theaters of Military Operations (TVDs) and Strategic Sectors

In 1979, Marshal N. V. Ogarkov, Chief of the Soviet General Staff, noted that "Soviet military strategy holds that war consists of a complex system of interdependent, large-scale, simultaneous, and successive strategic operations, including operations in continental theaters of military operations." In July 1981, writing in *Kommunist*, Ogarkov explained further the importance of the TVD in Soviet military planning: "It is not the front [*frontovaya*] operation, but the larger-scale form of military operations—the strategic operation in the theater of military operations—which should be regarded as the basic operation in a possible future war."

Ogarkov's statements on strategic operations and theaters of military operations now appear directly applicable to current Soviet strategic planning. The Soviet press recently has revealed that General of the Army (four-star) V. L. Govorov is the "commander in chief [*glavnokomanduyushchiy*] of the Troops of the Far East." This is the first time since the 1947–53 period that such a group has been specifically identified in the Far East, although there is evidence that he replaced General of the Army V. I. Petrov, who probably had been appointed to this position in December 1978.

A brief review of previous TVDs and similar organizations will facilitate an appreciation of the importance of this command in the Far East, with a commander in chief and staff assigned.

In 1941, soon after Hitler's invasion of the Soviet Union, three high commands were established in the Northwest, West, and Southwest strategic sectors. The disorganization of the Soviet Armed Forces at that time was such that the staffs of these commands were largely ineffective. Stavka of the VGK (Headquarters of the Supreme High Command) found it more expedient to deal with each front directly. A front was composed of one or more armies. At one time there were fourteen such fronts operating against the Germans, with an average width of 200 to 300 kilometers, and an average depth of 300 to 400 kilometers.

In 1945, in preparation for joining in the war against the Japanese, a theater of military operations was established in the Far East, under command of Marshal A. M. Vasilevskiy. The distance of this area from Moscow was so great that direct control by Stavka of a series of fronts fighting the Japanese would have been impractical. Shortly after the war ended in 1945, the TVD was abolished. It was reestablished in 1947, when the Chinese were in the midst of their revolution, and disbanded in 1953, shortly after the death of Stalin. The commander in chief of this TVD was Marshal R. Ya. Malinovskiy, and one of his staff officers was a young colonel, N. V. Ogarkov, now Chief of the Soviet General Staff.

Since the end of World War II, Soviet strategists have recognized that the front was not the best organization for a future war, and have examined carefully other formations that might improve command and control. According to the third edition of Marshal Sokolovskiy's *Military Strategy*, published in 1968, this would be a theater of military operations.

More than 300 high-performance MiG-25 Foxbat interceptors are deployed in the Soviet Union, Syria, Libya, and Algeria.

> The modern concept of a theater of military operations may include the entire territory of a belligerent or coalition, whole continents, large bodies of water, and extensive regions of the atmosphere, including space. On this basis, the traditional theaters of military operations can be grouped together: Western, Near Eastern, Far Eastern, etc. . . . Thus, the zone of military operations is no longer limited to the firing range of weapons, since the latter is almost unlimited. . . .

Within a theater of military operations there might be one or more strategic sectors, defined as follows:

> Strategic sector: a terrain area in a continental theater of operations and the aquatory next to it along with the airspace above them within the limits of which are located objectives of strategic significance and strategic groupings of armed forces which are deployed (concentrated) or might be deployed to fight for the achievement of strategic goals. Within the limits of a TVD there might be several strategic sectors and in a strategic sector several operational sectors.

TVDs, strategic sectors, and individual services of the Soviet Armed Forces are commanded by "*glavnokomanduyushchiye*" (commanders in chief). In 1977 the "*glavnokomanduyushchiye*" were as follows: commander in chief, Warsaw Pact Forces, commanders in chief of the Strategic Rocket Forces, Ground Forces, Troops of National PVO, Air Forces and Navy, *and* the commander in chief of the Group of Soviet Troops, Germany. Designation of the *glavnokomanduyushchiy* of Troops of the Far East brings to eight the officers in this category.

Soviet spokesmen emphasize that the command and

control structure needed in any future war must be established in time of peace, before war begins. This was one reason why the existence of the Council of Defense, chaired by the Party's General Secretary, Marshal of the Soviet Union L. I. Brezhnev, was revealed in 1976. Formation of the Troops of the Far East was yet another step in preparing a wartime organization.

Reportedly thirteen TVDs have been formed, as follows: five continental, four maritime or naval, and four intercontinental. One such continental TVD likely would be in the Far East, another in Central Asia, and a third in the Middle East. Another probably would be in the Southwest, to encompass Bulgaria, Romania, and the Southern Group of Forces, Hungary. A fifth could be the Western TVD, which would include the Soviet Group of Forces, Germany, the Central Group of Soviet Forces, Czechoslovakia, and the Northern Group in Poland. The Soviet area to the northwest, towards Finland, might be designated a strategic sector.

Is it possible that the Soviets are bringing together their *intercontinental* strategic nuclear forces, capable of launching strikes on the United States, into one organization?

Air Defense in a TVD or Strategic Sector

Looking back, it is apparent that PVO-Strany had been formed at a specific period for a definite purpose. In the late 1940s and 1950s, strategic bombers of the United States and Great Britain, carrying nuclear weapons, were regarded by the Kremlin as its major military threat. An air defense structure under centralized control, covering the entire nation, was considered necessary. Later in the 1950s, as resources became available, a new branch was formed in the Ground Forces to provide tactical air defense.

This Soviet dual organization for air defense posed many command and control problems. Assume, for example, a nonnuclear conflict in the Western portion of the Warsaw Pact area. First, there would have been the activities of troops of air defense of the Ground Forces, with antiaircraft artillery and surface-to-air mobile missiles. Second, the forces of PVO-Strany would have been involved, since its responsibilities extended throughout the Warsaw Pact bloc. PVO-Strany had under its control both interceptor aircraft and surface-to-air missiles. Third, there would have been the aircraft of Frontal Aviation, under command of the front commander through his deputy commander of aviation.

In such an overlapping and complex structure, establishing rules of engagement for enemy aircraft was difficult. At a medium altitude, an aircraft could be attacked by aircraft of Frontal Aviation, interceptor aviation of PVO-Strany, or surface-to-air missiles of both PVO-Strany and troops of air defense of the Ground Forces.

Introduction of attack helicopters into both NATO and Warsaw Pact forces may have been a major factor forcing the merger of PVO-Strany with the air defenses of the Ground Forces. Helicopters greatly complicate command and control problems of air defense units. United States plans for deploying the cruise missile may have been another reason. Soviet spokesmen have claimed that this weapon could be more important and deadly than any other single element in the current United States triad of ballistic missiles, aircraft, and submarines. Since cruise missiles would penetrate enemy airspace at extremely low altitudes, detection and interception are most difficult. The combined resources of all air defense organizations are required to deal with the cruise missile problem.

There are still unanswered questions about the new Soviet Troops of PVO. As with Frontal Aviation of the Soviet Air Forces, Troops of PVO units are now assigned to military districts, Soviet groups of forces abroad, and theaters of military operations or strategic sectors when activated. But what about antispace and antimissile defenses, which are staging a rapid comeback? These systems probably are still centrally controlled by PVO headquarters.

The Soviet air defense reorganization highlights the Soviet concept for war-fighting. Active measures are provided for the security of the USSR from air attack. As one Soviet general remarked: "Mutual assured destruction is not a military concept, and should not be accepted by the military of either side. It might be a political concept, or a philosophical concept, but it is not valid militarily. Whenever a new weapon system is developed, a defense must be provided against it." Soviet actions confirm this view.

Strategic Nuclear Forces

In his major policy article of July 1981, Marshal Ogarkov omitted specific reference to the Strategic Rocket Forces. Instead, he wrote of "strategic nuclear forces," adding later in the same paragraph that "launches of modern intercontinental ballistic missiles are automated."

Soviet spokesmen in the past have written about strategic nuclear forces, which they described as consisting of the Strategic Rocket Forces, nuclear-powered submarines, and long-range aviation. Following his discussion of strategic nuclear forces, Ogarkov identified by name the other four services—Ground Forces, Troops of Air Defense, Air Forces, and Navy. In his remarks about the Air Forces, he singled out only Frontal Aviation, noting that its basic formation is the division, "which includes approximately the same number of combat aircraft as an air corps had in the period of the Great Patriotic War." He said nothing of either air transport or long-range aviation.

"Dal'nyaya Aviatsiya"—long-range aviation—is a component of the Soviet Air Forces. However, it always has been a special command. Long-range bomber aviation of the High Command of the Red Army (DBA GK)

was formed in 1940. In early 1942, it was reorganized into aviation of long-range action (ADD) and directly subordinated to Stavka of the Supreme High Command (VGK). In December 1944, ADD was redesignated the 18th Air Army, subordinated to the commander in chief of the Air Forces. It still, however, retained its "special" designation as a reserve of the Supreme High Command, a place long-range aviation still maintains. It may be released to take part in Air Forces operations, operations of other services, or to perform independent air operations.

Ogarkov's failure to refer to long-range aviation adds to the mystery of what has happened to its staff. The previous commander, General Colonel of Aviation V. V. Reshetnikov, has been listed for several months as a deputy commander in chief of the Air Forces. No new commander of long-range aviation has been identified, although references have been made to the organization.

In the July article, Ogarkov stated that "the basis of the Navy's combat might is now made up of nuclear submarines with a diverse arsenal of missile and torpedo weapons, and also missile-carrying aviation." The wording here is slightly different from what had been used in the past concerning nuclear submarines and ballistic missiles. Normally, those nuclear submarines armed with "nuclear-tipped ballistic missiles" had been put in a class by themselves.

Is it possible that the Soviets are bringing together their *intercontinental* strategic nuclear forces, capable of launching strikes on the United States, into one organization? This would parallel the triad of the United States: ICBMs, long-range bombers, and nuclear submarines. Such an organization might be advantageous for bilateral talks with the United States on limitation of *intercontinental* strategic weapons. *Theater* or *Eurostrategic* nuclear forces might then be established as the forces considered for arms-control negotiations with NATO nations.

Actual evidence of changes in Soviet strategic nuclear forces is limited. It could be that failure to identify a commander of long-range aviation or to make specific reference to the Strategic Rocket Forces is accidental. Nevertheless, a different pattern of some type appears to be emerging, but the facts presently available are inconclusive.

Consistency of Doctrinal Concepts

Soviet Armed Forces have a more fluid structure than do the armed forces of NATO countries. Their organization is strongly influenced by Soviet military art, which holds that the goals of war can be achieved only by the combined efforts of all services of the Armed Forces and service branches, performing tasks in strategic, operational, and tactical cooperation. Reorganizations are undertaken for four reasons: to increase the fire and striking power of troops, to increase their mobility, to improve control of troops, and to utilize new technology.

The introduction of nuclear weapons into the Soviet Armed Forces brought about extensive organizational changes. Troops had to be able to fight with or without nuclear weapons; had to consider survivability on a nuclear, chemical, or bacteriological battlefield; and had to maximize maneuverability. Continual small changes led ultimately to qualitative jumps. In 1960, the Strategic Rocket Forces were formed as a service. New aircraft changed the shape of the Soviet Air Forces. The Troops of PVO-Strany incorporated surface-to-air missiles, antiballistic missiles, and antispace weapons.

One of the basic and strongest principles of what the Soviets call *"voyennoye stroitel'stvo"*—military development—is centralization of control of the Armed Forces. This is fostered by a General Staff that develops plans for the entire Soviet Armed Forces. Being basically a land power, the Soviet Union has a long tradition of orientation toward a continental theater of military actions, with main emphasis on land armies. This orientation changed in 1960 when the Strategic Rocket Forces became the number-one service. This was due to revolutionary changes that had taken place in Soviet military strategy, resulting from the introduction of nuclear weapons into all the Soviet military services.

The apparent concern evidenced by Brezhnev and his followers about the consequences of a nuclear war may be more for foreign than internal consumption. At the beginning of the 1980s, nuclear weapons retain the primary interest of Soviet military strategists.

In the late 1950s and throughout the early 1960s, as the Soviet nuclear buildup was under way, Soviet leaders from Party Secretary Khrushchev to Defense Minister Marshal Malinovskiy said a nuclear war would turn entire continents to ashes. During the late 1960s and early 1970s, the destructiveness theme was muted. Beginning about 1977, Leonid Brezhnev began to assert that nuclear war would bring an end to civilization. In 1981, this thesis was amplified by other Politburo members. Does this mean that actual sentiment exists in the Kremlin against nuclear weapons and that a new era in Soviet military thought is under way?

Soviet writings of the early 1980s do not show any decreased emphasis in the role of nuclear weapons. The 1981 edition of *Beginning Military Training,* published annually in more than 1,000,000 copies for study by youth before they are called up for active military duty, treats matter of factly the use of nuclear weapons on the battlefield.

In October 1980, one of the leading journals of the Communist Party of the USSR stated the following:

> In imperialism's hand, nuclear missile weapons are terrible weapons of war. In the hands of the socialist

states, nuclear weapons are a shield for peace. They have been created to curb an aggressor, and avert war.

A book published that same year, *Armed Forces of a Developed Socialist Society,* asserted:

> The principle of harmonious development does not exclude the more rapid development in certain conditions of one or another service of the armed forces. At the present time, for example, we are giving greater attention to improving the Strategic Rocket Forces—the basis of the nuclear might of our country, the main means of containment of the aggressive aspirations of imperialism.

. . . Soviet military art, encompassing military strategy, operational art, and tactics, is undergoing close reexamination.

These and other current Soviet writings show a remarkable consistency with doctrinal statements made in the early 1960s, when Soviet spokesmen explained that the introduction of nuclear weapons into the armed forces of major powers brought about a revolution in military affairs. The last such revolution had occurred centuries earlier, when gunpowder replaced "cold weapons"—the sword, pike, and spear. For the future, Soviet strategists concluded, the military might of a nation would be based on the quantity and quality of its nuclear weapons and their means of delivery to targets.

The apparent concern evidenced by Brezhnev and his followers about the consequences of a nuclear war may be more for foreign than internal consumption. At the beginning of the 1980s, nuclear weapons retain the primary interest of Soviet military strategists. The Cuban missile confrontation of 1962, the ouster of Nikita Khrushchev in 1964, and arms-control negotiations and agreements of the 1970s did not change the fundamental positions of Soviet military doctrine. Both Party and military leaders have reason to be pleased with its achievements. By adhering to the principles of its military doctrine, the Soviet Union reached the status of a military superpower in less than twenty years.

There have been doctrinal modifications. Until the mid-1960s, Soviet theorists maintained that any major war between nuclear powers would begin with all-out massive nuclear strikes. In the late 1960s, the concept was modified to provide for a period in which only conventional weapons might be used.

Another modification was announced by Marshal A. A. Grechko in 1974 when he declared that the role of the Soviet Armed Forces was no longer restricted just to defending "our motherland and the other socialist countries." This signified that the Soviets were preparing to project military power and presence any place in the world. The modification was the result of the Soviet military superpower status. Without its massive nuclear armaments and delivery means, Soviet power projection capabilities would have little significance.

A Reexamination of Military Art

Military doctrine, defined by Soviet spokesmen as being the military policy of the Communist Party, has changed but little in the past two decades. But Soviet military art, encompassing military strategy, operational art, and tactics, is undergoing close reexamination.

In 1964, the Soviet press announced that an "Officer's Library" to be used by officers for self-study, would explain the changes in military affairs brought about by nuclear weapons and missiles. Military doctrine and strategy were emphasized in this series. The final book in the group, *Scientific-Technical Progress and the Revolution in Military Affairs,* appeared in 1973. Translation of a few of these books into English, making them available to a large group of scholars, had a significant influence upon US perceptions of the Soviet Armed Forces.

On October 3, 1979, *Red Star* announced the titles of twelve books in a new "Officer's Library" series. At this time only one of these books is available. Titles of planned books, such as *Basic Methods of Combat Training* and *Tactics of Combined-Arms Battle,* suggest that the emphasis in this series will be on operational art and tactics, rather than doctrine.

Since 1978, those Soviet defense intellectuals permitted to meet with foreigners have insisted that a new work on military strategy will soon appear. Thus far, however, no work on this subject has been announced in the publication plan of the Soviet military press, including that for 1982. A book on strategy was written in the mid-1970s for use at the Soviet Academy of the General Staff, but this remains classified. It is unlikely that Soviet censors will permit another book such as Marshal Sokolovskiy's *Military Strategy.* The explicit statements about nuclear war, found in all three editions, still cause embarrassment to Soviet groups trying to explain the purely "defensive" nature of the Soviet Armed Forces.

Current Soviet attention to theaters of military operations and strategic sectors indicates the importance given to operational art, a Soviet expression that has no exact counterpart in the United States. It is defined as the theory and practice of preparing for and conducting combined and interdependent operations by major field forces or major formations of service. It is in this area and in tactics that changes will likely appear.

New missions and roles for the Soviet armored combat vehicle (BMP), wide deployments of attack helicopters, and the massive influx of tanks into motorized rifle divisions have significantly increased Soviet offensive capabilities. This has been matched by vastly improved tactical aircraft, now deployed in unanticipated numbers throughout the military districts and Soviet groups of forces abroad.

Recent changes in Soviet military organization are the most significant since those that occurred in the 1950s, following the Soviet decision to seek superiority in nuclear-rocket weapons. It is unlikely that these changes have run their full course, or that all that have taken place are known in the West. ■

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 fourth 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 First 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. Deputy of the Supreme Soviet 7th through 10th sessions. Commander of the Kiev Military District (1967–69), then Commander in Chief, Soviet Forces Germany (1969–71). Chief of the General Staff (1971–77). Frunze Military Academy (1953). Academy of the General Staff (1959).

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).

Marshal of the Soviet Union Sergey Leonidovich Sokolov. Born 1911. Russian. First Deputy Minister of Defense for General Affairs since 1967. Served on the Western and Karelian Fronts during World War II. First Deputy Commander (1964–65), then Commander of the Leningrad Military District to 1967. Candidate (1966), then Member (since 1968) of the Central Committee CPSU. Deputy of the Supreme Soviet 7th through 10th sessions. Military Academy of Armored and Mechanized Troops (1947). Academy of the General Staff (1951).

General of the Army Vladimir Fedorovich Tolubko. Born 1914. Ukrainian. Commander in Chief of Strategic Rocket Forces and Deputy Minister of Defense since 1972. Tank brigade commander during World War II. From 1960 to 1968, he was First Deputy Commander in Chief of the Strategic Rocket Forces. After tours as Commander, Siberian Military District, and the Far Eastern Military District, he was given his current assignment. Candidate (1971), then Member (1976) of the Central Committee CPSU. Deputy of the Supreme Soviet 8th through 10th sessions. Military Academy of Mechanization and Motorization (1941). Academy of the General Staff (1951). Higher Academic Courses of the Academy of the General Staff (1968).

General of the Army Vasiliy Ivanovich Petrov. Born 1917. Russian. Commander in Chief of Ground Forces and Deputy Minister of Defense since December 1980. In World War II, commanded a cavalry platoon, then chief of operations of a rifle division. In 1957, commanded a motorized rifle division. After 1961, various command posts. In 1966, First Deputy Commander and Chief of Staff of the Far Eastern Military District, and in 1972, Commander. In 1976, First Deputy Commander in Chief of Ground Forces. Commander in Chief of Troops of the Far East, 1978–80. Full Member of the Central Committee CPSU since 1976. Deputy of the Supreme Soviet 9th and 10th sessions. Frunze Military Academy (1948). Graduate of General Staff Academy's Higher Academic Courses (1969).

Marshal of Aviation Aleksandr Ivanovich Koldunov. Born 1923. Russian. Became Commander in Chief, Troops of Air Defense (Voyska PVO) and Deputy Minister of Defense in July 1978. Koldunov was one of the ten top Russian fighter aces of World War II, destroying forty-six enemy aircraft. In the postwar period, Koldunov commanded fighter aviation units. In November 1970, he was named Commander of the Moscow Air Defense District. In December 1975, Koldunov became First Deputy Commander in Chief of Troops of National Air Defense. Candidate Member of the Central Committee from 1971 to 1976. Deputy of the Supreme Soviet 9th and 10th sessions. Twice "Hero of the Soviet Union." Military Air Academy (1952), Academy of the General Staff (1960). Member of the Central Committee since 1981.

Chief Marshal of Aviation Pavel Stepanovich Kutakhov. Born 1914. Russian. Commander in Chief of the Air Forces and Deputy Minister of Defense since March 1969. In World War II, he flew 367 combat missions, shooting down fourteen enemy aircraft. Commanded the air forces of a military district before becoming First Deputy Commander in Chief of the Air Forces in 1968. Member of the Central Committee CPSU since 1971. Deputy of the Supreme Soviet 8th through 10th sessions. "Hero of the Soviet Union." Academy of the General Staff (1957). Distinguished Military Pilot USSR (1966).

Admiral of the Fleet of the Soviet Union Sergey Georgiyevich Gorshkov. Born 1910. Russian. He has held his present post as Commander in Chief of the Navy since 1956. Gorshkov took an active part in World War II landings in the Black Sea area, and supported fighting in Hungary and Yugoslavia. In July 1955, he became First Deputy Commander in Chief, then, in January 1956, Commander in Chief of the Navy and Deputy Minister of Defense. From 1956, he was Candidate, and from 1961, a Member of the Central Committee CPSU. Deputy of the Supreme Soviet 4th through 10th sessions. Graduate of Frunze Naval School (1931) and higher commanders' courses at the Naval Academy (1941).

—HARRIET FAST SCOTT

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 are also Deputy Ministers of Defense.

Organization of the Soviet Armed Forces

Editor's note: The organization of the Soviet armed forces continues to change, and key command assignments have not been made in many cases, AIR FORCE *Magazine is told.*

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

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

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

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

The **Strategic Rocket Forces,** established in 1959, operate all land-based ballistic missiles with ranges greater than 1,000 km—about 1,400 ICBMs and 600 IR/MRBMs. Little is known about the SRF outside the Soviet Union, but it is first among services, with its commander taking precedence over those of the other services, regardless of his actual rank. *The Military Balance,* published annually by The International Institute for Strategic Studies, London *(see December '81 issue of* AIR FORCE *Magazine),* credits the Strategic Rocket Forces with 385,000 personnel. Strength figures for the services below are from *The Military Balance* for 1981–82.

The **Ground Forces,** numerically the largest of the five services, are divided into three major branches: motorized rifle, tanks, and rockets and artillery. Airborne Forces (the USSR now has eight airborne divisions) are a special branch directly subordinate to the High Command. The 173 Ground Forces divisions, with tanks, armored personnel carriers, self-propelled artillery, and personal equipment all are designed for a CBR environment, and equipped and trained for combat with or without nuclear, chemical, and biological weapons. Ground Forces personnel, combined with Troops of Civil Defense, Troops of the Rear Services (logistical support), and various other support personnel that serve all the other services, number about 1,825,000.

The **Troops of Air Defense** (Voyska PVO) was formed in 1948 as PVO-Strany. Its three major components are its 2,600 fighter-interceptors, 10,000 SAM launchers, and huge radar network. Two other components are antimissile defense (PRO) and antispace defense (PKO). Exceeding NORAD's capabilities several times, PVO has some 550,000 troops.

Soviet Air Forces has three major components: Frontal Aviation, Long-Range Aviation, and Military Transport Aviation. Personnel strength, excluding Long-Range Aviation, is about 475,000.

Frontal Aviation is comparable to the USAF's Tactical Air Command. Its 4,350 combat aircraft are assigned to military districts within the USSR, somewhat analogous to US joint commands, and to four "Groups of Forces" in Eastern Europe. Operational control over joint commands remains with the General Staff. However, the Air Forces commander in chief has major responsibilities for Frontal Aviation, which is charged with maintaining battlefield air superiority and working with the Ground Forces.

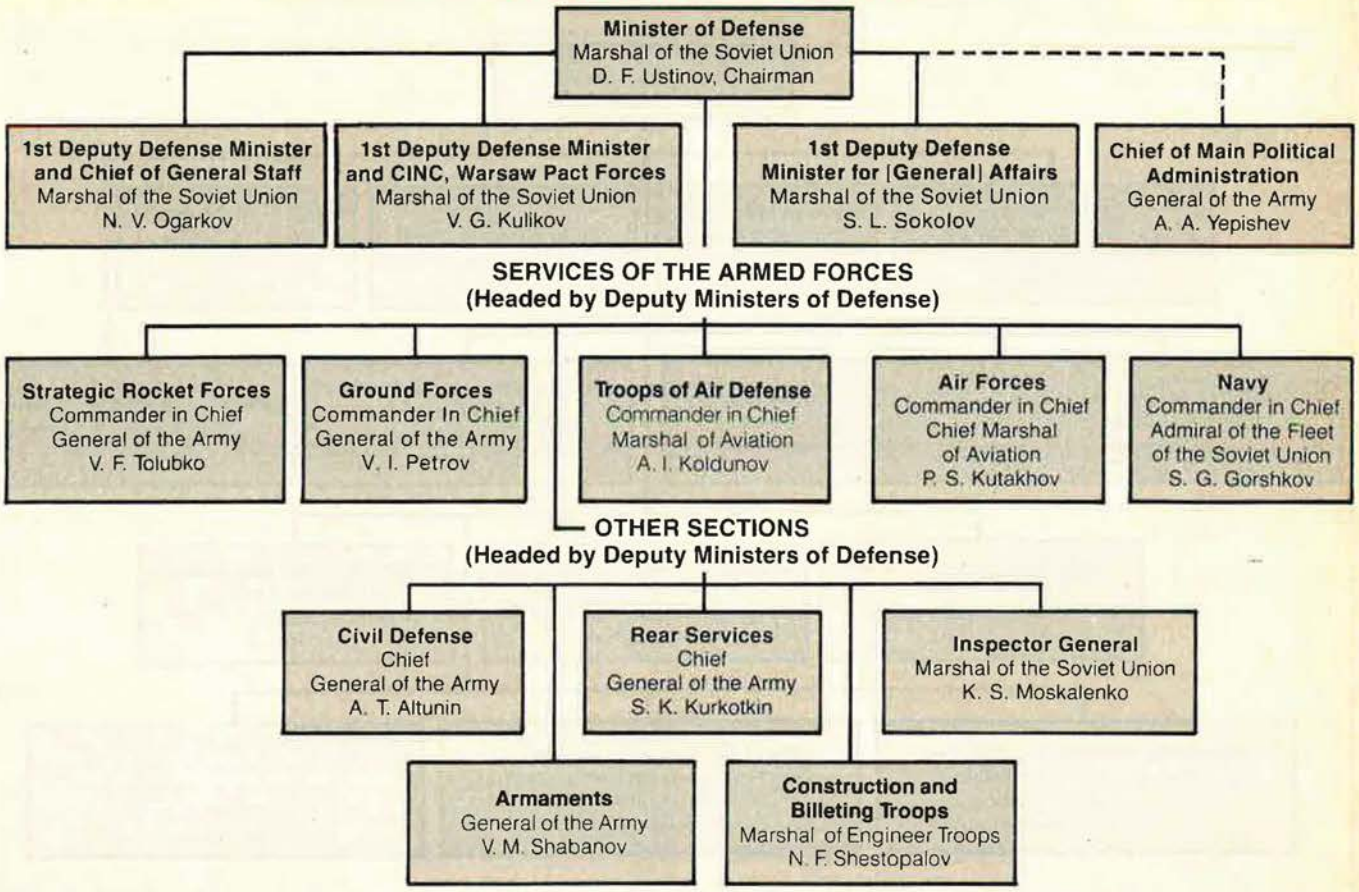
Long-Range Aviation has about 850 long-range (Bear, Bison, and Backfire) and medium-range (Badger and Blinder) bombers. Backfire and Blinder are supersonic, but the bulk of the bomber force is still subsonic. Capable of air-to-air refueling by LRA's small tanker force, the bombers can carry either nuclear or conventional weapons, including air-to-surface missiles. This component of the Soviet Air Forces is comparable to USAF's Strategic Air Command, less SAC's ICBMs.

Transport Aviation includes some 1,200 fixed-wing aircraft and helicopters, although some helicopters are also assigned to the Navy. The transport aircraft of the Soviet airline, Aeroflot, must also be included in this component essentially as a full-time reserve.

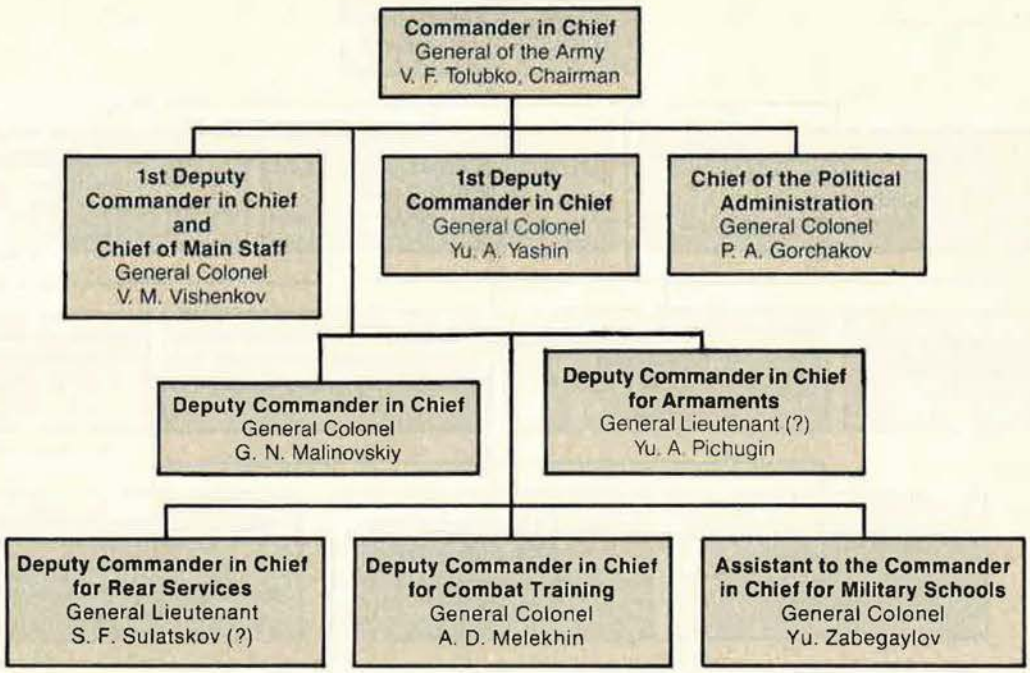
The **Soviet Navy** is now a maritime superpower. With its aircraft carriers of the *Kiev* class, Soviet Naval Aviation has a mix of carrier-based helicopters and V/STOL aircraft. Naval Aviation also has land-based and reconnaissance fighters, a limited transport force, bombers, and surveillance aircraft. Navy personnel strength is about 443,000, including 59,000 in Naval Aviation.

The accompanying charts, prepared by Harriet Fast Scott and current as of February 1, 1982, show the membership of the top military organization. ■

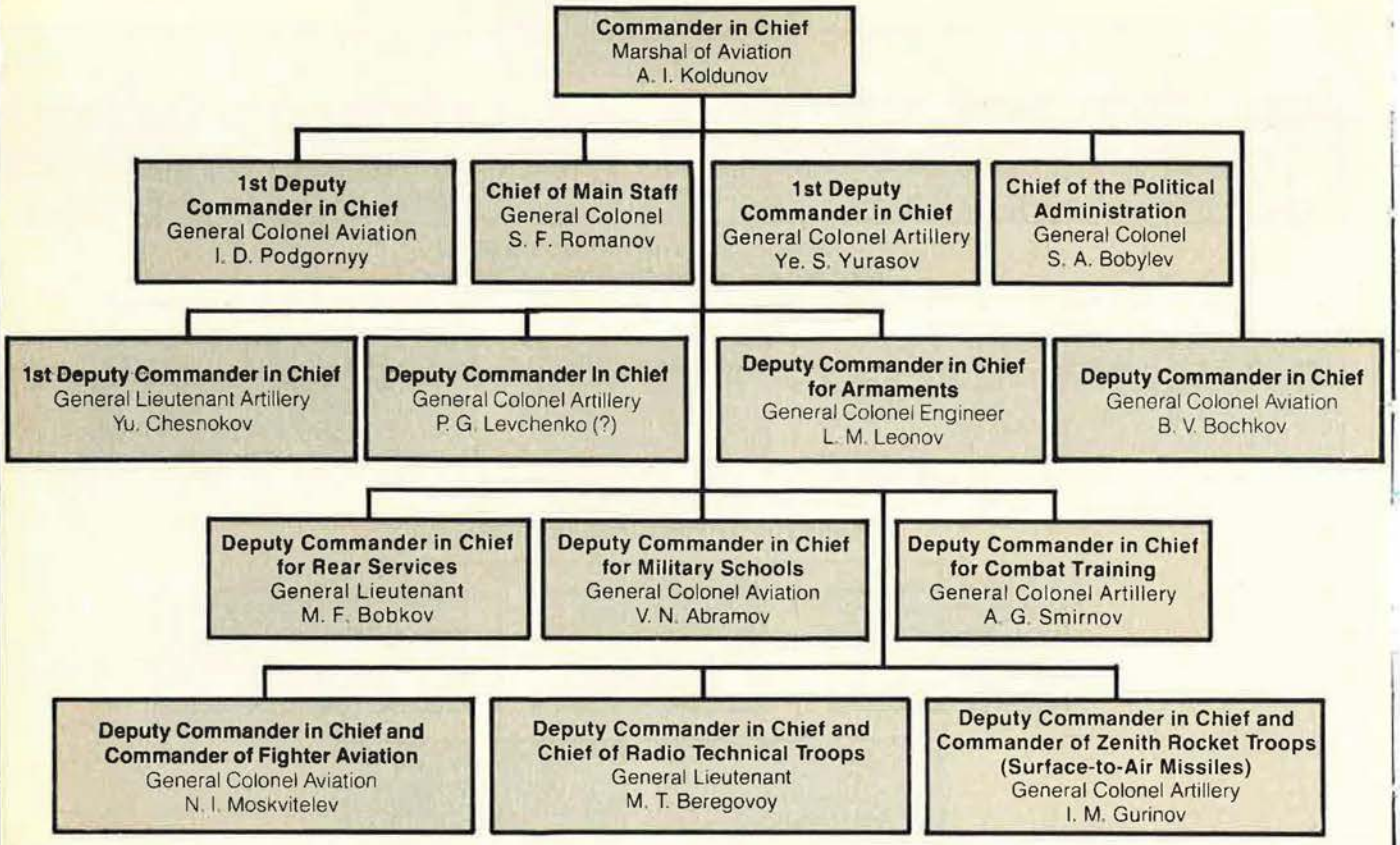
MEMBERS OF THE MAIN MILITARY COUNCIL *(KOLLEGIYA)* OF THE MINISTRY OF DEFENSE



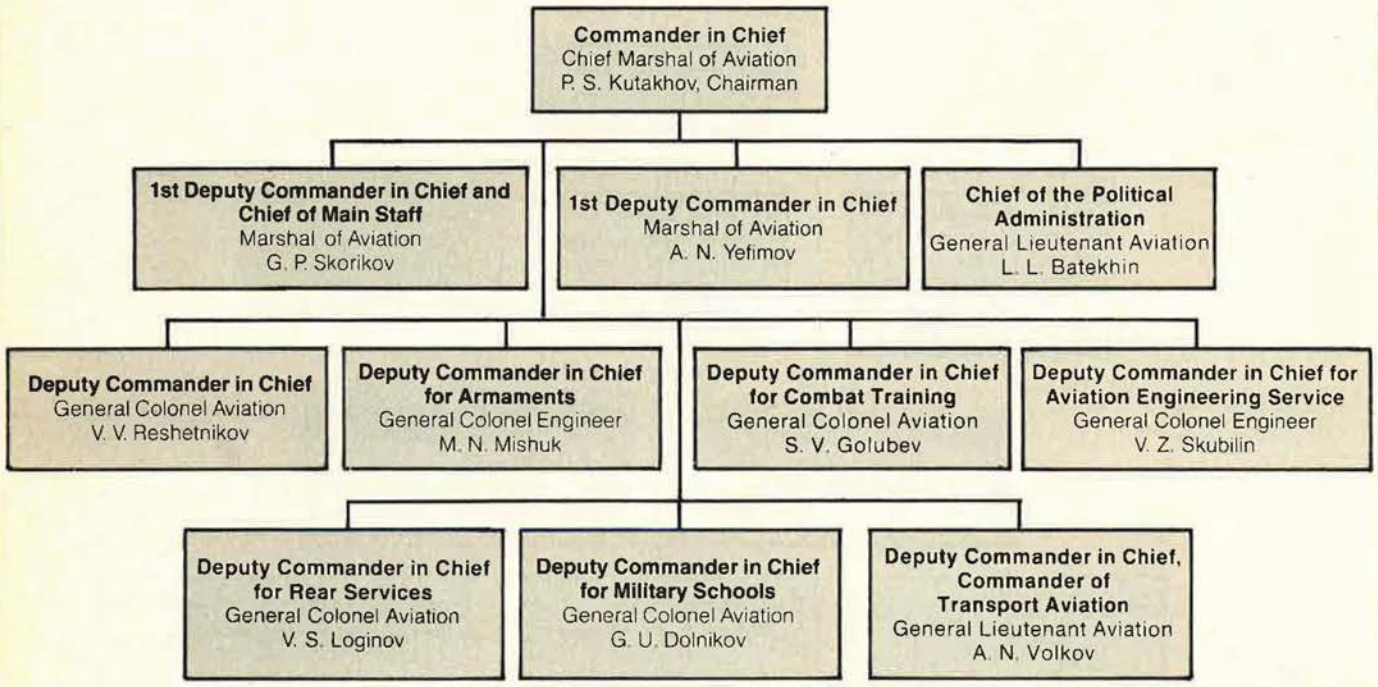
MEMBERS OF THE MILITARY COUNCIL OF COMMAND AND STAFF OF THE STRATEGIC ROCKET FORCES



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



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



—CHARTS COMPILED BY HARRIET FAST SCOTT

In this article, the successive commanders of the Soviet Air Forces are profiled and their careers interwoven with the development of the Air Forces. In the period between the 1917 Revolution and World War II, most of the Air Forces' commanders died at the hands of their masters, instead of as a result of enemy action or the perils of flight. Since the war, longevity in office has been a hallmark of the . . .

SOVIET AIR FORCES COMMANDERS

BY HARRIET FAST SCOTT

THE Soviet Air Forces had seven chiefs in its first twenty-three years. Of those seven, two were killed in the same air crash in 1933. Two more were shot in 1938, during Stalin's military purges. The other three were executed by order of Stalin in 1941, several months after the German invasion of Russia. By contrast, in the forty-one years since April 1941, there have been only four heads of the Soviet Air Forces. One of these was jailed following the war. Of all the heads of the Soviet Air Forces, only the current commander in chief, Chief Marshal of Aviation P. S. Kutakhov, is still alive.

The history of the leadership of the Soviet Air Forces is one of mystery, intrigue, and sudden death—but not at the hands of foreign enemies.

The history of the leadership of the Soviet Air Forces is one of mystery, intrigue, and sudden death—but not at the hands of foreign enemies. A clear picture of what happened and who the leaders really represented lies buried in the Kremlin's archives. Who these past leaders were and something of their known activities may provide insights into the nature of Soviet air capabilities and limitations.

Before and during World War I, Russia and then the new Soviet state were ahead of the US in air concepts. For example, the *Il'ya Muromets*—at the time the world's largest four-engine aircraft used as a bomber—was built in 1913 by Imperial aviation engineers.

Most aircraft, however, were of foreign design, built in Russia under license or purchased from abroad. After the 1917 Revolution, foreign workers fled, and several plants in the Baltic states were lost as those areas became independent. As a result, domestic aircraft production almost ceased. By September 1918, the Red Air Forces numbered 266 operational aircraft and fifty-nine in need of repair, plus 169 other assorted planes in warehouses or at scattered airfields. The Civil War was under way, and energetic measures were needed to keep the few planes the Soviets had in working order. Further, there were only 269 pilots and fifty-nine observer pilots in the entire Red Air Forces at the end of 1918. And seven of the ten flying schools in Russia were in the hands of the enemy.

Desperate Partners

This was the situation twenty-five-year-old A. V. Sergeyev found when he became the first chief of *Aviadarm* (aviation of the active army) on September 22, 1918. He successfully handled the post until it was no longer needed in 1920. Then, in February 1921, Sergeyev became Chief of the Main Directorate of the Air Fleet. With Igor Sikorskiy's emigration in 1917, Russia lost her remaining aircraft engineers and had no aircraft industry.

A desperate Germany, deprived by the Treaty of Versailles from further development of military aircraft, and, after May 1921, of even civil aircraft, turned to its equally desperate Eastern neighbor to make a deal. Junkers moved his factory to Russia in 1922, and German engineers and technicians flowed to the plant at Fili, near Moscow. Soon, there were more specialists in Russia than there were in Germany. Russians, too, were hired, and soon the plant employed more than a thousand workers.

The Soviets gave orders that military aircraft were to have first priority at the Junkers works. But testing facilities were either lacking or very primitive, so a network of airfields had to be built. The vastness of the Soviet Union and lack of a road net created ideal conditions for development of a civil airline. The first line from Moscow to Nizhni-Novgorod (now Gorkiy) opened in 1922 and was soon followed by dozens of other lines crisscrossing Russia from Baku to the Arctic, from beyond Lake Baykal to the Ukraine.

Young Sergeyev in the meantime asked to be excused

from his job as Chief of the Main Directorate of the largely nonexistent Air Fleet, and at the end of 1922 began studies at the Military Academy of the RKKA (Workers' and Peasants' Red Army). At the end of his studies, he was sent abroad by the Commissariat of Foreign Trade as an aviation specialist, first to Paris (1926–27) and then to the US, where he remained until 1933. On his return, he was named chief of transport aviation and deputy chief of the Main Directorate of Civil Aviation. But on September 5, 1933, while attempting to make an instrument landing, forty-year-old Sergeyev was killed.

In December 1922, when Sergeyev was replaced by A. A. Znamenskiy for a few months, Lenin had a final illness that forced him to stop work. When he suffered his third stroke in March 1923, which deprived him of speech, Trotskiy was apparently able to have his own man appointed as chief of the Air Fleet, A. P. Rosengolts. Rosengolts was broad-shouldered, strong-minded, like Trotskiy, Jewish, and an excellent administrator—just the man to build an air force. Arrested in 1937, Rosengolts went on trial with others for plotting a coup and giving away secrets about the Soviet Air Forces to the Germans. Along with a number of others, Rosengolts was shot in 1938.

The internal struggle that took place after Lenin's death in January 1924 culminated in the downfall of Trotskiy and the emergence of Joseph Stalin as the Party leader. When Mikhail Frunze replaced Trotskiy as Commissar of Defense, Petr Baranov took over the Air Fleet from his former chief, Rosengolts.

For the three years between 1922 and 1925, the German-trained Soviet engineers and pilots shared all confidential information and blueprints with the Soviet officials. Then, as has always happened in Russia, the Germans were forced to leave, despite a thirty-year contract. Only in the military field did cooperation continue and then only in deepest secrecy. Germans were allowed to train and conduct exercises in the Soviet Union to circumvent the Treaty of Versailles. New arms were tested on Russian soil, while Soviet officers went to Germany for training in strategy and tactics.

Petr I. Baranov had been Rosengolts's deputy, and at the end of 1924 took over from him as Chief of the Air Fleet. He helped carry out the military reforms of 1924–25. From 1925 to 1931, Baranov was also a member of the *Revvoyensovyet*—the Revolutionary Military Council of the USSR. In 1931, he was transferred to aircraft production, and, in January 1932, became Chief of the Main Directorate of Aviation Industry. He died with Andrey Sergeyev in the 1933 air crash. Baranov was five days short of his fortieth birthday.

Hazards of High Office

The development of military art in the 1920s and early 1930s had a great impact on Soviet aviation. Gone was the positional warfare of World War I. The new military leaders in the Soviet Union saw a future war that would be very mobile, as their Civil War had been. The decisive elements would be armor, artillery, and aviation. All of these had to be produced in the Soviet Union, and in great numbers. In 1929, the first Five-Year Plan of industrialization was undertaken. The Five-Year Plan for the military called for production of these three key weapons. All foreign planes were to be withdrawn from the Air Fleet and replaced with Soviet-produced models. Baranov was a logical choice for this undertaking. His able deputy, Yakov Alksnis, assumed his job as chief of the Air Fleet in June 1931.

In the fall of 1933, with the death of Sergeyev and Baranov in the air crash, Stalin was in trouble. His position was being challenged by many who wanted to see Kirov replace him as Party Secretary. Thousands of foreign workers who had been imported to work during the first Five-Year Plan were sent home that year, repeating the exodus of 1925. But Kirov was murdered in December 1934, and Stalin lived to exact a cruel price from those suspected of plotting against him.

Soviet Air Forces Chiefs, 1921–82

Name	Dates of Service
Sergeyev, A. V. (1893–Sept. 5, 1933)*	Feb. 1921 to Dec. 1922
Znamenskiy, A. A. (?)	1922–23
Rosengolts, A. P. (?–1938)**	Mar. 1923 to Dec. 1924
Baranov, P. I. (1892–Sept. 5, 1933)*	Dec. 1924 to June 1931
Alksnis, Ya. I. (1897–July 29, 1938)	June 1931 to Dec. 1937
Loktionov, A. D. (1893–Oct. 28, 1941)**	Dec. 1937 to Sept. 1939
Smushkevich, Ya. V. (1902–Oct. 28, 1941)**	Sept. 1939 to Apr. 1940
Rychagov, P. V. (190?–1941)**	Apr. 1940 to Apr. 1941
Zhigarev, P. F. (1900–63)	Apr. 1941 to Feb. 1942
Novikov, A. A. (1900–76)	Apr. 1942 to Mar. 1946
Vershinin, K. A. (1900–73)	Mar. 1946 to Oct. 1949
Zhigarev, P. F. (1900–63)	Oct. 1949 to Jan. 1957
Vershinin, K. A. (1900–73)	Jan. 1957 to Mar. 1969
Kutakhov, P. S. (1914–)	Mar. 1969 to present

*Killed in air crash
**Shot in purges

Yakov I. Alksnis took an active role in converting soldiers during the October Revolution, joined the Red Army in 1919, and fought in the Civil War. From 1926 to 1931, he served as Baranov's deputy. Alksnis became chief of the Air Forces of the RKKA and member of the *Revvoyensovyet* USSR on June 28, 1931. The latter was abolished in June 1934, and Alksnis became a member of the newly formed Military Council of the Commissariat of Defense. In January 1937, he became Deputy Peoples' Commissar for Aviation. In December 1937, Alksnis was arrested and on July 29, 1938, was shot along with dozens of others. (So shrouded in secrecy was Alksnis's fate that it was not until 1970, when the *Great Soviet Encyclopedia* published the exact date, that it was finally revealed. Even his official Soviet biography in 1967 ended with his 1937 appointment.)

After Alksnis was arrested, forty-four-year-old Aleksandr Loktionov became chief of the Air Forces of the Red Army. He came from the Central Asian Military District he had commanded for less than a year. From 1933 to 1937 he had been assistant to the commander for aviation of the Belorussian and then of the Kharkov Military Districts. On August 2, 1939, Loktionov was a member of the military delegation that met with British and French representatives to gain support against Hitler. Failure of this mission was followed by the signing of the Hitler-Stalin Nonaggression Pact, paving the way for World War II. Loktionov became a Deputy Commissar of Defense when the war began. When the new

ranks were published in May 1940, former Red Army Air Forces head Loktionov was one of seven three-star generals on the list. He was named commander of the newly formed Baltic Military District in July 1940, after the Soviet Union annexed the Baltic republics.

Despite his high position in the military and membership on the Party's Central Committee, Loktionov was arrested and, on October 28, 1941, was shot. He was forty-eight.

Thirty-seven-year-old Yan Smushkevich, a dashing hero of the Spanish Civil War, followed Loktionov as Air Forces chief in September 1939. Smushkevich had gone to Spain in the fall of 1936 as "General Douglas." During his ten months there, he had been the principal Soviet aviation advisor. He directed the use of the I-15 "Chaika" biplane (which went into serial production in 1935–36), the even newer monoplane, the I-16, SB bombers, and the old (1928) reliable R-5 reconnaissance planes.

Returning in 1937 from the Spanish Civil War, Smushkevich was named deputy chief of the Air Forces Directorate of the Red Army. His first job was to draw up new rules and regulations on the use of aviation in battle, based on his experience in Spain. In June 1937, he became a Hero of the Soviet Union. Then in May 1939, Smushkevich was named commander of aviation at Khalkhin-Gol. Ground Commander during the fighting that had broken out between the Japanese and Mongolians on the border with Manchuria was General Georgiy K. Zhukov, who was to become a celebrated military leader in World War II.

It was there that Smushkevich earned a second gold star of Hero of the Soviet Union for his actions against the Japanese during the Battle of Khalkhin-Gol. In September, Smushkevich became chief of the Red Army Air Forces. But six months later he was replaced by an even younger man, Pavel Rychagov. Smushkevich became a general inspector and then in December 1940 assistant to the Chief of the General Staff for Aviation. Zhukov became Chief of the General Staff the following month.

Smushkevich was not listed in a 1961 collection of biographies of twice Heroes of the Soviet Union. By 1965, he was included, but dates of birth, death, and rehabilitation were incorrect. A fourth edition of this book had corrected them. Smushkevich was one of thirteen two-star generals of aviation on the new generals' list in May 1940 and was on the Party Central Committee. But he and Loktionov were arrested and shot on October 28, 1941, four months after the war had started.

Developing Doctrine

The great strides made by Tukhachevskiy and others in Soviet military art during the early 1930s were lost with the purges in 1937–38.

The pilots who volunteered to fly in Spain introduced alien ideas into Soviet military thinking and soon dominated it. These concepts were later viewed as heresy. As Chief of the General Staff N. V. Ogarkov wrote on the fortieth anniversary of the beginning of the war, using tanks as an example:

> Thus back in the prewar years our military science, far outstripping bourgeois military thought, elaborated the advanced theory of deep operation—a fundamentally new method of conducting active offensive operations using massed, technically equipped armies. . . . However, subsequently, because of a number of objective and subjective factors, incorrect conclusions were drawn, based solely on limited experience of the use of tanks in Spain. As a result, in 1939 the corps which had been created were disbanded, and it was again proposed to use cavalry as the exploitation echelon in operations. This tenet was subsequently corrected, and, by 1942, we had created not only tank corps but tank armies, though it would have been better to have had them before the start of the war.

The pilots who volunteered to fly in Spain introduced alien ideas into Soviet military thinking and soon dominated it.

In aviation, heavy bombers, which in 1933 were combined in corps, were formed into three air armies in 1938. But in 1939, they were re-formed into corps. Only after the war was well under way were air armies again formed. Thus, the mistakes with tanks on the ground were repeated with planes in the air.

Pavel Rychagov had also been a volunteer pilot in Spain. As "Pablo Palankar," he was one of the first to become a Hero of the Soviet Union. In Spain he commanded a group of three squadrons of I-15s based near Madrid. Ironically they fought against German Junker Ju-52s. Rychagov shot down twenty enemy planes and had returned from Spain when he volunteered for service in China. Rychagov was a deputy chief of the Air Forces of the Red Army at the time. His *nom de guerre* this time was "General Batalin." In April and May of 1938, Rychagov worked out plans for using SBs, I-15s, and I-16s over China. He then served as aviation commander in the Far East under General Shtern when the latter replaced the arrested Blyukher. Two years later, in April 1940, he became head of the Air Forces.

At a high-level meeting at the end of 1940, along with such speakers as future Marshals of the Soviet Union Meretskov and Zhukov, Rychagov spoke on "Air Forces in Offensive Operations and in the Fight for Command of the Air." Zhukov in his memoirs praised Rychagov's speech as exceedingly profound. He argued that to prepare for a front offensive, protect troops and supplies, and make quick use of a breakthrough to move deep into the enemy formation, air superiority over the battlefield was essential.

Therefore, enemy aviation had to be destroyed in the air, and on the ground by hitting bases, fuel supplies, and ammunition. But no agreement was reached because several veterans of Spain, exaggerating their limited experiences, discounted Germany's subsequent destruction of the French and Polish Air Forces on the ground. The decline of the importance of bombers, evident from the middle of the 1930s, continued. It was helped by the

arrest of aircraft designer Tupolev for failure to produce a follow-on to the TB bomber.

When the reorganization of the Commissariat of Defense was announced on March 8, 1941, it consisted of seven divisions of responsibility. General Lieutenant of Aviation Rychagov was a deputy commissar of defense and headed the Main Directorate of Air Forces of the Red Army. Artillery was also a Main Directorate and was headed by a Marshal of the Soviet Union. Despite almost insurmountable problems, Rychagov called for, and got, a resolution to form 106 new units. But by the end of May, only nineteen had been formed. Some 190

P. F. Zhigarev was one of the wartime heads of the Soviet Air Forces.

The other wartime Commander in Chief of the Air Forces was A. A. Novikov.

new airfields were planned, but when war broke out few were finished.

Rychagov was replaced by Pavel F. Zhigarev in April 1941. Robert Conquest summed it up this way:

> The [Soviet] Air Force, greatly superior in numbers to the Luftwaffe, was almost annihilated in the first days of the war. Only about one-sixth of the Soviet fighter strength was in modern machines. Soviet air superiority was nevertheless about 5:1 in the mere numbers of machines, so that should not have been decisive. . . .
>
> All these long-established blunders were compounded by Stalin's last and most fateful blunder, the failure to believe in the imminence of attack. Large parts of the Air Force were caught on the ground and destroyed in the first hours. Stalin's immediate answer to this destruction of planes on the ground was, typically, the execution of General Rychagov, the aviation commander of the North-Western Front.

Rychagov was still in his thirties when he was shot.

Large, Strong High Command

The 1940 list of new ranks has been mentioned previously. Stalin wanted to show the world that, despite the purges, the Soviet Union had a large, strong high command. The list for the first time used ranks similar to those in the West. There were no three-star aviation generals on the list unless one counts General Loktionov, who briefly headed the Air Forces in 1937–39. There were thirteen two-star and ninety one-star generals of aviation. Two of the thirteen two-stars went on to become Marshals of Aviation; two were shot after the war started; five had high posts when the war started; and four others, one of whom had commanded a fighter group in Spain and had joined Blyukher's staff in the Far East in 1937, left no further trace.

Pavel F. Zhigarev, one of the thirteen two-star generals of aviation on the May 1940 list, was Air Attaché in China in 1937–38. He took over the group of volunteer pilots headed by Rychagov when the latter returned to Moscow in May 1938. In September 1938, he was named chief of the combat training directorate of the Air Forces and then aviation commander of the 2d Detached Far Eastern Red Army. In December 1940, he was back in Moscow as first deputy chief of the Main Directorate of the Air Forces under Rychagov, whom he replaced in April 1941. At the beginning of the war, Zhigarev became Commander in Chief of the Air Forces of the Red Army. In February, Zhigarev returned to the Far East as commander in chief of aviation of the Far Eastern Front. When the Soviet Union declared war on Japan in August

The Air Marshals

Incredible as it may sound, the Soviet Air Forces have had only three Commanders in Chief since 1946—a span of more than thirty-five years. Pavel Stepanovich Kutakhov, sixty-seven, has headed the Air Forces for thirteen years—since March 1969. His predecessor, Chief Marshal of Aviation Konstantin Andreyevich Vershinin, headed the Soviet Air Forces for nearly sixteen years—from March 1946 to October 1949 and from January 1957 to March 1969. When not head of the Air Forces, Vershinin headed the Troops of National Air Defense (1953–54). From 1949 to 1957, wartime (1941–42) Air Force chief Pavel Fedorovich Zhigarev replaced Vershinin as Commander in Chief of the Soviet Air Forces.

In terrible contrast to the postwar picture, the period from January 1937 to April 1941 witnessed four changes in the top command. Komandarm 2d Rank Yakov Alksnis, commander of the Air Forces of the Red Army from 1931, became deputy commissar of defense for aviation in January 1937. Before the year was out, he was arrested and, on July 29, 1938, shot. He was replaced by Komandarm 2d Rank Aleksandr Loktionov who lasted not quite two years. He and his successor—Spanish Civil War hero "General Douglas"—Yakov Smushkevich, who commanded the Air Forces less than a year, were shot the same day, October 28, 1941, for failing to fight off the German invasion. General Lieutenant of Aviation P. V. Rychagov did make it through one year only to be arrested and shot in the fall of 1941. Zhigarev was extremely lucky that his turn as Air Forces Commander, which lasted less than a year, did not cost him his life as well. Instead, he was banished to the Far East to command the air forces there for the duration of the war.

The five-star rank "Chief Marshal of Aviation" was first introduced in October 1943. Aleksandr A. Novikov, brilliant wartime commander of the Air Forces, was the first to become Chief Marshal of Aviation, on February 21, 1944. Close behind him was Aleksandr Golovanov, who had turned forty just a month before his promotion. Golovanov was commander of Long-

Among the living Soviet Marshals of Aviation are, from left, N. S. Skripko, S. I. Rudenko, and S. A. Krasovskiy.

1945, Zhigarev became commander of the 10th Air Army of the 2d Far Eastern Front until war's end.

Aleksandr Novikov at the beginning of the Russian-Finnish war in 1939–40 was chief of staff of aviation of the Northwest Front. He again became aviation commander in Leningrad, which became the Northern Front when Hitler's forces invaded. It was from this post that Novikov was appointed People's Commissar of Defense for Aviation in 1942. As Stavka representative for aviation, Novikov displayed remarkable abilities in coordinating aviation from the battle of Stalingrad to war's end with the conquest of Berlin. He was first to receive the new rank of Marshal of Aviation when it was introduced in 1943 and also first to be made Chief Marshal of Aviation in February 1944. In April and September 1945, Novikov was decorated with the gold star of Hero of the Soviet Union.

In 1946, however, Stalin began large-scale purges of the Air Forces. Soviet sources indicate that Novikov was arrested at the request of Stalin's son, Vasiliy, who was in the Air Forces during the war and had risen rapidly from captain to two-star general. Novikov's deputies, Marshals of Aviation Astakhov, Khudyakov, Vorozheykin, and Falaleyev, were all unexpectedly retired. With Stalin's death in 1953, Novikov was released from prison and returned as commander of Long-Range Aviation. In 1956, he was named commandant of the Higher Civil Aviation School in Leningrad. He died peacefully in 1976.

His place was taken by Konstantin A. Vershinin in March 1946, who was promoted to Marshal of Aviation that same year.

Biographies of Recent Leaders

Chief Marshal of Aviation Konstantin A. Vershinin

Chief Marshals of Aviation

Name	Promotion Date	Post
Novikov, A. A.	Feb. 21, 1944	CinC, Air Forces, Apr. 1942–Mar. 1946
Golovanov, A. Ye.	Aug. 19, 1944	CO, Long-Range Aviation, Mar. 1942–May 1948
Zhigarev, P. F.	Mar. 11, 1955	CinC, Air Forces, 1941–42, 1949–57
Vershinin, K. A.	May 8, 1959	CinC, Air Forces, 1946–49, 1957–69
Kutakhov, P. S.	Nov. 3, 1972	CinC, Air Forces since 1969
Bugayev, B. P.	Oct. 28, 1977	Minister of Civil Aviation since May 1970

Range Aviation, which was subordinated directly to Stavka of the Supreme High Command. This enabled Stalin to direct his heavy bombers wherever he wished to carry out strategic bombing.

Although Zhigarev and Vershinin were the same age as Novikov—all three were born in 1900—Zhigarev was not promoted to Chief Marshal of Aviation until 1955 and Vershinin only in 1959. Present Air Forces Commander in Chief Kutakhov was promoted in 1972 and Minister of Civil Aviation Boris Bugayev in 1977. These six flyers are the only ones thus far to have achieved the highest rank in aviation.

There are twelve Marshals of Aviation still living in 1982. Four or five of them are with the General Inspectors Group of the Ministry of Defense, being over seventy (N. S. Skripko, S. I. Rudenko, S. A. Krasovskiy, Ye. Ya. Savitskiy, and A. I. Pokryshkin, who until recently was chairman of DOSAAF). Here are quick sketches of the remaining seven:

Georgiy V. Zimin. Born 1912 in Leningrad. Promoted in 1973. Doctor of Military Sciences and Professor. Since July 1966, Commandant of the Zhukov Military Academy of Air Defense. Graduated from the Academy of the General Staff (1948). Was 1st Deputy Commander in Chief of National Air Defense from Dec. 1960 until July 1966. Fighter pilot in the war.

Ivan I. Pstygo. Born in 1918 in Bashkir ASSR. Promoted in 1975. Graduated from the Academy of the General Staff (1957). Deputy Commander in Chief, Air Forces, for Combat Training, July 1967 to Dec. 1970. Deputy Commander in Chief 1970 to June 1977. At present doing responsible work in the central apparatus of the Air Forces. Connected with flying safety. Visited Mexico in Sept. 1981.

Aleksandr P. Silant'yev. Born in 1918 near Sverdlovsk. Promoted in 1976. A 1957 graduate of the Academy of the General Staff. In Oct. 1969, Chief of the Main Staff and 1st Deputy Commander in Chief Air Forces, and, since June 1978, Deputy Commander in Chief, Air Forces. Fighter pilot.

Nikolay M. Skomorokhov. Born in 1920 near Saratov. Twice Hero of the Soviet Union. Graduate of the Frunze Military Academy (1949) and the Academy of the General Staff (1958). Since Aug. 1973, Commandant of the Gagarin Air Academy. One of the top aces of World War II (forty-six planes shot down). Promoted in 1981.

Aleksandr N. Yefimov. Born in 1923 near Voronezh. Twice Hero of the Soviet Union. Promoted in 1975. Candidate of Military Sciences. Graduate of the Military Air Academy (1951) and Academy of the General Staff (1957). Since Mar. 1969, 1st Deputy Commander in Chief, Air Forces. Reconnaissance and *shturmovik* pilot.

Aleksandr I. Koldunov. Born in 1923 near Smolensk. Promoted in 1977. Twice Hero of the Soviet Union. Graduate of Military Air Academy (1952) and Academy of the General Staff (1960). One of the top aces of World War II (forty-six planes shot down); 1st Deputy Commander of Baku Air Defense District from April 1967, Commander of the Moscow Air Defense District from Nov. 1970. From Dec. 1975, 1st Deputy Commander in Chief of National Air Defense. Since July 1978, Commander in Chief of National Air Defense (since Jan. 1981, Troops of Air Defense).

Grigoriy P. Skorikov. Birth date unknown. Promoted in 1980. Deputy chief from 1970 (?) and chief of a main directorate of the General Staff from Jan. 1975. From July 1978, Chief of Staff and since 1981 also 1st Deputy Commander in Chief, Air Forces.

Marshals of Aviation

Name	Date of Rank
Astakhov, F. A. (1892–1966)	1944
Falaleyev, F. Ya. (1899–1955)	1944
Khudyakov, S. A. (1902–50)	1944
Skripko, N. S. (1902–)	1944
Vorozheykin, G. A. (1895–1974)	1944
Zhavoronkov, S. F. (1899–1967)*	1944
Sudets, V. A. (1904–81)	1955
Rudenko, S. I. (1904–)	1955
Krasovksiy, S. A. (1897–)	1959
Savitskiy, Ye. Ya. (1910–)	1961
Agal'tsov, F. A. (1900–80)	1962
Loginov, Ye. F. (1907–70)	1967
Pokryshkin, A. I. (1913–)	1972
Borzov, I. I. (1915–74)*	1972
Zimin, G. V. (1912–)	1973
Yefimov, A. N. (1923–)	1975
Pstygo, I. I. (1918–)	1975
Silant'yev, A. P. (1918–)	1976
Koldunov, A. I. (1923–)	1977
Skorikov, G. P. (?–)	1980
Skomorokhov, N. M. (1920–)	1981

*Navy

was twice Commander in Chief of the Soviet Air Forces. At fourteen he began working in a sawmill and was nearly eighteen when the October Revolution broke out. A Party member, he soon was called into the army. After

Heads of the Soviet Air Forces

Prewar

Sergeyev, A. V. (1893–Sept. 5, 1933). Chief of *Aviadarm*—aviation of the active army (Sept. 1918–21). Chief of the Main Directorate of the Air Fleet (Feb. 1921–end 1922). Graduated from Military Academy of the RKKA. Aviation specialist for Foreign Trade Commissariat in Paris (1926–27) and the USA (1927–33); Chief of Transport Aviation, deputy chief of the Main Directorate of Civil Aviation (1933). Killed in air crash *(see Baranov).*

Rosengolts, A. P. (?–1938). Chief of the Main Directorate of the Air Fleet (Mar. 1923–Dec. 1924). Fought in Revolution and the Civil War. Served in London (1924?–28); Commissar of Foreign Trade since 1930. Arrested in 1937. One of the defendants in the last open political trials, which began in Mar. 1938. Shot, along with Bukharin, Rykhov, and others in 1938.

Baranov, P. I. (1892–Sept. 5, 1933). Born in St. Petersburg. Mobilized in Czarist Army in 1915 where he spread Communist propaganda. Arrested. In 1918, commander of 4th Donets Army, served on Eastern and Turkestan Fronts. Helped suppress Kronshtadt uprising. On Turkestan Front 1921–22. Chief and commissar of Armored Forces of RKKA (1923). Deputy Chief from (Aug. 1923), and then chief of the Air Forces of the Red Army (Dec. 1924–June 1931). Chief of the All-Union Aviation Combine (1931). Deputy Commissar of Heavy Industry and Chief of Aviation Industry (June 1932–33). Killed in air crash *(see Sergeyev).*

Alksnis, Ya. I. (1897–July 29, 1938). Latvian. In Czarist Army in 1917 where he spread revolutionary propaganda. Fought in Civil War. Graduated from Military Academy (1924). Deputy Chief of Air Forces of RKKA (1926–31), then Chief (1931). Member of *Revvoyensovyet*, later, the Military Council of the Commissariat of Defense. In Jan. 1937, named Deputy Commissar for Aviation. Although the youngest member of the Tukhachevskiy group, Alksnis sat on the board that condemned Tukhachevskiy. Arrested in Dec. 1937, tried and shot on July 29, 1938.

Loktionov, A. D. (1893–Oct. 28, 1941). Mobilized in 1914 into Czarist Army. Joined the Red Army in 1918 and fought in Civil War on Southern and Caucasus Fronts. In infantry (1921–33). Assistant to CO of military districts for aviation (1933–37). CO of Central Asian Military District (1937). Chief of the Air Forces of the Red Army (1937–39). Deputy Commissar of Defense (1939–40) when he met with British and French delegations to get support against Hitler. Failure of this mission led to Hitler-Stalin Pact, paving the way for start of World War II. CO of Baltic Military District formed when Baltic countries were annexed (1940). General Colonel (1940). Candidate member of the Central Committee CPSU. Arrested and, on Oct. 28, 1941, shot for "treacherous activity."

Smushkevich, Ya. V. (1902–Oct. 28, 1941). Twice Hero of the Soviet Union. Lithuanian Jew. Took part in Civil War. Graduated from Kacha Flying School (1931). Volunteer in Spanish Civil War (1936–37) as "General Douglas," was principal Soviet aviation advisor. Deputy Chief of Air Forces of Red Army (1937). Commander of aviation at Battle of Khalkhin-Gol (May–Aug. 1939). Chief of the Air Forces of the Red Army (Sept. 1939–Apr. 1940), then general inspector, and assistant to the Chief of Staff for aviation (Dec. 1940). General Lieutenant of Aviation (May 1940). Candidate member of the Central Committee CPSU. Arrested and shot on Oct. 28, 1941.

Rychagov, P. V. (190?–1941). Graduated from flying school in early 1930s. One of 160 volunteer pilots in Spanish Civil War. Deputy Chief of Air Forces of the Red Army (1937). Head of group of volunteer pilots in China (1938); Commander of aviation of the Far Eastern Front, then the 1st Detached Red Banner Army (June 1938–Apr. 1940). Chief of Air Forces of Red Army (Apr. 1940–Apr. 1941); General Lieutenant of Aviation (May 1940). Speaker at high-level meeting in Dec. 1940. Arrested and shot, probably on Oct. 28, 1941. No official biography available.

Wartime

Zhigarev, P. F. (Nov. 19, 1900–1963). Joined the Red Army in 1919. Finished cavalry school (1922), observer-pilots' school (1927), Zhukovskiy Air Academy (1932). Chief of Staff of the Kacha flying school (1933–34), also became military pilot. Soviet Air Attaché in China in charge of Soviet volunteer pilots (1937–38). Chief of combat training directorate of the Air Forces (1938), then commander of aviation of the 2d Detached Red Banner Army in the Far East. Named 1st Deputy (Dec. 1940), then Chief of the Air Forces of the Red Army (Apr. 1940). Commander of Air Forces (June 1941–Feb. 1942). Commander of Aviation of the Far Eastern Front (Apr. 1942–Aug. 1945). Commander of 10th Air Army of 2d Far Eastern Front in war with Japan (Aug.–Sept. 1945). 1st deputy Commander in Chief of the Air Forces (Apr. 1946–48), commander of long-range aviation and Deputy Commander in Chief of Air Forces (May 1948–Sept. 1949). Commander in Chief of Air Forces and, from Apr. 1953, Deputy Minister of Defense (Sept. 1949–Jan. 1957). Chief of Civil Air Fleet (1957–59). Commandant of Air Defense Academy (1959–63). Marshal of Aviation (1953) and Chief Marshal of Aviation (1955). Candidate member of Central Committee CPSU 1952–61.

Novikov, A. A. (Nov. 19, 1900–1976). Twice Hero of the Soviet Union. Joined Red Army in 1919. Graduated from infantry course (1920), "Vystrel" (1922), and Frunze Military Academy (1930). In Civil War. Transferred to Air Forces in 1933. Chief of Staff of aviation of Leningrad Military District. Chief of Staff of aviation of Northwest Front during the war with Finland (1939–40). Aviation commander in Leningrad when appointed Commissar of Defense for Aviation (Apr. 1942–Mar. 1946). Stavka representative for aviation on many fronts during the war. Arrested in 1946. In 1953, became commander of long-range aviation and, in 1954–55, Deputy Commander in Chief of the Air Forces. Commandant of the Higher Civil Aviation School in Leningrad (1956). First general promoted to Marshal of Aviation (1943) and first to Chief Marshal of Aviation (1944).

Postwar

Vershinin, K. A. (1900–73). Joined Red Army in 1919. Finished infantry course (1920), "Vystrel" (1923), and Zhukovskiy Military Air Academy (1932). Fought in Civil War. Worked in Research Institute of Red Army Air Forces. Completed training as military pilot at Kacha flying school in one month. Assistant to chief of Advanced Higher Aviation Courses for flying training. At beginning of war, named Commander of Air Forces of Southern Front, then commander of 4th Air Army until the end of the war. Commander in Chief of Air Forces and Deputy Minister of Defense (Mar. 1946–Oct. 1949). Commander of Baku Air Defense District (1949). Commander of border air defense, then commander of Troops of National Air Defense until 1954. Returned to Baku Military District as Commander (1954–57). Commander in Chief, Air Forces, a second time (1957–69). Marshal of Aviation (1946), and Chief Marshal of Aviation (1959). Candidate member of Central Committee (1952–56), Member of Central Committee (1961–71). Hero of the Soviet Union (1944).

Zhigarev, P. F. Commander in Chief of Air Forces from 1949–57. *(See Wartime entry.)*

Vershinin, K. A. Commander in Chief of Air Forces from 1957–69. *(See above.)*

Kutakhov, P. S. (1914). Joined the Red Army in 1935. Finished Stalingrad Military Pilots' School (1938), Higher Officers' Tactical Flying Courses (1949), and the Academy of the General Staff (1957). Took part in Polish invasion (1939) and war with Finland (1939–40). Shot down 14 enemy planes in WW II on Leningrad and Karelia Fronts. After the war, commanded several large units. 1st Deputy Commander in Chief, Air Forces (1967), and Commander in Chief, Air Forces, and Deputy Minister of Defense (since Mar. 1969). Marshal of Aviation (1969) and Chief Marshal of Aviation (1972). Hero of the Soviet Union (1943).

serving a short time at the front, he was sent to the "Vystrel" course for two years, renowned as the "field academy" of the army.

This was a time of great stirrings in the Red Army. The military reforms initiated by M. V. Frunze and the industrialization of the country were taking shape. Vershinin began his studies by correspondence with Frunze Military Academy just as the debates over the nature of future war and how to prepare for it were heating up. On July 15, 1929, the Central Committee of the Party issued a resolution, "On the State of the Defense of the USSR," in which the importance of creating a Red Air Force was stressed. This resulted in the military leadership taking energetic measures to provide this budding Red Air Force with qualified officers. In spite of ten years in the infantry and a clear desire to finish Frunze Military Academy, Vershinin was sent to the command faculty of the Zhukovskiy Military Air Academy. At the same course was Pavel F. Zhigarev, whose path would cross his so often in the future as they both rose to be Commander in Chief of the Soviet Air Forces.

Chief Marshal of Aviation Konstantin A. Vershinin was twice Commander in Chief of the Soviet Air Forces. He died in 1973.

For the next three years, Vershinin soaked up aerodynamics, flying tactics, even bombing practice. Upon graduation, he was sent to the Scientific Research Institute of the Red Army Air Force. But a desire to serve with the troops got him posted to the Kiev Military District at an air brigade. Vershinin requested flying training and became a military pilot. Subsequently, he qualified in every type of aircraft the Air Force had in those days. Because of his previous academic training, Vershinin mastered the three-year program in a little over a month. Thus, he repeated the feat of Chief of the Red Air Forces Yakov Alksnis, who had gone through the course in 1929 at lightning speed.

On finishing the famous Kacha flying school, Vershinin, a colonel at thirty-eight, was named assistant to the chief of the Advanced Higher Aviation Courses for flying training. It was August 1938. From all corners of the country came pilots to learn the latest in the operational art and tactics of air warfare. Lessons from Spain, China, the battles with the Japanese, the invasion of Poland, and the war with Finland would be distilled and passed on to this group.

But Vershinin then suffered a spell of bad luck. He was to lead a group of planes to Moscow to take part in an air exercise. The weather looked very bad, but Vershinin was advised to take off. When five bombers crashed during the journey, Vershinin was court-martialed. Although the tribunal found him innocent, he was relieved of duty, reduced in rank, and sent to a new posting. Four months later, he received a telegram from Moscow reading: "Return at once." With the purges at their height, this message was terrifying. But it was only to inform him that he had been reassigned to his old post with the advanced flying courses. With the growing need for pilots, the course had been doubled.

With the start of the war, Vershinin was again called to Moscow, this time to the Staff of the Air Forces. A frightened Vershinin, recalling the five lost planes and a few more recent mishaps, presented himself to the Chief of the Air Staff. But the general did not know why he had been summoned. Vershinin pulled himself together and telephoned his old classmate, General Pavel F. Zhigarev, at that time head of the Soviet Air Forces. "The Politburo and Stavka of the Supreme High Command have named you Commander of the Air Forces of the Southern Front. Congratulations!" Vershinin had a right to be worried. Only a month later, Loktionov, Smushkevich, and Rychagov, Zhigarev's three immediate predecessors, were shot.

In 1942 Vershinin was commander of aviation of the Transcaucasus Front. At different times he commanded the 4th Air Army (May to September 1942, and May 1943 to the end of the war) and in March 1946 became Commander in Chief of the Soviet Air Forces. In October 1949, as war clouds gathered in the Far East over Korea, Vershinin was transferred to Baku as commander of the Air Defense District there. In his place was the old China hand, Pavel Zhigarev, who, after an eight-year lapse, again became Commander in Chief of the Air Forces.

It is difficult to trace Marshal Vershinin's career before he again became Commander in Chief of the Air Forces in January 1957 when Zhigarev (promoted to Marshal of Aviation in 1953 and to Chief Marshal of

General Lieutenants of Aviation, Generals' List of May 7, 1940

Name	Status
Alekseyev, Pavel Aleksandrovich	Fate unknown.
Arzhenukhin, Fedor Konstantinovich	Fate unknown.
Astakhov, Fedor Alekseyevich	Marshal of Aviation 1944. "Retired" in 1950.
Gusev, Konstantin Mikhaylovich	Aviation Commander, Far Eastern Front (1941).
Denisov, Sergey Prokof'yevich	Aviation Commander, Transcaucasus Military District (1941).
Zhigarev, Pavel Fedorovich	Chief Marshal of Aviation 1955.
Kravchenko, Grigoriy Panteleyevich	Commander of an aviation group in 1941.
Proskurov, Ivan Iosifovich	Commander, long-range bomber aviation (1941).
Ptukhin, Yevgeniy Savvich	Aviation Commander, Kiev Military District (1941), then Commander, Aviation Southwest Front.
Pumpur, Petr Ivanovich	Arrested in 1938.
Rychagov, Pavel Vasil'yevich	Shot in 1941.
Samoylo, Aleksandr Aleksandrovich	Fate unknown.
Smushkevich, Yakov Vladimirovich	Shot in 1941.

Aviation in 1955) was transferred to chief of the Main Directorate of Civil Aviation.

In 1948, National Air Defense first began to be considered a service along with the Ground Forces, Air Forces, and Navy. Air defense forces were removed from control of the commander of Artillery of the Soviet Army and given a commander—not yet a commander in chief. At the end of 1951, lines of air defense were established within regions of air defense in border military districts. The commander of this line of border air defense was Marshal of Aviation Vershinin, who simultaneously was a deputy commander in chief of the Air Forces.

Aleksandr Golovanov was one of only six Soviet Chief Marshals of Aviation.

Another Chief Marshal of Aviation is Boris Bugayev, Minister of Civil Aviation.

This failed to solve the organizational problems of air defense, and in 1953 the troops of the border line of air defense were combined with National Air Defense Troops. Marshal Vershinin became commander of the Troops of National Air Defense. However, in 1954, National Air Defense was again reorganized. As its Commander in Chief was a Marshal of the Soviet Union representing the artillery faction. Baku Air Defense District was formed in 1954, and Marshal Vershinin became its first commander.

For the next twelve years, from 1957 to 1969, Vershinin served as Commander in Chief of Soviet Air Forces without interruption, bringing his combined service in that high post to nearly sixteen years. Times had certainly changed. As he neared his seventieth birthday, Vershinin became one of the general inspectors group of the Ministry of Defense, where he remained until his death in 1973.

Latest Commanders

Pavel Stepanovich Kutakhov, who in July 1967 had been named first deputy Commander in Chief of the Air Forces, picked up the reins in March 1969. Kutakhov was born in 1914, and in 1969 at age fifty-five became Marshal of Aviation. (Golovanov had been only thirty-nine when promoted to Marshal of Aviation in 1943.) Kutakhov graduated from Stalingrad Military School for Pilots in 1938 just in time to join the 1939 invasion of Poland. During the war with Finland, he flew 131 combat sorties. During World War II, Kutakhov flew on the Leningrad and Karelia Fronts. His squadron fought in seventy-four air battles and downed fifty-nine enemy planes, for which he was awarded the gold star of Hero of the Soviet Union. He himself logged 367 combat sorties. It has now been thirteen years since Chief Marshal of Aviation (he was promoted in 1972) Kutakhov took over the Soviet Air Forces. He is sixty-seven years old.

There have been, since the rank was first introduced in October 1943, exactly six Chief Marshals of Aviation. It is not a rank meant only for the Commander in Chief of the Air Forces, although four of the six have held that post. Two others have been Chief Marshals of Aviation. One was Aleksandr Golovanov, mentioned above as the youngest-ever Marshal of Aviation. Five months after Novikov was promoted to Chief Marshal, so was Golovanov. After serving in the Civil War (he joined the army at fifteen, according to his biography), Golovanov was demobilized and returned to school. In 1924, he joined the OGPU—the secret police. For a time he worked in heavy industry until learning to fly in 1932. He then became a Civil Air Fleet pilot, first commanding a detachment of heavy aircraft and in 1938 becoming Aeroflot's chief pilot. He took part in the battle of Khalkhin-Gol and in the war with Finland. It has even been reported that Golovanov's main task in 1938 was flying arrested officers to Moscow to be tried.

At any rate, Golovanov's experience with heavy aircraft over long distances made him the ideal commander of the long-range bomber aviadivision subordinated directly to Stavka throughout the war. In this way, Stavka could direct the bombing of Berlin, Königsberg, Danzig, Ploesti, and other strategic targets deep inside enemy territory. In February 1942, Golovanov became Commander of Aviation of Long Range (ADD). Following the war, Golovanov for a time continued to command the ADD, then served in other capacities before retiring in 1953. Since he was not quite fifty years old, his retirement may have been forced after the leadership change in 1953.

The youngest Chief Marshal of Aviation is the Minister of Civil Aviation Boris Bugayev, fifty-eight, who is not a member of the Ministry of Defense. During World War II Bugayev learned to fly and became an instructor pilot. In 1943, he requested service at the front and flew in support of partisans. After the war, he studied at the Civil Aviation's flying center and in 1948 commanded an aircraft in the international group of Civil Aviation. Beginning in 1951, Bugayev pioneered flights for Aeroflot to England, India, Indonesia, Africa, and the US. He also was the first to fly to Burma and Cuba. From 1957 to 1966, he commanded a group of special planes used by the Party leaders. In 1966, Bugayev became deputy minister of Civil Aviation; in 1967, first deputy minister; and, in May 1970, Minister of Civil Aviation. Military rank has followed. Bugayev was promoted to Marshal of Aviation in 1973 at age fifty and to Chief Marshal of Aviation in 1977. Civil Aviation has always been closely associated with the Soviet Air Forces.

It is a curious fact that all the heads of the Air Forces from 1919 until 1969—a time span of fifty years—were born between 1892 and 1902. In other words, Rosengolts, Alksnis, Loktionov, Smushkevich, and Rychagov, so cruelly cut down in the prime of their lives, were in the same generation as Novikov, Zhigarev, and Vershinin. Baranov, the oldest, was only twenty-five at the time of the October Revolution; Smushkevich was fifteen. ■

Man/machine interface technology on the move.

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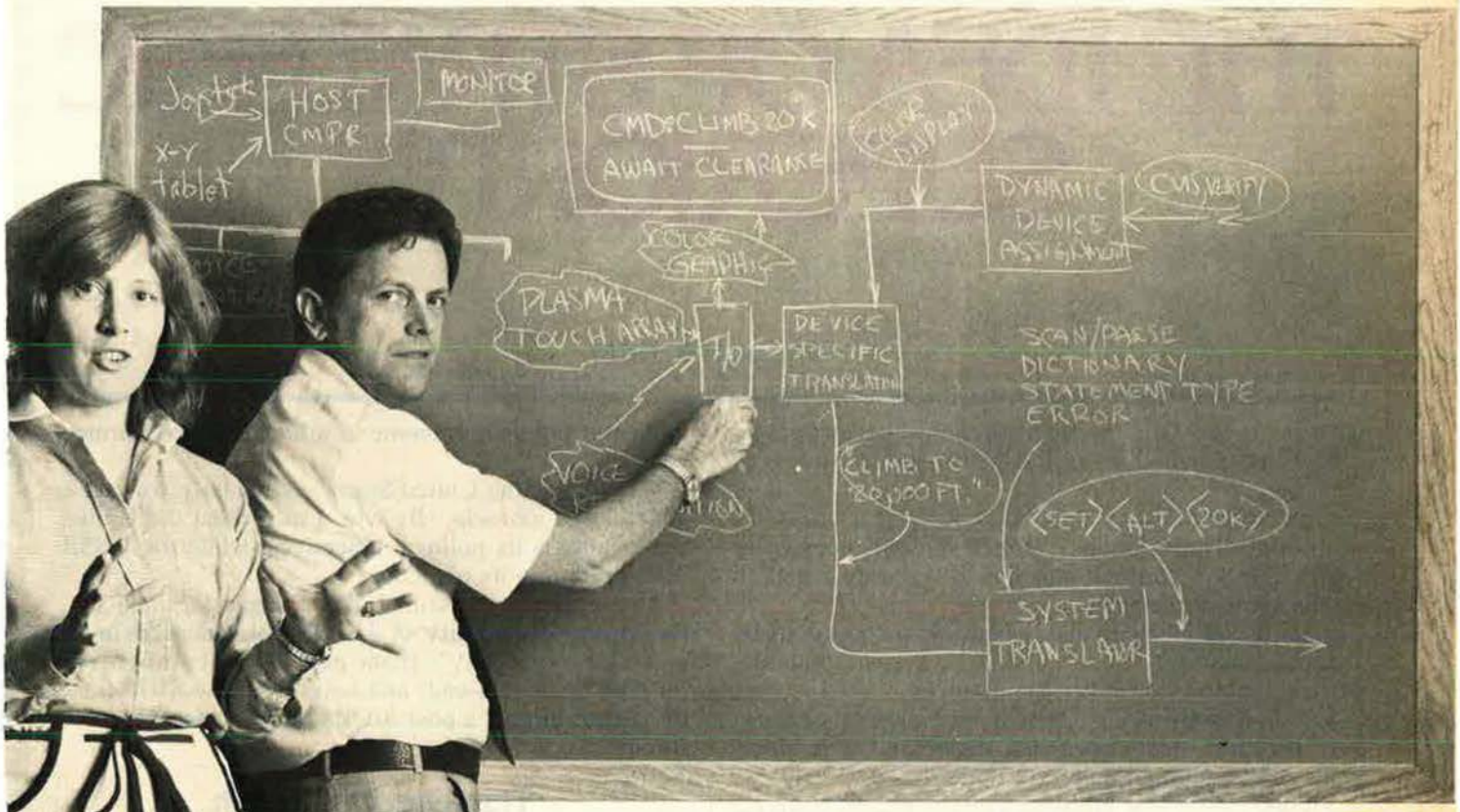

Modern man's ever-increasing involvement with computers has created a complex problem: how to expand the machine's ability to comprehend and communicate in ways that are more compatible with man's behavior patterns.

And that's the problem being tackled at Lockheed Electronics by Dr. Rita Knox and Senior Staff Engineer Ken Kendall.

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Soon, people will be able to act more like people in dealing with machines, because the machines will "know" more about what people are like.

Lockheed Electronics

Central to the concept of strategic superiority is the idea both that Soviet political-military power and designs be defeatable and that essential US-Western values be survivable.

THE IDEA OF STRATEGIC SUPERIORITY

BY COLIN S. GRAY

SINCE the late 1960s, strategic superiority has received a bad press. It has been judged widely to be:

- Incompatible with "success" in formal interstate arms-control negotiations ("The Soviets will not sign on for an 'inferior' strategic allowance."). Parity is held to be the name of the game.
- Quite unrealistic in that the USSR can now deny us strategic superiority, *i.e.*, superiority is not attainable, or sustainable (even if briefly attained).
- A dangerous idea because it encourages the strategic "illiterati" to believe that there are "winnable" nuclear wars (which there are not!).

A good part of our problem with the idea of strategic superiority is conceptual. The SALT process has sensitized us to the (often) trivia of "static" numerical balances and imbalances. Save for political perceptual reasons, we should be near-totally uninterested in various schemes for attaining apparent "mathematical parity." Strategic superiority should be a functional strategic-political concept, not a bean-count balancing idea. With explicit reference to the strategic nuclear forces (and other programs directly relevant to US national performance in a *general* war), what does strategic superiority mean? I suggest the following: Strategic superiority means the ability (actual *and* perceived/anticipated by Soviet political leaders and responsible general staff officers)

- To deter Soviet arms race challenges.
- To help deter Soviet fomentation of crisis challenges.
- To help significantly to deter Soviet military challenges in a crisis.
- To help significantly to deter Soviet military breakout from an acute military crisis.
- To help significantly to deter Soviet rational post-crisis military behavior.
- To enable the United States to break out from a "local" political or military crisis with a freedom of military action appropriate to the proximate political-military circumstances.
- To enable the United States to dominate any process of strategic-nuclear escalation that might ensue from a local acute crisis and seek, plausibly, for an improved political outcome at a higher level of armed conflict.
- To enable the United States, *in extremis*, to wage a general war *and win*. (By win, I mean that the United States attains its political objectives, while the USSR does *not* attain its objectives.)

The argument presented above suggests, implicitly, the strong desirability of US war planning having a political "integrity" from peacetime competition through to the tail-end, and beyond, of the SIOP (*i.e.*, the preparation of a post-SIOP secure strategic reserve force).

Thinking It Through

Central to the concept of strategic superiority, as outlined tersely above, is the idea both that Soviet political-military power and designs be defeatable and that essential US-Western values be survivable. It should be

The doctrinal "buzzwords" of the 1970s now lack operational relevance.

axiomatic to observe that US war planning, let alone strategic force implementation, cannot be appropriately effective solely in the context of the prospective defeat of Soviet political-military power. It is very likely indeed that it will be the United States who is required to force the nuclear escalation pace, in response to some unfolding local military catastrophe in the Persian Gulf or in Western Europe. If this point is accepted, it has to mean that a US President will need to consider the vital questions "Am I deterred?" and "If I take this or that step up the nuclear escalation ladder, what should I anticipate to be the likely Soviet reply?"

An American (of Dutch ancestry) theorist of international relations, Nicholas Spykman, put his finger appropriately on the issue forty years ago:

> There is no security in being just as strong as a potential

enemy; there is security only in being a little stronger. There is no possibility of action if one's strength is fully checked; there is a chance for positive foreign policy only if there is a margin of force which can be freely used.

As Spykman implied, a genuine parity in military power (which we do not have today—given Soviet superiority in conventional and theater-nuclear forces) translates into a paralysis of Western policy. If the United States and NATO are content to concede functional military superiority to the Warsaw Pact in conventional and theater nuclear forces, as they are (and this is a matter of Western choice), then functional military-political compensation has to be provided at the level of US central nuclear firepower.

The doctrinal "buzzwords" of the 1970s now lack operational relevance. Who will care whether or not US strategic forces are in a condition of "rough parity" or "essential equivalence"? What will matter is whether the United States can employ its strategic forces to compensate for a galloping disaster in a local theater. A key to understanding what we need in our strategic forces, as Richard Burt has maintained, is the idea of "escalation agility." Arms control may be newly fashionable in the State Department today, for excellent European-related political reasons, but there is something to be said for Burt's previous view that

> . . . SALT, as the American-Soviet nuclear competition begins to revolve around nuclear force management issues, has become irrelevant in a new strategic era.

The intention here is not to "put down" arms control, only to say that arms control, at best, may prove to be irrelevant to US nuclear employment planning, while—at worst—it could have the effect of severely inhibiting employment planning. For example, let us consider the President's so-called "zero option" for intermediate-range ground-based missiles in Europe. NATO's plan to deploy 108 Pershing IIs and 464 ground-launched cruise missiles is not intended to balance or counterbalance Soviet SS-20 deployment; rather it is intended to help guarantee an anticipation in Soviet minds that a large war beginning in West-Central Europe would, fairly rapidly, escalate to a conflict directly involving the superpower homelands. NATO needs a good number of those 572 launchers (or their equivalents), *whether or not* Soviet SS-20 deployment is reduced to zero.

A Definition

The uses of strategic superiority may be summarized as the possession of freedom of diplomatic action in peacetime; the ability to wage crises in expectation of achieving acceptable political outcomes: and the capability, if need be, to wage and survive war at any level. The advocate of US strategic nuclear superiority, far from being an atavistic super-hawk, simply looks at a map and draws prudent conclusions. If US and US-allied forces are overmatched, or even just matched, around the rimlands of Eurasia, how is the US to enforce a tolerable crisis or wartime outcome in the event of a theater struggle?

In extremis, the United States has to be able, not incredibly, to threaten central nuclear employment against the Soviet homeland. To pose such a threat requires that the US be able to deter a massive Soviet countermilitary (and counter C^3I) preemptive strike, and be able to strike at Soviet zone of interior military assets reasonably confident that the quantity and quality of Soviet retaliation can be intercepted, absorbed, and generally kept to a "tolerable" level. What is a "tolerable" level? One should not place unbounded faith in any single, or very limited number, of damage-limiting instruments. Serious damage-limitation would be the product of many programs functioning synergistically:

- Of hard-target counterforce (countermilitary and counter C^3I).
- Of strategic antisubmarine warfare.
- Of several layers of ballistic missile defense.
- Of continental United States air defense.
- Of civil defense and industrial hardening.
- And generally of robust preparation for societal survival and recovery.

A genuine functional strategic parity, or essential equivalence, with respect to central systems should spell catastrophe for the United States and her friends and allies. If the United States could not dominate a process of nuclear escalation to coerce the USSR, how could Soviet gains in a theater be reversed? No less to the point, how could a US President, behaving responsibly, even initiate a process of escalation? *Sic transit* NATO "strategy."

The problem, clearly, pertains both to political-strategic education and to technical proficiency. First, the United States and NATO should not seek a genuinely equitable strategic or long-range theater nuclear forces agreement with the USSR that would preclude that functional superiority discussed above—that is the road to policy paralysis and to local defeat (or general disaster).

Second, it is vitally important that the following questions be addressed very directly, "Can the job be done?" "What is 'the job'?" Can the United States extend a plausible promise:

- To defeat Soviet military-political power (to the point of bringing the future of the Soviet state into very serious question), while
- Holding down (physically—*not* through hopes of intrawar deterrence) US casualties to an "acceptable" level?

The above line of argument is not necessarily incompatible with SALT/START. Fairly permissive SALT/START ceilings/floors, in the context of robust US civil, air, and ballistic missile defenses—assuming very intelligent US employment planning—may well be all that we need. We should take a leaf out of the Soviet book and talk parity while planning to win, if need be. ■

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Even though President Reagan has attempted to implement a number of his campaign promises in foreign, defense, and domestic areas, the Soviets believe that serious ambiguities persist.

THE SOVIET SCORECARD ON THE REAGAN ADMINISTRATION'S FIRST YEAR

BY LEON GOURÉ

THE problem of understanding a given US administration's internal politics, decision process, and policies is usually far from simple. A large corps of analysts, pundits, commentators, and newsmen devotes much time and effort to it, all too often with confusing results. Compounding this problem is the coming to power of a new administration, which takes office in a cloud of election rhetoric and campaign promises and whose arrival always portends not only a change in the style of conduct of US policies but, to varying and often marked degrees, changes in the character and direction of the policies themselves. Furthermore, whatever the views and policies of a new administration may be at the outset of its tenure in office, it is highly likely that, over time, they will undergo extensive and unpredictable changes.

There is good evidence that . . . present Soviet leaders have a very imperfect understanding of the American political system and decision process and of what really motivates the US leadership.

One can sympathize, therefore, with foreign governments which must learn to know, understand, and deal with a new American leadership, assess its evolving policies, and anticipate its actions. No doubt, the Soviet leadership, with its totally different political system, experience, and practice finds this task peculiarly difficult and frustrating. Indeed, there is good evidence that, despite their long tenure in power and the availability to them of a large number of experienced Soviet diplomats, analysts, and "Americanologists," present Soviet leaders have a very imperfect understanding of the American political system and decision process and of what really motivates the US leadership. One consequence of this has been the Soviet Union's repeated failure to anticipate US foreign policies and responses to their actions correctly. Yet, understanding the US and correctly foreseeing its policies and actions are especially important for the Soviet Union in the present case. After all, President Reagan came to office promising important, even fundamental, changes in US foreign and defense policies, which he said were intended to alter significantly ongoing and future US-Soviet relations and the power balance between them, as well as strengthen the US role and influence in world affairs.

Some Basic Initial Soviet Views

The Soviets have been well aware of the progressive changes in the US public mood and attitudes prior to the elections. Although the Soviets were not pleased with the outcome of the election, it did not come as a surprise to them. There is also no indication, given President Reagan's long-standing views and the character of his political base, that the Soviets were surprised by his positions and rhetoric in the course of the campaign. Furthermore, while the Republicans campaign on a platform of distrust of Soviet intentions, peace through strength, containment of Communist expansion, and restoration of US prestige and leadership in the free world, sharply different from that entertained by the incoming Carter Administration only a scant four years earlier, by the time of the elections the difference between the proposed foreign and defense policies of the two presidential candidates had become considerably blurred.

According to the Soviet public view, a marked deterioration in US-Soviet relations had occurred during the last years of the Carter Administration. Symptomatic of this was the US trade embargo and the boycott of the Moscow Olympics in retaliation for the Soviet invasion of Afghanistan, the failure of Congress to ratify the SALT II Treaty, US adoption of the countervailing strat-

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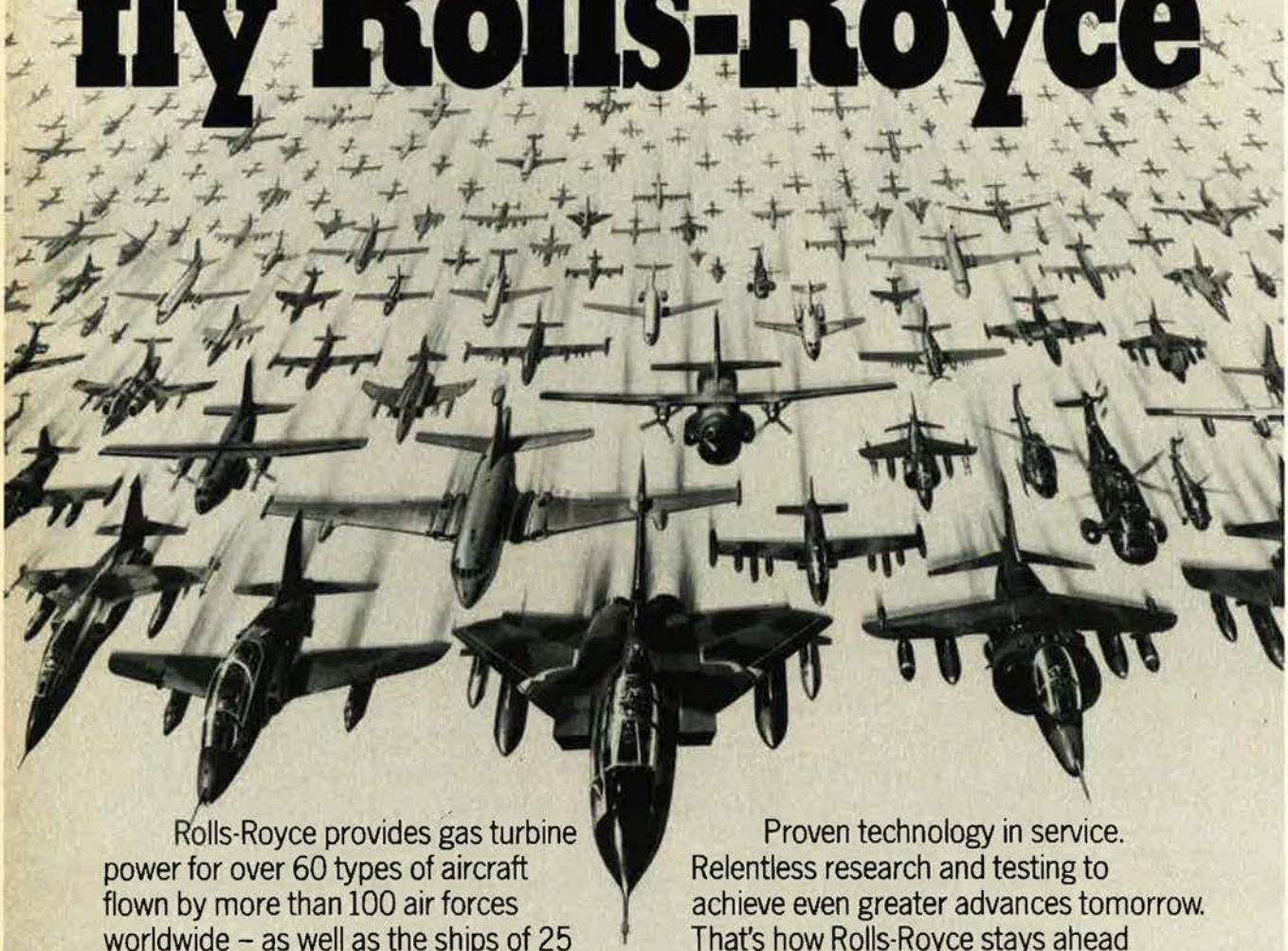

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egy and of a long-range program for the modernization and buildup of its strategic forces, the development of plans for a Rapid Deployment Force and the deployment of new missiles in Europe, and so on. Under these circumstances, and given President Reagan's views and campaign promises, the Soviets could not have been expected to entertain any optimism about the future of US-Soviet relations. Yet, at the time President Reagan took office, there were signs that the Soviets were cautiously optimistic.

From a Soviet point of view, US hostility to communism and to its main power base, the Soviet Union, and US resistance to Soviet policies to alter the international *status quo* are taken for granted by Soviet leaders and as a given by Marxist-Leninist ideology. As the Soviets put it, "World imperialism, particularly US imperialism, has no desire to reconcile itself with the objective realities of the present day: the strengthening of socialism, the development of the world revolutionary process, the successes of the national liberation struggle of the peoples."

Even in the heyday of US-Soviet détente, Brezhnev had insisted that "the world outlook and class aims of socialism [*i.e.*, the USSR] and capitalism [*i.e.*, the West] are opposed and irreconcilable." Fundamental to the Soviet view is the belief that the struggle between the two opposing systems is inevitable and that both know it to be so. Consequently, the West's hostility toward the Soviet Union is recognized by the Soviets as being consistent with Western interests. By the same token, however, Western accommodations to the Soviet Union and yielding to its policies are assumed to be not the result of Western goodwill and peaceful intentions, but as largely forced upon the West by the "objective realities" and, in particular, the "correlation of forces."

In the case of last year's election, therefore, the Soviets apparently did not take President Reagan's campaign rhetoric as predetermining his future policies. Soviet analysts and commentators kept insisting that "it has been known for a long time that the preelection statements of future American presidents are a far cry from their subsequent political practices." The reason for this was said to be the belief that when a new administration comes face to face with realities and the requirements of actual governing, its policies are likely to become more "pragmatic." In the Soviet view, an essential element of this US pragmatism must be an appreciation of Soviet power, of the limitations on US ability to compete with the Soviet Union and, therefore, of the necessity of avoiding dangerous confrontation with it and managing this competition and these relations primarily through negotiations. Of course, it remained uncertain whether the Reagan Administration would, in fact, be responsive to the logic of the implications of what the Soviets claimed to be the "objective realities."

During the election campaign, Soviet commentators claimed to see little difference between the positions adopted by the two main candidates. Both were seen as committed to increased defense spending, a US military buildup, and a more "aggressive" foreign policy, although only the Republicans called for US strategic superiority over the Soviet Union. From the Soviet viewpoint, the most notable difference between them was on the key question of the SALT II Treaty, which Reagan had rejected but which Carter continued to endorse and promote.

Despite his tough campaign rhetoric, however, the President-elect, according to Soviet analysts, showed signs of considerable ambivalence and increasing moderation in his views. In particular, they noted his stated wish to avoid confrontation with the Soviet Union and the importance he attached to continuing good relations with it, his willingness to lift the grain embargo despite the persistent Soviet military presence in Afghanistan, and, especially, his expressed readiness to seek a new arms-control agreement. Soviet commentators predicted that "this process will continue."

The Soviets gleefully note that the US is facing increasing disarray in its alliances, growing unwillingness on the part of allies, friends, and clients to support its policies, and a massive upsurge of popular opposition in Western Europe to the presence of US nuclear weapons and the deployment of new ones.

While the more optimistic Soviet forecasts did not come to pass, a year later the Soviets still appear to feel that no definitive judgment can be made about the long-term course and policies of the Reagan Administration. Even though President Reagan has attempted to implement a number of his campaign promises in foreign, defense, and domestic areas, the Soviets believe that serious ambiguities persist.

Foreign Policy

According to Soviet analysts, the Reagan Administration does not appear to have developed a clear and coherent foreign policy during its first year in office. Some have characterized it as an "erratic swerving from side to side." The intensity and truculence of US declar-

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atory policy was not matched by actions or, as a prominent Soviet "Americanologist" put it, American leaders "bark worse than they bite." In part this is attributed to the Administration's own internal politics and personality clashes and also to President Reagan's primary attention to domestic economic problems.

Overall, in the Soviet view, US foreign policy suffered a series of notable defeats and failures during 1981 and could be said to have ended the year in a worse state than at its beginning. The US failed to regain its influence and reestablish its leadership in the free world, to strengthen the latter's opposition to the Soviet Union and to forge a broad anti-Soviet strategic consensus in the Middle East and elsewhere, to gain significant support for its containment policy in Central America, or to exploit the turmoil in Poland or Soviet difficulties in Afghanistan effectively. Instead, the Soviets note gleefully that the US is facing increasing disarray in its alliances, growing unwillingness on the part of allies, friends, and clients to support its policies, and a massive upsurge of popular opposition in Western Europe to the presence of US nuclear weapons and the deployment of new ones. It also confronts the possibility of serious damage to its relations with China, isolation in the Middle East, and marked distrust of its intentions and policies in the less-developed countries.

Some Soviet analysts characterize US attempts to impress the Soviet Union and the world with its military power and programs as containing "a considerable element of bluff."

In the Soviet opinion, a number of factors contributed to these US setbacks. Among these is believed to be the lack of credibility and realism of proclaimed US intentions and policies and their being largely out of tune with the prevailing attitudes and aspirations of other countries. In addition, there was widespread distrust of the Administration, generated by its alarmist or incautious pronouncements, which the Soviets skillfully exploited in their propaganda, the West's economic difficulties, close identification of the US with Israel, and various errors in tactics and timing. The most important factor, however, is believed to have been the effectiveness of the Soviet peace campaign whose appeal was enhanced by growing fears of a nuclear war and Western Europe's and Japan's increased dependence on and interest in trade with the Soviet bloc.

The Soviet Union was not surprised by the US attempts to gain some political or propaganda advantages from the developments in Poland or by the US warnings against Soviet military intervention there. No doubt, Soviet leaders saw this as a natural move in the context of US-Soviet rivalry. They did partially succeed in weakening the adverse political effects on the West of their attempts to bring military pressure on Poland by causing Washington to sound repeated false alarms of an imminent Soviet invasion. Even so, they recognized that US foreign policy stood to gain a great deal in Europe or elsewhere from actual Soviet military intervention.

However, it appears that they failed to anticipate that President Reagan would impose sanctions on both Poland and the Soviet Union in the wake of the Polish military suppression of Solidarity. Yet, even while this may somewhat increase the burden on the Soviet economy, the unwillingness of US allies to follow suit and to give more than token support to the Administration's "attempts to internationalize the Polish problem" is naturally perceived in Moscow as another major defeat for US foreign policy. Furthermore, barring a Soviet military intervention in Poland, it is unlikely that the Administration will carry out its threat of a possible further escalation of its sanctions against the Soviet Union.

Defense Policy

Although the Soviets had expected the Reagan Administration to increase defense spending and accelerate US weapons development and acquisition programs, they found that much of its first year in office was characterized by indecision and debates about the actual program it would adopt. Indeed, President Reagan did not announce his strategic program until October 2, 1981. Even then, it failed to reflect final decisions in a number of important defense areas.

Predictably, Soviet public commentaries have been highly critical of the program. The US has been accused of seeking to achieve superiority, of intensifying the arms race, of increasing the dangers of an outbreak of war, and planning military intervention in Third World countries. The main focus of Soviet propaganda, however, was aimed at preventing or delaying the deployment of new US theater nuclear weapons in Western Europe and, in line with this, refuting US claims of a growing Soviet military threat to that region. Moscow is clearly well pleased with the results of this campaign in terms of its effects on NATO politics, attitudes, and defense programs.

Soviet analysts see the Reagan defense program as essentially a continuation and expansion of the one proposed by President Carter. The Administration also appears to have adopted Carter's countervailing strategy. The analysts note, however, that most of the planned capabilities will be deployed only in the second half of the 1980s or later and, therefore, will have little effect on the military balance in the next several years. Significant improvements in US conventional forces and in US capabilities to fight in distant areas will also take a long time to accomplish. Furthermore, the Administration has cut by more than half the number of MX missiles to be deployed and has postponed a final decision on their basing mode. Meanwhile, it proposes to place the first forty MX missiles in potentially vulnerable Minuteman silos. This may have raised some doubts in Soviet minds about the seriousness of the Administration's commitment to the acquisition of the

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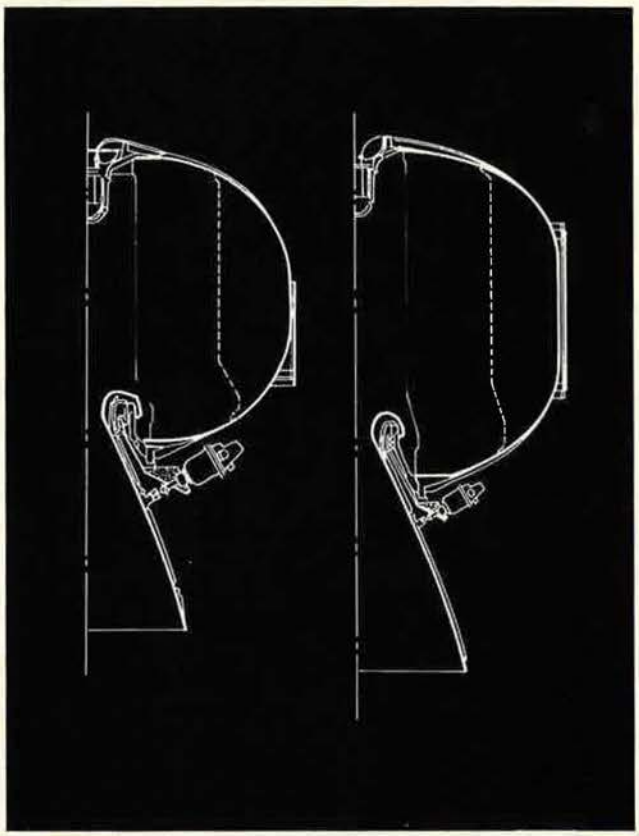

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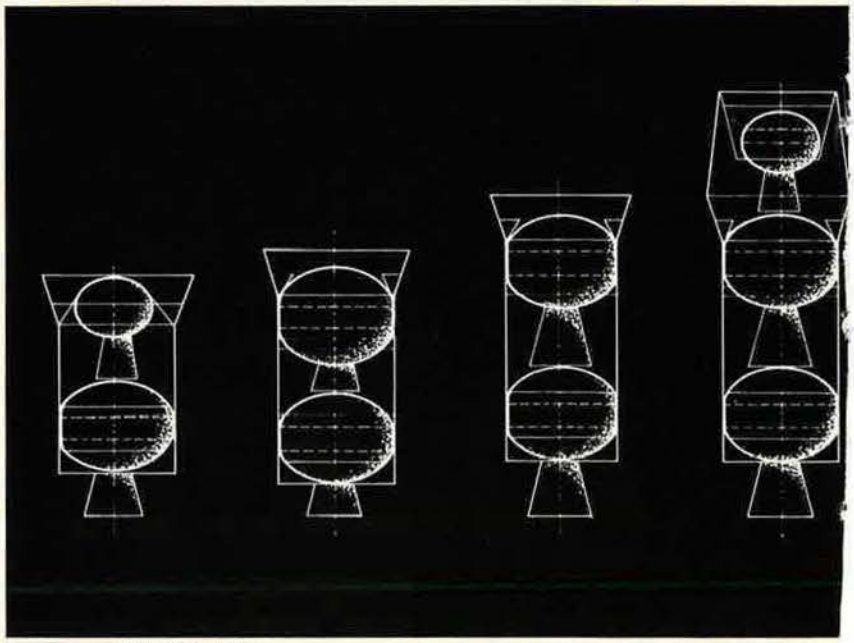

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counterforce and protracted war-fighting capabilities called for by the countervailing strategy. It is also not surprising that some Soviet analysts characterize US attempts to impress the Soviet Union and the world with its military power and programs as containing "a considerable element of bluff."

Prior to October 2, however, Soviet reactions to the US defense debate suggested that Moscow was concerned about the possibility of a US decision to open new areas of arms competition, for example in space or in ballistic missile defense, and that the US may launch programs designed to achieve significant technological advantages over Soviet defense capabilities. This concern appears to persist. While the Administration did not choose to do so, the Soviets are aware that its programs call for further investment in R&D in such areas and that it retains this as a future option. Meanwhile, the Soviet Union has been campaigning for an international agreement to prohibit all weapons in outer space. It also insists that it will not allow the US to alter the military balance and that it is capable of matching or countering any new weapon system the US may acquire.

From the Soviet viewpoint, an important test of the Administration's intentions and attitudes . . . has been its willingness to renew arms-control negotiations before achieving improvements in US and NATO's defense postures.

Arms Control

From the Soviet viewpoint, an important test of the Administration's intentions and attitudes, as well as of potential constraints on its defense programs, has been its willingness to renew arms-control negotiations before achieving improvements in US and NATO's defense postures. Since President Reagan assumed office, Moscow has been campaigning for such negotiations and was clearly disappointed by his obvious unwillingness to do so at an early date. Consequently, when contrary to its views on the requirement to redress the nuclear balance in Europe, the Administration agreed to negotiations on medium-range nuclear weapons in that region, the Soviets saw this as having been foisted upon the US by its NATO allies and skillful Soviet propaganda and diplomacy and, therefore, as representing a significant defeat for the Administration.

The President's unexpected "zero option" proposal on November 18 clearly put the Soviet Union, at least temporarily, on the defensive in the competition for European opinion. However, precisely because of this competition and the importance of maintaining NATO's cohesion, the Soviets appear to believe that the US cannot afford to take the primary blame for the failure of the negotiations and, therefore, eventually will have to show some flexibility as proof of its seriousness.

While rejecting its specific proposals, Soviet commentators claim that the arms-reduction program outlined by President Reagan on November 18 as well as his acquiescence to the current negotiations in Geneva are indicative of a "positive" change in the Administration's "tone" and possibly also policy. This is credited to its "desire to project a different image of America" and, in view of the failures of its "policy of confrontation," to its need to find another avenue to achieve some foreign policy successes during its second year in office. Thus, "a certain adaptation of American policies to reality" may be taking place. An encouraging sign, Moscow believes, is the Administration's willingness to continue the Geneva negotiations even while it seeks to penalize the Soviet Union for its role in Poland.

Constraints on US Policies

In the Soviet view, there has been growing evidence in the past year that the Reagan Administration's objectives and policies, as well as its freedom of action, face major foreign and domestic constraints that have limited and will, in the future, increasingly limit its policy choices. First, despite a high level of confrontational rhetoric, the US recognizes that it is simply not in a position, militarily, to risk an armed confrontation with the Soviet Union and its allies.

Second, the US finds itself increasingly at odds with its allies and friends over foreign and even defense policies, which results in its isolation and in growing pressures to find ways to accommodate divergent views and interests.

Third, the antinuclear and antiwar movement has not only had but is likely to continue to have a marked influence on the policies of Western European governments and is spilling over to the US itself, where it may also become a significant political factor.

Finally, and most important, are the constraints imposed by US economic conditions. Even though it is recognized that the Administration had public and congressional support for strengthening US defenses, it is argued that the US is unlikely to be able to pull out of its economic crisis while maintaining the planned increases in defense spending. The resulting economic, political, and social costs of the Administration's defense program may, therefore, prove too great to allow its implementation in the coming years.

In the Soviet judgment, even though an initial tough stance on the part of the Reagan Administration was expected, its policies are as yet neither clearly defined nor coherent and, therefore, may be subject to change in the future. Soviet analysts view the Administration as still not having fully grasped the foreign and domestic limitations confronting its choices of policies. Thus, in the opinion of the prominent Soviet "Americanologist" G. A. Arbatov, the "political and social mechanisms which demand some kind of accommodation on the part of the Administration have just been set in motion." ■

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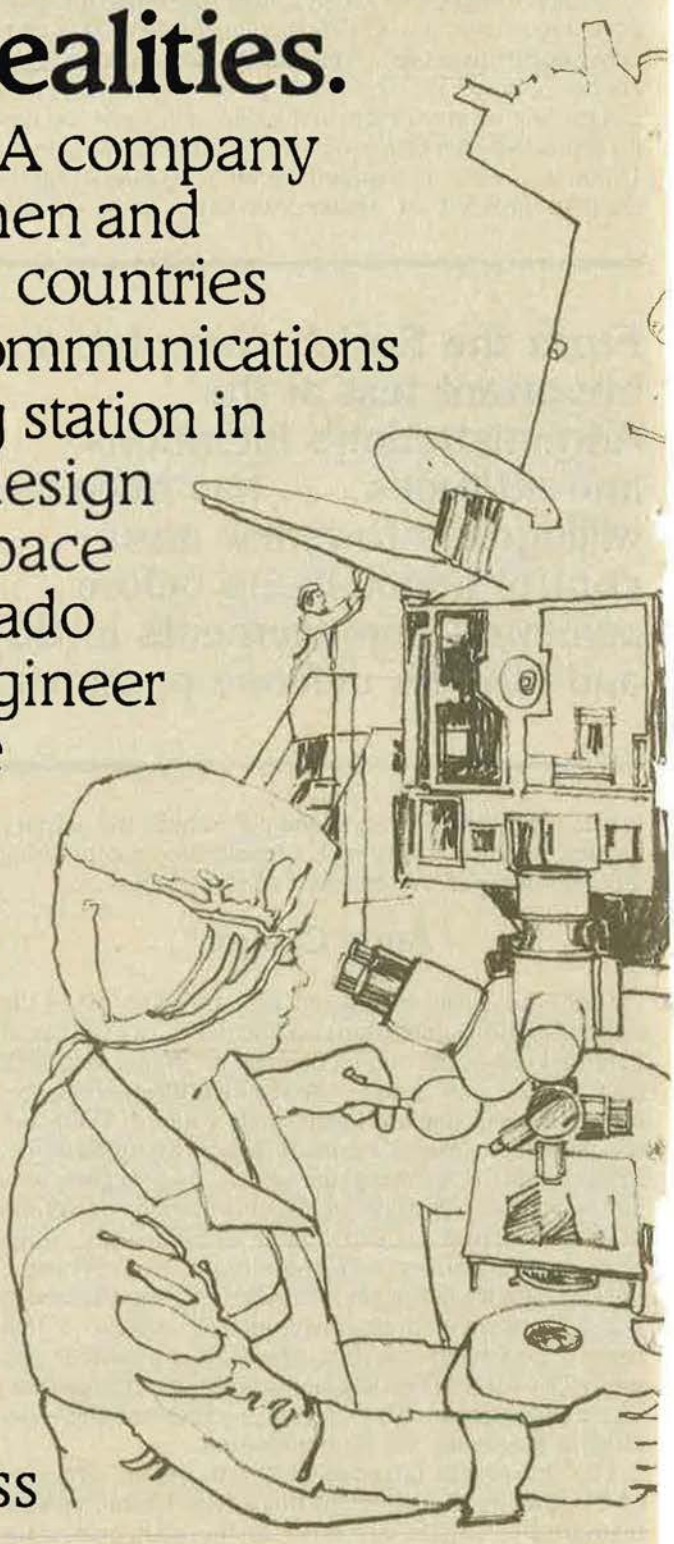

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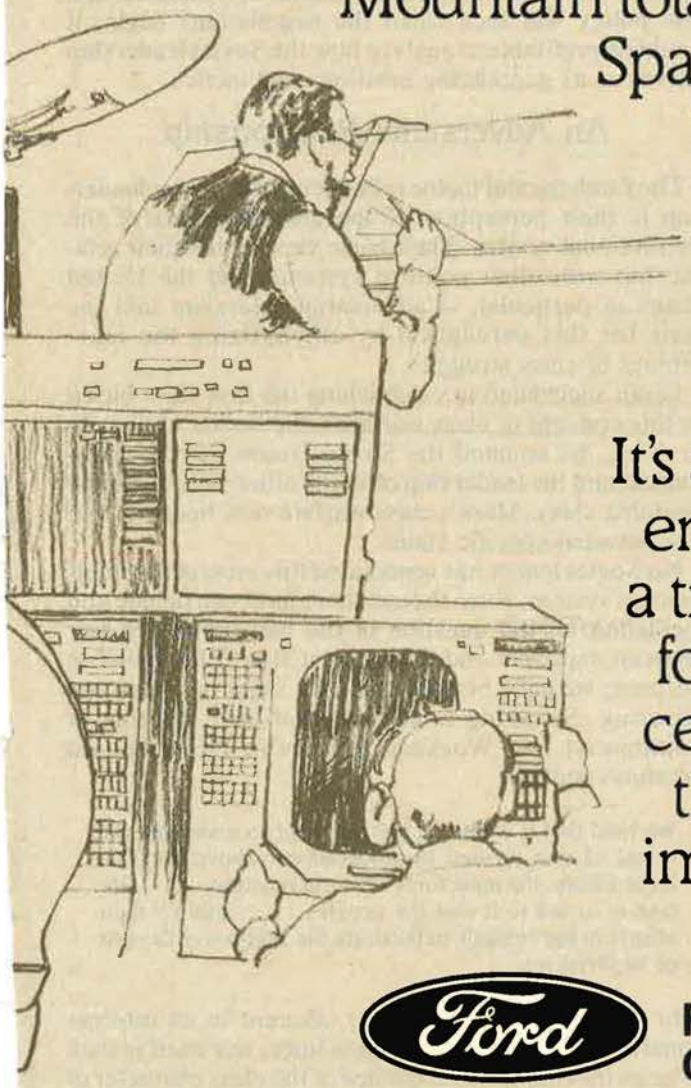

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SALT I and SALT II negotiations provided valuable lessons about how different the Soviet goal in arms negotiations is from our own. With the Reagan Administration launching its maiden effort in strategic arms limitations negotiations (now called the Strategic Arms Reduction Talks, or START), a critical look at Soviet intentions is in order.

STARTing FROM REALITY

BY LT. COL. FRANK J. DELLERMANN, USAF

On November 18, 1981, President Reagan announced his proposal to open negotiations with the Soviet Union on strategic arms as soon as possible in 1982. President Reagan has changed the designation of the negotiations from Strategic Arms Limitations Talks (SALT) to Strategic Arms Reduction Talks (START). Aside from giving political cartoonists and commentators fresh material for puns and double entendres, there is deeper significance in this change.

First, it is an effort to separate the new negotiations on strategic arms from their predecessors—SALT I and SALT II, neither of which is very popular among the President's followers.

Secondly, the President certainly wishes to emphasize, both domestically and to the Soviets, that the Administration is committed to new goals with the negotiations. No longer will strategic arms be a pawn in an effort to better political relations between the superpowers. No longer will the negotiations be a ready rationale for eliminating, delaying, or deferring needed military improvements. No longer will tangential objectives overshadow the primary political or military objectives of the negotiations.

Whether this will hold true as the negotiations progress remains to be seen. Each of the preceding negotiations began in the best of faith that the outcome would be in the US interest. The conclusions of SALT I and II left much to be desired, however. Yet, with the public change of name for the negotiations, the President has burned his bridges behind him. He cannot conclude the negotiations with anything less than what he called "truly substantial reductions" in strategic weaponry without the attendant stigma of having knuckled under to the Soviets. This would be a particularly telling political liability to a President whose campaign rhetoric and early speeches as President centered on standing up to Soviet aggressiveness.

The Administration's posturing portends an American negotiating stance substantively different from previous efforts. Whether this is actually the case, only time will tell. However, there is another factor that must be considered in the negotiation strategy. This factor is the Soviet Union—its negotiating attitude, strategies, and goals. While the US has publicly changed its government and negotiating attitude, the Soviet Union has the same leadership that successfully faced Presidents Johnson, Nixon, Ford, and Carter. There is no indication of any change in either Soviet attitudes or negotiating methods. Therefore, to understand what the Reagan Administration, with its new acronym, new attitude, and new policy will face when the negotiations begin, it would be profitable to analyze how the Soviet leadership arrives at its negotiating positions and tactics.

An Adversarial Relationship

The fundamental factor influencing the Soviet leadership is their perception of the characteristics of the international system. Their basic view is that their relationship with other political systems, and the United States in particular, is adversarial. Marxism laid the basis for this perception by emphasizing the inevitability of class struggle.

Lenin succeeded in establishing the first state based on this concept of class warfare—the Soviet Union. In so doing, he equated the Soviet Union with the proletariat, and the leadership of all the other states with the capitalist class. Marx's class warfare now became warfare between specific states.

No Soviet leader has repudiated this view of the international system. Even though there has been debate and vacillation on the question of the inevitability of war between capitalist and Communist states, the belief in the basic struggle between the two sides has been unwavering. Speaking to the International Meeting of Communist and Workers' Parties in 1969, Leonid Brezhnev stated:

> We hold that it would be a gross error to underrate the threat of war created by imperialism, above all U.S. imperialism, the main force of world reaction. . . . Our task is to see to it that the peoples . . . multiply their efforts in the struggle to frustrate the aggressive designs of imperialism.

In addition to this struggle, inherent in an international system divided along class lines, war itself is seen to be an inevitable consequence of the class character of states. Lenin observed that "history suggests that peace

is a breathing space for war." A contemporary view is not more optimistic. In *Problems of Contemporary War,* published in Moscow in 1972, the cause of war is explained as resulting from the conflict between the "exploiter society" (*i.e.*, capitalism) and the "transition of all mankind to socialism and communism."

The existence of capitalist states is the basis for war. The Soviet Union must constantly be on guard to anticipate military activities by the imperialist camp and to thwart them from the start.

With Soviet ideology viewing war as inherent in a world where capitalist states exist, several questions arise. What is the utility of war? Can it serve a useful purpose or is it only detrimental in the affairs of states? Here the Soviet concept of just and unjust war comes to the fore. The Soviet view of war is founded on class analysis. V. D. Sokolovskiy, in his seminal work, *Military Strategy,* describes the criteria for a just war:

> War between the imperialist and socialist camps . . . would be aggressive, predatory, and unjust, on the part of imperialism and a liberating, just, revolutionary war on the part of the socialist community.

Although the concept that all wars are inherently meaningless or counterproductive is rejected, this does not mean that pacifism cannot be profitably used. Lenin's instructions about the 1922 Geneva Conference to Chicherin provides an insight into his attitude about pacifism: "Who denied the utilization of pacifists by this party *in order to demoralize the enemy, the bourgeoisie*?" (Emphasis added.)

This statement is then related to contemporary affairs in General-Major A. S. Milovidov's book, *The Philosophical Heritage of V. I. Lenin and Problems of Contemporary War:*

> This comment is of enormous significance in defining the tactics of Communist parties in the struggle for peace and socialism, in the cause of building a broad front of democratic forces around the Communists for the struggle against imperialist reactionary forces.

If wars can be just or unjust, if wars are not inherently counterproductive, what is the purpose of war? On this Lenin takes Clausewitz's dictum and places it in a class perspective—war is a continuation of politics. This does not mean that war should be entered into lightly on all occasions. The negative consequences of a war should be ascertained, as well as whether a war is just. Lenin, in 1918, led the fight for a peace treaty with Imperial Germany despite the harshness of German demands. He saw correctly that the consequences of continuing the war would be worse than the terms of peace demanded by the Germans.

The Soviets today evaluate nuclear war in a similar manner. The negative consequences of a nuclear war are emphasized. Brezhnev has stated:

> Under present-day conditions a nuclear war could result in hundreds of millions of deaths, in the destruction of entire countries, in contamination of the earth's surface and atmosphere. Communists must draw from this the most serious political conclusions.

Yet, this does not mean that war has lost its meaning.

Their basic view is that their relationship with other political systems, and the United States in particular, is adversarial.

The Soviet leadership clearly learned a lesson from the Cuban missile crisis of 1962. However, the lesson was diametrically opposed to that learned by the American leadership.

Again, the book *Problems of Contemporary War* specifically addresses this:

> . . . the growth in the might of socialism and other peace-loving forces, as well as the fact that the USSR wields a mighty "nuclear sword," make it possible to check the forces of aggression: world war has ceased to be an inevitability. But this does not mean that nuclear war . . . has ceased to be an instrument of politics. . . .

The Soviet leadership clearly learned a lesson from the Cuban missile crisis of 1962. However, the lesson was diametrically opposed to that learned by the American leadership. In the United States, Clausewitz's dictum that war is a continuation of politics was seen to be negated by the destructiveness of nuclear weapons. While this concept had been communicated as early as 1946, it was only after the Cuban missile crisis that it became a clearly stated part of US policy. Secretary of Defense Robert McNamara stated that thermonuclear power "has proven to be a limited diplomatic instrument."

The Soviet leadership learned the opposite lesson. Soviet First Deputy Foreign Minister Vasily Kuznetsov told American officials a decade after the crisis, "You Americans will never be able to do this to us again." The growth of Soviet military power is seen as circumscribing American freedom of action.

Georgi Arbatov, head of the Institute of the USA and Canada, has written along these lines, stating that "the matter at issue is essentially that of further limiting the freedom of action of imperialism—above all, US imperialism."

Supremacy in military power is seen as making victory possible, not inevitable. It only provides the state with favorable conditions for victory. Victory still depends on the leadership of the people and social forces.

Soviet writers state that the "revolution in military affairs," as they call the change in warfare brought about by nuclear weapons and long-range delivery capability, has not changed the essence of war, but rather required that "not only quantitative superiority, but also qualitative superiority over the opponent has become a matter of prime importance."

The Quest for Secrecy

Due in large part to its adversarial attitude, the Soviet political system is also characterized by an almost paranoid quest for secrecy. Every attempt to understand the Soviet political decision-making process is faced with this Soviet compulsion for secrecy. Where matters of national security are involved, secretiveness becomes extreme—all pervasive. Even the existence of one of the highest organizations for decision-making on national security matters, the Defense Council, has only recently been acknowledged officially.

Military information is tightly held by the military and by the highest levels of the political structure.

Another example is the refusal of the Soviet SALT delegation to present their force figures for use in the SALT I and II negotiations. Only after almost eight years of SALT negotiations did the Soviets start providing parts of a data base of Soviet weapons for use in the negotiations. This was only after Sen. Charles Mathias (R-Md.), a leading supporter of SALT, told the head of the Soviet delegation that there was "no way we could vote for this treaty without a data base."

This penchant for secrecy is not confined to giving information to foreigners. Military information is tightly held by the military and by the highest levels of the political structure. Igor Glagolev, a former Chief of the Disarmament Section of the Soviet Institute of World Economy and International Relations (IMEMO), said that anyone outside the military who dealt with military questions normally had to refer to Western sources for data about the Soviet military. John Newhouse, in his book about the SALT I negotiations, cited one occasion when the head of the Soviet delegation confused the small Minuteman silos with the Soviets' large SS-9 silos. He appeared to be unaware of the elementary fact that Soviet ICBMs are physically much larger than their American counterparts. According to Newhouse, at a later date Colonel-General Ogarkov, officially the deputy head of the Soviet delegation,

> took aside a U.S. delegate and said there was no reason why the Americans should disclose their knowledge of Russian military matters to civilian members of his delegation. Such information, said Ogarkov, is strictly the affair of the military.

Thus, it would appear that nonmilitary people, even those in the Soviet hierarchy, because of whose duties and status would seem to warrant familiarity with Soviet military capabilities and forces, are kept ignorant.

Another facet of this environment where military data is the exclusive purview of the Soviet military is the study and development of military doctrine, force requirements, and employment of forces. The previously quoted *Military Strategy* is a classic example. Written in three editions between 1962 and 1968, this authoritative academic work was edited by V. D. Sokolovskiy, Marshal of the Soviet Union. Other authors were also high-ranking officers, all of whom have impressive academic qualifications as well.

This combination of military and academic rank is characteristic for Soviet works dealing with military matters. Even where "civilian" institutes such as IMEMO and the Institute of the USA and Canada become involved in matters such as arms control, military officers or civilians closely connected to the military or the defense industry are found to be in charge of the "appropriate" offices.

This is in sharp contrast to the formulation of military doctrine and strategy and for arms-control policies in the United States. Here the foremost writers and theoreticians are almost exclusively civilian academics having no military connections, such as Bernard Brodie, Thomas Schelling, Herman Kahn, and Glenn H. Snyder.

This monopoly of information and expertise does not imply that all policy decisions concerning military matters are left to the military. On the contrary, decision-making is centralized to an extreme degree in the Soviet Union and the highest decision-making body is the Politburo. A simple but accurate description of the delegation of authority for defense policy decision-making within the Soviet Union is the distinction between two levels of policy decisions. Those decisions that call for some substantial allocation of state funds or resources or that result in some change in the capabilities of the forces in the field are taken by the central leadership, and all other decisions are delegated to the appropriate lower levels.

While the full Politburo certainly has formal decision-making authority over defense decisions, Edward L. Warner III, a noted observer of the Soviet military, has theorized that the Defense Council, chaired by Brezhnev,

> serves as the forum within which such matters as significant weapons development and procurement programs, defense budgets, and major force deployments are discussed. These deliberations . . . are likely to culminate in preliminary decisions that are, in turn, considered and almost certainly approved by the full Politburo.

Yet with the zealous protection of military information from nonmilitary officials, it would appear that the top leadership is uniquely dependent on the military for its information and has few nonmilitary sources from which to receive alternative views.

During the negotiation of SALT I and SALT II, the Soviets invested heavily in military arms and became a true global power. This occurred while most other aspects of Soviet society and policy were facing mounting

problems and/or continued failures. The military capabilities of the Soviet Union are a *unique* source of success for the Soviet leadership. There is, therefore, little reason to go against the advice of the military or to look for alternative sources of information or policy options concerning military matters. In short, if you have a good thing going, why change?

This period of a Soviet general military buildup and a halcyon relationship between the military and political leadership has also been a period of major activity in the area of arms control. In the Brezhnev-Kosygin era the Non-Proliferation Treaty, the Seabed Arms Control Treaty, the SALT I Agreements, the Biological Weapons Convention, the Threshold Test Ban Treaty, the Peaceful Nuclear Explosions Treaty, the Environmental Modification convention, and the SALT II Agreements were negotiated and initialed (although not all have been ratified). While the impetus for these agreements did not always come from the Soviet leadership, they did react positively and showed a positive attitude toward the arms-control initiatives of other states on many occasions.

To many in the United States in the 1960s and early 1970s, this positive attitude on the part of the Soviet Union toward arms control signified that the USSR had accepted (1) American concepts of deterrence and mutually assured destruction, (2) a more cooperative role in the international system, and (3) the necessity of living with societies having non-socialist political systems.

These assumptions were only questioned to any significant extent when the Soviet military buildup continued past a position of parity with the United States to where the ICBM portion of the US strategic triad was seen to be vulnerable to a Soviet attack. Heightened arms-control activity, concomitant with a degradation of perceived US and international security, appeared to be a paradox in the mind of the American public and has caused a general disillusionment with the process of arms control. While a number of reasons have been proposed for this paradox, I would maintain that this is not a paradox at all. Rather, it is a result of the Soviet attitude toward arms control and where arms control fits in the Soviet defense policy decision-making process.

Who Runs the Show?

The Soviet political leadership has had a lasting, compatible relationship with the Soviet military. It appears that the political leadership has supported across-the-board military increases, and that the military has been allowed to restrict the dissemination of military data to the extent that other participants in the Soviet political system are precluded from actively arguing against Soviet military programs. Within this political bureaucratic environment, arms control has been viewed by the political leadership as under the purview of the military. This was certainly true during the SALT negotiations.

During the negotiations of SALT I and SALT II, the Soviets invested heavily in military arms and became a true global power.

The formal organization of the Soviet SALT delegation would not make it readily apparent that the military had primary responsibility for SALT. The head of the Soviet delegation was an official of the Foreign Ministry: from 1969 to 1978 Deputy Foreign Minister Vladimir S. Semyonov, thereafter Victor Karpov, who had served as the representative of the Foreign Ministry on the SALT delegation since the beginning of the negotiations. Several factors indicate that the official head of the delegation was not the most powerful member of the delegation.

The formal organization of the Soviet SALT delegation would not make it readily apparent that the military had primary responsibility for SALT.

First, the Soviet delegation's composition was based on the organization of the US delegation. Raymond Garthoff, a member of the US SALT I delegation, has indicated that the Soviets had originally considered naming a very senior military man as the head of their SALT I delegation, but after inquiring as to the membership of the US delegation, they appointed a civilian instead. Even as the civilian leader of the delegation, Semyonov was not apparently the Soviets' first choice but had come aboard "after the train was moving," substituting for Deputy Foreign Minister Kuznetsov who had been transferred to the Sino-Soviet negotiations in Peking.

Second, the incidents cited above also support this view, *e.g.*, when Semyonov confused US and Soviet missile silos and when Ogarkov told a US delegate that civilian members of the Soviet delegation should not be privy to military data. In line with this, US SALT delegation members have reported that a great deal of interest was shown by the civilian members of the Soviet delegation as to the deployment and capabilities of *Soviet* weapons.

Third, outside observers of the SALT process have also expressed the view that the military member of the delegation was a stronger influence on the delegation than Semyonov. This has been most noted with regard to the relationship between then Colonel-General Nikolai Ogarkov and Semyonov. John Newhouse indicated that Ogarkov's influence was stronger than Semyonov's, even after Ogarkov had left the delegation.

Yet, the relative position of the members of the Soviet delegation would appear to mean little except as a reflection of the status of their respective bureaucratic organi-

zations in Moscow. Western observers saw the Soviet SALT delegation as powerless in the negotiations, acting only as the obedient spokesmen for the Soviet leadership. This is simply a continuation of the historical practice of the Soviet Union in arms-control negotiations.

The Soviet negotiators are known for maintaining a particular position inflexibly while awaiting "instructions from Moscow." These instructions undoubtedly originate in the Politburo—the highest level of decision-making in the USSR. When dealing with such grave matters as negotiations on strategic arms, the concurrence of the Politburo certainly would be necessary. Yet, the Politburo is limited in its capability to analyze and debate the overwhelming number of issues that come before it simply because its charter encompasses every aspect of Soviet society. Each member has, therefore, taken on special responsibilities in one or more particular areas. In this context, the Defense Minister would specialize in military matters and be an important voice in any debate on arms control. Yet he would not be the only Politburo member with a major interest in military affairs. Rather, those leaders who were primarily concerned in military matters, including arms control, would be found on the Defense Council. Marshall Shulman, a noted Sovietologist and the Carter Administration's primary advisor on Soviet affairs, has indicated that it is via the Defense Council that the political leadership becomes involved in military decision-making. Thomas Wolfe has theorized that the Defense Council "is in fact the body in which final SALT policy decisions are resolved on behalf of the Politburo as a whole." If Wolfe is correct, this point of interface between the military and the political leadership becomes the Soviet's policy-making body for SALT.

The Soviet negotiators are known for maintaining a particular position inflexibly while awaiting "instructions from Moscow."

The role of the Defense Council as the policy-making body for SALT would highlight a number of characteristics regarding the Soviet strategic arms limitation process. First, the Soviet military would have an overwhelming role in the decision-making process with regard to data input due to the very nature of this decision-making body. In dealing with defense matters, the Soviet military are seen as the "technical experts" on the military assessment of particular weapons, possible employment, and any military threat to the USSR. Due to the compartmentalization of information in the Soviet Union, no other organization has access to Soviet military data to refute what the Soviet military leadership advocates.

Second, even if such organizations were able to obtain sufficient information to make a particular point, any arguments would be confronted by the "professional" advice of the military to the Defense Council, and this organization, on the basis of its presumed membership, would appear to be highly sympathetic to the military position. Even if "nonmilitary" Politburo members were on the Defense Council, they would most likely be looked to for advice on probable US diplomatic responses to Soviet initiatives, for estimates of the actual military forces of foreign states, and forecasts of future military forces of foreign states.

Third, in any case, none of those named by Sovietologists as possible members of the Defense Council have been noted for their proclivities toward accommodation with the US or the West in general.

The Politburo would serve to legitimize decisions made in the Defense Council and provide the official authority for necessary actions by the Foreign Ministry, the negotiating delegation, and any other organization required.

Other Policy-Making Input

The Ministry of Foreign Affairs appears to have little, if any, substantive input in the SALT process. What inputs are made appear to be of a diplomatic and political nature and do not involve the ascertaining of militarily acceptable bargaining positions. Glagolev, in fact, relates that Semyonov told him "that the Ministry of Foreign Affairs does not have a decisive voice in the formulation of the Soviet position on arms limitation. In fact, the ministry's function is limited to selecting wording for possible agreement." The formulations selected must not interfere with the realization of Soviet military programs.

Another organization associated with the SALT talks is the Soviet Academy of Sciences and, specifically, the Institute of the USA and Canada and IMEMO. Statements by Georgi Arbatov, head of the Institute of the USA and Canada, have frequently been quoted by American scholars to prove that the Soviet view of nuclear war and mutual deterrence is almost, if not quite, the same as that accepted by the American proponents of mutual assured destruction. Other members of these institutes are often cited in a similar manner by Western scholars.

However, a different view of these institutes and their members is portrayed by former members who are now living in the West. Galina Orionova left the Soviet Union on April 30, 1979. She had been a research fellow at the

Lt. Col. Frank J. Dellermann, USAF, is a political-military affairs officer serving as an Associate Professor of Political Science at the USAF Academy. During his sixteen years in the Air Force, Colonel Dellermann has also been a missile combat crew commander, operations staff officer, and intelligence officer. Now serving his second tour at the Academy, he has a Ph.D. in International Relations from the University of Southern California, and has published several scholarly works on arms limitations and the USSR. Colonel Dellermann was also a member of the team that formulated the Defense Department's positions for the US delegation to the Madrid Review Conference on Security and Cooperation in Europe in 1981, and helped draft the DoD portion of a review of the Mutual and Balanced Force Reduction negotiations.

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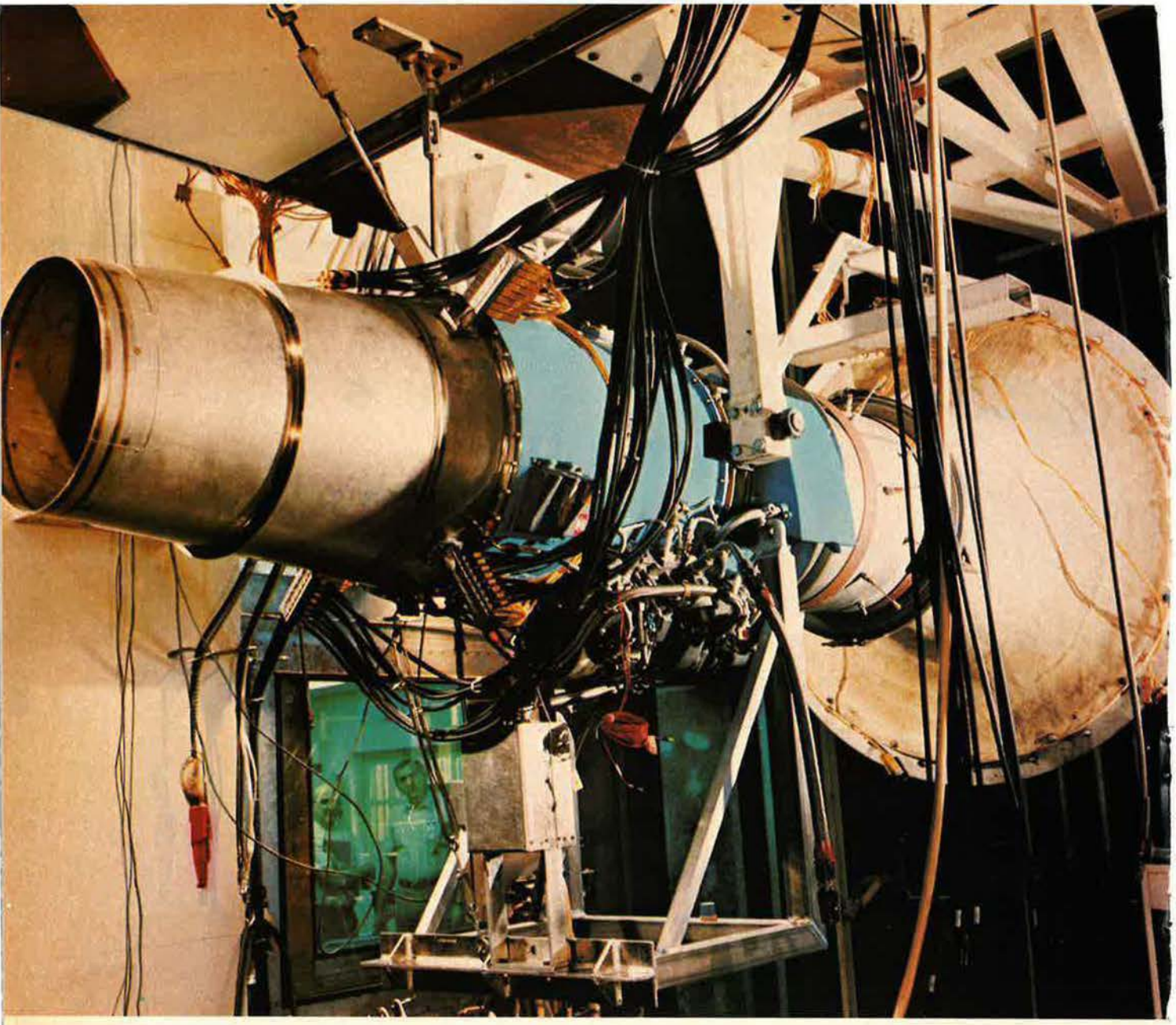

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Institute of the USA and Canada at the time. Her assessment in a November 1980 article in *The Atlantic* was that the Institute has not the slightest impact on Soviet foreign policy:

> Unlike leading American academic specialists, nobody in the Institute has the remotest connection with the government. Only Arbatov . . . ever had access to policy-makers. Between 1971 and 1975 he was so busy with government affairs we hardly saw him. When détente declined he came back.

Yet, while Americans exaggerate the Institute's influence on Soviet foreign policy, according to Orionova, they underestimate its propaganda role to explain Soviet foreign policy to the Soviet public, and to sell Soviet peace-loving intentions to Americans. It would appear that Arbatov's influence with Brezhnev (Orionova indicates he is a personal advisor to Brezhnev) is most likely in the area of advising as to what the American leadership and public would want to hear from the Soviet leader, rather than what course the Soviet Union should take in a technical area such as arms control.

Another defector, Igor S. Glagolev, indicates a similar environment for IMEMO, the other major institute of world affairs in the USSR. However, his background related directly to arms control. Of his seventeen years at IMEMO, he was head of the Disarmament Section of the Institute for three years and the senior research analyst of the section for nine years. He was also a part-time advisor on foreign affairs to Politburo member V. V. Grishin for three years, until he defected.

Glagolev confirms Orionova's statements that sources for academic research projects in foreign affairs are limited to foreign sources. He wrote that the specialists in the institutes and in the Ministry of Foreign Affairs are not given data on existing Soviet arms and weapons programs "and thus are confined to writing only about the armaments of the United States." In sharp contrast to the Western practice, individual initiative in writing papers for the Central Committee, according to Glagolev, "result in penalties, both in the party and the professional career of the author."

The tenor of the reports produced is a direct result of the adversarial attitude toward the West that is mandated by the Soviet leadership. Glagolev states:

> Overt support by any Soviet citizen for an American proposal to reduce Soviet arms is inevitably interpreted by the party leadership as a sign of political unreliability. In the past, support of U.S. proposals by some Soviet scholars has resulted not only in removal from the decision-making process but also in accusations of pro-Americanism, party penalties, transfers to inferior positions, reductions in salary, and prohibition to travel abroad.

For all the emphasis on Soviet military development and the severe limitations placed on those who oppose the increase in military might, Glagolev and Orionova do bring out an opposite and enlightening aspect of the Soviet arms-control environment. It is that a number of people within the bureaucracy are opposed to the steady increase in Soviet military power to the detriment of the other sectors of society. These opponents may be in the highest of positions, *e.g.*, Kosygin. Yet due to the nature of their society, they must make their argument—if they are in a position to argue at all—from a position of steadfast anticapitalism. No favor or understanding of the opponent's position would appear to be allowed. Rather, the argument must show a net benefit to the Soviet Union in its power relationship with the United States.

Dealing With An Adversary—Some Conclusions

After reviewing the political environment and the decision-making process by which policy on SALT is made in the Soviet Union, some conclusions may be made. (Due to the lack of complete information on almost all aspects of this study, these conclusions are tentative.)

. . . the argument must show a net benefit to the Soviet Union in its power relationship with the United States.

The primary conclusion is that the USSR has little, if any, desire for a mutually beneficial accommodation with the United States in strategic arms limitations. The political environment is one that emphasizes the adversarial nature of the US-Soviet relationship and precludes any arguments based on mutual benefit. All emphasis must be placed on the resultant advantage for the USSR and the concomitant weakening of the US position. This mandatory formulation of proposed positions on strategic arms limitations is reinforced by the overwhelming emphasis on military opinion and perception in constructing and evaluating the Soviet positions.

This leads to a second conclusion: The Soviets' adversarial perspective is primarily a military perspective. The Soviet political environment dictates that the Soviets view negotiations on strategic arms limitations as an arena of military confrontation with the US. The United States has often approached the SALT negotiations as a series of technical problems to be solved. How is stability to be achieved? What is the impact of cruise-missile technology on the ability of both sides to come to an agreement? The positions we propose must be verifiable from a technical standpoint.

The Soviet Union stresses the political/military aspects of SALT. Will this enhance Soviet defense capability? Should war break out, will the USSR be able to defeat its opponent with acceptable losses? How does this position affect the political standing of the USSR in the international system?

The Soviets embrace the Clausewitzian dictum that war is a continuation of politics by other means, and thus see the SALT negotiations as a political tool. The Soviet leadership rejects the "technical connection" that the Americans stress. Instead, the Soviet leadership sees SALT as a question concerning the relative power of the

two states. Negotiating in SALT then becomes a method of modifying the current strategic power relationships in the Soviets' favor.

The final result of SALT I is an excellent example of this. Through a combination of negotiation and the simultaneous rapid expansion of their strategic forces, the Soviets were able to conclude a strategic arms limitation treaty in which their opponent agreed to the codification of the USSR as a superpower and agreed to a reversal in the observable strategic balance with regard to ICBMs and SLBMs. At the same time, US policy-makers were employing fairly technical formulas to show that the strategic balance had not shifted to the Soviet Union. Detailed explanations were made of "equivalent megatonnage," which allowed for "qualitative" advantage to be brought into consideration against the Soviets' blatant numerical superiority. Essential equivalence was expounded to show that the United States was not at a military disadvantage, despite appearances to the contrary.

My point is not that we were placed at a strategic disadvantage in SALT I, but rather that the Soviet leadership emphasized the attainment of a treaty that allowed them clear political and military advantages that needed no elaborate explanations to be understood.

The third conclusion is that any internal opposition to this adversarial political/military view is severely inhibited. Several factors combine to effectively inhibit any opposition. The adversarial political environment does not allow any manner of support for the opponent. An opponent to a particular policy, whether he is a government official, an academic, or anyone else, risks his position, his livelihood, and even his ability to dwell in a particular city or apartment by voicing his opposition. In the USSR, to hold that a particular negotiating position should be pursued because both sides will benefit is to ensure its rejection. In addition, the decision-making process many times does not allow groups that might be opposed to certain military or political policies to express policy opinions.

This leads to the fourth conclusion: There is opposition to the military's control over arms-control policy within the Soviet political system. However, the opposition is fairly isolated and appears to be without any significant support. In and of itself, it appears that the opposition is incapable of pressing its recommendations either freely or forcefully.

The fifth conclusion is related to its predecessor. The only effective counter to the position of the military on arms control has been when the leading member of the Politburo made a policy decision contrary to the wishes of the military. The primary example of this is Khrushchev's acceptance of the Limited Test Ban Treaty and restructuring of the Soviet military to make the Strategic Rocket Forces preeminent despite strong military opposition.

However, Brezhnev does not appear to be a Khrushchev. (It would appear the military was one of the groups that supported Brezhnev and Kosygin in their successful ouster of Khrushchev in 1964.) Brezhnev's pro-military stance very likely has been a factor in his rise to *primus inter pares* within the Politburo. Therefore, the prospects of a significant change in attitude toward arms control within the Soviet decision-making organization appear to be almost nonexistent at this time.

Once Brezhnev passes from the scene, there will be a general jockeying for positions of power within the Politburo. Historically, those leaders who have called for increased attention to the production of consumer goods have failed to maintain their power when a rival has issued a call for increased attention to defense.

After the close of the Brezhnev era, a number of different voices will be heard offering different solutions to the USSR's problems at hand. We should not be unduly encouraged to believe that those advocating moderation will win the day and that a new era might begin. On the other hand we should not be unduly discouraged at the calls for increased vigilance and defense spending. Only when the issue of succession has been clearly settled will the new Soviet leader be in a position to press nonmilitary priorities, should he so desire.

. . . it is the conclusion of this author that should the United States want to direct the Soviet Union away from a continual strengthening of its military forces as a means to obtain political advantage, then the US should not follow a policy of accommodation.

Finally, it is the conclusion of this author that should the United States want to direct the Soviet Union away from a continual strengthening of its military forces as a means to obtain political advantage, then the US should not follow a policy of accommodation. Understanding the Soviet political environment and the decision-making process shows clearly that any effort on the part of the US leadership to indicate that it is sincere in striving for mutual benefit and no unilateral gain is seen as a sign of US weakness by the Soviet leadership. Paradoxically, it only strengthens the position of those who press for the largest unilateral Soviet gains.

The only way those Soviet leaders who are in favor of arms control can be politically successful is by arguing on ideologically sound (*i.e.*, adversarial) grounds that, without some Soviet acquiescence to US demands in arms control, the result will be a US military program that would place the USSR in a militarily and politically inferior position relative to its current position. Thus, to strengthen Soviet proponents of arms control, the US must shun conciliatory gestures toward the USSR and emphasize our capability and determination to pursue military advantages. ■

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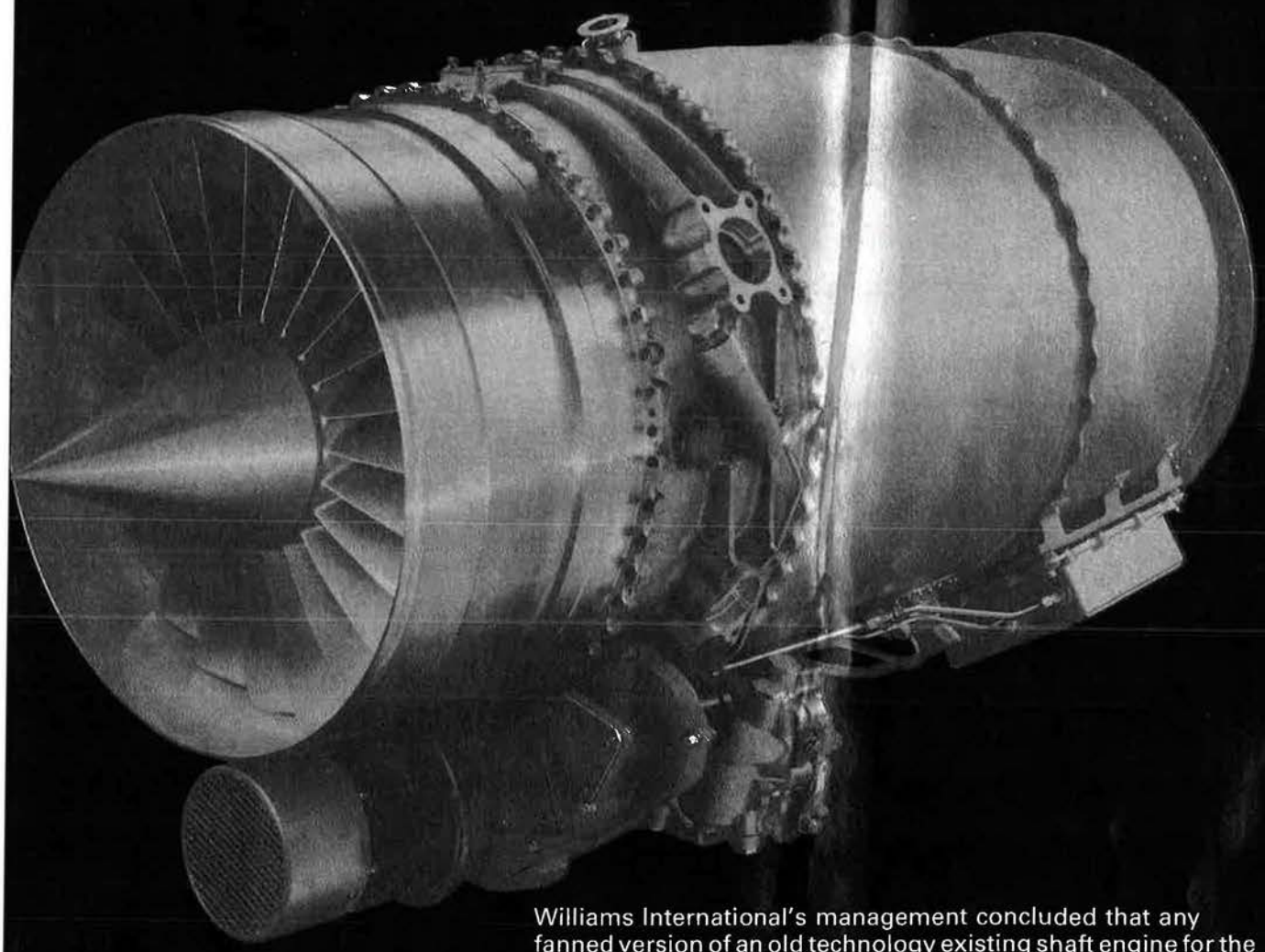

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With this market opportunity Williams modified its general aviation fanjet engine design to meet both Air Force and FAA requirements. The FJ44 was designed from the outset as an optimum configuration fanjet taking full advantage of the advanced status at Williams of its cruise missile fanjet engine technology.

An early prototype completed development testing followed by flight testing in a two man VTOL system. This program provided valuable data for the present FJ44 design. A flight weight FJ44 began its development testing in April 1981 and already exceeds the thrust required by the Gulfstream American Next Generation Trainer.

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SPERRY UNIVAC

The Soviet Union has used a variety of "active measures" to influence world opinion against the United States and NATO, and, at the same time, support Soviet foreign relations goals. Disinformation, propaganda, and other measures present a difficult battleground for a democracy.

DISINFORMATION: War With Words

A STAFF STUDY

IN DECEMBER 1981, the Soviet Union published a booklet in Moscow titled *The Threat to Europe*. In January of this year, a second Soviet booklet, *Whence the Threat to Peace*, appeared. Both these publications were printed in six languages to reach their target audiences—the populations of the NATO nations—more easily. In both cases, the booklets are sophisticated disinformation efforts designed to provide ammunition for those who argue that the Soviet Union is not the potential aggressor in Europe. The arguments contained in the two booklets include a discussion of the Soviets' SS-20 missiles as purely defensive weapons, countering forward-based American aircraft systems and the French and British nuclear capabilities; examples of how the US has troops stationed in so many foreign nations as to be dangerous; and statements that indict the US as the major proponent of the arms race because it developed nuclear weapons first and continued to lead in improving those weapons.

Active measures consist of several activities, including forgery, disinformation actions, and political operations designed to denigrate the United States and its allies, build empathy toward the Soviet Union, and generally influence public opinion throughout the world in support of Soviet goals.

Though the Soviets acknowledge some numerical superiority, such arguments as US and NATO defense policy being based on qualitative superiority, rather than numerical superiority, are lost or discounted. Soviet numerical superiority, on the other hand, is defended as necessary for protection of the large landmass that is the Soviet Union.

These two publications appear at a time when opposition to the 1979 NATO decision to modernize its theater nuclear forces in Europe seems to be growing. These and other Soviet-produced efforts are recent examples of Soviet tactics known as "active measures," according to a State Department paper published in the fall of 1981. Active measures consist of several activities, including forgery, disinformation actions, and political operations designed to denigrate the United States and its allies, build empathy toward the Soviet Union, and generally influence public opinion throughout the world in support of Soviet goals.

The three tools described in the State Department paper are each distinct but related and often used to complement each other. Disinformation efforts involve any number of activities from the covert publication of propaganda—an example is the publication by Tass, the Soviet news agency, of a story that alleged US involvement in the death of Panamanian leader Gen. Omar Torrijos—to the routine spreading of false or misleading rumors either through official or popular channels—such as the rumor spread throughout the Moslem world in 1977 that the US was behind the occupation of the Grand Mosque in Mecca or advisories given to a West European country's officials that the US was developing plans to sponsor a coup in that country.

Forgeries of US government documents are also used to mislead foreign governments about US intentions. The State Department paper cites forged war orders and plans, patterned after actual documents passed to the KGB by a convicted Soviet agent, US Army Sgt. Robert Lee Johnson, as examples of such forgeries. Political influence operations vary and may include suborning diplomats or others, and using journalists like Pierre-Charles Pathé, a French journalist convicted in 1980 of being a Soviet agent, to publish the Soviet line. This is by no means a complete listing of Soviet active mea-

sures, but it does provide an example of the varied activities involved.

Disinformation Problems and Goals

Democracies like those of the NATO alliance are particularly susceptible to Soviet disinformation and deception efforts. Since the democracies rely on public opinion for policy formulation, election of leaders, and so forth, attempts to influence public opinion become particularly important. Joseph D. Douglass, Jr., a noted international security expert, provided a comprehensive discussion of Soviet disinformation efforts and the difficulties encountered by the US and other democracies in dealing with those efforts in the Fall 1981 edition of *International Security Review.*

Among the difficulties cited by Mr. Douglass are such things as a central point for receiving information and assessing it to separate the truth from the misleading and partially true; the continued need within a democracy to hear or read various perspectives legitimately in order to make appropriate decisions; and the long-held belief that Soviet disinformation and propaganda efforts are so blatant or clumsy as to be ludicrous and therefore easily discounted. Mr. Douglass, the State Department paper, and other authors, however, provide enough examples of actual Soviet achievements in this field to dismiss effectively any idea that the Soviet Union is clumsy in this area.

Complicating Western efforts to deal with disinformation and deception from the Soviet Union is the nature of some disinformation efforts. Soviet disinformation goals are rather subtle in some cases. Mr. Douglass cites a CIA release about Soviet disinformation that was inserted into the *Congressional Record* in 1965 and a more recent CIA study to reveal the subtle goals of Soviet disinformation:

- Confuse world public opinion regarding the aggressive nature of certain Soviet policies;
- Create a favorable environment for the execution of Soviet foreign policy;
- Influence world (and US) public opinion against US military and political programs;
- Destroy public and congressional confidence in US personnel and agencies engaged in anti-Communist and cold war activity;
- Undermine American prestige and denigrate American leaders with NATO and non-Communist governments; and
- Create distrust of the United States in the Western Hemisphere and among new nations in Africa and Asia.

Long-Range Planning

These goals require long-range planning and long-term effort. They result necessarily in the creation of small, seemingly innocuous pieces of disinformation aimed at aiding in shifts of public attitude. To some extent, the same arguments that democracy would seem to require in order to ensure effective decision-making in the public arena after exhaustive debate may, in fact, be presented by agents of the Soviet Union. Consider, for example, a recent article by a Soviet journalist in a national newspaper. The journalist decries the anti-Soviet attitude he finds in the US today. A facile writer, he makes his point effectively. Though the newspaper should not be faulted for printing this piece, especially since the author was identified as a Soviet journalist working for the Novosti Press Agency in the US, the question remains—is this apparently harmless story actually a calculated part of a disinformation campaign designed to reduce US concern about the actual intentions of the Soviet Union? Since the article's author works for the same press agency that circulated the report that the US was implicated in the shooting of the Pope, there are surely some grounds for questioning the purpose of the piece.

Democracies like those of the NATO alliance are particularly susceptible to Soviet disinformation and deception efforts.

Such subtle efforts are not used independently of other efforts, for disinformation and deception are not the sole province of the KGB or any other Soviet agency. Rather, disinformation and deception are state responsibilities in the Soviet Union. Disinformation goals are created at the very highest level—by the Central Committee. Various committee members are responsible for planning and implementing disinformation activities within their individual ministries and departments in support of the overall disinformation goals (which, in turn, support the Soviets' military and foreign policy efforts).

Active measures, including disinformation, are closely linked to all other aspects of the state's international affairs operations—they are not separate, comprising a specialized branch of operations within the intelligence community, Propaganda Department, and KGB. Although these departments do participate in active measures, the Politburo provides direction with the Administration Department (day-to-day operation of the Party), the Military Committee (Council), the Department of the Press, the International Department, the Academy of Sciences of the USSR, and other agencies, all planning and executing disinformation efforts. In addition, the Warsaw Pact nations also produce subordinate plans and are tasked to assist in deceptive operations.

Front Groups

Another aspect of the disinformation effort is operated by the International Department's International Organizations Section. Through this organization, the Soviets control international, national, and local front organizations. Masking their pro-Soviet purpose, these organizations are capable of drawing membership from a broad political spectrum and allying themselves with well-intentioned groups within a nation to assist in a cause that is determined in the best interest of Soviet goals.

Among the most prominent of the organizations controlled by the International Organizations Section are these: the World Peace Council, the World Federation of Trade Unions, the World Federation of Democratic Youth, and the Women's International Democratic Federation.

These organizations, with their contacts in various nations, combined with national Communist parties and directly linked Soviet friendship and cultural societies, provide the basis for engaging in direct action in many Western nations—whether in disinformation efforts or in organizing opposition to a nation's policies that are determined to be detrimental to Soviet interests.

The Soviet disinformation effort is massive—though those participating in it are not readily distinguishable from other functionaries of the party and government apparatus.

A good example of how these agencies contribute to the Soviet disinformation effort, and of its scope, is the anti-neutron bomb campaign mounted by the Soviets in the mid- to late-seventies. This effort was estimated by the CIA to have cost more than $100 million, according to Mr. Douglass. It involved all levels of the Soviet apparatus, including letters from President Brezhnev to every Western government, warning of the dangers of the weapon to the future of détente; letters from members of the Supreme Soviet to Western parliamentarians; letters from Soviet trade union officials to their Western counterparts; sponsorship and leadership of demonstrations in European countries by national Communist parties; organization of international forums and peace committees to oppose the weapon by national Communist front organizations; participation of Soviet journalists in demonstrations outside a US consulate; requests for propaganda support from other governments by the World Peace Organization front group; and

The Soviet disinformation effort is massive—though those participating in it are not readily distinguishable from other functionaries of the party and government apparatus.

other activities. In addition, numerous articles were published during that period that spoke to the need to maintain détente and the Soviet peaceful attitude against the arms race, while at the same time the SS-17, -18, and -20 missiles came on line and the Soviets continued production of their Backfire bomber.

This effort, involving all aspects of the Soviet government, also included the use of forged documents designed to discredit the US. During this time, one Western European country was even advised by Soviet agents that the US was preparing a coup attempt. The anti-neutron bomb campaign was deemed successful by the Soviet Union—in fact, the State Department paper on the subject quotes a top Hungarian Communist Party official as saying: "The political campaign against the neutron bomb was one of the most successful since World War II."

El Salvador and Europe

The Soviet efforts in other areas have also been successful. Disinformation efforts aimed at the El Salvadoran situation have, according to the State Department document, resulted in the formation of Salvadoran insurgent sympathy organizations in Canada, Latin America, and elsewhere. In fact, these groups organized more than seventy demonstrations against the Salvadoran government and US actions in support of that government in a six-month period.

That the Soviet disinformation effort is sizable is amply demonstrated; that it should be of concern to Americans seems obvious.

In Central Europe, Soviet front groups and national Communist parties have joined well-meaning peace, ecology, and other groups in a concerted effort to challenge the decision of the NATO ministers to modernize the alliance's theater nuclear weapons. This effort is now viewed by many as a popular movement. In fact, however, the roots of the movement are lodged in a variety of concerns, such as legitimate concern about land use, the economy, etc., and in the concerns of front organizations in support of Soviet goals. In addition, some groups may even be duped by the disinformation material circulated for their use during the anti-Theater Nuclear Forces (TNF) campaign—such as the forged "top secret" letter from the US Secretary of State. The current anti-TNF modernization debate raises a significant problem in dealing with disinformation—legitimate special interest groups within democracies may sometimes enter into coalitions to achieve their goals and, albeit inadvertently, serve Soviet goals at the same time.

That the Soviet disinformation effort is sizable is amply demonstrated; that it should be of concern to Americans seems obvious. Nonetheless, the complexities of dealing with these efforts within a democracy are great. Perhaps all that can be done is to maintain a critical eye for the subtle forms of disinformation. To some extent, this has not been done. In fact, Mr. Douglass cites an ex-CIA counterintelligence chief's claim that even mid- and senior-level intelligence officers tend to discount Soviet disinformation.

Perhaps the renewed efforts of the International Communications Agency, with regard to the "Propaganda War" in Poland, are an indication of a serious effort to counter the Soviets' disinformation action—if so, American foreign policy can only benefit. ■

The Soviets appear to have an excellent grasp of the theory and use of what in the US is called command control and communications countermeasures.

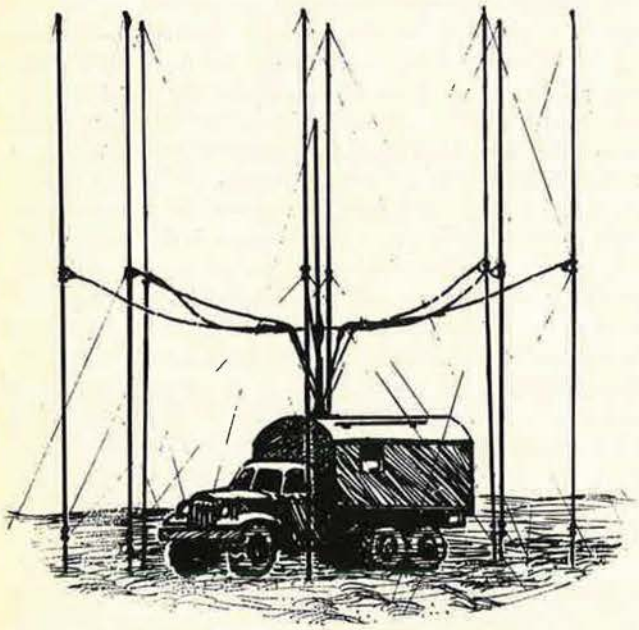
SOVIET RADIOELECTRONIC COMBAT

BY LT. COL. D. B. LAWRENCE, USAF

We call the Soviet version of command control and communications countermeasures (C^3CM) "radioelectronic combat," or REC for short. It's a Soviet military doctrine that adds a new dimension to our view of electronic warfare.

The Russian Dictionary of Basic Military Terms enumerates many words and phrases that have a bearing on this Soviet concept of combating an enemy's use of command control and communications (C^3). The basic Russian phrase from which we derive the REC acronym is *radioelektronnaya bor'ba, "bor'ba"* being translated as struggle, warfare, combat, or as our NATO allies prefer, combat support.

During the last decade, military leaders on both sides have made statements reflecting a view that victory in any future war will probably go to the side that can best control the electromagnetic spectrum. As a means toward that end, the Soviet REC doctrine can be described as the total integration of electronic warfare and physical destruction resources to deny an enemy the use of his electronic control systems and, concurrently, to protect friendly electronic control systems from enemy disruption. We believe the Soviets will try to destroy or disrupt at least fifty percent of an adversary's C^3 systems by using REC.



A Soviet Fix Eight HF intercept and RDF semipermanent station, with an Adcock array of vertically polarized dipoles.

The specific measures to attain these objectives involve gaining good intelligence on the opposing control network. This is a first priority. This means extensive reconnaissance and target acquisition through various means, including electronic intercept and direction-finding (DF). This information-processing phase is then coupled with intensive electronic countermeasures (ECM) jamming and suppressive fire to deprive an enemy full use of his C^3 network. Deception and use of electronic counter-countermeasures (ECCM) comprise the final REC measure aimed at Soviet C^3 self-protection.

Reconnaissance and Acquisition

ESM or electronic warfare support measures is a term we use to describe actions taken to search for, intercept, identify, and/or locate sources of radiated electromagnetic energy. In the opinion of some Western observers, Soviet radioelectronic equipment to do that job—be it airborne or ground-based—generally lacks the technical sophistication of the latest Western hardware, but is credited with being rugged, simple, and relatively easy to maintain.

Most of the ground-based REC equipment is truck-mounted for mobility. Some of it still relies on extensive use of vacuum tubes; others are modern and transistorized.

Various types of mobile directional antenna systems can be used by REC units in the radio direction finding (RDF) role. One of the most common types used by Soviet forces is the Adcock RDF antenna, which is especially effective against VHF tactical communications transmitted from vertically polarized, omnidirectional antennas. Tactical VHF-FM radios set on low power can be picked up by Soviet-equipped RDF units at distances in excess of ten kilometers and high power signals detected at distances of thirty to eighty kilometers. Operational accuracies are usually within ±3.5 degrees, which is to say a total error of seven degrees for target-plotting purposes.

Semipermanent RDF equipment, usually targeted against HF communications, is located to the rear area, well behind the forward edge of the battle area (FEBA). Although such HF intercept stations are usually not more accurate than ±2 degrees, the greater distance between the target transmitter and the RDF site results in a larger linear error and in a circular error probable (CEP) close to fifty kilometers.

Mobility is also a feature of the forward-area ground radar direction finders, an example of which is the jeep-mounted pole dish antenna system. Due to signal characteristics, ground radars may be located with greater precision than radio emitters, often within fifty to 200 meters.

While knowledge of equipment capabilities was derived from Arab use of Soviet REC equipment during the October 1973 Middle East War, ground systems observed probably did not represent the full range of Soviet REC systems, nor were they necessarily the most modern. Egyptian use of Soviet equipment in the '73 war showed a well-integrated defense effort. Following the REC concept, radio and radar technical units provided reconnaissance and aircraft early warning through interception and direction-finding of Israeli communications links and through radar detection. In short, Western observers learned that the Soviets have an extensive intercept capability for both radio and radar.

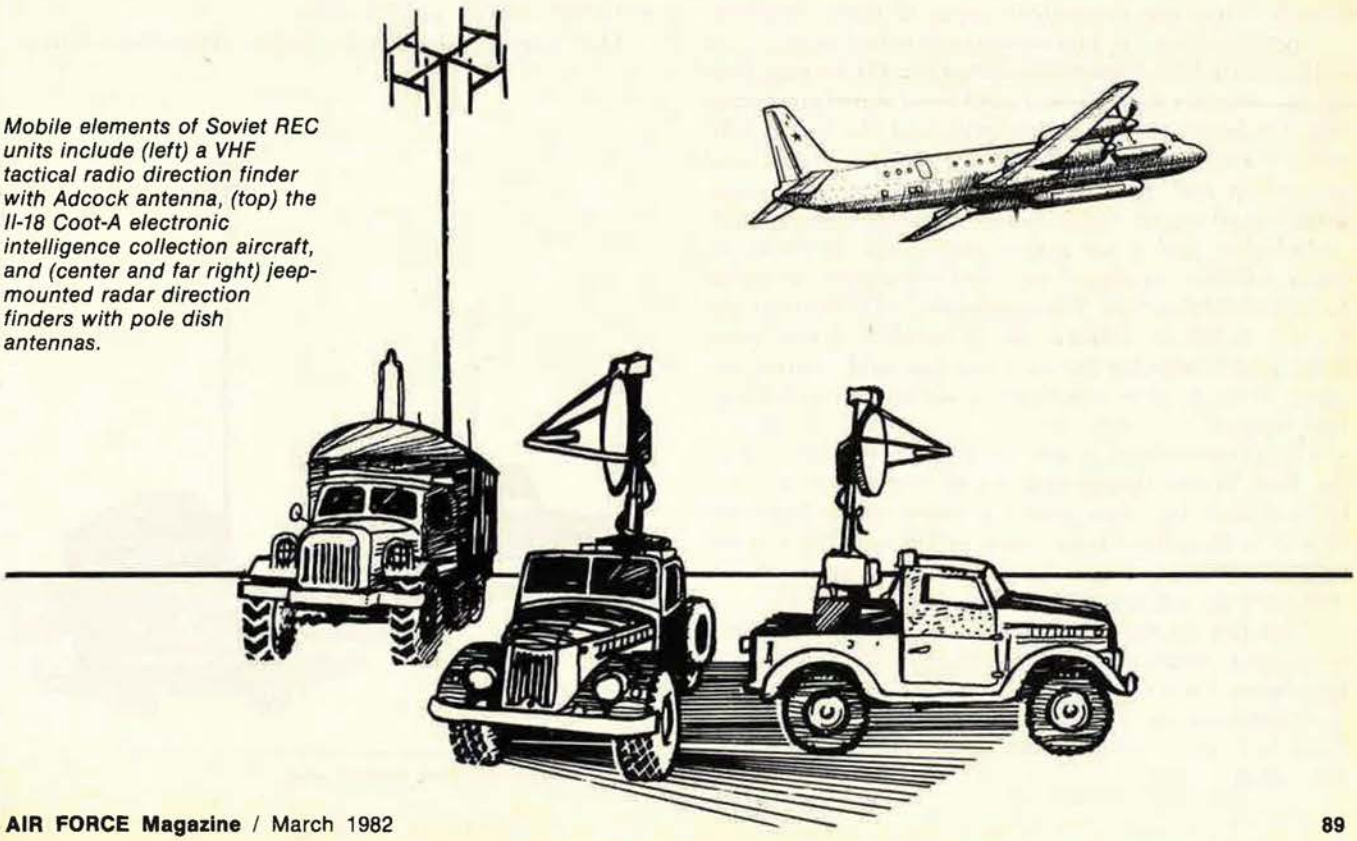
Vozdushnaya razvedka is the Soviet phrase for air reconnaissance, and one of the principal methods includes the use of airborne radio technical facilities. By mounting RDF systems in aircraft like the Il-18 Coot-A, the Soviets enhance receiver ability to intercept radio and radar signals more frequently and at longer distances than ground systems. This airborne electronic reconnaissance platform is aimed at the detection and location of our battlefield radars, command posts, communications centers, and tactical nuclear delivery systems.

The Coot-A ECM or ELINT variant of the twenty-year-old Il-18 transport reportedly appeared in 1978. It has a thirty-three-foot-long under-belly container, which is assumed to house a side-looking airborne radar (SLAR). Another container located along each side of the forward fuselage contains a door over a camera or other intelligence sensor. Numerous antennas and blisters are located on the underside of the fuselage. The Soviets perform continuous air surveillance with electronic ferreting over broad areas, to aid the targeting efforts of missile and artillery units.

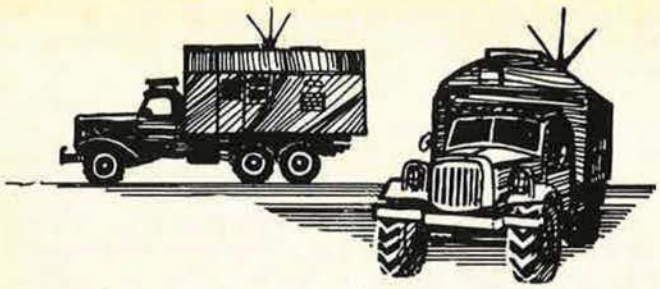
The Antonov An-12 military transport aircraft has also been modified for ELINT duties. Designated by NATO as the Cub-B, this variant has four blister fairings under the forward and center fuselage, plus other antennas. Reportedly, it can locate radios eighty kilometers away—twice the distance of some truck-mounted RDF networks.

Air reconnaissance is conducted by separate reconnaissance regiments or squadrons, whether by Coot-A and Cub-B transports or by modified tactical fighter aircraft, like the MiG-21R. (NATO calls it the Fishbed-H, easily recognized by specialized equipment—an external centerline-pylon-mounted pod for forward oblique cameras and infrared sensors or ECM devices.)

The latest state-of-the-art in tactical air reconnaissance REC support is the MiG-25 Foxbat-B, which reportedly saw operation in Egypt in the early to mid-1970s, carrying out high-speed reconnaissance of the Israeli coastline and the Sinai peninsula. The aircraft carries numerous cameras and is also believed to have a SLAR capability. Given a priority reconnaissance mis-



Mobile elements of Soviet REC units include (left) a VHF tactical radio direction finder with Adcock antenna, (top) the Il-18 Coot-A electronic intelligence collection aircraft, and (center and far right) jeep-mounted radar direction finders with pole dish antennas.



VHF-FM radios linking ground-based FACs and airborne FACs would be jammed by a three-pole omnidirectional antenna unit.

sion and a priority post-mission analysis, some military analysts believe that targets detected in this way might be engaged in about two hours.

Electronic Attack

REC doctrine establishes a requirement to jam Army-Air Force command and control systems and weapon systems communications when they cannot be destroyed by suppressive firepower. As we've seen, the Soviets must depend on photoreconnaissance and radio and radar DF as analytical aids in selecting and locating target transmitters. *Radio-pomekhi* is their term for signal jamming—technical resources used in support of air defense operations to suppress radar bombsights, navigation aids, radio control links, and for jamming in support of ground operations to suppress our communications, electronic surveillance systems, and missile weapons control links.

The principal systems that Soviet technical writings on electronic warfare cover in detail are radar jamming, electronic jamming of command guidance systems, and radio communications noise jamming of AM and FM signals. They use three main types of noise jamming: (1) spot jamming—to jam certain individual frequencies without affecting adjacent frequencies, (2) barrage jamming—where a high power broad band signal jams adjacent frequencies simultaneously, and (3) sweep jamming—where a narrowband (spot jamming) signal moves up and down a broad band at varying rates, affecting all preset victim radars in the frequency band.

Airborne assets for active radio/radar jamming include another version of the An-12 transport, modified for the ECM function. Designated by NATO as the Cub-C, this jamming platform has a number of electronic pods faired into the forward fuselage and ventral surfaces. It has been photographed in operation with Egyptian insignia.

The Yakovlev Yak-28 Brewer-E model has been called the first Soviet operational ECM escort aircraft. It's been around for more than ten years and is likely designed to illuminate large areas of US and allied radarscopes, hindering target detection and disrupting radars that have an automatic target-tracking capability.

Rounding out REC jamming support from an airborne standpoint, there is an ECM version of the Mi-4 Hound helicopter. First reported in 1977, the heliborne jammer is designated the C-model, distinguished by multiple communications jamming antennas that protrude from the cabin.

On the ground, the Soviets use special radio jamming groups *(gruppa radiopomekh)* equipped with mobile communications jammers to carry out specific assignments generally targeted against our tactical radio nets. Their jammers may be used in concert with RDF techniques to block communications for prolonged periods, causing a traffic backlog—which, when transmitted later, enables refined DF fixes to be obtained.

Soviet radio jamming resources recognize that our Army-Air Force operations require joint planning and synchronized employment—that in the main battle, the Army needs close air support directed against targets in and around the FEBA. We fully expect that jamming against US and allied organs of control would include the tactical air control system, which uses HF radios for immediate air requests, VHF-FM radios to link forward air controllers on the ground with airborne forward air controllers, and UHF radio links for strike control.

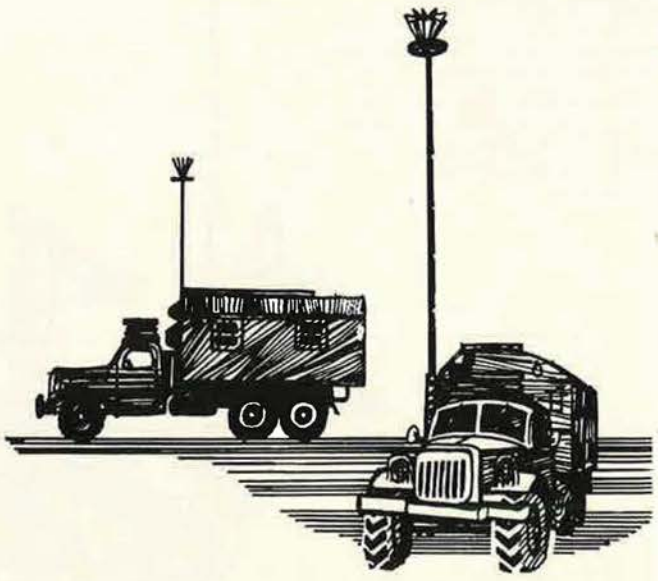
Ground-based mobile jammers are also deployed to disrupt the operation of opposing airborne and ground radar systems.

Physical Destruction

We stressed at the outset that REC is built around and integrated with firepower. According to Soviet doctrine, the motorized rifle division or tank division with its attached or supported electronic warfare resources forms the basic element of execution for REC.

The division is the basic maneuver element of the combined arms army (CAA) and represents the lowest echelon capable of performing fully integrated combat. REC plays a significant role in combined arms operations and is, therefore, integrated into division-level tactics. Physical countermeasures capability of the Soviet division includes artillery and rocket forces; motorized rifle or tank forces; and supporting aviation, airborne, and air assault units.

The Soviets also have special operations forces



UHF radio links for strike control would be jammed by the mobile basket-antenna jammer unit.

Lt. Col. D. B. Lawrence is currently a specialist in radioelectronic combat applications at Hq. Electronic Security Command, San Antonio, Tex. He holds a bachelor's degree in fine arts from Cornell University and a master's in business administration from Webster College, St. Louis, Mo. A long-time student of Soviet military affairs, he has served in a variety of assignments in Vietnam, Hawaii, Korea, and Washington, D. C.

trained for combat sabotage *(diversiya)* behind enemy lines. Specifically, their mission is to disorganize the rear area—destroying such strategic objectives as nuclear and key governmental and military facilities.

Deception and Electronic Protection

The last component of REC concerns self-protection of Soviet command and control through what they call *maskirovka*—a complex word for which there is no English equivalent, but which encompasses the elements of active and passive masking, camouflage, concealment, and deception. The Soviets classify it as an art that requires imagination and resourcefulness, tailored for each situation, varying in time, place, and nature.

It embraces traditional forms of artificial camouflage, such as netting to screen communications facilities, equipment, and weapons from air reconnaissance and strike aircraft. This screening method may also extend to the use of metal nets, mats, felled trees, or brushwood between Soviet troops and our sensors. This *maskirovka* technique tends to negate visual or night-vision instruments as well as radars. Such screens absorb electromagnetic energy and block viewing.

Maskirovka may also be employed by simulating activity where there is none. Through use of dummy and decoy equipment, almost any object—tanks, artillery, aircraft, command posts, even entire dummy installations, such as an airfield—may be constructed and made to appear active.

Another physical protective measure is smoke *(dymovya maskirovka)*. Based on their World War II performance, we can expect the Soviets to use artificial smoke generators to create clouds of smoke or fog to conceal objects and activities, *e.g.*, river crossings. No doubt they are aware that smokescreens may also degrade the effectiveness of antitank guided missiles and laser-guided munitions, as well as interfere with infrared, television, night vision, and night reconnaissance instruments.

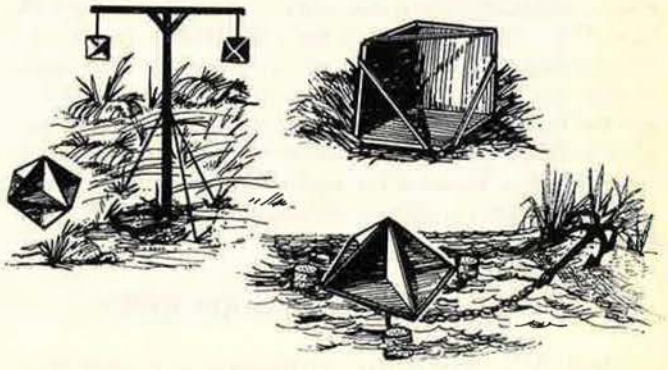
Terrain masking *(maskiruyushchiye svoystva mestnosti)* is another technique used by Soviet troops to provide protection from visual reconnaissance and electronic detection. By plotting fields of invisibility on contour maps, field commanders can pick an appropriate route of march or axis of attack that maximizes the use of natural cover and camouflage.

Electronic deception or antiradar jamming camouflage *(maska-pomekha)* is accomplished by use of corner reflectors that produce flickering luminous blips on an enemy radar screen. Nearby troops or command control and communications facilities would ideally remain undetected by ground and airborne surveillance radars. Additionally, floating corner reflectors and low-power active emitters may be used to simulate radar echoes of bridges.

Another tactical defensive measure is the use of communications deception. Tied into the combat operations plan, this REC application may be imitative or manipulative. The Soviets call this *radiodezinformatsiya* (radio deception), carried on to mislead by propagating false information about troop dispositions, intentions, and capabilities. They may intrude on US and allied radio nets with imitative voice transmissions, what we would call nuisance intrusions, or they could simulate radio traffic in their own language for the benefit of our ears—what we call manipulative deception.

Radiomaskirovka, on the other hand, refers to a wide range of operations security techniques—techniques such as counter-reconnaissance and ECCM, directed toward hindering US and allied signals intelligence-collection efforts. While physical destruction of a jammer is regarded as important CM technique, more traditional techniques would include the use of varying signals and call signs, alternate use of different radars, skip echelon communications, and using high-ground and directional or remote antennas to reduce exposure. For example, the use of highly directional VHF antennas for Soviet weapon system command and control permits VHF jamming of an opponent's emitters without jamming their own. We know that Soviet radio operators are thoroughly drilled in the use of their equipment and its built-in ECCM features; air defense radar operators receive regular training in both chaff and active jamming environments. They seek to minimize the electronic warfare vulnerability of their C^3 systems by equipment redundancy, operator enforcement of signal security, and use of alternate subsystems. Radio silence is standard operating procedure. Landlines, couriers, flags, and flares are reportedly emphasized.

In summary, we conclude from various unofficial sources—including Soviet military writings—that Soviet technicians have an excellent grasp of the theory and use of the four main measures of REC: reconnaissance and acquisition, electronic attack, integrated firepower, and the means to protect their own control communications while under attack. To what extent this REC doctrine has been fully translated into today's deployed systems is only partially known. Western military specialists believe it probably will become fully apparent only with the outbreak of a major war involving the Soviet Union. ■

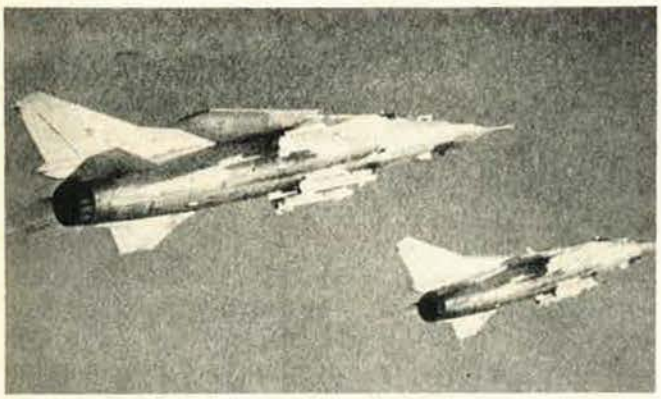


Three types of antiradar jamming camouflage corner reflectors, which produce misleading blips on a radar screen.

By deploying with its ground forces a wide array of antiaircraft defenses, the USSR since the 1960s has been able to alter the role of its tactical air forces from defensive to offensive operations. While still in a state of transition, there seems little doubt about the ultimate objective . . .

FRONTAL AVIATION: Committed to Air Superiority

BY LT. COL. KERRY L. HINES, USA



In addition to the missiles mounted on the three weapons stations, these Flogger-B (MiG-23MF) fighters have a twin-barrel 23-mm gun.

SINCE the late 1960s, Soviet aviation has changed dramatically with the introduction of a large number and variety of sophisticated helicopters and third-generation jet aircraft. Soviet aviation has become a major strike force, capable of executing diverse missions under any weather and tactical conditions, and has attained the capability to conduct sustained operations in a protracted nonnuclear conflict.

The changes in Frontal Aviation are more significant than those made in other components of Soviet aviation. Frontal Aviation has lost much of its former, almost total focus on defensive air operations and has attained significant deep-penetration and conventional strike capabilities. This reorientation has been facilitated, in part, by the deployment of a wide array of mobile and semimobile air defense missile and gun systems with the ground forces. The reorientation of Frontal Aviation has also obviated earlier Soviet reliance on nuclear medium-range ballistic missiles for strikes against an opponent's nuclear delivery systems, command and control facilities, and airfields.

Emphasis on Air Superiority

The shift to an offensive orientation in Frontal Aviation operations brought new Soviet emphasis on the early achievement of total air superiority. Recent articles in prominent Soviet military journals indicate a strong interest in air superiority as a prerequisite to the successful employment of the tremendous offensive capability of Frontal Aviation.

The heavy emphasis on the early achievement of air superiority is based, to a considerable extent, on Soviet experiences during the Great Patriotic War (World War II). The Soviets lost more than one-third of their air assets—many aircraft were destroyed on the ground—during the first few weeks of the war. Consequently, they were unable to mount effective air operations for more than a year, until late 1942. Marshal Kutakhov, Chief of Staff of the Soviet Air Forces, writing in a Soviet military journal, described a valuable lesson:

> The experience of the War verifies that the achievement of air superiority is the necessary and obligatory condition for the attainment of success in operations and a war. Having secured it, aviation will be able to concentrate its principal forces on the support of ground and naval forces.

The principal means for achieving air superiority is strong offensive action aimed first at destroying the enemy's airpower, and then his air defense capability. The Soviet-preferred method of destroying an opponent's airpower is massive, surprise strikes on airfields. Their own wartime experiences are reinforced by their examination and evaluation of air actions in postwar "local" conflicts. A Soviet journal noted,

> During the 1950s–1970s there has not been a single local conflict in which modern [for their time] combat aircraft and air defense means have participated, that has not included aviation strikes on the enemy's airfields. Such strikes proved to be, for example, the decisive influence on the outcome of the 1967 "Six-Day" War in the Middle East.

Importance of Surprise

Despite the new factors that impact on the planning and conduct of airfield strikes, such as electronic warfare improvements, "surprise continues to play the decisive role" in the successful execution of such strikes,

The most formidable Soviet fighter, the Su-24 or Fencer, is a ground attack aircraft carrying pilot and weapon system officer.

according to the journal article. Surprise can be attained by selecting a propitious time for the strike, conducting the flight (approach) in secrecy, and attacking from the direction which the enemy considers as presenting the least danger. Night strikes or strikes during periods of heavy overcast are preferred because of the limitations on visually directed air defense systems.

In a Soviet study of six World War II and postwar surprise air operations (supposedly based on foreign press materials), the authors state that the most significant factor ensuring "the element of surprise in the operations was the choice of the time of attack." The authors further pointed out that successful attacks were usually made "in the morning hours before holidays, just before a weekend or on a weekend, giving the attacker a considerable moral-psychological advantage."

The same study divided the measures that ensure surprise into these four categories:

- Concealment of preparations and time of the strike.
- Increasing the level of Air Force combat readiness.
- Reducing the time that aircraft (helicopters) are in the effective zone of air defense weapons.
- Improving the tactics of air operations in delivering a strike.

The route to and from the target should, ideally, avoid the enemy's air defenses; however, this will not always be possible. When hostile air defenses must be overcome, deception tactics will be employed to mask the true intentions of the strike force; electronic warfare measures will be used to cause maximum degradation to the enemy's early warning capability—particularly to confuse command and control personnel and prevent them from making valid estimates of the intentions, strength, and attack objectives of the strike force; and a secondary force will precede the main strike force by one to two minutes to blast a corridor through the air defense network.

This secondary force may consist of up to one-third of the strength of the attacking forces, to ensure the free passage of the strike groups. However, the main strike force must have a force ratio of at least 1:1 to the enemy in the target area. Only such a force ratio will ensure the full destruction of enemy aircraft at the designated target area (airfield).

Appropriate ordnance for an airfield strike, according to Soviet journals, includes: concrete-piercing bombs to destroy runways and taxiways; fragmentation bombs to destroy unprotected aircraft and cause personnel casualties; and medium high-explosive bombs to handle other targets.

Air Defense

The experiences of "local wars" in the 1950s–1970s also show vast increases in air defense capabilities, which must be destroyed for the effective employment of aviation. As an example of air defense capability, a Soviet military journal author notes, during the 1973 War in the Middle East, Israel lost 105–107 aircraft in the course of eighteen days, ninety-nine percent of which were shot down by ground-based air defenses. Of the total number of Israeli aircraft lost to ground fire, eighty percent were downed by surface-to-air missiles.

Weak air defenses can be overcome by massive employment of aviation using dense, echeloned, mutually supporting formations. Strong air defenses, particularly those equipped with guided missile systems, should be attacked by small, echeloned groups of aircraft, operating at the lowest possible altitude. The exposure time of the attacking aircraft to the enemy's air

MiG-21PF aircraft, Fishbed-Ds, have no gun, but carry a variety of external ordnance and have enhanced all-weather capability.

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defenses must be kept to a minimum. In this respect, airfields must be situated as close as possible to the front line. Also of increasing importance is the development of bombs and missiles that allow aircraft to execute a strike against an air defense system without approaching "to a close, dangerous distance from the air defense weapons." The strike force must also be supported by the intensive jamming of all types of radio-electronic equipment of the enemy air defense systems.

Air Superiority and Flexibility

The advantages of establishing air superiority, especially early in a conflict, are multifold. First, as Marshal Kutakhov pointed out, it allows the concentration of the principal aviation forces on offensive operations. During the Great Patriotic War, Soviet interceptors were sometimes employed in ground support roles, a secondary mission for modern Soviet interceptors. However, unlike the World War II-era aircraft, many of the modern Soviet interceptors are dual-capable aircraft. The release of these aircraft from defensive missions dramatically increases offensive air capabilities. Second, air superiority allows greater flexibility in the conduct of offensive air operations.

One Soviet technique of tactical air employment during the war, after they had achieved at least air parity with the Germans, was the use of armed reconnaissance flights *(svobodnaya okhota)* in the enemy's rear areas to disrupt resupply operations and troop movements. In practically every one of their recent major tactical exercises the Soviets have employed helicopters in airmobile, fire support, and antiarmor roles. Invariably, the helicopters are committed only after air superiority has been established.

There may also be other factors which the Soviets perceive as demanding their early establishment of air superiority. Until very recently, Soviet interceptors operated only under the direct control of a ground intercept controller. The vulnerability of such a system to electronic countermeasures and the limitations of the system to handle simultaneously a large number of air threats are obvious. A second necessity for establishing air superiority could well be the complication in airspace management that the rapid expansion of air and air defense assets has created. Western armed forces have struggled for some time with the airspace management problem, applying various procedural and technical innovations in search of a solution. Yet, despite these efforts, a considerable number of aircraft are "lost" to their own ground air defense systems in practically every major exercise.

The major modernization and restructuring program that has been applied to Soviet aviation since the late 1960s has had a dramatic impact. Frontal Aviation, the major beneficiary of the program, has changed its orientation from primarily defensive to offensive operations. There are indications, however, that Frontal Aviation is still a force in transition, seeking to match the capabilities of its personnel with those of its new equipment. While new employment concepts are being discussed in Soviet journals and tested in tactical exercises, Soviet aviation has already made a strong commitment to one concept—the early achievement of air superiority. ■

Principal Frontal Aviation Air Assets

TYPE	NUMBER*	ROLE	COMBAT RADIUS**	DEPLOYED
Aircraft				
Su-7 Fitter-A	165	Air Support	120–300 miles	1959
Su-17 Fitter-C/D/H	640	Air Support/Interdiction	225–400 miles	1971
Su-24 Fencer-A	370	Interdiction	200–300 miles	1974
MiG-21 Fishbed-C/D/F	850	Interdiction	125–375 miles	1956
MiG-21 Fishbed-J/K/L/N	1,000	Air Superiority/Support	300–400 miles	1968
MiG-21 Fishbed-H	250	Reconnaissance	300–400 miles	
MiG-23 Flogger-B/G	900	Air Superiority	250–600 miles	1972
MiG-25 Foxbat-B/D	170	Reconnaissance	500–700 miles	1970
MiG-27 Flogger-D	400	Air Support/Interdiction	300–400 miles	1975
Yak-28 Brewer-D	175	Reconnaissance	300–550 miles	1962
Yak-28 Brewer-E	20	ECM (dedicated)	350–600 miles	1970
An-12 Cub-C	5	ECM/ELINT	300–1,000 miles	
Helicopters				
Mi-2 Hoplite	300	Airlift/Air Support	50–100 miles	1961
Mi-4 Hound-A	170	Airlift (being replaced by Mi-8)	75–100 miles	1953
Mi-4 Hound-C	30	ECM/ELINT	75–100 miles	197?
Mi-6 Hook	380	Transport/Heavy Lift	150–300 miles	1957
Mi-8 Hip-B/C/E	1,600	Airlift/Air Support	150–200 miles	1967
Mi-24 Hind-A/C/D/E	750	Air Support/Airlift	50–225 miles	1972

* Numbers are approximate.
** There is considerable variation of combat radius figures among various unclassified sources. Also, the combat radius will vary considerably due to load and flight pattern.

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

GALLERY OF SOVIET AEROSPACE WEAPONS

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

Bombers and Maritime

New Bomber Programmes

A single reconnaissance photograph has at last been declassified to confirm that the Soviet Union is developing new manned penetrating bombers to match USAF's projected B-1B through the remaining years of this century. Taken over the flight test centre at Ramenskoye, on November 25, 1981, the photograph shows a large variable-geometry bomber parked near two Tu-144 supersonic airliners. Direct scaling of size could be misleading, and lack of clarity prevents detailed description of the new bomber. However, it appears to be about 180 ft long, making it 20% larger than the B-1 and nearly 40% bigger than the currently operational Tupolev 'Backfire'. Any impression that it is simply a scale-up of 'Backfire' would be dangerous. The new bomber is shown to have its horizontal tail surfaces mounted at the intersection of the dorsal fin and main fin. The fixed root panel of each wing seems to be long and very sharply swept, like the inboard section of the Tu-144's delta wing. This could suggest an engine installation resembling that of the airliner rather than 'Backfire', although this is pure conjecture.

The DoD commented in its 1981 document on *Soviet Military Power* that "Evidence would indicate that the Soviets are in the process of developing a new long-range bomber, and possibly a strategic cruise missile carrier." We now have an idea of the form of the bomber. Unofficial sources have suggested that it might have an over-target dash speed of Mach 2.3 and an unrefuelled range of 8,400 miles.

Beriev M-12 (NATO 'Mail')

The fact that this 1960-vintage maritime patrol aircraft continues to hold all 21 FAI records listed in Class C3 Group II for turboprop amphibians, and all 19 Class C2 Group II records for turboprop flying-boats, is both a tribute to its own qualities and a reminder of its uniqueness. Except for the Japanese Shin Meiwa PS-1, and a few ancient piston-engined Beriev Be-6s believed to serve still with the Chinese Naval air arm, 'boats have given way to shore-based aircraft and helicopters throughout the world. Of 100 M-12s believed to have been built, about 80 operate from coastal bases of the Soviet Northern and Black Sea fleets, for antisubmarine and surveillance duties out to some 230 miles from shore. Payloads of up to 10 tons have been carried by these aircraft under record-flying conditions.

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

Beriev M-12 (NATO 'Mail') (Swedish Air Force)

Ilyushin Il-38 (NATO 'May')

Surveillance and reconnaissance are the basic duties allotted by the Soviet Navy to the crews of its 60 or so Il-38s. The airframe was developed from that of the Il-18 airliner in the same way that the US Navy's P-3 Orion was based on the Lockheed Electra. Its lengthened fuselage retains few cabin windows. Added equipment includes a large radome under the forward fuselage and a MAD tail-sting, with an internal weapon/stores bay aft of the radome. To compensate for the effect on the CG position of these changes, and equipment inside the cabin, the wing had to be moved forward.

Il-38s are encountered frequently over the Atlantic and Mediterranean, together with longer-range Tu-142s. A Soviet Treaty of Friendship and Co-operation, signed with the People's Democratic Republic of Yemen in October 1979, permits patrols over the Indian Ocean from a base in that country. Also to be seen are the first three of six Il-38s ordered for No. 315 Squadron of the Indian Navy, based at Dabolim, Goa.

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.

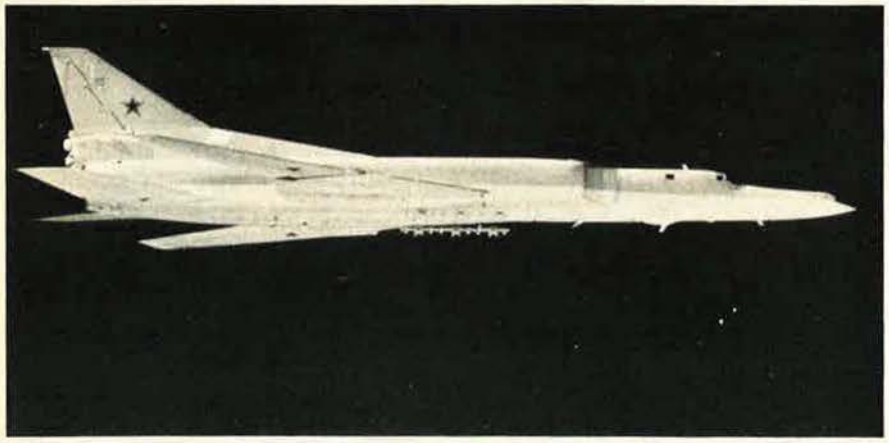
Myasishchev M-4 (NATO 'Bison')

At the time of the abortive SALT II discussions, the Soviet delegation listed only 43 M-4s among the heavy bombers available to Dalnaya Aviatsiya, their long-range air force. A further 31 were then configured as in-flight refuelling tankers to support the 'Bear-Bison' attack force, with an internal probe-and-drogue hose-reel unit which makes them equally compatible with 'Backfire'. Under SALT II proposals, the tankers would have been

Myasishchev M-4 (NATO 'Bison-B') undergoing simulated decontamination after exposure to nuclear fallout

Tupolev Tu-16 (NATO 'Badger-F') and (foreground) USN F-4 Phantom II (US Navy)

Tupolev Tu-22 (NATO 'Blinder-C') (Royal Danish Air Force)



Tupolev Tu-22M/Tu-26 (NATO 'Backfire-B') (Swedish Air Force)

given functionally related observable differences (FRODs) indicating that they could not perform the mission of a heavy bomber. Whether or not this has been done, the DoD suggests that the bomber/tanker mix has remained as it was. Bearing in mind that the prototype of the strategic bomber version flew in 1953, making it only one year younger than the original B-52, and that the M-4 carries only free-fall bombs, there seems little likelihood that the Soviets would ever consider it worthwhile converting the tankers back into bombers. 'Bison' has already disappeared from the Pentagon listing of types operational with the Soviet Naval Air Force. *(Data for 'Bison-A' strategic bomber follow.)*

Power Plant: four Mikulin AM-3D turbojet engines; each 19,180 lb st.

Dimensions: span 165 ft 7½ in, length 154 ft 10 in.

Weight: gross 350,000 lb.

Performance: max speed 620 mph at 36,000 ft, service ceiling 45,000 ft, range 4,970 miles at 520 mph with more than 12,000 lb of bombs, max unrefuelled combat radius 3,480 miles.

Armament: ten 23 mm guns in twin-gun turrets above fuselage fore and aft of wing, under fuselage fore and aft of weapon-bays, and in tail. Three weapon-bays in centre-fuselage.

Tupolev Tu-16 (NATO 'Badger')

Although this twin-jet strategic bomber was first flown 30 years ago, it remains a major component of both the Dalnaya Aviatsiya bomber force and the Soviet Naval Air Force. It also equips the main heavy attack units of the Egyptian Air Force, and continues in production as the H-6 at Xian in China, as the carrier for that nation's atomic bombs. Western intelligence sources appear to have raised considerably their estimates of the numbers still operational in the USSR. DoD's *Soviet Military Power* document comments that "The 600 intermediate-range Tu-16 and Tu-22 aircraft represent a significant capability for use in theater strike operations" by the DA, adding that the Tu-16 is by far the most numerous aircraft in the force. Earlier, the same source states that "The prime strike force of Soviet Naval Aviation consists of over 300 twin-jet 'Badger' and 'Blinder' aircraft which are fitted to carry one or two of several types of antiship cruise missiles with 'standoff' ranges varying from 90 to over 300 km. Some missiles have variable flight paths and various homing techniques to help penetrate ship defenses. All these missiles are assessed to carry either a nuclear or a high explosive warhead of about 1,000 to 2,000 lb. . . . In addition to naval aircraft armed with antiship missiles, certain 'Bear' and 'Badger' bombers of Soviet Long Range Aviation can be used for attacks against ships, and these aircraft regularly participate in naval exercises." The DA bombers are supported by a small number of Tu-16 tankers, more than 90 of various versions equipped for ECM duties, and 15 for reconnaissance. Naval units have about 70 tankers, and 40 reconnaissance and ECM models. The various current versions are identified by NATO 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.

Badger-C. Antishipping 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') which can be carried to a range greater than 2,000 miles. Majority serve with antishipping squadrons of the Soviet Naval Air Force. 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; others seen subsequently with a 'Kingfish' under each wing.

Badger-G modified. Specially equipped carrier for 'Kingfish' air-to-surface missiles, of which first photograph was released, by Swedish Air Force, in mid-1981. Large radome, presumably associated with missile operation, under centre-fuselage. Device mounted externally on glazed nose might help to ensure correct attitude of Tu-16 during missile launch.

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

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

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

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

Dimensions: span 108 ft 0 ½ in, length 114 ft 2 in, height 35 ft 6 in, wing area 1,772.3 sq ft.

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

Performance: max speed 616 mph at 19,700 ft, service ceiling 40,350 ft, range 3,000 miles with 8,360 lb bomb load, max unrefuelled combat radius 1,800 miles.

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

Tupolev Tu-22 (NATO 'Blinder')

As the Soviet Union's first operational supersonic bomber, the Tu-22 caught the attention of the world press when it made a surprise appearance at the 1961 Aviation Day display in Moscow. However, production was limited to about 250 aircraft. Of these, about 125 are said to remain operational with medium-range units of Dalnaya Aviatsiya, plus about a dozen for reconnaissance duties. The Soviet Navy has around 40 for maritime reconnaissance and ECM duties, based mainly in the Southern Ukraine and Estonia to protect the sea approaches to the USSR. Versions identified by NATO reporting names are as follows:

Blinder-A. Original reconnaissance bomber version, with fuselage weapons-bay for free-fall nuclear or conventional bombs. Limited production only. 12 supplied to Iraq.

Blinder-B. Similar to 'Blinder-A' but equipped to carry air-to-surface missile (NATO 'Kitchen') recessed in weapons-bay. Larger radar and partially-retractable flight refuelling probe on nose. Major version for Dalnaya Aviatsiya. 20 serve with Libyan Air Force.

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

Blinder-D. Training version. Cockpit for instructor in raised position aft of standard flight deck, with stepped-up canopy.

Power Plant: two unidentified turbojet engines in pods above rear fuselage, on each side of tail-fin; each estimated at 27,000 lb st with afterburning. Lip of each intake is extended forward for take-off, creating annular slot through which additional air is ingested.

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

Weight: gross 185,000 lb.

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

Accommodation: three crew, in tandem.

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

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

More than 150 of these elegant twin-turbofan variable-geometry bombers are operational, with production continuing at a nominal rate of 30 a year. About half serve with medium-range bomber squadrons of the Soviet Strategic Nuclear Forces opposing NATO in Europe and over the Atlantic. The others are deployed by Soviet Naval Aviation in a maritime role, which caused the DoD to comment: "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 concen-

trate aircraft, coordinate attacks with air, surface, or submarine-launched missiles, and use new technology to find our fleet units, jam our defenses, and screen their approach." Since then, one 'Backfire' unit is reported to have been based at Komsomol'sk, about 500 miles north of Vladivostok, in the Far East of the USSR.

Western defence agencies seem prepared to accept the designation Tu-22M by which Soviet delegates to the SALT II discussions referred to this aircraft; but it might be premature to forget that DoD used Tu-26 in all previous references to 'Backfire'. Controversy concerning the aircraft's range *has* ended. Both range and payload are now admitted to be comparable with those of 'Bison', and there is no longer any point in leaving the in-flight refuelling nose-probe at home when flying 'Backfire' over international waters. This seems to have been done to stress the claimed peripheral/theatre range capability which would have excluded the aircraft from SALT II restrictions. Few places in North America are beyond its reach, and the Naval model greatly increases the capability and extends the range at which strike aircraft can attack Western surface forces such as aircraft carrier or amphibious battle groups. Two production versions have been identified by non-classified NATO reporting names:

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

Backfire-B. Extensively redesigned, with increased span and with landing gear pods eliminated except for shallow underwing fairings, no longer protruding beyond the trailing-edge. Main wheels retract inward into bottom of intake trunks. *(Data for this version 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 radius 3,400 miles.

Armament: twin 23 mm guns in radar-directed tail mounting. Nominal weapon load 26,450 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 many Naval aircraft photographed since 1978 have carried multiple racks for external stores under the front of their air intake trunks. Soviet development of decoy missiles has been reported, to supplement very advanced ECM and ECCM.

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

When the prototype of Tupolev's four-turboprop strategic bomber first flew in the late Summer of 1954, the switch to turbojets for high-performance aircraft was well under way. Nobody would have predicted that the type would still be in production 28 years later, or that developed versions would provide such important elements of both the long-range strategic air force and the Naval Aviation service. A total of 113 Tu-95 bombers was declared as the backbone of Dalnaya Aviatsiya's strategic bomber force at the time of the abortive SALT II talks. Naval Tu-142s, being employed only for reconnaissance and anti-submarine warfare, and being observably different from the DA bombers, were excluded from SALT bargaining. There are about 75 of them. Operating from places like Cuba and Angola, they have demonstrated their capability of covering the North and South Atlantic from the Mediterranean approaches westward to the US east coast, and southward to the Cape of Good Hope. Long range and endurance are only two of the attributes that have kept the huge four-turboprop Tu-95s and Tu-142s in first-line service for so long. 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 unclassified NATO reporting names, as follows, include a variety of sub-types, with ever-changing 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 in pairs in remotely-controlled forward dorsal and rear ventral turrets, and manned tail turret.

Bear-B. As 'Bear-A' but able to carry large air-to-surface winged missile (NATO 'Kangaroo') under fuselage, with associated radar in wide undernose radome replacing glazed nose. Defensive armament retained. A few 'Bs' operate in maritime reconnaissance role with Naval Air Force, with large flight refuelling nose probe, and, sometimes, a streamlined blister fairing on the starboard side of the rear fuselage. Some 'Bears' are equipped to carry 'Kitchen' air-to-surface missiles. One was photographed in 1978 with a pointed canister under each wing, presumably for air sampling.

Bear-C. Third strike version, with ability to carry 'Kangaroo', first observed near NATO ships in 1964. Differs from 'Bear-B' in having a streamlined blister fairing on each side of its rear fuselage.

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 50 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 antisubmarine 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 on a few early aircraft, to improve aerodynamics; later 'Fs' have standard size nacelles. Armament reduced to two guns, in tail mounting. Two stores bays in rear fuselage, one replacing ventral gun turret. Bulged nosewheel doors, over larger or low-pressure tyres. About 30 operational in 1981, with production continuing to balance attrition of 'Bear' force.

Individual aircraft photographed by NATO interceptors, over international waters, during the past two years have displayed significant new equipment configurations additional to those listed. They include an unidentified projection from the rear of the fin tip of a 'Bear-F'.

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

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

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

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

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

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

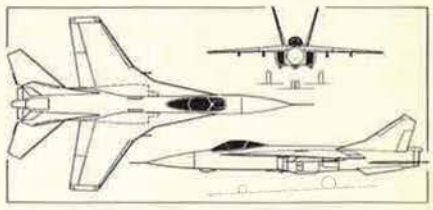
Tupolev Tu-142 (NATO 'Bear-D') (Royal Air Force)

Fighters

New Fighter Programmes

Soviet Military Power hints that "A number of new interceptor aircraft types could enter the [Soviet] air defense force over the next decade", adding that "Soviet research and development most likely will emphasize the development of look-down/shoot-down systems designed to be able to operate above their intended targets, identify and track them against the cluttered background of the earth and fire missiles capable of functioning in the same environment." As such a fighter system is already known to exist, in the shape of the 'Modified Foxbat', this is logical but gives little indication of how far the Soviets have progressed in their widely-reported development of air-superiority fighters in the class of the USAF F-16 and US Navy F-18.

One type said to have been under flight test at Ramenskoye since 1979 is described unofficially as a twin-fin twin-engined single-seater comparable with the F-18, with wide-chord fixed wings embodying large root extensions. The aircraft's T-O weight is said to be in the 25,000 lb class, giving an optimum thrust:weight ratio of 1.2:1 in combat. Armament is said to include a 30 mm gun and up to eight air-to-air missiles, with look-down/shoot-down radar capability. Max level speed has been estimated as Mach 2.3 at height, Mach 1.2 at sea level, with a max combat radius of 575 miles. This aircraft is illus-



Provisional drawing of single-seat twin-jet fighter, said to have been under flight test at Ramenskoye since 1979 (Pilot Press)

MiG-21MF (NATO 'Fishbed-J')

MiG-21bis of Finnish Air Force

MiG-23MF (NATO 'Flogger-B') (Tass)

trated by a provisional three-view drawing in the current *Jane's*. Insufficient information is available to produce a worthwhile drawing of a second fighter seen at Ramenskoye, with variable-geometry wings.

MiG-21 (NATO 'Fishbed')

As the MiG-21 is flown by at least 36 air forces worldwide, this is one Soviet type concealing few secrets. According to pilots of the Egyptian Air Force who entertained representatives of both *Jane's* and AIR FORCE Magazine at operational MiG-21 bases last year, the late-model 21MF bears comparison with anything it would be likely to meet in combat in that area. They want improvements to IFF, navigation, and other systems, but reckon to be airborne in under three minutes from an order to go, and to be capable of maintaining six sorties a day per aircraft for a two/three-day emergency period. Engine change of the Tumansky R-13-300 after 300 hours reflects steady improvement of Soviet turbojet technology.

The original E-5 prototype of 1956 was designed by the late Colonel-General Artem Mikoyan on the basis of jet-to-jet combat experience during the Korean War, with the emphasis on good transonic and supersonic handling, high rate of climb, small size, and modest power. Subsequent development has centred on improved weapons, avionics, and range, within the limitations of an airframe much smaller and lighter in weight than either of the US types that were built under the LWF (lightweight fighter) programme of the early 1970s. How many have been manufactured in the Soviet Union, Czechoslovakia, India, and China (as the J-7), we may never know. About 1,300 equip Soviet tactical air forces, including 175 of the reconnaissance models known to NATO as 'Fishbed-H'. Most 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 12 miles but ineffective below 3,000 ft because of ground clutter. Max permissible speed at low altitude is 683 mph.

MiG-21PFMA ('Fishbed-J'). Multi-role development of PFM, with improved radar (NATO 'Jay Bird') and four underwing pylons instead of two. Armament can include GP-9 underbelly pack, housing GSh-23 twin-barrel 23 mm gun, instead of external fuel tank. Deepened dorsal spine fairing above fuselage contains some tankage, but internal fuel totals only 687 gallons. Two additional pylons carry either 130 gallon fuel tanks or radar-homing 'Advanced Atoll' missiles to supplement 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 avionics, and generally improved construction standards. Internal fuel capacity increased to 766 gallons.

MiG-21*bis* ('Fishbed-N'). Advanced version of 'Fishbed-L' with Tumansky R-25 turbojet engine, rated at 16,535 lb st with afterburning. Enhanced avionics indicated by 'bow and arrow' antenna under nose. Radar detection range 18 miles. Rate of climb at T-O weight of 15,000 lb, with 50% fuel and 2 'Atoll' missiles, is 58,000 ft/min. Armament uprated to 2 radar-homing 'Atolls' and 2 'Aphids'. *(Data for MiG-21MF follow.)*

Power Plant: one Tumansky R-13-300 turbojet engine; 14,550 lb st with afterburning.

Dimensions: span 23 ft 5½ in, length 51 ft 8½ in, height 13 ft 5½ in, wing area 247 sq ft.

Weight: gross 20,725 lb.

Performance: max speed Mach 2.1 above 36,000 ft, Mach 1.06 at low altitude, service ceiling 59,050 ft, range 683 miles on internal fuel, 1,118 miles with three external tanks.

Accommodation: pilot only.

Armament: one twin-barrel 23 mm GSh-23 gun, with 200 rounds. Typical underwing loads for interceptor role include two K-13A ('Atoll') and two 'Advanced Atoll' air-to-air missiles; two K-13As and two UV-16-57 (sixteen 57 mm) rocket pods; two drop tanks and two missiles. Typical ground attack loads are four UV-16-57 rocket packs; two 1,100 lb and two 550 lb bombs; or four S-24 240 mm missiles.

MiG-23 (NATO 'Flogger')

In a massive effort to re-equip its air forces, and at the same time meet the needs of allied and friendly nations, the Soviet Union has built 1,300 fighters and fighter-bombers each year since 1978. As a result, the MiG-23/27 family of multi-role variable-geometry fighters now forms the backbone of the Soviet Frontal Aviation tactical air forces and the Voyska PVO interceptor force. Others, usually equipped to a lower standard, are flown by all of the Warsaw Pact air forces except that of Romania, and have been exported to at least nine other air forces. The 22,485 lb st Tumansky R-27 afterburning turbojet used in early production aircraft seems now to have been superseded by the R-29B in all versions except the training two-seaters. The full list of MiG-23 variants identified by unclassified NATO reporting names is as follows:

MiG-23 ('Flogger-A'). Prototype, shown in 1967 Aviation Day flypast, and small initial production series to equip one or two development squadrons from 1970. Experience with these dictated almost total redesign of the major production versions which followed.

MiG-23MF ('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.

MiG-23U ('Flogger-C'). Tandem two-seater for both operational training and combat use. Identical to early MiG-23MF (with R-27 engine), except for slightly raised second cockpit to rear, with retractable periscopic sight for occupant, and modified fairing aft of canopy.

MiG-23 ('Flogger-E'). Export version of 'Flogger-B', equipped to lower standard. Smaller radar (NATO 'Jay Bird'; search range 18 miles, tracking range 12 miles) in shorter nose radome. No laser rangefinder or Doppler. Armed with 'Atoll' missiles and GSh-23 gun.

MiG-23BN ('Flogger-F'). Export counterpart of Soviet Air Forces' MiG-27 ('Flogger-D') ground attack/interdictor. Has the nose shape, raised seat, cockpit external armour plate and larger, low-pressure tyres of the MiG-27; but retains the power plant, variable-geometry

intakes, and GSh-23 twin-barrel gun of the MiG-23MF.

MiG-23MF ('Flogger-G'). First identified when six aircraft from Kubinka Air Base made goodwill visits to Finland and France in the Summer of 1978. Although basically similar to 'Flogger-B', these aircraft had a much smaller dorsal fin. Absence of operational equipment suggested that only a few aircraft had been modified to this standard for improved aerobatic capability as a display team. 'Flogger-G' has, however, been seen with an undernose sensor pod of new design, and is an operational variant.

MiG-23BN ('Flogger-H'). As 'Flogger-F', but with small avionics pod added on each side at bottom of fuselage, immediately forward of nosewheel doors.

Further versions have been reported, and it is likely that a seagoing variant of 'Flogger' will equip any future large aircraft carriers built for the Soviet Navy.

There are believed to be about 750 'Flogger B/G' interceptors in the 2,500-strong Voyska PVO air defence interceptor force, and a total of 1,400 'Flogger-B/D/G/J' variants in Frontal Aviation regiments. Other Warsaw Pact air forces operate mainly 'Flogger-B/C/H'. Algeria, Cuba, Iraq, and Libya have 'Flogger-E/F'; Egypt, Ethiopia, Syria, and Vietnam have 'Flogger-F'.

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. Leading-edge flap on outboard two-thirds of each main (variable-geometry) wing panel. Horizontal tail surfaces operate differentially and collectively for aileron and elevator functions respectively. Conventional rudder. *(Data for current Soviet AF MiG-23MF follow.)*

Power Plant: one Tumansky R-29B turbojet engine, rated at 27,500 lb st with max afterburning. Variable-geometry air intakes and variable nozzle. Provision for external fuel tank on 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 2.35 at height, Mach 1.1 at sea level, service ceiling 61,000 ft, combat radius 560–745 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 rocket packs, air-to-air missiles (NATO 'Apex' and 'Aphid'), or various other stores.

MiG-25 (NATO 'Foxbat-A and C')

The air of mystique that had long surrounded the world's fastest combat aircraft began to disperse when Lt Viktor Belenko defected to Japan in a MiG-25 in 1976. Today, instead of being a highly secret machine for supermen, it is sighted routinely in the hands of pilots from India, and those who fly under the national markings of Algeria, Libya, and Syria. This can only reflect credit on the team headed by the late Artem Mikoyan which succeeded in making a Mach 3 aeroplane so manageable. Five versions have been identified:

MiG-25 ('Foxbat-A'). Basic interceptor designed to attack high-flying targets. Built mainly of steel, with titanium only in places subject to extreme heating, such as the wing leading-edges. Slightly reduced wing sweep towards tips, which carry anti-flutter bodies housing CW target-illuminating radar. Nose radar (NATO 'Fox Fire') of MiG-25 examined in Japan in 1976 was the most powerful fitted to any interceptor of that period but embodied vacuum tubes rather than modern circuitry, with emphasis on anti-jamming capability rather than range. ECCM standards were high. Armament comprises four air-to-air missiles on underwing pylons. Known also in USSR as E-266. Over 300 operational with Voyska PVO, others with air forces of Algeria, Libya, and Syria. Production cut back in 1977–78, reflecting new emphasis on interception of low-flying targets.

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 search 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 11.7 sec. Subsequent flights set an absolute height record of 123,524 ft and a record for climb to 121,654 ft with a two-ton payload. The engines of this version are uprated to 30,865 lb st each.

The operational version of the E-266M is probably the 'Modified Foxbat', described in the US as a tandem two-seater with an armament of four radar-homing AA-X-9 missiles plus probably four shorter-range infra-red missiles, and a radar that can display 20 targets and track four of them simultaneously. Soviet news services have reported numerous successes against simulated cruise missiles achieved by modified MiG-25s fitted with improved 'look-down/shoot-down' radar/missile systems. On one occasion the fighter detected a target flying below 200 ft at a range of 12.5 miles, fired an unarmed missile against it and achieved a theoretical 'kill'. In a later test, a UR-1 target operating at 70,000 ft was attacked successfully by a modified MiG-25 flying at 55,000 ft. *(Data for 'Foxbat-A' follow.)*

Power Plant: two Tumansky R-31 (R-266) turbojet engines, each 24,250 lb st with afterburning. Internal fuel capacity approx 30,865 lb. Electronically-controlled variable ramps in intakes.

Dimensions: span 45 ft 9 in, length 78 ft 1¾ in, height 20 ft 0¼ in, wing area 611.7 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, max combat radius 900 miles.

Armament: four air-to-air missiles. These may comprise one infra-red and one radar homing example of the AA-6 (NATO 'Acrid') under each wing. More usually, it is believed that one AA-7 (NATO 'Apex') and one AA-8 ('Aphid') are carried under each wing.

MiG-25 (NATO 'Foxbat-A') of Libyan Air Force (US Navy)

MiG-23BN (NATO 'Flogger-H') of Czechoslovak Air Force

MiG-27 (NATO 'Flogger')

This single-seat ground attack aircraft has many airframe features in common with the MiG-23, but differs in such important respects that its Soviet designation was changed to MiG-27. It appears to have the same basic power plant as the Soviet Air Force's MiG-23MF, 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. The seat and canopy are raised to improve the pilot's view. 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 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.

Two versions of the MiG-27 are known to be operational in Frontal Aviation regiments:

Flogger-D. Basic version, as described above.

Flogger-J. Generally similar to 'Flogger-D' but with equipment changes affecting shape of nose.

The 'Flogger-F/H' export counterparts of the MiG-27 are members of the MiG-23 series (which see). *(Data for 'Flogger-D' follow.)*

Power Plant: generally similar to MiG-23F, but engine rated at 25,350 lb st with afterburning.

Dimensions: as for MiG-23.

Weights: max weapon load 7,715 lb, gross 44,310 lb.

Performance: max speed Mach 1.6 at height, Mach 0.95 at S/L, service ceiling 52,500 ft, combat radius 340–500 miles, max ferry range (3 external tanks) 1,550 miles.

Accommodation: pilot only.

Armament: one six-barrel 23 mm Gatling-type gun; bomb rack under each side of rear fuselage; five pylons for external stores, known to include rocket packs, bombs, tactical nuclear weapons, and, probably, AS-7 (NATO 'Kerry') air-to-surface missiles.

Sukhoi Su-9s (NATO 'Fishpot-B')

Sukhoi Su-15 (NATO 'Flagon-D') (Tass)

Yakovlev Yak-36MP (NATO 'Forger-A') (Tass)

Sukhoi Su-9 (NATO 'Fishpot-B')

Two-thirds of the Voyska PVO interceptor force is now made up of MiG-23MFs and Su-15s. About 200 Su-9/11 'Fishpots' remain in use, but after more than two decades of first-line service, the Su-9 must be nearing the end of its useful life. Its radar is an R1L (NATO 'Spin Scan A').

Power Plant: one Lyulka AL-7F turbojet engine; 19,840 lb st with afterburning. Provision for two external fuel tanks side by side under fuselage.

Dimensions: span 27 ft 8 in, length 55 ft 0 in.

Armament: no guns; four 'Alkali' air-to-air missiles under wings.

Sukhoi Su-11 (NATO 'Fishpot-C')

As its NATO reporting name implies, the Su-11 limited all-weather interceptor is an uprated version of the Su-9. First displayed at Domodedovo in 1967, it has a lengthened nose of less tapered form, with an enlarged centrebody for the Uragan 5B (NATO 'Skip Spin') X-band radar, and two slim duct fairings along the top of the fuselage, as on the Su-7B. Its armament is also much improved, and an uprated version of the AL-7F turbojet is installed.

Power Plant: one Lyulka AL-7F-1 turbojet engine; 22,046 lb st with afterburning.

Dimensions: span 27 ft 8 in, length 56 ft 0 in.

Weight: gross 30,000 lb.

Performance: max speed Mach 1.8 at 36,000 ft, ceiling 55,700 ft.

Accommodation: pilot only.

Armament: no guns; two air-to-air missiles (NATO 'Anab') under wings, one radar homing, one infra-red homing.

Sukhoi Su-15 (NATO 'Flagon')

First deployed with the PVO-Strany in the late sixties, the Su-15 underwent continuous refinement through the seventies, through modernisation of the avionics and added armament. Because of this, there are still around 700 'Flagons' in the Soviet home defence force, although the basic design owes much to the old Su-11, from which it inherited its original wings, tail surfaces, and cockpit section. Main innovations were the two side-by-side engines and large conical nose radome, which necessitated side intake boxes with splitter plates. Development led to a succession of significant changes, and five production 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 some of MiG-21 series, each rated at 13,668 lb st. Probably limited to small initial quantity.

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 R-13F-300 turbojets, each rated at 14,550 lb st, increasing speed and range. Uprated avionics. Major production version, operational since second half of 1973.

Flagon-F. Latest version in service, identified by ogival nose radome. Generally similar to 'Flagon-E', but with uprated engines. *(Data for 'Flagon-F' follow.)*

Power Plant: two afterburning turbojets, reported to be Tumansky R-13F2-300s; each 15,875 lb st.

Dimensions: span 34 ft 6 in, length 68 ft 0 in.

Weight: 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')

Western defence experts appear never to have been impressed with 'Fiddler', the largest purpose-designed interceptor yet put into squadron service. The Voyska PVO, on the other hand, seems in no hurry to retire the estimated 120 still equipping first-line interceptor units. These are generally designated Tu-28P in the press, but the Department of Defense prefers Tu-128. When **'Fiddler-A'** was first displayed in public, at Tushino in 1961, it carried two missiles (NATO 'Ash'), each 18 ft long, had a large blister fairing under its fuselage, and was fitted with two ventral fins. The production **'Fiddler-B'** dispensed with the fairing and ventral fins, but appeared at Domodedovo in 1967 with armament increased to four missiles.

Power Plant: two unidentified afterburning turbojet engines; each estimated at 27,000 lb st. Half-cone shockbody 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 65,600 ft, range 3,100 miles.

Accommodation: crew of two in tandem.

Armament: four air-to-air missiles (NATO 'Ash') under wings, two radar homing, two 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 Voyska PVO fighter force. The much longer dielectric nosecone fitted retrospectively to some aircraft does not indicate any increase in radar capability or aircraft performance, but simply a change of material and shape.

Power Plant: two turbojet engines, believed to be related to the Tumansky R-11 fitted in some MiG-21s; each 13,120 lb st with afterburning. Each intake houses a centrebody shock-cone.

Dimensions: span 42 ft 6 in, length 71 ft 0½ in, height 12 ft 11½ in.

Weight: gross 35,000 lb.

Performance: max speed Mach 1.1 at 35,000 ft, service ceiling 55,000 ft, combat radius 575 miles.

Accommodation: crew of two in tandem.

Armament: two air-to-air missiles (NATO 'Anab') under outer wings, with alternative infra-red or semi-active radar homing heads.

Yakovlev Yak-36MP (NATO 'Forger')

Having bred successfully a truly rare bird, in the shape of a fixed-wing VTOL combat aircraft that works, the Soviets have shown little haste in pushing their state of the art further. It is now approaching six years since the Yak-36MP was first displayed openly on board the carrier/cruiser *Kiev* during the ship's maiden voyage through the Mediterranean and North Atlantic in July 1976. The aircraft seen on that occasion were almost certainly from a pre-production series, operated by a development squadron. Detail differences were noted between aircraft; these had been standardised on the Yak-36MPs carried by the *Kiev's* sister-ship *Minsk* in 1979, and there is no reason to anticipate more advanced aircraft on the third ship of the class, *Novorossiisk*, launched in December 1978, or the fourth which was expected to be launched in late 1981. It would, however, be surprising if Soviet Frontal Aviation failed to show any interest in a type of combat aircraft which offers independence from fixed and easily-damaged runways.

The two currently-operational versions of the Yak-36MP are as follows:

Forger-A. Basic single-seat combat aircraft. Twelve appear to be operational on each Soviet carrier/cruiser, in addition to about 19 Kamov Ka-25 helicopters. Primary operational roles are assumed to be reconnaissance, strikes against small ships, and fleet defence against shadowing, unarmed maritime reconnaissance aircraft.

Forger-B. Two-seat trainer, of which one is deployed on each carrier/cruiser. Second cockpit forward of normal cockpit, with its ejection seat at lower level, under a continuous canopy. Rear fuselage lengthened to compensate for longer nose. No ranging radar or weapon pylons. Overall length about 58 ft 0 in.

The Yak-36MP has a single large turbojet, exhausting through a pair of rotating nozzles aft of the wing roots. Two lift-jets are mounted in tandem aft of the cockpit, inclined at an angle so that their thrust is exerted both upward, and slightly forward. As the main vectored-thrust nozzles turn up to 10° forward of vertical during take-off and landing, the total of four effluxes can be envisaged as forming a V under the fuselage. Only vertical take-offs were observed during operations from the *Kiev* and *Minsk*. It is difficult to conceive how STOL take-off could be effected with such a power plant arrangement, which also seems to rule out the possibility of thrust vectoring in forward flight, which has proved such an advantage on the Harriers of the US Marine Corps. Puffer-jets at the wingtips and tail help to give the Yak-36MP commendable stability during take-off and landing.

Power Plant: one unidentified turbojet, without afterburner, based possibly on the Lyulka AL-21; thrust estimated at 17,500 lb. Two Koliesov lift-jets; each estimated at 8,000 lb st.

Dimensions: span 24 ft 0 in, length 50 ft 0 in.

Weight: gross 25,500 lb.

Performance: max speed Mach 1.1 at height, service ceiling 39,375 ft, combat radius 115–230 miles.

Accommodation: pilot only.

Armament: four pylons under inner wings for estimated 3,000 lb of stores, including short-range air-to-surface missiles, air-to-air missiles, gun pods, rocket packs, bombs, and auxiliary fuel tanks.

Attack Aircraft

New Sukhoi Close Support Aircraft

Since 1978 there have been persistent reports concerning a Sukhoi counterpart to USAF's A-10 Thunderbolt II single-seat close support combat aircraft. A prototype is said to have been observed first by satellite at Ramenskoye flight test centre, leading to US designation of the type as Ram-J. The Pentagon has suggested that, in general configuration, Ram-J is more like the Northrop A-9A *(see 1972–73 Jane's)* than the A-10. No reliable illustration is yet available, but it is said to be smaller than the A-10 and powered by two Tumansky R-13-300 non-afterburning turbojets, each rated at 11,240 lb st. Normal T-O weight is quoted as 36,050 lb, including 500 kg bombs, rocket pods, or missiles on each of two underfuselage and eight underwing weapon pylons. Like the A-10, Ram-J is said to have also a heavy-calibre Gatling-type gun. It is expected to be fully operational with Soviet tactical air forces by 1983–84.

Sukhoi Su-7 (NATO 'Fitter-A')

About a dozen countries continue to operate this sweptwing counterpart of the Su-9/11 interceptor, but no more than 160 are thought to await replacement in the Soviet Union's own tactical air forces. Standard versions are as follows:

Su-7B. First production model. Pitot boom mounted centrally above air intake. Fuselage and tail unit almost identical with those of Su-9.

Su-7BKL. Introduced two slim duct fairings along top of fuselage, as on Su-11. Pitot offset to starboard.

Su-7BM. As Su-7BKL, but with uprated engine, twin brake-chutes in container at base of rudder, and larger blast panels forward of wing-roots.

Su-7BMK. Short-field version of 7BM with JATO attachments and low-pressure nosewheel tyre, necessitating bulged doors to enclose it when retracted. *(Data for this version follow.)*

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 155–215 miles.

Accommodation: pilot only.

Armament: two 30 mm NR-30 guns in wing roots, each with 70 rounds; underwing pylons for two 1,650 lb and two 1,100 lb bombs, including nuclear weapons, or rocket pods. External weapon load reduced to 2,200 lb when two underbelly fuel tanks are carried.

Sukhoi Su-17, Su-20, and Su-22 (NATO 'Fitter-C, D, E, F, G, H, and J')

The original prototype of this family of aircraft, known to NATO as 'Fitter-B', was simply an Su-7 with about 13 ft of each wing pivoted, outboard of a very large fence. By the time the Sukhoi Bureau had introduced also a more powerful engine and improved avionics, the variable-geometry 'Fitter' was seen to be in a completely different class from 'Fitter-A'. A doubled external load could be lifted from strips little more than half as long as those needed by the original fixed-wing aircraft; it could then be carried about 30% further and delivered with greater accuracy. The resulting ground attack fighter now serves with both Frontal Aviation regiments, which have about 650 in first-line units, and Soviet Naval Aviation, which deploys about 40 in the Baltic Sea area for antishipping strike and amphibious support roles. Variations in equipment fit in these aircraft and others exported to 12 other air forces have led to use of the following type designations:

Su-17 ('Fitter-C'). Basic single-seat attack aircraft for Frontal Aviation, with Lyulka AL-21F-3 turbojet. Manual wing sweep control. Fuselage diameter constant between wing and tailplane. Curved dorsal fin between tail fin and dorsal spine fairing. Equipment said to include SRD-5M (NATO 'High Fix') I-band centrebody ranging radar, ASP-5ND fire control system, Sirena 3 omni-directional radar homing and warning system, and SRO-2M IFF. Serves also with Soviet Navy.

Su-17 ('Fitter-D'). Generally similar to 'Fitter-C', but forward fuselage lengthened by about 1 ft 3 in. Added undernose radome for terrain avoidance. Laser marked target seeker in intake centrebody.

Su-20 ('Fitter-C'). Export counterpart of Soviet basic 'Fitter-C', with reduced equipment standard. Supplied to Algeria, Czechoslovakia, Egypt, Iraq, Poland, and Vietnam.

Su-22. Variant of Su-20 first delivered to Peru in 1977 (48 single-seat, 4 two-seat) and subsequently to Libya, Syria, and North and South Yemen. 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') surface-to-air missiles. Weapons include 'Atoll' air-to-air missiles.

It has been known for some years that aircraft of the Su-17/20/22 series have been delivered with two different types of engine. 'Fitter-C and D' operated by the Soviet Air Forces have a rear fuselage of basically constant diameter between the wing and tailplane, and are known to be powered by a Lyulka AL-21F-3 turbojet. It was assumed that versions with a more bulged rear fuselage were export aircraft with a lower-rated engine. In fact, the Peruvian Air Force has stated that its Su-22s have a Tumansky R-29B turbojet, as fitted in the MiG-27, with a considerably higher rating than the AL-21F-3. It must be assumed that this is the standard power plant of all 'Fitters' with a heavily bulged rear fuselage.

It is not yet possible to relate to the Su-17, Su-20 and Su-22 type numbers the unclassified NATO reporting names allocated to later variants of the variable-geometry 'Fitter' which follow:

Fitter-E. Tandem two-seat trainer for Soviet Air Force. Generally similar to 'Fitter-C' but entire fuselage forward of wing drooped slightly to improve view from rear seat. Port wing-root gun deleted.

Fitter-F. Export counterpart of 'Fitter-D', with undernose radome. Single-seat. Gun in each wing-root. Tumansky R-29B turbojet, rated at 25,350 lb st with afterburning, in increased-diameter rear fuselage. Operators include Peruvian Air Force.

Fitter-G. Developed two-seater, with combat capability. Lyulka engine. Deepened dorsal spine fairing. Drooped front fuselage like 'Fitter-E'. Taller fin with straight top. Shallow ventral fin. Starboard gun only. Laser target seeker fitted.

Fitter-H. Improved single-seater for Frontal Aviation, basically as 'Fitter-C', with Lyulka engine. Wide and deep dorsal fairing aft of canopy, almost certainly providing additional fuel tankage. Taller fin of 'Fitter-G', with curved dorsal fin. Shallow ventral fin. Retains both wing-root guns. Small pylon for external store under wing centre-section on each side.

Fitter-J. Generally similar to 'Fitter-H' but with Tumansky engine. More angular dorsal fin.

In early 1980, a photograph of an unidentifiable tandem two-seat version was published in the Soviet press. This has the increased-diameter rear fuselage and fin shape of 'Fitter-F', and the front fuselage droop of 'Fitter-E'. The width and depth of the dorsal spine are increased aft of the rear canopy. Other features include a ventral fin, and a laser seeker in the intake centrebody like that of 'Fitter-D'. *(Data for Su-17 'Fitter-C' follow.)*

Power Plant: one Lyulka AL-21F-3 turbojet, rated at 24,700 lb st with afterburning. Internal fuel capacity 1,200 gallons. Up to four 211 gallon drop-tanks under fuselage and wings.

Dimensions: span 45 ft 11¼ in spread, 34 ft 9½ in swept; length 61 ft 6¼ in; height 15 ft 7 in; wing area 431.6 sq ft spread, 400.4 sq ft swept.

Weights: empty 22,046 lb, take-off clean 30,865 lb, gross 39,020 lb.

Performance: max speed Mach 2.17 at height, Mach 1.05 at sea level, ceiling 59,050 ft, combat radius 340–560 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 8,820 lb of bombs, including nuclear weapons, rocket pods, and guided missiles such as the air-to-surface AS-7 (NATO 'Kerry').

Sukhoi Su-24 (NATO 'Fencer')

Although smaller and lighter than USAF's F-111, this variable-geometry attack aircraft brings entirely new capability to Soviet Frontal Aviation. Lt Gen Donald R. Keith, US Army Deputy Chief of Staff for Research, Development and Acquisition, has said that 'Fencer' is credited with having terrain-avoidance radar, in addition to nav/attack radar, and "has the capability to deliver ordnance in all weather within 180 ft of its target". The radar dish appears to have a diameter of at least 49 in, and is reported to be of the pulse-Doppler type. Equipment includes a laser rangefinder and marked target seeker.

'Fencer' entered squadron service in December 1974, as a replacement for the Yak-28 ('Brewer'). At least 400 are now serving with first-line squadrons in the European theatre, including two full regiments at Tukums in Latvia, near the Gulf of Riga, and at Chernyakhovsk, near Kaliningrad on the Soviet Baltic coast. There are two more at Starokonstantinov and Gorodok in the Ukraine, and a single regiment in the Soviet Far East. No 'Fencer' was allowed to fly outside the Soviet Union or its home waters until July 1979, when an Su-24 regiment was

Sukhoi Su-7BM (NATO 'Fitter-A') of Egyptian Air Force (Denis Hughes)

Sukhoi Su-20 (NATO 'Fitter-C') of Egyptian Air Force (Denis Hughes)

Sukhoi Su-24 (NATO 'Fencer-A')

Ilyushin Il-18 (NATO 'Coot-A') (Royal Air Force)

MiG-21RF (NATO 'Fishbed-H') of Polish Air Force (Royal Danish Air Force)

MiG-25R (left to right: NATO 'Foxbat-D' and 'B') (Tass)

Tupolev Tu-126 (NATO 'Moss')

Yakovlev Yak-28 (NATO 'Brewer-D') (Flug Revue)

deployed briefly with the 16th Air Army, at Templin air base, north of Berlin in East Germany. Following this, photographs of the aircraft became available for publication.

The Su-24 was the first modern Soviet fighter assigned specifically for ground attack and the first to carry a weapon systems officer, in the side-by-side two-seat cockpit. Wing sweep appears to be about 16° in the fully spread position, and 68° fully swept. The outer panels carry the first pivoting pylons seen on a Soviet variable-geometry aircraft. RAF assessment suggests that it has five times the weapon load and five times the range of its immediate predecessor, enabling it to reach any target in England from East German advanced bases.

Power Plant: two unknown afterburning turbojets; possibly Tumansky R-29B, each rated at 25,350 lb st, or Lyulka AL-21F. Internal fuel capacity estimated at 3,435 gallons. Provision for large drop-tank on each glove pylon.

Dimensions: span 56 ft 3 in spread, 31 ft 3 in swept, length 69 ft 10 in, height 18 ft 0 in.

Weight: gross 87,080 lb.

Performance: max speed above Mach 2 at height, service ceiling 57,400 ft, combat radius (lo-lo-lo) over 200 miles, (hi-lo-hi, with 4,400 lb weapons and two external tanks) 1,115 miles.

Armament: one gun on port side of belly; eight pylons under fuselage, wing-root gloves, and outer wings for 17,635 lb of guided and unguided air-to-surface weapons, including nuclear weapons.

Reconnaissance, ECM, and Early Warning Aircraft

Antonov An-12 (NATO 'Cub-B and C')

The large hold of this four-turboprop transport can accommodate a wide variety of equipment for special duties. Two variants may be identified by NATO reporting names:

Cub-B. Conversion of 'Cub-A' transport for electronic intelligence (elint) missions. An example photographed over international waters by the pilot of a Swedish combat aircraft had four additional blister fairings under the forward- and centre-fuselage, plus other antennae. Few produced.

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. About 30 in service with both Soviet Air Force and Navy.

Ilyushin Il-14 (NATO 'Crate')

The traditional Soviet reluctance to discard any aircraft that remains airworthy is exemplified by the variety of types that have been adapted for reconnaissance, ECM, and other support duties after replacement in their primary roles. Thus, small numbers of Il-14 transports, each powered by two 1,900 hp Shvetsov ASh-82T piston engines, are operated on ECM and reconnaissance tasks by the Warsaw Pact air forces.

Ilyushin Il-18 (NATO 'Coot-A')

This ECM or electronic intelligence (elint) aircraft appears to be a conversion of the standard Il-18 four-turboprop transport (see under *Transports* heading). An under-fuselage container, about 33 ft 7½ in long and 3 ft 9 in deep, is assumed to house side-looking radar. Smaller containers on each side of the forward fuselage each contain a door over a camera or other sensor. About eight antennae and blisters can be counted on the undersurface of the centre and rear fuselage, plus two large plates projecting above the forward fuselage.

Ilyushin Il-76 (NATO 'Candid')

As a replacement for the limited-value Tu-126 in the AWACS role, the Soviets are evaluating several Il-76 transport aircraft equipped with an over-fuselage rotating 'saucer' radome. Other modifications to these aircraft include installation of AWACS avionics in the main cabin, and addition of an in-flight refuelling probe. Up to 30 Il-76s are expected to be operational in this form by the mid-eighties, by which time the shortcomings that make the Tu-126's radar of little use overland should have been overcome.

MiG-21 (NATO 'Fishbed-H')

Two versions of this supersonic single-seat fighter are operated by the Soviet Air Forces and their allies as specialised tactical reconnaissance aircraft:

MiG-21R ('Fishbed-H'). Basically similar to MiG-21PFMA, but with a pod housing forward-facing or oblique cameras, infra-red sensors, or ECM devices, and fuel, carried on the fuselage centreline pylon. Suppressed antenna at mid-fuselage; optional ECM equipment in wingtip fairings.

MiG-21RF ('Fishbed-H'). Generally similar to MiG-21R, but based on MiG-21MF. Total of 175 'Fishbed-Hs' of both models estimated in service with Soviet tactical air forces.

MiG-25 (NATO 'Foxbat-B and D')

Although generally similar to the basic MiG-25 interceptor, the reconnaissance variants have a modified wing and, carrying no external weapons, are not limited to Mach 2.8. Two versions have been identified in service, as follows:

MiG-25R ('Foxbat-B'). Basic reconnaissance version, with five camera windows and various flush dielectric panels aft of very small dielectric nosecap for radar. Equipment believed to include Doppler navigation system, and side-looking airborne radar (SLAR). No armament. Slightly reduced span. Wing leading-edge sweep constant from root to tip. Total of about 160 'Foxbat-Bs and Ds' estimated in service with Soviet tactical air forces. 'Foxbat-B' also operational in Algeria, Libya, Syria, and with No. 106 Squadron of the Indian Air Force.

MiG-25R ('Foxbat-D'). Similar to 'Foxbat-B', but with larger SLAR dielectric panel, further aft on side of nose, and no cameras. Supplied to Libya, with 'Foxbat-Bs'.

Dimension: span 44 ft 0 in.

Weights ('Foxbat-B'): basic operating 43,200 lb, gross 73,635 lb.

Performance: max speed Mach 3.2 at height, service ceiling 88,580 ft, operational radius 680 miles.

Mil Mi-4 (NATO 'Hound-C')

Superseded by turbine-powered helicopters in their original transport and anti-submarine roles, Mi-4s continue in service with support units. A version first identified in 1977 is known to NATO as 'Hound-C'. The multiple antennae of a communications jamming system project from the front and rear of the cabin, on each side.

Power Plant: one Shvetsov ASh-82V piston engine; 1,700 hp.

Dimensions: rotor diameter 68 ft 11 in, length of fuselage 55 ft 1 in, height 17 ft 0 in.

Weight: gross 17,200 lb.

Mil Mi-8 (NATO 'Hip-D')

This medium-size helicopter has been adapted for electronic duties, under the following NATO reporting name:

Hip-D. Generally similar to 'Hip-C' transport, but with canisters of rectangular section on outer stores racks, and added antennae.

Tupolev Tu-126 (NATO 'Moss')

The Tu-126 is the Voyska PVO's counterpart to the USAF's Boeing E-3A AWACS (Airborne Warning and Control System). About ten 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.

Power Plant: four Kuznetsov NK-12MV turboprop engines; each 14,795 ehp. In-flight refuelling probe standard.

Dimensions: span 168 ft 0 in, length 181 ft 1 in, height 52 ft 8 in, wing area 3,349 sq ft.

Weight: gross 374,785 lb.

Performance: max speed 528 mph, normal operating speed 404 mph, max range without flight refuelling 7,800 miles.

Accommodation: crew of twelve.

Armament: none.

Yakovlev Yak-28 (NATO 'Brewer')

The original 'Brewer-A, B, and C' versions of the Yak-28 were two-seat tactical attack aircraft, with the navigator/bomb-aimer stationed in the glazed nose. Most have been switched from first-line attack to support roles, and Yak-28s now operational include the following two versions:

Brewer-D. Reconnaissance aircraft, carrying cameras instead of weapons in its internal bomb-bay. About 200 operational.

Brewer-E. Deployed in 1970 as the first Soviet operational ECM escort aircraft, with an active ECM pack built into its bomb-bay, from which the pack projects in cylindrical form. No radome under front fuselage, but many

other additional antennae and fairings are apparent. A rocket pod can be carried under each outer wing, between the external fuel tank and balancer wheel housing. About 40 estimated in service.

Dimensions, weight, and **performance** should be in the same order as those of the Yak-28P ('Firebar') interceptor (which see).

Transports

Antonov An-12BP (NATO 'Cub')

Replacement of the An-12BP with four-turbofan Il-76s has been under way since the mid-seventies, but 'Cubs' continue to form the mainstay of the Soviet VTA (Military Transport Aviation) service. About 400 remain, but what should not be forgotten is that in a time of need VTA can call upon the huge reserve offered by the Soviet state airline Aeroflot. This puts at its disposal another 200 An-12s and Il-76s, plus about 1,100 medium- and long-range passenger transports, and several thousand short-range transports and helicopters. An-12s also fly still in the insignia of more than 10 foreign air forces.

Layout of the basic An-12BP transport version (NATO 'Cub-A') is conventional for a freighter, with access to the hold via a ramp-door which forms the bottom of the upswept rear fuselage when closed. This ramp-door is made in two longitudinal halves, which can be hinged upward inside the cabin to permit direct loading from trucks on the ground, or airdropping of supplies and equipment. A full load of 100 paratroops can be despatched via this exit in under one minute. The 'Cub-B and C' elint and ECM versions are described separately.

Power Plant: four Ivchenko AI-20K turboprop engines, each 4,000 ehp.
Dimensions: span 124 ft 8 in, length 108 ft 7¼ in, height 34 ft 6½ in, wing area 1,310 sq ft.
Weights: empty 61,730 lb, gross 134,480 lb.
Performance: max speed 482 mph, service ceiling 33,500 ft, range 2,236 miles with max payload.
Accommodation: crew of six; 44,090 lb of freight, vehicles, or 100 parachute troops. Built-in freight handling gantry with capacity of 5,070 lb.
Armament: two 23 mm NR-23 guns in manned tail turret.

Antonov An-22 (NATO 'Cock')

The prototype of this giant turboprop freighter flew for the first time on February 27, 1965; more than 50 production An-22s remain in service with the military air transport force. Each can carry a payload of up to 176,350 lb, including 'Scud-A' and 'Ganef' missiles on their tracked launchers; and the An-22 is the only Soviet transport capable of lifting a T-62 tank. Production ended in 1974.

Power Plant: four Kuznetsov NK-12MA turboprop engines; each 15,000 shp.
Dimensions: span 211 ft 4 in, length 190 ft 0 in, height 41 ft 1½ in, wing area 3,713 sq ft.
Weights: empty 251,325 lb, gross 551,160 lb.
Performance: max speed 460 mph, range 6,800 miles with 99,200 lb payload.
Accommodation: crew of five or six, 28–29 passengers in cabin forward of main freight hold. Four travelling gantries and two winches to speed freight handling.
Armament: none.

Antonov An-24 (NATO 'Coke')

Although the Soviet Air Forces operate only a few An-24s, several hundred can be put at their disposal by Aeroflot, in four main versions. The **An-24T** freighter differs from the basic passenger-carrying **An-24V** in having a belly freight door at the rear, instead of the port-side passenger door, and two ventral fins instead of one. The belly door can be opened in flight for airdropping payload or parachutists. The **An-24RV** and **An-24RT** versions differ in having a 1,985 lb st RU 19-300 auxiliary turbojet in the rear of the starboard engine nacelle, for turboprop starting and to provide additional power for take-off, climb, and cruising flight, as required. *(Data for An-24V follow.)*

Power Plant: two Ivchenko AI-24A turboprop engines; each 2,550 ehp.
Dimensions: span 95 ft 9½ in, length 77 ft 2½ in, height 27 ft 3½ in, wing area 807.1 sq ft.
Weights: empty 29,320 lb, gross 46,300 lb.
Performance: normal cruising speed 280 mph at 19,700 ft, service ceiling 27,560 ft, range 341 miles with max payload, 1,490 miles with max fuel.
Accommodation: crew of three to five; seats for 44–52 passengers in main cabin. (An-24T can carry 30 paratroops, 38 combat-equipped troops, or 24 litters instead of freight.)
Armament: none.

Antonov An-26 (NATO 'Curl')

This extremely useful twin-turboprop freighter was the first aircraft to feature Oleg Antonov's new-type rear-loading ramp. This forms the underside of the rear fuselage when retracted, in the usual way, but can be slid forward under the rear of the cabin to facilitate direct loading on to the floor of the hold, or when the cargo is to be airdropped. In other respects, the An-26 is basically an An-24RT with more powerful turboprops and a completely redesigned rear fuselage. Conversion of the standard freighter to carry troops or litters takes 20 to 30 minutes in the field. Optional equipment includes an OPB-1R sight for pinpoint dropping of freight. Max payload is 12,125 lb. The Soviet Military Transport force has a total of about 40 An-24/26s; others are flown by about 20 foreign air forces.

Power Plant: two Ivchenko AI-24VT turboprop engines; each 2,820 ehp. One 1,765 lb st RU 19A-300 auxiliary turbojet in starboard nacelle *(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 273 mph at 19,675 ft, service ceiling 24,600 ft, range 683 miles with max payload.
Accommodation: crew of five, plus station for load supervisor or despatcher. Electrically-powered mobile hoist, capacity 4,409 lb, and conveyor to facilitate loading and airdropping. Provision for carrying 40 paratroops or 24 litters.
Armament: none.

Antonov An-32 (NATO 'Cline')

Only the Indian Air Force is known to have expressed interest so far in this specialised "hot and high" short/medium-range transport. The basic airframe is similar to that of the An-26, with much more powerful turboprops, a slotted tailplane, and enlarged ventral fins. The An-32 is able to operate from airfields 13,000 to 14,750 ft above sea level in an ambient temperature of ISA + 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-72 (NATO 'Coaler')

Although the An-72 was viewed as a scaled-down copy of the much larger Boeing YC-14 AMST when photographs were first released in early 1978, it has a much simpler powered lift system, and introduced a number of special refinements of its own. The intention was to produce a STOL replacement for the An-26 that would be able to operate from unprepared airfields or from surfaces covered with ice or snow. The high location of the engines was adopted primarily to avoid problems caused by foreign object ingestion. Their efflux is ejected over the wing upper surface and then down over large multi-slotted flaps, to provide a considerable increase in lift for short-field operation, using the so-called 'Coanda effect'. Deflector doors at the rear of the engine nacelles, which 'spread' the efflux for optimum effectiveness during take-off and landing on the prototypes, are believed to have been dropped from production An-72s as an unnecessary complication. The first prototype flew on August 31, 1977; the second was shown at the 1979 Paris Air Show, by which time just over 1,000 flying hours had been logged by the two aircraft in about 300 flights. Handling in the air was described as outstanding, and a completely automatic Doppler-based navigation system is standard. Production is believed to be under way, and a brochure distributed at the 1981 Paris Air Show suggests that a special "slide-forward" ramp of the kind fitted to the An-26 will be standard also on the An-72.

Power Plant: two Lotarev D-36 high bypass ratio turbofan engines; each 14,330 lb st.
Dimensions: span 84 ft 9 in, length 87 ft 2¼ in, height 27 ft 0¼ in.
Weights: max payload 22,045 lb, gross weight 72,750 lb.
Performance: max cruising speed 447 mph, service ceiling 36,100 ft, range 2,360 miles with max fuel, or 620 miles with max payload.
Accommodation: crew of two or three on flight deck. Folding seats for 32 passengers along walls of freight hold. Provision for carrying 24 casualties and attendant in ambulance role.
Armament: none.

Ilyushin Il-18 (NATO 'Coot')

With its airline service drawing to a close, this four-

Antonov An-12BP (NATO 'Cub-A') (US Navy)

Antonov An-22 (NATO 'Cock')

Antonov An-26 (NATO 'Curl')

Antonov An-72 (NATO 'Coaler')

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. Thirteen air forces have flown passenger versions, usually in a VIP configuration. The Soviet Air Force is thought to retain about 15 in this form.

Power Plant: four Ivchenko AI-20M turboprop engines; each 4,250 ehp.
Dimensions: span 122 ft 8½ in, length 117 ft 9 in, height 33 ft 4 in.
Weights: empty 76,350 lb, gross 134,925 lb.
Performance: max cruising speed 419 mph, range 3,230 miles with max fuel, or 1,990 miles with max payload.
Accommodation: crew of five; up to 122 passengers.
Armament: none.

Ilyushin Il-76 (NATO 'Candid')

Delivery of military Il-76s to a development squadron began in 1974, only three years after the first flight of the prototype, on March 25, 1971. Since then, the expected replacement of An-12s with Il-76s has been much slower than expected, and only 140 of the four-turbofan aircraft are thought to serve currently with the VTA transport force. Aeroflot has about 40, which it uses in areas like Siberia, the north of the Soviet Union, and the Far East, where conditions are often difficult, with short, unprepared airstrips. Iraq, Czechoslovakia, and Poland are said to have ordered military Il-76s, with a rear gun turret. Others are expected to go into service with the Soviet Air Force in AWACS and flight refuelling tanker roles.

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. For the VTA, this meant that the new aircraft would carry twice the payload of its An-12BP over five times the range. Design features include rear-loading ramp/doors, a T-tail, full-span leading-edge slats, and triple-slotted flaps for good field performance, a navigator's station in the glazed nose, with ground-mapping radar in a large undernose fairing, and a unique and complex 20-wheel landing gear. The entire accommodation is pressurised, making it possible to carry 140 troops as an alternative to freight. 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 25 official records set by the Il-76 in July 1975 includes a payload of more than 70 metric tons (154,590 lb) lifted to a height of 38,960 ft, and a speed of 532.923 mph around a 1,000 km circuit with the same load.

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; up to 140 passengers.
Armament: gun turret in tail.

Ilyushin Il-76M (NATO 'Candid') (Swedish Air Force)

Trainers

Aero L-39 Albatros of East German Air Force

MiG-15UTI (NATO 'Midget')

MiG-21U (NATO 'Mongol-B') of Czechoslovak Air Force

Aero L-29 Delfin (NATO 'Maya')

About 3,600 L-29 two-seat basic and advanced jet trainers were manufactured in Czechoslovakia between 1963 and 1974, for standardised use by the air forces of all Warsaw Pact nations except Poland, which preferred its own TS-11 Iskra, and for export. Replacement with another Czech-designed trainer, the L-39, has been under way since 1974, but L-29s can still be seen in the markings of 15 air forces.

Power Plant: one M701c500 turbojet engine; 1,960 lb st.
Dimensions: span 33 ft 9 in, length 35 ft 5½ in, height 10 ft 3 in.
Weights: empty 5,027 lb, gross 7,804 lb.
Performance: max speed 407 mph at 16,400 ft, service ceiling 36,100 ft, range 555 miles with external tanks.
Accommodation: crew of two, in tandem.
Armament: provision for two bombs of up to 220 lb, eight air-to-ground rockets, or two 7.62 mm machine-gun pods under wings.

Aero L-39 Albatros

The first prototype of the L-39 flew on November 4, 1968, and series production began in 1972 to replace the L-29 as the standard trainer of the Soviet and other air forces. Well over 1,000 have been delivered already, and the eventual production total is expected to match that of the L-29. There are three current versions:

L-39C. Basic and advanced flying trainer, delivered to the air forces of Afghanistan, Czechoslovakia, the German Democratic Republic, and the USSR.

L-39Z0. Weapon training version, with four underwing weapon stations. Strengthened wings. Exported to Iraq and Libya.

L-39Z. Weapon systems training/ground attack and reconnaissance version, with underfuselage gun and underwing weapon stations. Strengthened wings and landing gear.

Power Plant: one Ivchenko AI-25-TL turbofan engine; 3,792 lb st. *(Data for L-39C follow.)*
Dimensions: span 31 ft 0½ in, length 39 ft 9½ in, height 15 ft 7¾ in, wing area 202.36 sq ft.
Weights: empty 7,859 lb, gross (trainer, clean) 10,028 lb.
Performance: max speed 485 mph at 19,700 ft, service ceiling 37,730 ft, range 683 miles on internal fuel.
Accommodation: crew of two, in tandem.
Armament (L-39Z): underwing bombs, rockets, air-to-air missiles, or reconnaissance packs, on four hardpoints, and a 23 mm GSh-23 twin-barrel cannon in an underfuselage pod.

MiG-15UTI (NATO 'Midget')

After completing their basic and initial advanced training on the L-29 or L-39, pupil pilots of the Soviet Air Force graduate to this tandem two-seat version of the 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** (NATO 'Mongol-A') is generally similar to the MiG-21F, but has two cockpits in tandem under a sideways-hinged double canopy, larger main wheels and tyres, a one-piece forward airbrake, and repositioned pitot boom, above the air intake. It carries no guns, and exists in two forms, later production models ('Mongol-B') having a wide-chord fin and deeper dorsal spine fairing. A third variant is the **MiG-21US,** which adds SPS flap-blowing and a retractable periscope for the instructor. The **MiG-21UM** is a trainer counterpart of the MiG-21MF, with R-13 turbojet and four underwing stores pylons.

MiG-23U (NATO 'Flogger-C')

(See page 98.)

MiG-25U (NATO 'Foxbat-C')

(See page 99.)

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. Versions in service are the **Su-7UM** and **Su-7UMK,** corresponding to the single-seat "M" and "MK" respectively.

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 100.)

Sukhoi Su-17 trainer (NATO 'Fitter-E')

(See page 101.)

Tupolev Tu-22U (NATO 'Blinder-D')

(See page 96.)

Yakovlev Yak-11 (NATO 'Moose')

Operated still by more than a dozen 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, service ceiling 23,300 ft, max range 795 miles.

Armament: provision for one machine-gun and underwing practice bombs.

Yakovlev Yak-18 (NATO 'Max')

Like the Yak-11, the prototype of this primary trainer first flew in 1946. About 8,000 have since been built, mostly for the civilian or paramilitary schools at which pilots of the Warsaw Pact air forces receive their primary training, including the Soviet DOSAAF centres. The original tandem two-seat Yak-18 had a 160 hp M-11 radial engine and tailwheel landing gear. The **Yak-18U** introduced a nosewheel and longer fuselage. **Yak-18A** switched to a 300 hp AI-14RF engine and was generally cleaned up. The **Yak-18P** and **PM** were refined single-seat aerobatic variants of the 18A, and the **Yak-18PS** a tailwheel counterpart of the PM. All can still be seen. *(Data for Yak-18A follow.)*

Power Plant: one Ivchenko AI-14RF piston engine; 300 hp.

Dimensions: span 34 ft 9¼ in, length 27 ft 4¾ in, height 11 ft 0 in, wing area 183 sq ft.

Weights: empty 2,259 lb, gross 2,910 lb.

Performance: max speed 186 mph, service ceiling 16,600 ft, max range 435 miles.

Armament: none.

Yakovlev Yak-28U (NATO 'Maestro')

Although the operational Yak-28P ('Firebar') is a tandem two-seater, it was not possible to adapt the existing rear cockpit in order to produce a dual-control training version. Instead, the Yakovlev bureau had to design a completely new front fuselage for the Yak-28U. This has two individual single-seat cockpits in tandem, each with its own blister canopy. The front canopy is sideways hinged, to starboard. The higher rear canopy is rearward-sliding. A very large conical probe projects forward of the nosecone.

Yakovlev Yak-36 trainer (NATO 'Forger-B')

(See page 100.)

Yakovlev Yak-50 and Yak-52

The Yak-50 single-seat aerobatic trainer flew for the first time in 1975 and virtually swept the board in both the men's and women's events at the 1976 World Aerobatic Championships. Its configuration is almost identical to that of the earlier Yak-18PS, but it has a 360 hp engine, a reduced span with no wing centre-section, and a semi-monocoque rear fuselage instead of the Yak-18's fabric-covered steel tube structure. It has been followed by the tandem two-seat Yak-52, which differs mainly in having a tricycle undercarriage which leaves all three wheels fully exposed when retracted to reduce damage in a wheels-up landing. The Yak-52 is being manufactured in the IAv Bacau factory at Bacau in Romania to replace the Yak-18s of DOSAAF and other training organisations. *(Data for Yak-52 follow.)*

Power Plant: one Vedeneev M-14P piston engine; 360 hp.

Dimensions: span 31 ft 2 in, length 25 ft 2 in, height 9 ft 8¼ in.

Weights: empty 2,205 lb, gross 2,844 lb.

Performance: max speed 177 mph, service ceiling 19,750 ft, max range 341 miles.

Armament: none.

Tupolev Tu-22U (NATO 'Blinder-D') (Tass)

Yakovlev Yak-52, built in Romania (Brian M. Service)

Helicopters

Kamov Ka-25 (NATO 'Hormone')

About 460 Ka-25s were built in 1966–75, to replace Mi-4s in the Soviet Navy's ship and shore-based force of around 250 helicopters, and for export in small numbers to countries such as India, Syria, and Yugoslavia. Some of the tasks performed by these aircraft cannot yet be discussed, and only two variants may be identified by NATO reporting names, 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, which is much enlarged on one recently photographed Ka-25 as a container for wire-guided torpedoes. A few have a streamlined blister fairing built into the base of the central tailfin; others have a fairing of flower-pot shape, with a transparent top, above the central point of the tailboom. Each of the four wheels of the landing gear is usually enclosed in an inflatable pontoon, surmounted by inflation bottles. The rear legs are pivoted, so that the wheels can be moved into a position where they offer least interference to signals from the nose radar. Dipping sonar is housed in a compartment at the rear of the cabin, but is said to be inoperable at night or in adverse weather. An electro-optical sensor and a towed magnetic anomaly detector are carried. Ka-25s fly from cruisers of the *Kara* and *Kresta* classes, the nuclear-powered guided missile cruiser *Kirov*, the carrier/cruisers *Kiev* and *Minsk*, each of which carries 16 'Hormone-As' and 3 'Bs', and the helicopter cruisers *Moskva* and *Leningrad*, each of which accommodates about 18 aircraft.

Hormone-B. Special electronics variant, able to provide over-the-horizon targeting information for SS-N-12 'Sandbox' 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.

Other versions of which photographs have appeared in the press include a utility model, generally similar to 'Hormone-A' but with unnecessary operational equipment and weapons removed. This version sometimes has a yagi aerial mounted on the nose; it has been photographed in non-operational red and white paint finish. *(Data for 'Hormone-A' follow.)*

Power Plant: two Glushenkov GTD-3 turboshaft engines; each 900 shp.

Dimensions: rotor diameter (each) 51 ft 8 in, length of fuselage 32 ft 0 in, height 17 ft 7½ in.

Weights: empty 10,500 lb, gross 16,500 lb.

Performance: max speed 130 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.

Kamov 'Hormone Variant'

In the *Soviet Military Power* document appears a reference to the new *Sovremennyy* class of guided missile destroyers for antisurface warfare. After mentioning the ship's primary armament of guns and missiles, this item states that "The *Sovremennyy* has a secondary ASW mission and can carry **Hormone variant** helicopters in its telescoping hangar." No further details are given, but it may be worth recalling that 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." It may be of further significance that the *Udaloy*, first of a new class of Soviet ASW guided missile destroyers, which began its sea trials in November 1980, has two hangars for ASW helicopters.

Mil (WSK-PZL Swidnik) Mi-2 (NATO 'Hoplite')

More than 12,000 turbine-powered helicopters of Mil design have been manufactured, with production in the USSR continuing at a rate of more than 1,000 a year. They include the largest, fastest, and most-heavily armed types in the world; and a total of at least 3,500 are deployed with first-line units of the Soviet tactical air forces. Only type not built in the USSR is the small Mi-2, of which manufacture was transferred to the WSK-PZL at Swidnik in Poland in 1964. More than 3,000 have been delivered for military and commercial service, with the air forces of Czechoslovakia, Poland, Romania, and the Soviet Union among known operators. The USSR has received over 2,000, and production is continuing at a rate of 300 per year.

Power Plant: two Polish-built Isotov GTD-350P turboshaft engines; each 400 or 450 shp.

Dimensions: rotor diameter 47 ft 9¼ in, length of fuselage 39 ft 2 in, height 12 ft 3½ in.

Weights: basic operating 5,213 lb, gross 8,157 lb.

Performance: max speed 130 mph at 1,640 ft, service ceiling 13,125 ft, range 360 miles with max fuel, 105 miles with max payload.

Accommodation: pilot on flight deck; eight passengers, 1,543 lb of freight, or four litters and medical attendant in cabin.

Armament: provision for air-to-surface rocket pod, or

Kamov Ka-25 with underbelly container for wire-guided torpedoes

Mil (WSK-PZL Swidnik) Mi-2 (NATO 'Hoplite')

Mil Mi-6 (NATO 'Hook')

Mil Mi-8 (NATO 'Hip-C') in East German service

Mil Mi-24 (NATO 'Hind-A') (Flug Revue)

Mil Mi-24 (NATO 'Hind-D') gunships in Czechoslovak service

two 'Sagger' air-to-surface missiles, on each side of cabin.

Mil Mi-6 (NATO 'Hook')

When announced in the Autumn of 1957, the Mi-6 was the world's largest helicopter. It was also the first Soviet production helicopter fitted with small fixed wings to offload the main rotor in cruising flight. These wings are normally removed when the aircraft operates in a flying crane role, carrying external freight. More than 860 production Mi-6s are believed to have been delivered for commercial and military service, the latter with the air forces of the Soviet Union (about 500 currently operating with the tactical air forces), Algeria, Bulgaria, Egypt, Ethiopia, Iraq, Peru, Syria, and Vietnam. Task of these helicopters is to haul guns, armour, vehicles, supplies, freight, or 65–90 troops at a time, in combat areas.

Power Plant: two Soloviev D-25V turboshaft engines; each 5,500 shp.

Dimensions: rotor diameter 114 ft 10 in, length of fuselage 108 ft 10½ in, height 32 ft 4 in.

Weights: empty 60,055 lb, gross 93,700 lb.

Performance: max speed 186 mph, service ceiling 14,750 ft, range 385 miles with 17,637 lb payload.

Accommodation: crew of five; up to 90 passengers, 26,450 lb of freight, or 41 litters and two medical attendants.

Armament: some aircraft have a 12.7 mm gun in the nose.

Mil Mi-8 (NATO 'Hip')

When teamed with the Mi-24 gunship, the Mi-8 assault transport makes up the most formidable helicopter attack force in the world. Production of the Mi-8 now exceeds 7,500, and is continuing at the rate of about 750 a year. Primary task of the aircraft, for which the crews are well trained, is to put down assault troops, combat equipment, and supplies behind enemy lines, within 15–20 minutes of a nuclear or conventional bombardment/strike. Versions serving with about 40 air forces are as follows:

Hip-C. Basic assault transport. Twin-rack for stores on each side of cabin, able to carry 128 × 57 mm rockets in four packs, or other weapons.

Hip-D. For electronic duties; see page 102.

Hip-E. Described by DoD as the world's most heavily armed helicopter. Standard equipment of Soviet tactical air forces. One flexibly-mounted 12.7 mm machine-gun in nose. Triple stores rack on each side of cabin, able to carry up to 192 rockets in six suspended packs, plus 4 'Swatter' homing anti-tank missiles above racks.

Hip-F. Export counterpart of 'Hip-E'. Missile armament changed to six 'Saggers'.

Power Plant: two Isotov TV2-117A turboshaft engines; each 1,700 shp. (Developed **Mi-17** variant has TV3-117 engines, each 2,200 shp.)

Dimensions: rotor diameter 69 ft 10¼ in, length of fuselage 60 ft 0¾ in, height 18 ft 6½ in.

Weights: empty 16,007 lb, gross 26,455 lb.

Performance: max speed 161 mph at 3,280 ft, service ceiling 14,760 ft, range 311 miles as passenger transport.

Accommodation: crew of two or three; up to 32 passengers, 8,820 lb of freight, or 12 litters and attendant.

Armament: see individual model descriptions.

Mil Mi-10 (NATO 'Harke')

So impressive have been the achievements of Soviet flying crane helicopters in combat areas such as the Ogaden region of Ethiopia that the Mi-10 was reinstated in production after a six-year break. Even now, production is very limited by Soviet standards, but at least 60 Mi-10s are thought to have been delivered. Each embodies the power plant, rotor system, transmission, gearboxes, and most equipment of the Mi-6. The depth of the fuselage is reduced considerably, and the tailboom is deepened so that the flattened undersurface extends unbroken to the tail. The Mi-10 also lacks the wings of the standard Mi-6. Payloads can be carried by sling or cable, clasped under the belly, or on interchangeable wheeled platforms slung between the legs of the wide-track, stalky landing gear. Further freight, or up to 28 passengers on tip-up seats, can be accommodated in the main cabin.

Dimensions: rotor diameter 114 ft 10 in, length of fuselage 107 ft 9¾ in, height 32 ft 2 in.

Weights: empty 60,185 lb, gross 96,340 lb, max payload including platform 33,070 lb.

Performance: max speed 124 mph, service ceiling 9,850 ft, range 155 miles with 26,455 lb platform payload.

Mil Mi-14 (V-14) (NATO 'Haze')

Comparison of photographs of this aircraft and the Mi-8 transport helicopter will reveal that the Mi-14 has shorter engine nacelles, with the intakes positioned above the mid-point of the sliding cabin door. Such nacelles, found also on the Mi-24 'Hind' and new Mi-17, house TV3-117 turboshaft engines in place of the lower-rated TV2s of the Mi-8. Overall dimensions and dynamic components of the Mi-14 are generally similar to those of the Mi-8 from which it was derived. New features to suit it for its role as a shore-based anti-submarine aircraft include a boat hull of the kind used on the Sikorsky Sea King, and a sponson on each side at the rear to confer a degree of amphibious capability. The landing gear is fully retractable. Operational equipment can be seen to include a large undernose radome and a towed magnetic anomaly detection (MAD) bird stowed against the rear of the fuselage pod. About 65 Mi-14s are currently in service with the Soviet Naval Air Force, which has been able, in consequence, to retire the last piston-engined Mi-4s from its shore-based ASW units. Twelve Mi-14s have been exported to Bulgaria.

Mil Mi-24 (NATO 'Hind')

Events in Afghanistan have focused so much attention on 'Hind's' potential as a gunship that it is easy to forget that it was designed originally to deliver a squad of eight assault troops into a battlefield. Its weapons were intended then to clear a path past any tanks, guns, or other obstructions to its progress, but it was not long before training exercises caused a major change in tactics. Today, the Mi-24 is regarded as not only an anti-tank weapon, but capable itself of functioning as a high-speed, nap-of-the-earth 'tank', and of destroying enemy helicopters in air-to-air combat. During exercises, Mi-24s have operated usually as escorts to troop-carrying Mi-8s, with responsibility for suppressing anti-aircraft defences en route. A report in *Red Star* has claimed that they are "superior to other anti-tank weapons in terms of field vision, manoeuvrability and firepower; and capable of hitting armoured enemy targets while remaining out of reach of anti-aircraft weapons. The correlation between tank and helicopter losses is 12:1 or even 19:1 in the helicopter's favour." To exploit 'Hind's' proven potential, steel and titanium have been substituted for aluminium in critical components, and glassfibre-skinned rotor blades have replaced the original blade-pocket design. The helicopter is now almost invulnerable to small arms fire from the ground. Variants identified to date are as follows:

Hind-A. Armed assault transport, with large enclosed flight deck for crew of four, and places for up to eight fully-equipped troops in main cabin. Dynamic components based on those of Mi-8. Fully-retractable landing gear. Auxiliary wings of this version have considerable anhedral. One 12.7 mm machine-gun in nose; four hardpoints under stub-wings for 32-round packs of 57 mm rockets, or bombs; four 'Swatter' homing anti-tank missiles on wingtip launchers. 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 quantity.

Hind-C. Generally similar to late-model 'Hind-A' but without nose gun and undernose blister fairing, and no missile rails at wingtips.

Hind-D. Basically similar to late-model 'Hind-A', with 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 12.7 mm machine-gun in a turret with a wide range of movement in azimuth and elevation, providing air-to-air as well as air-to-surface capability. Undernose pack for sensors including possibly radar and low-light-level TV. Wing armament retained. Many small antennae and blisters. Nosewheels semi-exposed when retracted.

Hind-E. As 'Hind-D', for Soviet armed forces, but with four laser-homing 'Spiral' anti-tank missiles instead of

Swatters', and structural hardening.

Under the Soviet designation A-10, the Mi-24 has set a number of major FAI-approved records, including the current world speed record for helicopters of 228.9 mph over a 15/25 km course.

Deliveries of all models of the Mi-24 are known to exceed 1,000, with production continuing at the rate of more than 15 per month. Full regiments of these aircraft are known to have been based at Parchim and Stendal, northwest and west of Berlin, near the border with the German Federal Republic, since the Spring of 1974. Other operators include the air forces of Afghanistan, Algeria, Bulgaria, Czechoslovakia, East Germany, Hungary, Iraq, Libya, Poland, and South Yemen. *(Data for 'Hind-A' follow.)*

Power Plant: two Isotov TV3-117 turboshaft engines; each 2,200 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: see individual model descriptions.

Mil Mi-26 (NATO 'Halo')

Design of the Mi-26 heavy-lift helicopter began in the early 1970s to meet the requirement for an aircraft of greater capability than the Mi-6 and Mi-10. Except for the four-engined twin-rotor Mi-12, which did not progress beyond prototype testing, it is the heaviest helicopter yet flown anywhere in the world. Its rotor diameter is smaller than that of the Mi-6 and Mi-10, but this is offset by the fact that the Mi-26 is the first helicopter to operate successfully with an eight-blade main rotor. Other features include a payload and cargo hold very similar in size to those of a C-130 Hercules, loading via clamshell doors and ramp at the rear of the cabin pod, and main landing gear legs which are adjustable individually in length to permit landing on a slope.

By mid-1981 the Mi-26 had completed two years of flight development, and production was said by representatives of the Mil Bureau to be imminent. The helicopter has obvious military applications.

Power Plant: two Lotarev D-136 turboshaft engines; each 11,400 shp.
Dimensions: rotor diameter 105 ft 0 in, length of fuselage 110 ft 8 in, height 26 ft 5¼ in.
Weights: empty 62,170 lb, gross 123,450 lb, max payload 44,090 lb.
Performance: max speed 183 mph, service ceiling 14,760 ft, range 497 miles.
Accommodation: crew of five; about 40 tip-up seats along side walls of hold.

Mil Mi-26 (NATO 'Halo')
(Brian M. Service)

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 320 remain operational, mostly near the western borders of the Soviet Union but some east of the Urals, targeted on China. Replacement with SS-20s is being maintained at the rate of one every five days. The age of the weapon system is indicated by the fact that about 12 tractors with special trailers, and 20 men, are needed to transport, erect, and fire the SS-4.

Power Plant: one four-chamber RD-214 liquid-propellant (nitric acid/kerosene) sustainer; 163,142 lb thrust in vacuo.
Guidance: inertial.
Warhead: alternative nuclear (1 megaton) or high-explosive.
Dimensions: length 77 ft 0 in, diameter 5 ft 7 in.
Launching weight: 60,000 lb.
Performance: max speed Mach 6.7, max range 1,200 miles.

SS-5 (NATO 'Skean')

About 35 of these intermediate-range missiles supplement SS-4s and SS-20s in the 600-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 2,500 miles.

SS-11 (NATO 'Sego')

About 580 of these 'light' ICBMs remain in their silos. Replacement of a proportion of the original force with new SS-17s appears to have been completed; others are expected to make way for SS-19s. No photograph of an SS-11 has ever been identified. It is believed to be about 3 ft shorter than the SS-13, with no space between its liquid-propellant stages. Two versions remain operational:

SS-11 Mod 2. Differs from now-retired Mod 1 in being fitted with penetration aids. Single re-entry vehicle, of slightly higher yield than that of the comparable US Minuteman, but considerably less accurate.

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')

In the Minuteman category; only 60 SS-13s are deployed.

Power Plant: three-stage solid-propellant.
Guidance: inertial, offering CEP of 2 km (1¼ miles).
Warhead: nuclear (1 megaton).
Dimensions: length 66 ft 0 in, max diameter 6 ft 6 in (first-stage skirt).
Performance: range 6,200 miles.

SS-X-16

About the same size as USAF's Minuteman, the SS-X-16 was the only solid-propellant missile among the new generation of Soviet ICBMs. It promised particular problems for the US at one time, being designed for mobile deployment and having a relationship to the SS-20 which meant that, 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. In fact, the SS-X-16 has never been deployed. It was fitted with a post-boost vehicle (PBV, known in the US as a bus-type dispensing system), but was tested with only a single re-entry vehicle. Its range was at least 5,000 miles.

SS-17 (Soviet designation RS-16)

Known in the Soviet Union as the RS-16, this two-stage "light" liquid-propellant ICBM (which the US designates SS-17) is designed for cold launch. This means that it is "popped" out of its silo by a gas generator before the main booster motors are fired. As a result the silo is not heavily damaged and could be reloaded, although this would be a slow process. Since 1975, a total of 150 SS-11 silos have been modified to accept SS-17 missiles, of which deployment is believed to be complete. Two versions are operational, as follows:

SS-17 Mod 1. With four 900 kiloton MIRVs, shaped for high-speed atmospheric re-entry to ensure greater accuracy.

SS-17 Mod 2. With single large (5 megaton) re-entry vehicle, for capability against hard targets.

DoD believes that some of the silos modified for these and other modern Soviet ICBMs have been hardened to resist very high over-pressure.

Dimensions: length 75 ft 0 in, max diameter 8 ft 6 in.
Performance: range Mod 1 6,200 miles with CEP of around 500 m (0.3 mile), Mod 2 6,800 miles.

SS-18 (Soviet designation RS-20)

Replacement of the SS-9 (NATO 'Scarp') with 308 of these cold-launched "heavy" two-stage liquid-propellant missiles has been completed. Each has a greater throw-weight capability than any other Soviet or US ICBM, coupled with greater accuracy and flexibility than the SS-9 at the cost of a slightly reduced maximum range. Three versions are deployed:

SS-18 Mod 1. Some operational, each with single 18–25 megaton warhead, for use against deep underground shelters.

SS-18 Mod 2. Major current operational version, with eight to ten relatively large (2 megaton) MIRVs dispensed by a post-boost vehicle (PBV) similar to that employed on the US Minuteman III and Poseidon missiles.

SS-18 Mod 3. Longer-range version, with single re-entry vehicle lighter and more accurate than that of Mod 1, which it may ultimately replace. Crew training launches began in February 1976, CEP better than 590 ft achieved in trials.

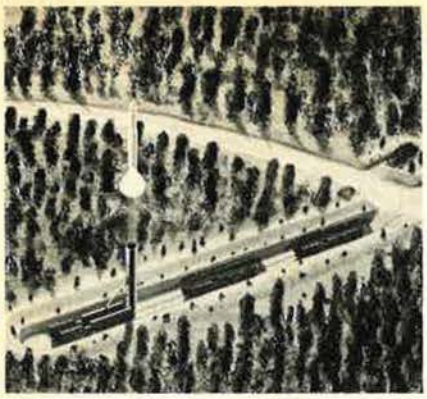
Dimensions: length 118 ft 0 in, max diameter 10 ft 0 in.
Performance: range Mod 1 7,450 miles, Mod 2 6,800 miles, Mod 3 9,940 miles.

SS-19 (Soviet designation RS-18)

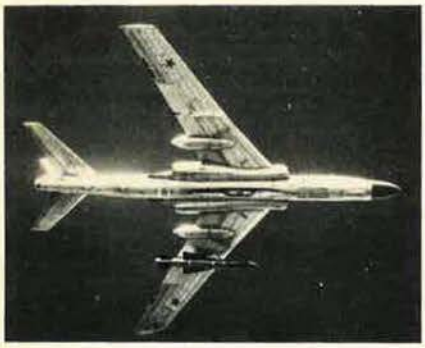
Like the SS-17, the SS-19 is rated as a "light" ICBM, and is replacing older SS-11s. It is a hot-launched two-

SS-4 (NATO 'Sandal')

SS-13 (NATO 'Savage')



Artist's impression of SS-20 launch area



AS-6 (NATO 'Kingfish') under wing of Tu-16, showing for the first time the underbelly recess for carrying AS-2 (NATO 'Kipper') (Royal Danish Air Force)

stage liquid-propellant missile, with a range of 5,950–6,200 miles. Being longer than the SS-11 and SS-17, it requires more extensive modification to existing silos in which it is emplaced; yet at least 300 are already operational. This lends weight to DoD's belief that the SS-19's combination of accuracy and yield makes it the most capable of the current generation of Soviet ICBMs, although it carries fewer re-entry vehicles than the SS-18 Mod 2. Testing began in 1974, leading to rapid deployment of the **SS-19 Mod 1,** with a MIRVed payload of six re-entry vehicles (each 550 kilotons yield). A **Mod 2** version, with a single large (5 megaton) re-entry vehicle, has been tested. Under the terms of SALT II, all SS-17, SS-18, and SS-19 silos would have counted as MIRVed missile launchers, since these ICBMs have been tested in a MIRV mode.

SS-20

This mobile solid-propellant IRBM, which consists of the first two stages of the SS-X-16 ICBM, represents the most formidable Soviet threat to NATO nations in Western Europe. It would not, however, have been subject to any restrictions under SALT II, as its range is less than 5,500 km (3,417 miles). About 250 had been deployed by July 1981, each with a MIRVed payload of three re-entry vehicles (yield of each 150 kilotons). CEP is reported to be about 2,500 ft when the SS-20 is fired from its tracked carrier/launcher at a pre-surveyed site, and the vehicle offers a multiple reload capability. Eventual force total is expected to be 300/400 plus reloads. SS-20s could reach the Aleutian Islands and western Alaska from present and likely deployment areas in the eastern USSR, but could not reach the contiguous 48 States.

AS-3 (NATO 'Kangaroo')

When comparing the range of Soviet air-to-surface and submarine-launched cruise missiles with their US counterparts, it is important to remember that the Soviet requirement for long range is minimal. Fifty-five important US cities with some 74,000,000 inhabitants are within 530 miles (850 km) of the 100 fathoms depth curve in the Atlantic and Pacific Oceans. Only six of the major cities in the Soviet Union, with some 2,200,000 people, are located within a similar distance of the 100 fathoms depth curve. There is, however, no doubt about Soviet capability to develop a strategic cruise missile if it were required. Largest current Soviet air-to-surface missile is the AS-3, which resembles a sweptwing jet fighter in size and configuration, and was displayed for the first time under its Tu-95 carrier aircraft on Aviation Day 1961. It is known still to be operational with alternative nuclear (500 kiloton) or high-explosive (5,070 lb) warhead on about 75 Tu-95 'Bear-B' and 'C' bombers.
Guidance: initial beam-riding; subsequent pre-programmed flight under autopilot control.
Dimensions: span 30 ft 0 in, length 48 ft 11 in.
Weight: 17,600 lb.
Performance: max speed Mach 1.8, range 400 miles.

AS-4 (NATO 'Kitchen')

Developed as a stand-off weapon for the Tu-95 and Tu-22 strategic bombers, and now carried also by the variable-geometry 'Backfire', the AS-4 was first seen on a single Tu-22 ('Blinder-B') in 1961. Most of the 22 Tu-22s which participated in the 1967 Aviation Day display at Domodedovo carried an AS-4, semi-submerged in the fuselage, and production by 1976 was stated by the UK Defence Minister to be around 1,000. The missile, which has been seen in more than one form, has an aeroplane configuration, with stubby delta wings and cruciform tail surfaces. Propulsion is believed to be by liquid-propellant rocket motor. Alternative nuclear (350 kiloton) or 2,200 lb high-explosive warheads can be assumed.
Guidance: inertial, with radar terminal homing.
Dimensions: span 9 ft 10 in, length 37 ft 0 in.
Weight: 13,225 lb.
Performance: max speed above Mach 2, range 185 miles at low altitude.

AS-6 (NATO 'Kingfish')

First sighting of this air-to-surface missile was by the pilot of a Japan Air Self-Defence Force F-86F, in late December 1977. When scrambled to investigate a Tu-16 ('Badger') flying 50 miles to the north of the Noto Peninsula, he was able to photograph the aircraft which was carrying a 'Kingfish' under its port wing. The missile has a cylindrical body with ogival nose; two short-span, long-chord wings; and a cruciform tail unit with folding ventral fin. Propulsion is said to be by liquid-propellant rocket motor, with inertial midcourse guidance, and active radar terminal homing, giving an exceptional degree of accuracy. The warhead can be either nuclear (200 kiloton) or 2,200 lb high-explosive. Primary carrier was expected to be the variable-geometry 'Backfire'; there has been no evidence of this, but Tu-16s have been seen frequently with 'Kingfish' under one or both wings.
Dimensions: span 8 ft 2½ in, length 34 ft 6 in.
Weight: 11,000 lb.
Performance: max speed Mach 3, range 135 miles at low altitude.

Airborne and Tactical Defence Missiles

AS-2 (NATO 'Kipper')

First seen 21 years ago, at the 1961 Aviation Day display, this aeroplane-configuration missile, with underslung turbojet engine, was described by the commentator at Tushino as an anti-shipping weapon. Radar is carried in the nose of the Tu-16 carrier aircraft, and guidance is believed to comprise initial beam-riding, subsequent pre-programmed flight under autopilot control, and active radar terminal homing. A 2,200 lb high-explosive warhead is fitted.
Dimensions: span 16 ft 0 in, length 31 ft 0 in.
Weight: 9,260 lb.
Performance: max speed Mach 1.2, range 130 miles.

AS-5 (NATO 'Kelt')

According to the UK Minister of Defence, well over 1,000 AS-5s had been delivered by the Spring of 1976. About 25 were used operationally during the October 1973 war between Israel and the Arab states, when Tu-16s from Egypt launched them against Israeli targets. Only five eluded the air and ground defences, to hit a supply depot and two radar sites in Sinai.

The transonic AS-5 has a similar aeroplane-type configuration to that of the turbojet-powered AS-1 ('Kennel') which it superseded. The switch to liquid rocket propulsion eliminated the need for a ram air intake, and permitted the use of a larger radar inside the hemispherical nose fairing. Guidance is said to be by autopilot on a pre-programmed flight path, with radar terminal homing which can be switched from active to passive as required. A 2,200 lb high-explosive warhead is standard.
Dimensions: span 15 ft 0 in, length 31 ft 0 in.
Performance: max speed Mach 1.2 at 30,000 ft, Mach 0.9 at low level, max range 200 miles.

AS-7 (NATO 'Kerry')

Carried by the Su-17 'Fitter' and Yak-36 'Forger', this tactical air-to-surface missile is said to have a single-stage solid-propellant rocket motor, radio command guidance system, and 220 lb high-explosive warhead.
Dimension: length 11 ft 6 in.
Weight: 2,640 lb.
Performance: max speed Mach 0.6, max range 7 miles.

AS-X-9

A reported anti-radiation missile, with a range of 50–56 miles, to arm the Su-24 ('Fencer').

AT-2 (NATO 'Swatter')

This standard Soviet anti-tank weapon formed the original missile armament of the Mi-24 ('Hind-A and D') helicopter gunship, and is carried by the 'Hip-E' version of the Mi-8. 'Swatter' is steered in flight via elevons on the trailing-edges of its rear-mounted cruciform wings, and embodies terminal homing.
Dimensions: span 2 ft 2 in, length 2 ft 11½ in.
Weight: 55 lb.
Performance: cruising speed 335 mph, range 985–7,220 ft.

AT-3 (NATO 'Sagger')

In conformity with the Soviet practice of not supplying advanced equipment on its export aircraft, the wire-guided 'Sagger' replaces 'Swatter' on the 'Hip-F' version of the Mi-8, as well as arming the Polish-built Mi-2.
Dimensions: span 1 ft 6 in, length 2 ft 10¼ in.
Weight: 25 lb.
Performance: speed 270 mph, range 1,650–9,850 ft.

AT-6 (NATO 'Spiral')

Unlike previous Soviet helicopter-launched anti-tank missiles, 'Spiral' does not appear to have a surface-launched application. Few details are yet available, except that it is tube-launched, and homes on targets illuminated by a laser designator. It equips the 'Hind-E' version of the Mi-24, and is said to have a range of 4.3 to 6.2 miles.

AA-1 (NATO 'Alkali')

First Soviet air-to-air missile to become operational, 'Alkali' equipped the older generation of Voyska PVO 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 and Sukhoi Su-22. 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.

AA-2-2 (NATO 'Advanced Atoll')

The multi-role versions of the MiG-21 (NATO 'Fishbed-J, K, L, and N') can carry a radar homing version of 'Atoll' on the outer stores pylon under each wing, in addition to a standard infra-red homing 'Atoll' on the inboard pylon. The radar version is known as 'Advanced Atoll'.

AA-3 (NATO 'Anab')

The UK Ministry of Defence estimates production of this solid-propellant air-to-air missile as being "in the thousands". It was first observed as armament of the Yak-28P all-weather fighters which took part in the 1961 Aviation Day display at Tushino. Subsequently, it became standard on the Sukhoi Su-11 and Su-15 interceptors. Each aircraft normally carries one 'Anab' with an I/J-band semi-active radar seeker and one with an infra-red homing head.

Dimensions: length 13 ft 5 in (IR) or 13 ft 1 in (SAR), body diameter 11 in, wing span 4 ft 3 in.
Performance: range over 10 miles.

AA-5 (NATO 'Ash')

Several thousand of these large air-to-air missiles have been produced as armament for the Tu-28P interceptors of Voyska PVO. The version with infra-red homing head is normally carried on the inboard pylon under each wing of the Tu-28P, with an I/J-band semi-active radar homing version on each outboard pylon.

Dimensions: length 18 ft 0 in (IR) or 17 ft 0 in (SAR).
Performance: range 18.5 miles.

AA-6 (NATO 'Acrid')

This is the air-to-air missile that was identified during 1975 as one of the weapons carried by the 'Foxbat-A' interceptor version of the MiG-25. Its configuration is similar to that of 'Anab' but it is considerably larger. Photographs suggest that the version of 'Acrid' with an infra-red homing head is normally carried on each inboard underwing pylon, with a radar homing version on each outer pylon. The wingtip fairings on the fighter, different in shape from those of 'Foxbat-B', are thought to house continuous-wave target illuminating equipment for the radar homing missiles.

Dimension: length 20 ft 0 in (radar version).
Performance: range at least 23 miles.

AA-7 (NATO 'Apex')

This long-range air-to-air missile is one of the two types carried as standard armament by interceptor versions of the MiG-23, and is reported to be an alternative weapon for the MiG-25. 'Apex' has a solid-propellant rocket motor, and is 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.

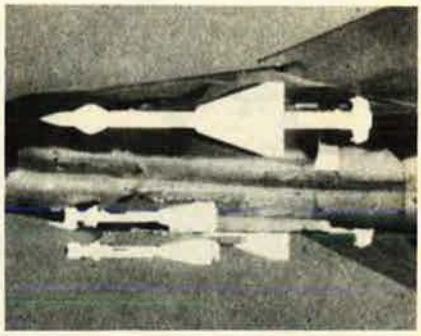
AA-8 (NATO 'Aphid')

Second type of missile carried by the MiG-23, and also by late-model MiG-21s, 'Aphid' is a close-range solid-propellant weapon with infra-red homing guidance.

Dimensions: length 6 ft 6¾ in, body diameter 5.12 in.
Weight: 121 lb.
Performance: range 3.5–5 miles.

AA-X-9

The missile known in the West as AA-X-9 is reported to have achieved successes against simulated cruise missiles, after 'look-down/snap-down' launch from a modified MiG-25 interceptor. No details are yet available.



AA-7 (NATO 'Apex') and AA-8 (NATO 'Aphid') missiles under wings and fuselage of MiG-23MF

Surface-to-Air Missiles

ABM-1B (NATO 'Galosh')

The Soviet Union deactivated half of the 64 operational launchers of its 'Galosh' ABM (anti-ballistic missile) defence system, which were deployed around Moscow, during 1980. Under the terms of the SALT I agreement, the USA and USSR were each permitted a total of 100 ABMs on launchers for the defence of their 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 64 'Galosh' sites were considered to be capable of protecting Moscow adequately against small attacks using unsophisticated missiles without penetration aids; but no attempt was made to add the other 36 launchers to the system, although Soviet ABM R&D has been continued at a high priority. It is possible, therefore, that the launcher deactivation may be a prelude to updating of the system, of which few details have ever been released. 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 nuclear warhead is fitted. Missile range is said to be over 200 miles.

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 31 miles.

SA-2 (NATO 'Guideline')

This missile is a standard anti-aircraft weapon in about 20 countries and has been operational since 1959. 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 are 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: 5,070 lb.
Performance: max speed Mach 3.5, slant range 28 miles, effective ceiling 82,000 ft.

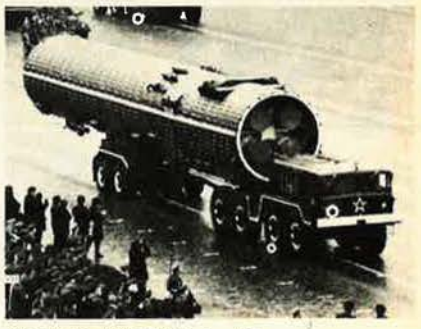
SA-3 (NATO 'Goa')

Soviet counterpart of the American HAWK, the SA-3 is deployed in increasing numbers by the Soviet Union, its allies, and friends as a mobile low-altitude system to complement the medium/high-altitude SA-2. As the **SA-N-1**, it is also the most widely-used surface-to-air missile in the Soviet Navy, fired from a roll-stabilised twin-round launcher.

Power Plant: two-stage solid-propellant.
Guidance: radio command, with radar terminal homing.
Warhead: high-explosive, weight 132 lb.
Dimensions: length 22 ft 0 in, body diameter 1 ft 6 in, wing span 4 ft 0 in.
Launching weight: 1,323 lb.
Performance: max speed Mach 2, slant range 21.75 miles, effective ceiling 49,200 ft.

SA-4 (NATO 'Ganef')

Ramjet propulsion gives this anti-aircraft missile a very long range. Its usefulness is further enhanced by its mobility, as it is carried on a twin-round tracked launch



ABM-1B (NATO 'Galosh')

SA-3 (NATO 'Goa') (Tass)

SA-5 (NATO 'Gammon') (Tass)

SA-6 (NATO 'Gainful')

SA-7 (NATO 'Grail')

SA-8 (NATO 'Gecko')

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, with semi-active radar terminal homing.
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 1,200 fixed 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 1,200 are deployed. Suggestions of a possible ABM capability were denied during the SALT II talks.

Power Plant: two-stage solid-propellant, possibly with terminal propulsion for warhead.
Guidance: semi-active radar homing.
Dimensions: length 54 ft 0 in, body diameter 2 ft 10 in, wing span 12 ft 0 in.
Launching weight: 44,090 lb.
Performance: max speed above Mach 3.5, slant range 185 miles, effective ceiling 95,000 ft.

SA-6 (NATO 'Gainful')

This mobile low-altitude weapon system took an unexpectedly heavy toll of Israeli aircraft during the October 1973 war. Its unique integral all-solid rocket/ramjet propulsion system was a decade in advance of comparable Western technology, and the US-supplied ECM equipment which enabled Israeli aircraft to survive attack by other missiles proved ineffective against the SA-6. First shown on its three-round tracked transporter/launcher, in Moscow, in November 1967, the missile has since been produced in very large quantities. Export models have been acquired by Bulgaria, Czechoslovakia, Egypt, Hungary, Iraq, Libya, Mozambique, Poland, Syria, and Vietnam.

Power Plant: solid-propellant booster. After burnout, its empty casing becomes a ramjet combustion chamber for ram air mixed with the exhaust from a solid-propellant gas generator.
Guidance: radio command; semi-active radar terminal homing.
Warhead: high-explosive, weight 176 lb.
Dimensions: length 20 ft 4 in, body diameter 1 ft 1.2 in.
Launching weight: 1,212 lb.
Performance: max speed Mach 2.8, range 18.5 miles, effective ceiling 59,000 ft.

SA-7 (NATO 'Grail')

This Soviet counterpart of the US shoulder-fired, heat-seeking Redeye first proved its effectiveness in Vietnam against slower, low-flying aircraft and helicopters. It repeated the process during the 1973 Arab-Israeli war, despite countermeasures, including the use of decoy flares, and deflecting upward the exhaust of helicopters. In addition to being a standard weapon throughout the Warsaw Pact forces since 1968, it has been supplied to about 20 other nations, and to various guerrilla/terrorist movements. Designed for use by infantry, the SA-7 is also carried by vehicles, including ships, in batteries of four, six, and eight, for both offensive and defensive employment, with radar aiming. An uprated version has a more powerful motor, giving higher speed and an effective ceiling of about 14,000 ft. *(Data for basic version.)*

Power Plant: solid-propellant booster/sustainer.
Guidance: infra-red homing with filter to screen out decoy flares.
Warhead: high-explosive, weight 5.5 lb.
Dimensions: length 4 ft 5 in, body diameter 2.75 in.
Launching weight: 20 lb.
Performance: max speed Mach 1.5, slant range 2.15 miles, effective ceiling 5,000 ft.

SA-8 (NATO 'Gecko')

First displayed publicly during the parade through Moscow's Red Square on November 7, 1975, this short-range, all-weather system is unique among Soviet tactical air defence weapons in that all components needed to conduct a target engagement are on a single vehicle. Missile configuration is conventional, with canard foreplane control surfaces and fixed tail-fins. Fire control equipment and four- or six-round launcher are mounted on a rotating turret, carried by a new three-axle six-wheel amphibious vehicle. Surveillance radar, with an estimated range of 18 miles, folds down behind the launcher, enabling the weapon system to be airlifted by Soviet transport aircraft. The tracking radar is of the pulsed type, with an estimated range of 12–15 miles. The SA-8 is believed to use the same missile as the well-established but enigmatic naval SA-N-4 system. Each vehicle carries up to six reload missiles.

Power Plant: probably dual-thrust solid-propellant.
Guidance: command guidance by proportional navigation. Semi-active radar terminal homing.
Warhead: high-explosive, about 90–110 lb weight.
Dimensions: length 10 ft 6 in, body diameter 8.25 in.
Launching weight: 440 lb.
Performance: range 1.8–7.5 miles, effective ceiling 32,800 ft.

SA-9 (NATO 'Gaskin')

This weapon system, deployed initially in 1968, comprises a BRDM-2 amphibious vehicle, carrying a box launcher for two pairs of infra-red homing missiles. The launcher rests flat on the rear of the vehicle when not required to be ready for launch.

Dimensions: length 5 ft 9 in, body diameter 4.33 in.
Launching weight: 66 lb.
Performance: range 4.35 miles, effective ceiling 16,400 ft.

SA-10

If all reports emanating from the US press are to be believed, this is the weapon that 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 60 miles in the 1,000–16,500 ft height band is suggested, with active radar terminal homing. Reported dimensions are a length of 23 ft and body diameter of 17.7 in. Predicted IOC varies from 'about now' to the mid-1980s. Full deployment is likely to be protracted, as the DoD considers that an effective anti-ALCM defence system would need between 500 and 1,000 sites, each with ten launchers, and would cost $50 billion if manufactured in the US.

SA-11

This new weapon system comprises a three- or four-rail launch vehicle for Mach 3 radar-guided missiles with a reported ability to deal with targets at altitudes between 80 and 49,000 ft, at ranges up to 12 miles. SA-11s are said to be deployed already alongside SA-6s, and may represent an improved version of the latter.

SA-12

Intended to replace the SA-2 and SA-5, this weapon uses a phased-array radar antenna and active radar homing. Altitude limits are said to be from 100 to 100,000 ft, over ranges up to 60 miles.

SA-13

Deployed on a tracked vehicle in the late seventies, the SA-13 is a replacement for the SA-9. Together with the ZSU-23-4 tracked gun vehicle, it equips the antiaircraft batteries of motorised rifle and tank regiments. Range is about 5 miles.

New Infantry SAM

To overcome the limitations of shoulder-fired, infra-red homing missiles like the SA-7, the Soviet Union has been developing improved infantry SAMs for some years. One type, of which deployment is about to start, uses a laser beam for beam-riding guidance.

SA-N-1 (NATO 'Goa')

Ship-launched variant of SA-3.

SA-N-2 (NATO 'Guideline')

Ship-launched version of SA-2. On cruiser *Dzerzhinski* only.

SA-N-3 (NATO 'Goblet')

The twin-round surface-to-air missile launchers fitted to many of the latest Soviet naval vessels, including the carrier/cruisers *Kiev* and *Minsk*, helicopter cruisers *Moskva* and *Leningrad*, and *Kara* and *Kresta II* cruisers, carry a new and more effective missile than the SA-N-1 ('Goa'). This is said to have an antiship capability, and to carry alternative nuclear or 132 lb high-explosive warheads. The original version has a range of 18.6 miles and effective ceiling of 82,000 ft. A later version has a range of 34 miles.

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. The missiles are similar to those used in the land-based mobile SA-8 system.

SA-N-5

A variety of small Soviet ships have this simple air defence system, which carries four SA-7 'Grail' launch-tubes in a framework that can be slewed for aiming.

Continuing AIR FORCE Magazine's coverage of foreign air forces, Gen. T. R. Milton takes a first-hand look at Brazil—the country, the situation, and its air force. This giant country to the south of us is on its way to becoming a world power to be reckoned with. It's important to be aware of . . .

THE BRAZIL SITUATION

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

THE view from the handsome American Embassy in Brasilia takes in a large and singularly unattractive building; flying from its flagpole is the hammer and sickle. Life has been quiet at the American Embassy these past several years, a reflection of the cool relations between Brazil and the United States that marked President Carter's time. Down the road at the Soviet Embassy, business during that same period has been brisk, for while Brazil's ruling military junta remains staunchly anti-Communist so far as Brazil itself is concerned, there are no ideological hang-ups about dealing with Communist regimes elsewhere in the world.

Jimmy Carter's hostility toward Brazil in the name of human rights ended a longstanding close relationship between the two major hemispheric powers, and Brazil is now setting its own course. While it remains friendly to the United States, which is, after all, its principal trading partner, there is no indication Brazil will again predictably follow the US policy lead, as witness its refusal to honor the Olympic boycott and the grain embargo to the USSR, and the decidedly different Brazilian attitudes toward Angola and Southern Africa. Nonetheless, after an uncertain beginning, the Reagan Administration is making a definite effort to put Brazil back in focus as a very important friendly nation.

The results thus far have been hard to measure beyond a noticeable warming in the diplomatic and military atmosphere. The new US Ambassador to Brazil, Langhorne A. Motley, was dismissed by some critics, at the time of his appointment, as an Alaskan businessman who owed his job to an election payoff. True enough, he is an Alaskan businessman, and there is no doubt his Republican credentials were an asset, but Ambassador Motley was raised in Brazil, speaks Portuguese like a Brazilian, and has

More than seventy of the EMBRAER Xavante fighter/trainer aircraft are in service with the Brazilian Air Force.

close ties in the country. He was also—not just incidentally, considering the military nature of Brazil's government—a USAF officer for a dozen years. As our representative in that strangely sterile capital city plunked down right in the middle of the central Brazilian plateau, he is determined to reverse the ebb in Brazilian-American relations.

It will not be easy. There appears to be no chance we will get back to the position we enjoyed for so many years. The setback caused by Mr. Carter's human rights policies is, to some extent, a permanent one; Brazil now views itself as an independent power, no longer seeking either guidance or major assistance from the United States.

All of which is strange when we consider how supportive the United States was, under President Lyndon Johnson, of the military takeover in 1964. Brazil in the early 1960s was drifting aimlessly during the short regime of President Janio Quadros. When Quadros resigned, his Vice President, Joao Goulart, faced a military establishment opposed to his taking over, an opposition based on its suspicion that he was inclined toward the radical left. It was a well-founded suspicion, for Quadros, once installed, began making populist appeals to the peasantry and, unforgivably in the eyes of the military hierachy, to the enlisted ranks in the armed forces. Then, when he presented Brazil's highest award to Ché Guevara, Cuban revolutionary, things had gone far enough. With US blessing, the military removed Goulart from office and took charge. Our blessing was more than a tacit one: a classified logistic effort—Project SAM—was laid on, along with the dispatching of the carrier *Forrestal* as a show of force. As it turned out, neither was needed, the revolution came off without a shot being fired, and with only one casualty, an unfortunate pedestrian run over by a tank.

The EMB-312 is designed and produced by EMBRAER for the Brazilian Air Force, which has ordered 118. Export sales are in prospect for the aircraft, unveiled at the Farnborough Air Show in 1980 and flown at the 1981 Paris Air Show.

Post-1964 Brazil

In the eighteen years since that March 30 coup, there have been a number of swings back and forth in the junta's style, from fairly severe repression to the present relaxed approach, but there has been no break in military rule. This year President Joao Baptista Figueiredo has promised elections for provincial governorships and for the bicameral congress, with a presidential election scheduled for 1985. According to some observers, these elections might well go to the opposition party, itself created by the junta, instead of to the ruling government party. The question remaining to be answered is whether or not the military, after eighteen years, is ready to leave things up to the uncertain dictates of an electorate, or whether, in fact, the elections will be put off for various reasons. There are always some to be found, say the cynics.

Whatever happens, Brazil is clearly a nation to be reckoned with, and not taken for granted, in the years ahead. The sardonic old aphorism that says Brazil is the next great power and always will be still has some small measure of truth in it, but there is no denying the emerging Brazilian clout in the world.

Even so, there are distressing signs of the enormous gap that continues to exist between the rich and the poor, keeping in mind the trouble this may yet cause. A traveler need go no farther than Rio de Janeiro to see opulence in Ipanema and poverty in the favelas—slums that represent human existence in its lowest state. Inflation of more than 100 percent has made the Bra-

zilian cruzeiro a doubtful currency, a sign that this huge country has not yet learned to manage its resources of minerals, unused fertile agricultural land, timber, and all the other attributes that make Brazil, in theory at least, one of the most blessed lands on this earth.

Brazil's Armed Forces

Well, we all have our problems, and Brazil's are minor by comparison, when we look around the world. The Brazilians, for instance, have not fought a war in South America in this century—although they did send an infantry division to Italy in World War II, the only South American country to join the Allies—and even their revolutions are pacific affairs. Relations with Brazil's old arch-rival, Argentina, are now on a friendly and cooperative basis, and there are no serious disputes with any neighbor. Brazil's problems, then, are essentially internal ones, a fact that gives rise to a question: With no visible external threat and no alliance commitments, what are the mission justifications for Brazil's armed forces?

In the first place, considering the great size of a country that occupies almost half the South American continent, Brazil's military is not all that large. According to the latest Military Balance in the December '81 AIR FORCE Magazine, there are 272,550 people in the total armed forces, of whom 113,000 are conscripts. For a nation with more than 3,286,000 square miles—larger than the continental United States—and a population that has grown from 52,000,000 to 125,000,000 in the last thirty years, this is a modest enough investment in military manpower, not even taking into account the military nature of Brazil's government these past eighteen years.

As is almost invariably the case when military men take over the running of a country, the Army is the dominant branch in the Brazilian system. It is the Army that has the primary job of maintaining internal security, a simple and clear-cut mission. To some extent, the Navy and Air Force share in this mission, the Navy with river patrol craft and the Air Force with counterinsurgency helicopters and other aircraft, but it is the Army that holds the keys to power.

The Navy, with an aircraft carrier along with assorted destroyers, frigates, submarines, and corvettes, does have some blue-water aspirations. Brazil's ties to West and Southern Africa are historically close, and the Brazilians show every intention of maintaining and strengthening those ties. The route we exploited in World War II, from Brazil's northeast coast to Africa, is an important one today for other reasons. One obvious mission for Brazil's Navy is to keep that route, and the South Atlantic—an ocean Brazil's admirals view in a certain proprietary manner—free of hostile interference.

The Brazilian Air Force shares this task, along with that of maintaining security up and down Brazil's 4,603-mile coastline, a coastline that extends, by Brazilian fiat, 200 miles to sea. There are also, of course, the traditional roles of air defense and tactical support of the Army; F-5Es, at the moment, for tactical support and Mirage IIIs for air defense, as well as the less traditional role of operating the carrier-based aircraft.

Building Its Own Aircraft

The counterinsurgency Air Force mission is carried out in the AT-26 Xavante. It is an airplane made in

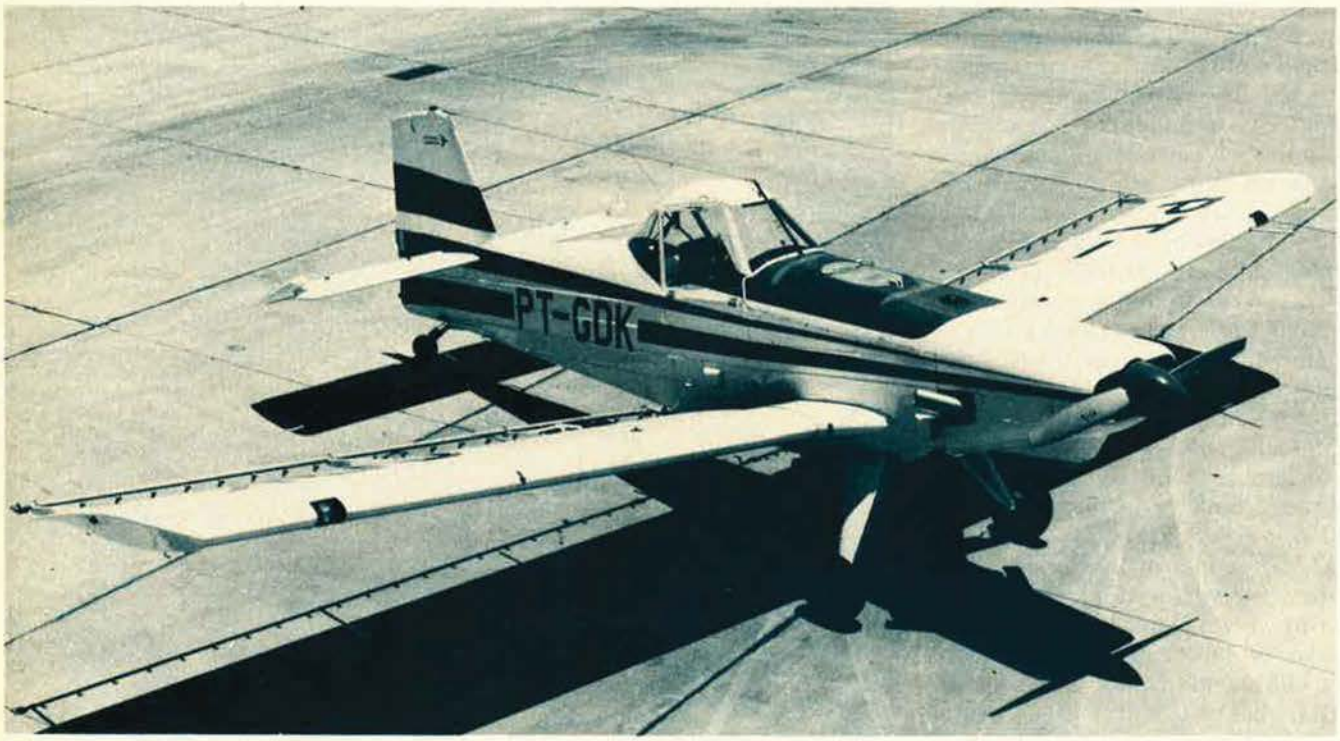
Brazil and a forerunner of things to come. For a variety of reasons stemming from the anti-arms sale policies of the Pentagon in the days of Robert McNamara, general indifference to Latin America during the Nixon and Ford Administrations, and, more recently, to the legislative bias reflecting President Carter's human-rights crusade, the United States may have sold its last fighter airplanes to Brazil. Instead, there are indications that Brazil now proposes to make its own, never again to be dependent on the changing whims of American governments. To do this, the Brazilians have created EMBRAER, a private corporation that functions under the watchful eye of the Air Ministry, itself a powerful extension of the Air Force with authority over all air activity in the country.

EMBRAER (Empresa Brasileira de Aeronáutica SA), located near the major industrial city of São Paulo, represents a genuine attempt at independence from the aircraft industries of the United States and Europe, although there is still no Brazilian engine industry. The list of EMBRAER products is an impressive one: a crop-duster airplane, the Ipanema, powered with a Lycoming engine, is at one end of the line. At the other would be the Bandeirante, available in a number of configurations from commuter transport to maritime surveillance, all powered by Pratt & Whitney turboprop engines. So far, 270 Bandeirante have been delivered.

EMBRAER makes an executive turboprop, a line of Piper airplanes on license, and it has a thirty-seat turboprop transport, the Brasilia, under development and scheduled for first flight this year. The interesting EMB-312, a tandem two-seat, Pratt & Whitney-powered turboprop trainer, has moved into full production after extensive tests and an appearance at the Paris Air Show. The Brazilian Air Force has ordered 118 of these, and EMBRAER is clearly looking for export business on this one. The EMB-312 will have hard points for weapons along with the kind of performance that should make it a useful ground-attack airplane in low-threat conflicts. It is, besides, a pretty airplane, faintly reminiscent of the P-51, and, as most pilots will agree, looks do count in flying machines. Ugly ones are hardly ever nice to fly.

Then there is the Xavante, a versatile advanced trainer that also serves as a fighter-bomber. The Xavante is an Italian design produced under license by EMBRAER, and while it is little more than a modern T-33 when it comes to performance, the Xavante does give EMBRAER a valuable boost up the learning curve. Brazil's Air Force has 112 of these aircraft and has ordered fifty-five more.

For the immediate future, the Mirage IIIs and the F-5Es should be enough for any high-performance missions. The interesting question lies in Brazil's decision on a new-generation fighter, whenever that may come. Despite EMBRAER's impressive growth, it does seem beyond their present capability to produce an airplane competitive with those of France, the USSR, or the United States. The Brazilian Air Force is the largest in South America, a fact that has not gone unnoticed by the world's airplane drummers. Brazil's neighbor, Venezuela, has pushed ahead of the pack in its deal for F-16s. It is fair to assume Brazil has begun to look around.



The Ipanema agricultural aircraft is produced by EMBRAER for the domestic and foreign markets. It is used widely in Brazilian crop-dusting.

Arms Exports and Relationships

The Brazilian armament industry

is flourishing these days, quite beyond the remarkable emergence of EMBRAER. Arms exports are running about $1 billion a year, a figure that puts Brazil very much in the major leagues. In shipbuilding, Brazil is now second only to Japan: it even makes submarines for, of all people, the Federal Republic of Germany.

Brazilian armored personnel carriers, as well as other armored vehicles, are seeing action in the war between Iraq and Iran. The arms trade to the Mideast has become large enough, in fact, to justify the creation of a Brazilian cargo airline just to haul the stuff. While Brazil has taken no overt stand on the divisive Mideast issues that mark the eternal Israeli-Arab confrontation, there is no doubting the cordial relationships between Brazil and most Arab states. Part of this empathy may be traced to a large and influential Brazilian citizenry of Arab descent, although there is also a considerable Jewish presence in that South American melting pot. Perhaps a more direct reason for the Arab tilt in Brazil's policy lies in petroleum. That land, so wonderfully endowed with practically everything else in the way of natural resources, was shortchanged when the oil was handed out. Accordingly, eighty percent of Brazil's petroleum must be imported, a situation that does tend to influence attitudes.

In the face of this oil shortage and its heavy effect on the economy, Brazil has taken the lead in alcohol fuel production. The government has subsidized alcohol at sixty-five percent of the price of gasoline, currently running about $3.50 per gallon. With this encouragement, a good many of the cars in Brazil's incessant flow of urban traffic run on alcohol, very much including the Volkswagen Beetles that have found, in Brazil, their last production redoubt.

In another attempt to find alternative energy sources, Brazil has gone to nuclear power, a move that has brought it additional, and deeply resented, difficulties with the United States. The problem lies in the Nuclear Non-Proliferation Treaty, a document Brazil chose not to sign. Because of that, and even though Brazil has a contract with the Westinghouse Corp. to develop nuclear reactors, the United States has denied fuel for the project. Since Israel, India, and Pakistan have also failed to ratify this treaty, say the Brazilians, why pick on us? It is, in their judgment, just one more indication of lingering US prejudice against Brazil's government.

During USAF's fiftieth anniversary observance, a number of aircraft showed the flag in Brazil. Here a C-130 makes a low pass over Copacabana Beach in Rio, November 19, 1957.

Looking Ahead

The first year of the Reagan Administration has seen visible improvement in the general attitude of Brazilians toward the United States. While military relationships have never really suffered on a personal basis, there has been a noticeable thawing, this past year, in official channels. The Brazilian military still shows an understandable suspicion, given our behavior in the recent past, but it is a suspicion that will undoubtedly go away if the United States removes some of the restrictions that now so inhibit our relationship.

It seems a poor way to serve American self-interest, for instance, to discourage the attendance of rising Brazilian officers at our staff colleges. As everyone knows who has ever gone to such a school, friendships made there are lasting ones. In the case of Brazil, friends of its next generation of military leaders are apt to be French.

This giant country to the south of us is on its way—no matter how badly things may go from time to time—to becoming a world power. The mere fact of its enormous and largely unexploited resources guarantees that, along with an industrious population to do the exploiting. There seems no doubt that the United States and Brazil will share in shaping the future politics of the Western Hemisphere. Sometimes, it appears, there will be differences, as in the present case of Africa, but for the most part, the United States and Brazil would seem to have basically the same things in mind, very much including hemispheric security.

This coming October, Presidents Reagan and Figueiredo are scheduled to meet, for the first time, in Mexico at a conference of Western Hemisphere leaders. It will be a meeting to watch, not so much for results as for signs pointing toward the future relationship of the two largest nations on this side of the Atlantic. ■

Gen. T. R. Milton's monthly column always illuminates airpower issues and concerns. When he can devote time to a longer piece such as this one, AIR FORCE *Magazine readers benefit. This article is the first of three by General Milton on key air forces of Latin America; Argentina and Venezuela follow in coming months. General Milton graduated from West Point in 1940. He commanded bomber units in the European air war, was Chief of Staff of the (Berlin) Airlift Task Force, and held a series of high-level command and Air Staff jobs during his career.*

TAC's operational fighter courses produce wingmen for the fighting squadrons. Here, two F-15s of the 36th TFW patrol Central European skies.

An instructor (CLAW 14) and his student (CLAW 15) are dueling in F-15s at 26,000 feet over southwestern Arizona. The student is the attacker; the instructor, the target.

CLAW 14: "We'll set up for a barrel roll attack. I'll turn south all the way back to the east. Set up on a forty-five degree extension, and call when ready."

"CLAW 15 is ready."

CLAW 14: "Cleared in."

The maneuver begins, and the instructor comments to himself as it evolves: *"Good angle there, pulling his nose in right, now a little too high . . . starting to slow . . . now, that's better, coming into me now, that's good."*

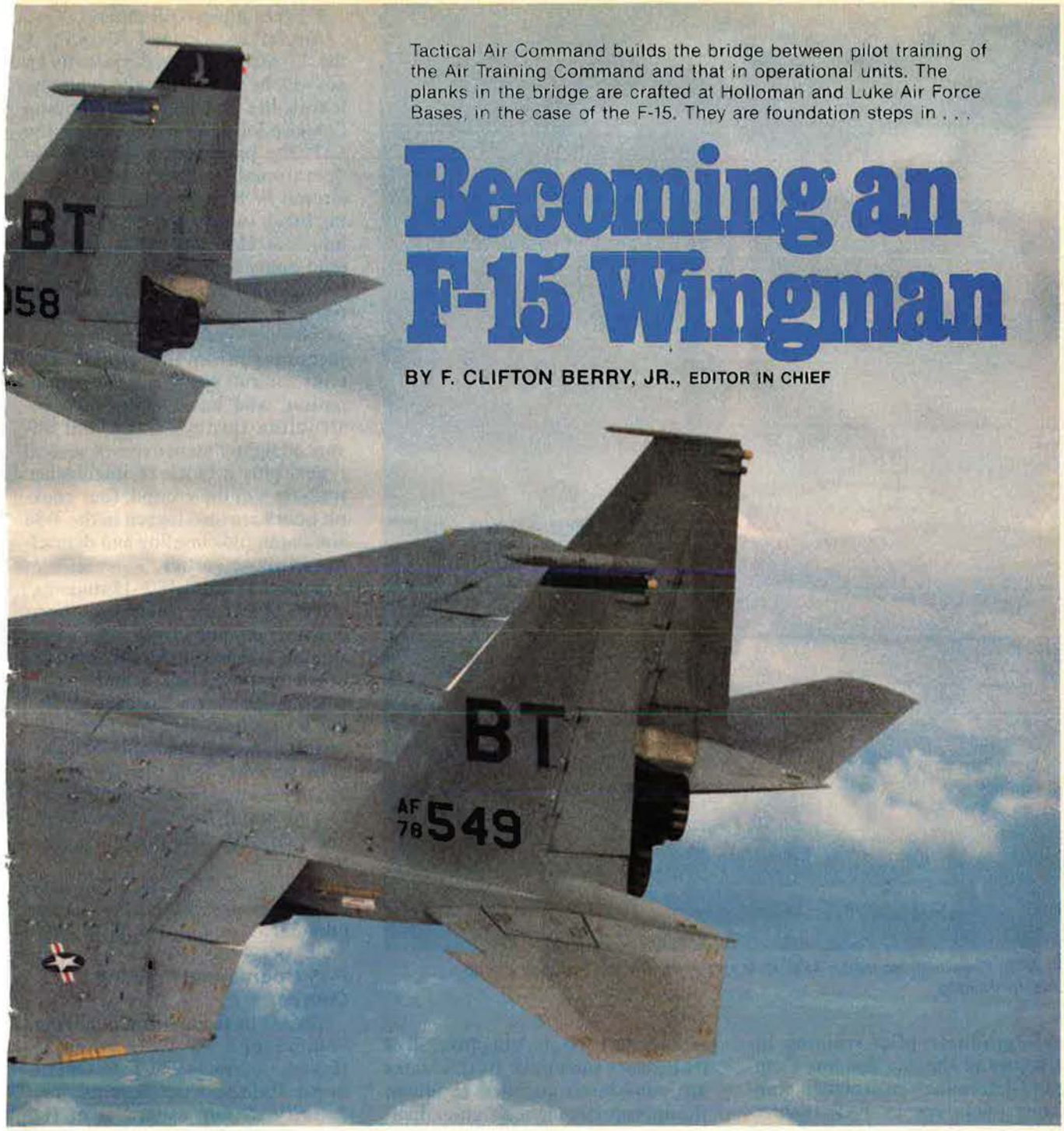
CLAW 14: "OK, that worked pretty well, but you did a couple of things that could have been better. One, when you started to bring your nose up before you began the roll, you brought it higher than needed. Two, you played the roll well, but when I got in front of you, you delayed pulling your nose into me. You ended up in Fox Two [short-range missile] parameters, but I was a real duck, and I think you could have been there a little bit quicker."

CLAW 15: "Copy."

CLAW 14: "OK, turn back along this ridge line now, and you can slide back wide for an Immelmann attack."

"CLAW 15 is ready."

This extract of the dialogue of aerial combat training is just a slice that illustrates the teaching and learning process in the F-15 Opera-



Tactical Air Command builds the bridge between pilot training of the Air Training Command and that in operational units. The planks in the bridge are crafted at Holloman and Luke Air Force Bases, in the case of the F-15. They are foundation steps in . . .

Becoming an F-15 Wingman

BY F. CLIFTON BERRY, JR., EDITOR IN CHIEF

tional Training Course at Luke AFB. In this case, both pilots are instructors of the 426th Tactical Fighter Training Squadron; CLAW 14 is Capt. Barry Thompson, and CLAW 15 is Capt. "Dutch" Riefler. Captain Riefler is conducting a regular standardization check of Captain Thompson. For this session, Riefler is a "student" in the second lesson of Offensive Basic Fighter Maneuvers. His job is to fly as a student, not an instructor; Thompson briefs, flies, analyzes, and critiques in his normal instructor's role. An AIR FORCE Magazine editor is privileged to fly with Captain Riefler for the mission.

Training to Win

Preparation for winning in aerial combat is honed in two Tactical Air Command (TAC) flying courses. They are the Lead-In Training course at Holloman AFB, N. M., and the F-15 Operational Training course at Luke AFB.

Taken in sequence, the courses produce pilots for operational fighter squadrons proficient in basic air-to-air mission tasks. Specifically, after graduating from the F-15 OTC, the pilot is able to fight as a wingman in a formation at medium to high altitudes.

To attain mission-ready status, the graduate must fulfill training requirements and be certified by his operational squadron commander.

A similar flow of training by TAC applies to pilots headed for A-7, A-10, F-4, F-16, and F-111 units. The

An AT-38 Talon from Holloman AFB, N. M., flies over the top of a loop during Lead-In Training.

undergraduate pilot training instructors of the Air Training Command determine which of their graduating pilots can be FAR (fighter-attack-recce) recommended, and thus be expected to complete a demanding fighter operational training course.

Lead-In Training

The Lead-In Training (LIT) course is for pilots without previous experience as tactical fighter pilots. It is conducted by the 479th TTW, commanded by Col. James Chambers. Course duration is forty-three training days—five ground training and thirty-eight flying. The wing flies about 34,000 sorties and graduates about 1,100 students from all of its courses each year. Its graduates are considered qualified to attend the appropriate tactical fighter operational courses for the aircraft of assignment.

Students entering this course have one of these qualifications:

- UPT—Assigned directly from Undergraduate Pilot Training;
- T-38A (C)—Pilot whose last rated assignment was as a T-38A instructor pilot, and who was current in the T-38A within ninety days of his first flight in this course.
- T-38A (NC)—Last rated assignment was a T-38A IP, but not current within ninety days of first flight in this course.
- Other input—All others.

Aircraft used in the LIT course is the AT-38B. This lets the pilot fly an aircraft he's familiar with while he learns the harsh and demanding fighter-pilot tasks ahead. After the LIT, the pilot then goes on to an operational training course in the aircraft he'll fly in a squadron, having flown twenty-six sorties of 25.6 hours at Holloman (for the UPT grad going to F-15s).

The UPT grad heading for F-15 training spends 55.5 hours in academics during the LIT course. Subjects range from life-support systems, aircraft systems, crew coordination, and basic instrument instruction through basic and advanced fighter maneuvers of several types, plus a block of intelligence training. On the ground, four cockpit hours are also logged in the T-38 simulator, plus briefing and debriefing on those sorties.

Sixteen of the UPT/F-15 students' sorties in LIT are common to those flown by students from other input sources and headed for other operational aircraft. They include a transition sortie, two of instrument flying instruction, five for formation instruction, and eight of basic fighter maneuvers. They then fly six sorties of advanced fighter maneuvers, two of aerial combat maneuvers, and two defensive maneuver sorties.

After graduation from the LIT course, the prospective F-15 fighter pilot moves on to Luke AFB, Ariz.

F-15 Operational Training Course

The 405th Tactical Training Wing, commanded by Col. Peter D. Hayes, conducts the F-15 Operational Training Course as its main activity. Other programs of the 405th include F-5 training (at Williams AFB) for foreign students, and the Japanese and Saudi F-15 pilot courses at Luke.

Colonel Hayes cites USAF output from the F-15 OTC in FY '81 as 238 pilots. In producing those pilots, the wing flew 18,383 sorties covering 23,991 hours. About eighteen percent of the flying was for instructor pilot continuation training. For FY '82, Colonel Hayes projects almost 290 graduates, and flying time of 25,542 hours over 19,800 sorties.

Fighter training also includes building ties with the men and women who make the missions possible. Here, at the operational 49th TFW, munitions experts upload Sparrow and Sidewinder missiles on an F-15.

He says, "The key to producing superb wingmen—our graduates—is a group of mature, experienced instructors who are valid role models for the pilots they are instructing." The entering pilots need positive attitudes, of course, and have met the rigorous criteria of Air Training Command and TAC's own LIT at Holloman before joining the 405th. It's the job of the 405th Wing's men and women to mold those pilots into the "superb wingmen" cited by Colonel Hayes.

The process begins at the 405th Tactical Fighter Training Squadron. Its commander, Lt. Col. J. O. McFalls, notes that his squadron is the pilot's "first real exposure to the tactical fighter environment." Most of the entering pilots are UPT graduates who have been accustomed to considering instructors as "them" (as in "we vs. them"). In the 405th TTW, beginning with the 405th TFTS, the pilot and his own family (about sixty percent are married) begin to become part of the larger "fighter family."

That means creating an atmosphere where the new pilot sees his instructors and leaders as collaborators whose job is to win the aerial battle. To do that involves creating a fighter pilot frame of mind and outlook. It includes the basic flying qualifications, of course, and the powerful desire and motivation needed to fly alone but as part of an aerial team. It also means becoming acutely aware of the importance of ground crew, maintenance personnel, and all those other men and women who keep a fighter pilot and his machine in trim.

Colonel McFalls and his instructors and their staff begin the process. It involves a concentrated period of eighteen ground training days (and nights, for studying). That includes twenty-four academic classes, four simulator sorties, and as much time as the pilot wants to invest in cockpit procedures trainers and studying. Each class includes about eight pilots. Each instructor is assigned a pilot "one-on-one, so the instructors and other 405th personnel can deal with each as a person, not as a number." All of the instructors have F-15 operational experience, with several exceeding the thousand-hour mark in the airplane. They all have at least a thousand hours in jet fighters.

Now to Flying the F-15

The 405th TTW has four flying F-15 squadrons in addition to the F-5 outfit at Williams, McFalls's 405th TFTS, and the support squadrons. The flying squadrons (and their tail markings) are the 426th (red), 461st (yellow), 550th (silver and black), and the 555th "Triple Nickel" (green with five white stars). AIR FORCE Magazine spent some time with the 426th, as typifying all four.

Lt. Col. Dave Paulsen commands the 426th. He and Lt. Col. Mike Langston explained the OTC syllabus. It builds basic fighter skills into each graduate, using the building-block approach, so that the pilot who completes the course is already integrated into the tactical air forces

and prepared to fly as a wingman in the unit he joins.

But a note about the instructors first. About twenty percent of their flying is done away from the student-instructor milieu, in what is called "continuation training." That means standardization checks to keep up to snuff; it also means flying as an operational F-15 pilot in the Red Flag exercises at Nellis or in weapon system evaluations at Eglin, where they remain abreast of the latest ways to fight the aerial threats. It also includes visiting and corresponding with all the F-15 squadrons worldwide. That garners reactions from gaining units about the pilots the 405th has produced, and also keeps the 405th's instructors informed on the latest operational thinking and activity.

The basic F-15 course covers 195 academic hours over eighty-four training days. Eighteen of the days are ground training; sixty-six are flying training days. Flying sorties are forty-one, encompassing 52.9 hours; an additional twenty-seven hours are logged in eighteen sessions of cockpit time in the F-15 simulators at Luke.

After finishing ground training with the 405th TFTS, pilots who have joined the 426th, 461st, 550th, or 555th begin the flying training.

BASIC FIGHTER MANEUVERS

Preparation for an AIR FORCE Magazine editor to fly the OBFM-2 mission with Captains Riefler and Thompson began the afternoon before, following the discussions with Colonels McFalls and Paulsen on course content. Capt. Tom Berry briefed on the symbology to be displayed on the Head-Up Display (HUD), using actual films of engagements captured by the HUD cameras in the 426th's aircraft. Viewing the series of films creates four strong impressions: that they are an invaluable learning tool; that use of videotape instead of film would make them available faster and cheaper; that the clear, easy-to-understand HUD symbology aids engagement; and that engagements are decided much more rapidly than one expects.

TSgt. W. E. Farver and A1C Susan Smith handle life-support equipment fitting out and briefing. The helmet (HGU-2/P) and oxygen mask (MBU-5/P) are carefully adjusted to fit comfortably but very firmly to stay in place during the repeated high-G, abrupt maneuvers expected during the flight. Bill Farver's expert briefing, fitting, and responses to questions add to knowledge and build confidence. Knowing the helmet won't develop a painful "hot spot" during the flight and that the oxygen mask fits precisely frees the mind to concentrate on the flight.

Capt. Stan Whitfield of the 461st TFTS conducts the egress training, going over the possible emergencies that might arise, signals and commands from the pilot, and actions the visitor is to take in each case. He, too, deals confidently and fully with questions, as well as requiring his student to demonstrate that he understands the briefing.

A stop at the F-15 simulators is next, to build familiarity with the cockpit and its displays. Capt. Ned Schantz, 555th TFTS, notes that the wing's simulators are scheduled for student and instructor practice at least eighteen hours per day.

Early to Rise

Briefing is scheduled for 6:00 a.m. After a light breakfast, we meet Captains Riefler and Thompson at the operations desk of the 426th TFTS, then adjourn to one of the squadron's classrooms for the pre-mission briefing. Capt. Barry Thompson is the instructor for this mission; he will fly F-15A, tail number 6021. Capt. "Dutch" Riefler is flying as a student in order to perform a standardization check on Captain Thompson. Captain Riefler will wear three hats during this flight: standardization instructor, student for Thompson's instruction, and commentator for AIR FORCE Magazine throughout. His two-seat F-15B is tail number 6140.

Captain Thompson begins with coverage of key times: step at 7:20, start engines at 7:40, check in with Luke ground control at 7:55, and take off at 8:10. He explains the mission in detail to his students.

Our aircraft are configured with full internal fuel plus one 610-gallon tank on the centerline. External ordnance is AIM-9L Sidewinders and AIM-7F Sparrows.

This lesson, OBFM-2, practices offensive basic fighter maneuvers. The student is expected to continue to develop a "feel" for the F-15 as a fighting system, and learn to employ the weapons. In flying techniques, the student enhances his G awareness, is aware of turn rates and radius of turn vs. Gs and airspeed, and builds proficiency in weapons selection and employment while flying the fighter maneuvers.

The engagements will be set up as a series in the exercise area. First problem will be with a low closure rate, attacker behind target. In it, the attacking student accelerates, executes a low yo-yo maneuver, and engages the enemy from an advantageous setup. Captain Thompson demonstrates the maneuvers, and discusses the techniques in each. Second problem involves a high closure rate with a turning situation; the student reduces closure via the high yo-yo, reposition, and engages to kill. Other problems include engagement via the lag roll, barrel roll, and Immelmann turn. Added to this sortie to demonstrate beyond-visual-range engagement are two radar intercepts at maximum range.

After the fighter engagements, the flight will practice a high TACAN instrument approach, followed by landing practice. That includes simulated single engine landing, low approaches in formation (with go-around), and low approach formation landing to a full stop.

The "emergency of the day"—double generator failure—is discussed by Captain Riefler. He covers diagnosis and corrective actions. He also demonstrates knowledge of the "threat of the day," the AA-6 air-to-air missile.

Next, Captain Thompson covers the Rules of Engagement (weather, minimum altitude, separation, loss of visual contact, approaches, termination rules). He briefs the Rules to Live By (communication instructions, no live ordnance, fire control systems, authorized areas, fuel minimums, operations checks, and emergency frequencies). Finally, he covers the rules for ending an engagement—Knock It Off. Among them are an unscheduled flight in the area, radio failure, unsafe situation, low fuel, approaching altitude and airspace boundaries, and when one or the other pilots calls "Knock It Off" for any reason.

Ready to Go

After donning personal equipment and riding the crew van to the assigned aircraft, the pilots conduct their preflight inspections and go over the aircraft conditions and records with the crew chiefs. All then strap in and are ready for engine start.

Engine start occurs promptly at 7:40. At sixty-five percent power, fuel flow is 1,000 pounds per hour, but with the canopy down and locked only a low hum is heard. Engine checks are made, as are the checks of flight controls, brakes, and other systems. We arm ejection seats, the pilots listen to the Automated Terminal Information System (ATIS) for its update, and call Ground Control. Ground Control clears the flight to taxi and, with Captain Thompson in the lead, we taxi southward to the ready position for runway 3R. At that point, end-of-runway checks are performed within the aircraft by the pilots and externally by squadron personnel. With all checks done, Luke Tower clears the flight for takeoff.

On the Way

Runway 3R, 9,910 feet long and 150 feet wide, has a slight

First flights are two for transition. In the first one, local area procedures and navigation are covered, as well as basic F-15 handling and normal traffic patterns and landing. On the second, proficiency is demonstrated; then the student moves on to three formation flying blocks. In the second of those, the student flies his first solo in an F-15. The formation instruction is followed by two instrument training sorties, and then the fighter practice is begun.

Fighter Flying

The blocks of fighter flying training are groups of sorties to build upon experience and proficiency as they are learned. The first flying block in aerial attack training is devoted to offensive basic fighter maneuvers (OBFM). Five sorties, each of 1.1 hours, are flown. The student learns and practices offensive basic fighter maneuvers in four sorties, then is required to demonstrate proficiency in the fifth. These sorties are flown one-vs.-one (1v1), with the student attacker trying to gain the advantage over the instructor who is flying as an enemy defender.

Instructors critique during the maneuvers and in extensive ground debriefings after each flight. Gun-camera film of the student's Head-Up Display (HUD) is available for

upgrade, three-tenths of a percent. It is not apparent visually from the high perch of the back seat of 6140. Ready to go now. Captain Thompson drops his head, the signal to release brakes. Both pilots do so, and advance their throttles smoothly to military power. The acceleration is quick and heavy. The aircraft gain speed, rotate together, then break ground within the first 2,000 feet. Thompson's head nods up and both pilots raise gear and flaps as airspeed passes rapidly through 160 knots. A gentle climbing left turn gains altitude and airspeed as the flight turns northwestward toward the maneuver area.

En route in a line abreast tactical formation (about 6,000 feet horizontal separation), the pilots check their own aircraft, then fly behind each other to perform operational checks on the other plane. We perform left and right turns of ninety and 180 degrees at 400 knots in steep banks, seeing the G-meter needle reach 3.5 and 4.0.

Begin the Fights

Everything is working right. We are flying in the assigned area, a large chunk of time and space carved out of northwestern Arizona, called Gladden W/Y. Horizontally, it encompasses about 200 square nautical miles, in altitude about 20,000 feet (from 11,000 feet to 31,000 feet), and in time from 8:10 to 8:50 a.m.

Ready to start the engagements now. To a non-fighter pilot, they become chunks of kaleidoscopic maneuvering punctuated by abrupt changes in orientation in all three axes. The rapidly unfolding engagements are accentuated by two primary sensations: trying to acquire the enemy and keep him in the lethal cone of our weapons, and absorbing a succession of Gs, ranging from 4.0 through 6.5. Thanks to the extensive discussion during the briefing and Capt. Dutch Riefler's running commentary, the maneuvers make sense. After each, as the pilots reposition for the next engagement, Capt. Barry Thompson's immediate critique reinforces the learning. An observer then begins to realize the difference between these fighter instructors and other pilots. These men are *wearing* their airplanes, with the weapon system an extension of their brain and

Capt. Barry Thompson, 426th TFTS, briefs the actions to be flown during the offensive basic fighter maneuver mission.

Formation takeoff at Luke AFB, Ariz., by F-15A of 555th Tactical Fighter Training Squadron.

sinews. Their conscious minds are teaching, while subliminally their nerves and muscles are making the systems perform.

As the engagements continue, an observer becomes aware also of the energy concept, and the absolute requirement for having an energy advantage over the foe, or energy in reserve to bore in for the kill. It's also clear that the displays and symbology presented so clearly to the pilot free his mind to concentrate on winning the fight.

Radar intercepts work out as intended, and it's time to turn for home via the Wickenburg TACAN. Flight leader Captain Thompson clears us out of the maneuver area with Albuquerque Center, and forms us into a tactical formation en route to Luke. The approach is flown as briefed, and the series of landings is practiced. Initial approach speed is 250 knots downwind for runway 3L. On base the speed is reduced to 200 knots with speed brakes out and the angle of attack indicator stabilized at twenty-one degrees. Airspeed declines to 150 knots on final approach. The landing series is performed, with the final one to a full stop at 9:15. We then turn off the active runway to taxi back to the 426th parking area.

Debriefing of the crew chief and maintenance personnel is first, then the van ride back to the classroom for the overall debriefing. That covers lessons learned, mistakes made, areas for practice, and details of each engagement. When we finish, the time is 10:30 a.m., so four and one-half hours have been occupied for 1.1 hours in the air. That is about standard for the instructors of the 405th TTW, and does not count the pre- and post-briefing preparation time they and their students have put in to prepare for the mission and reflect upon it.

It is time well spent, for the product is a wingman carrying known proficiencies against observable standards. When he reports to an operational F-15 squadron he is prepared to fly and become mission-ready without wasting time and money.

—F. C. B., Jr.

What the F-15 pilot sees in an aerial engagement—the enemy centered in his HUD, and choice of weapons at his fingertips.

debriefing and critique. Offensive maneuvers have also been practiced in the simulator before the OBFM flights. In this series the offensive maneuvers are practiced from a visual setup. The student is expected to maneuver his aircraft to engage the target with the F-15's medium-range missiles (AIM-7F Sparrow), short-range missiles (all-aspect AIM-9L Sidewinder), and its 20-mm M-61A1 gun. Concurrent practice is performed in tactical formation flying, instrument flying, emergencies, and other procedures that must become second nature if the man is to become a proficient fighter with the F-15 weapon system.

In the next group of four sorties, pilots learn and build proficiency in defensive basic fighter maneuvers (DBFM). In these, the student is being attacked. He practices counters against enemy guns and missiles and counteroffensive maneuvering against an attacker employing offensive maneuvers. Proficiency in those skills leads to the next block—five sorties of neutral basic fighter maneuvers. These are 1v1 visual exercises with both aircraft at about the same altitude as the engagement begins. As proficiency builds, the student moves to radar intercepts beyond visual range. The object is to defeat the other aircraft soonest at the greatest distance possible. Concurrent flying includes building proficiency in daylight air-to-air refueling.

Six intercept sorties are next. They are longer duration flights of 1.4 to 1.6 hours. The intercepts are vectored against penetrating aircraft by ground control until the F-15's own radar acquires the target at maximum radar range. They include intercepts against high-, medium-, and low-altitude targets, with front and beam quadrant setups. They are done both in daylight and at night, and integrate concurrent practice in night air-to-air refueling and precision instrument flying.

Now the training progresses to two-ship maneuvers in eight one-hour sorties. They practice 1v2 and 2v1 engagements (both defensive and offensive) with visual, radar, and ground-controlled intercepts included. Students switch roles between attacker and defender on these sorties to develop proficiency in both. In addition, they practice radar sorting of friends from enemies in a multibogey environment.

Through this point, all engagements have been F-15 vs. F-15. Now, nearing the course end, and with proficiency having been built, pilots fly four air combat sorties against dissimilar aircraft. The adversaries execute "threat" maneuvers and employ "threat" weapons. The engagements are fought 1v1, 1v2, and 2v2. Student pilots have GCI support, and attempt to survive engagements while inflicting heaviest damage on the enemy. In one engagement, the F-15s execute combat air patrol tactics, using their own radar capabilities to locate and destroy a penetrating enemy force, preferably beyond visual range.

The final two sorties of the course are for air-to-air gunnery qualification. Students acquire DART targets towed by an F-4, perform a visual setup, then execute dry and wet firing passes on the target. They are graded on engagement tactics and hits on the target.

Graduates of the course then report to their operational F-15 squadrons to begin the process of achieving mission-ready status under the leaders they will fly and perhaps fight with. ■

A tribute to the four who died in the desert and the Thunderbirds team . . .

The Men With the Right Stuff

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

LIKE everybody who ever flew, I suppose, I have always been a fan of the Thunderbirds. Watching them is to most of us like watching Jack Nicklaus play golf. We understand what they are doing, and we could even, on a good day perhaps, do some of the things they do, just as we can sometimes hit a shot the way Nicklaus does, but that's about as far as it goes. The Thunderbirds, like the Navy's Blue Angels, play in a different league than the great majority of people who fly airplanes.

The sickening accident in the Nevada desert killed four superb young men. Coming so soon after the fatal crash last fall of the Thunderbird leader, there will doubtless be some discussion of disbanding the team. It will not be the first time this has come up, and the arguments this time around will be more persuasive than usual. Just in the unlikely case they are needed, let me make a few points in rebuttal.

A long time ago, before aviation grew into the serious and expensive business it has now become, playing games in airplanes was almost considered a pilot's fringe benefit. Since regulation of airspace was a pretty loose affair until after World War II, the buzzing of sailboats, trains, and very often girl friends' houses was the sort of misdemeanor a pilot could usually get away with. Unless, of course, he hit something or rolled up the airplane.

The Eighth Air Force was having a rough time during 1943. The tour length of twenty-five missions in a B-17 or B-24 meant a good many hours over a continent entirely in German hands. The Luftwaffe did its level best that year to make twenty-five missions an unattainable goal. When someone did come home after his twenty-fifth, the authorities were usually tolerant if he decided on a performance in his bomber, scattering ground crews, putting everyone on the floor in the control tower, and generally raising hell in one last glorious ride.

The fighters occasionally celebrated their return by doing victory rolls down the runway, a hazardous maneuver, especially for a tired and excited young pilot. Even fines failed to work in at least one P-51 outfit. I recall standing in the tower with my friend Jack Christian—soon to be killed over Europe—who told me he had put a stop to the victory-roll business. A roll, he said, would cost the offender $100. The formation came in, broke for landing, then one pilot pulled up his gear, sped down the runway at fifty feet or so, and broke Jack's rule, meanwhile calling out in synchronization with his maneuver, "One hundred dollars."

Well, all that was long ago. Those practices were dangerous, and as the war began to go our way we put a stop to that sort of thing. Flying safety began to be an important part of military flight operations instead of something we were lectured about now and then.

The postwar era was a period of great letdown for tactical air people. Only the transport command seemed to have a mission in those uncertain years. The atomic bomb had convinced many people, including a fair number in the Air Force, that the glamorous business of fighter aviation was, like most conventional weapon systems, a thing of the past.

The Thunderbirds began in that era with underpowered and ground-loving straight-wing F-84s. Then, as if to prove they could put on a show flying anything, they turned up in sweptwing F-84Fs, not the greatest airplane the Air Force ever bought, but no one watching them perform could know that. My favorite Thunderbird airplane was the F-100, which, for some reason, seemed absolutely perfect for the job, although there are a lot of pilots around, myself included, who have some reservations about that bird.

Well, the team moved briefly into F-105s—a definite mistake—then back into F-100s. They shifted to F-4s in the late sixties, and that did make for a wonderful sight. Unhappily, the career of the F-4 in Thunderbird markings was a short one, cut off by budget trimming and as a symbolic sacrifice to the energy crisis. In its place came the T-38, the airplane they were flying in that Nevada tragedy.

Over the years these splendid young men in their flying machines have shown millions of people what military aviation is all about: precision, discipline, and, as the recent tragedy in the desert brings home, occasionally danger. But beyond that, the Thunderbirds have been a spectacular example of how important a role trust in one another plays in military flying, in combat or in everyday practice.

The Thunderbirds have been a tremendous public-relations asset at home, where the citizenry is becoming detached from its all-volunteer military, and overseas where people in other lands can meet young America at its very best. You have only to see, just once, the people of Germany, Japan, or wherever, flocking around the red, white, and blue airplanes to know this is one program that puts a message across, a message that the United States still has men with the right stuff.

The Thunderbirds are the ones who show the world the kind of skills their less-visible comrades are using in Red Flag exercises, over the Egyptian desert, in Turkey, Okinawa, and Spain. They are the fellows who put the idea of an Air Force career into the heads of who knows how many Air Force Academy cadets, past and present. They are, in short, what the Air Force is supposed to be all about—something we tend to forget in this era of missiles and the everlasting struggle to keep up in the nuclear-arms contest, a miserable, if essential, business at best.

It has been a bad year for the Thunderbirds, perhaps the worst ever. The investigation will find the probable, if not the absolutely certain, cause of this awful crash, but it will not, I am certain, find anything wrong with the qualifications of the four men who died. Like all the ones who have made that team, they were the pick of a very exclusive group. Bad year notwithstanding, most of the years have been great ones. Watching the Thunderbirds is a privilege that should not be denied a new generation. And since we really don't get in the way, we old-timers would like to watch them as well. ■

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By James A. McDonnell, Jr., MILITARY RELATIONS EDITOR

First Woman Judge

Lt. Col. Mildred L. Raichle, the Air Force's highest ranking female military lawyer, was recently sworn in as an Appellate Military Judge on the Air Force Court of Military Review *(see photo)*. This seven-member tribunal is the highest court of review within the Air Force. Colonel Raichle is the first woman to serve in this position, normally a four-year assignment. There are just under ninety women in the some 1,200-member Air Force Judge Advocate General corps.

Most of the cases that reach the Military Review Court are "paper" cases, rather than "in person" hearings. There has been an increasingly heavy case load lately—in 1981 it handled 745 reviews, the highest since 1964.

Colonel Raichle has been an Air Force judge advocate since 1966. A graduate of the Indiana University Law School, she has been admitted to practice before the Supreme Court of Indiana and the United States District Court of Indiana. In 1974, she was named one of the Outstanding Young Federal Lawyers of the Year.

Who's Watching the Kids?

An increasing number of Air Force families are headed by two blue-suit parents. Also, more and more single Air Force parents have custody of minor children. All this has raised questions in the minds of the members concerned, commanders, and supervisors as to what happens when duty requirements conflict with child-care responsibilities.

The Air Force has faced up to this squarely with a new regulation—Dependent Care Responsibilities, AFR 35-59—which answers these questions. Single member sponsors and military couples with families now should have a clearer understanding of what the Air Force expects of them. Clearer guidance is also provided to all concerned on possible disciplinary or involuntary separation actions if individuals fail to make and maintain proper dependent-care arrangements.

The new regulation specifies the types of duties for which all members are expected to be available, *i.e.*, permanent changes of station, both accompanied and unaccompanied; both long and short temporary duty; no-notice deployments; alerts, recalls, and extended duty hours; and shift work. Guidance is also provided to assist members in ensuring their dependents are properly cared for in their absence.

For example, a civilian must be appointed, in writing, to assume care of the member's dependents during absences due to military commitments, so that the member will be available for the expected range of military duties. Single-member sponsors and military couples accompanied by dependents in overseas locations must have legal guardians available for these dependents in the event of evacuation.

The regulation sets up annual counseling sessions. Additional counseling is called for prior to PCS or reenlistment, or when pregnancy is confirmed. Each member now has sixty days from the time of check-in at a new duty station to certify dependent-care arrangements.

Air Force Assistance Fund Campaign Begins

Air Force units worldwide kicked off the 1982 Air Force Assistance Fund Campaign this month. The 1982 theme is "Commitment to Caring: An Air Force Family Affair." This year's campaign goal for the month-long drive is $3.65 million. Last year's effort netted nearly $4 million, against a goal of $3.2 million. Money raised will help support the three Air Force charitable affiliates: Air Force Village, Air Force Enlisted Men's Widows and Dependents Home, and Air Force Aid Society.

Air Force Village is in San Antonio, Tex., and operates a community for retired officers, their spouses, widows, widowers, and certain qualified dependents *(see photo)*. The minimum age for residency is sixty-two.

The Air Force Enlisted Men's Widows and Dependents Home is in Fort Walton Beach, Fla. It provides a home for widows and widowers fifty-five years old and older and a limited number of retired enlisted people, age sixty-five and older, and their spouses.

CHAMP Battles Obsolescence

Shockingly, the average age of Air Force medical treatment facilities is twenty-three years. Many, according to Lt. Gen. Paul W. Myers, the Air Force Surgeon General, are inefficient, undersized, and cannot meet today's fire and safety code standards. Not only does this limit ability

Lt. Col. Mildred L. Raichle is sworn in as an Appellate Military Judge on the Air Force Court of Military Review. Col. Earl E. Hodgson, Jr., Chief Judge of the Court of Military Review, administers the oath. (See item.)

Cindy Lopez, a nurse's aide, helps Mrs. Bessie Bigelow enter the new $1.5 million Health Care Center at Air Force Village. The Center, which opened last November, will employ fifty San Antonians, adding an annual payroll of $300,000 to the local economy. (See item.)

to provide quality health care in peacetime, but, more important, these inadequacies seriously hamper wartime capabilities.

CHAMP, short for Clinic and Hospital Accelerated Modernization Program, is a new Air Force Medical Service effort to upgrade and modernize the Air Force's health-care facilities worldwide. General Myers has worked long and hard to get this program off the ground. He is proud of it, he told AIR FORCE Magazine, and believes it's "a significant forward step in identifying the most urgent medical facilities' needs of the Air Force and in developing definitive plans to provide Air Force people with modern, well-equipped facilities."

The first step in CHAMP is to identify accurately facility requirements and priorities. Major air command surgeons are busily assessing these needs. This will lay the groundwork for a five-year facilities plan for upgrade and replacement. The next step is economic analysis to ensure that planned work not only meets future beneficiary needs but is cost-effective.

CHAMP is big business—an estimated billion dollar program over five years. The payoff will include enhanced wartime capability, and more "in-house" care.

VA Care Rated High—Once You Get It

In other medical news, VA patients think they get good care—but like patients everywhere, they hate to wait.

A recent patient survey, scrupulously geared to protect anonymity, gave the VA's medical facilities very high grades in five of six areas rated. Favorable responses were received from eighty percent or more of the patients on key questions related to physician care, nursing care, food, cleanliness, and their perception of "no negative events." Highest grades were received in nursing care and cleanliness, where favorable responses exceeded ninety percent. The survey made some comparisons between VA and non-VA health system experience, and showed patient satisfaction levels in VA as high or higher than those in non-VA facilities.

Lowest ratings among the six key components were in the area of emotional support. According to fifty-nine percent of the inpatients, doctors should take more time to tell them how they are doing, and forty-eight percent expressed the same complaint about nurses. Waiting times were a big irritant. Some thirty-four percent of the hospitalized respondents and about nineteen percent of the outpatients said that they had to wait too long for services.

The survey has been conducted biennially since 1974. This edition marks a change to an annual basis.

Dobbins AFB Units Are Really "Family"

Husbands, wives, brothers, cousins, a niece, an uncle—and, even a mother and daughter—make the 94th Tactical Airlift Wing a real "family affair" on Reserve training weekends at Dobbins AFB, Ga. In all, twenty-seven members of the wing are related to each other, and some work with each other in the same flights and squadrons.

Seven married couples are on the rolls, and one of the spouses has her mother in the same unit. All but one of the couples got married after they joined the unit.

TR-1 Pilots Sought

Ever heard of the TR-1? You will. Although the Air Force doesn't have any yet, several are in production. The Air Force is seeking qualified volunteer pilots to fly the new single-seat updated version of the U-2 reconnaissance planes. The first squadron is scheduled to become operational in early 1983 at RAF Alconbury, in the United Kingdom. Selected officers, who must have less than sixteen years of service, will be sent to Beale AFB, Calif., for qualification testing.

Applicants must have at least eighteen months as pilot in command and meet one of two following requirements: 1,500 hours of total flying time, with 1,000 hours in jet aircraft, or 1,500 hours of total flying time, of which 1,000 hours are as first pilot or instructor pilot.

Although experience with two or more types of military aircraft, particularly single engine/centerline thrust aircraft, is desirable, it is not mandatory. This is an on-going program, so volunteers may be chosen to attend school at Beale AFB with only ninety days' notice. Base CBPOs have details.

If You Don't Like Something—Say So

DoD, just like other government agencies, has an active Consumer Affairs Program to ensure that "persons affected by DoD-sponsored legislation, regulations, policy decisions, or program actions have an opportunity to present their views and that these views are considered in the decision-making process."

Where DoD might have the edge on other agencies was pointed up by the recent review of its program conducted by Lawrence J. Korb, Assistant Secretary of Defense for Manpower, Reserve Affairs and Logistics. His study emphasizes that the existing advisory groups, councils, and committees that all services have maintained over the years already do a good job of surfacing complaints. In making sure that DoD's program is in line with the current Administration's

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priorities, Secretary Korb confirmed that the more costly procedures for collecting and categorizing complaints that other agencies must use to maintain their consumer-affairs programs are not necessary given the abundance of consumer-voice channels within DoD.

Some examples of the type of consumer products and services provided by DoD to its own people are: base exchanges, commissaries, and hobby shops. In cooperation with the civilian community, DoD provides such services as surplus property sales, air shows, and support of community ceremonial events. Good channels exist for "consumers" of these products and services to air any complaints.

VA Moves Rapidly on Management Problem

Responding rapidly, VA Administrator Robert P. Nimmo recently visited the VA's Rehabilitation Engineering Center in New York, following a disturbing preliminary report from his Inspector General.

The Center's mission is to develop, test, and distribute prosthetic devices for disabled veterans. The preliminary IG report indicates that as much as $1 million in stocks were not properly controlled or accounted for over a period of ten years. Wastage through overstocking of expensive components also was identified; inefficient and ineffective distribution controls were noted; and many expensive items were bought, the report noted, that had no clear relation to the mission of the Center.

One example of faulty procurement practices cited in the report was that 725 expensive "electric hands" were procured in 1972, and fewer than half have been issued. An example of where budget projections appeared to be equally faulty was that the budget for prosthetic shoes was overestimated by almost a third.

Based on the preliminary report, the Administrator suspended the Center's independent contracting authority, brought the Center directly under the Associate Deputy Chief Medical Director in Washington, and ordered a complete inventory of equipment and stocks, a review of clinical records, and the establishment of complete stock-control procedures. He also stressed that the audit won't interfere with the Center's service to veterans.

Short Bursts

An Air Force **Reserve pilot** from the 349th Military Airlift Wing (Associate) at Travis AFB, Calif., has achieved a first in Air Force history. **Lt. Col. Robert D. White, Jr.,** is the first pilot and first Air Force Reservist to chalk up **5,000 hours flying time** exclusively in **the C-5 Galaxy,** the world's largest cargo aircraft.

A recent VA study shows that **most veterans who have served in the Vietnam theater** have **successfully readjusted** to the civilian labor market. The study found about **ninety percent** of the Vietnam returnees, aged twenty-five and over, gainfully employed, most in full-time jobs.

A total of 101 USAF men and women, right hands raised, repeat in chorus, "So help me, God," during what is believed to be the largest reenlistment ceremony in Air Force history. The event took place at Eglin AFB, Fla. Those reenlisting represent a total of 1,450 people-years of USAF experience. (Photo by Sgt. Rex Swenson)

Many were earning above-average incomes. However, the study also underscored that those who sustained chronic impairments, either mental or physical, during their Vietnam service are **still experiencing grave difficulties** in the labor market.

Would-be passengers signing up for **space-available travel on MAC flights** no longer must be present at the terminal for every space-A call. Instead, they are required only to return to the terminal **every three days** to revalidate their flight intentions. Those leaving from commercial gateways with infrequent scheduled flights, such as St. Louis, only have to check in **every seven days.**

If you **don't agree on a decision the VA makes** on an application for benefits, appeal procedures are simple. All it takes to start the process is to **write the VA**—no form is required. Send the VA full information on the exact disagreement.

The ads say, "Fly 'here' and we'll give you a ticket to 'there,' " but if you are a government employee on official travel, forget it. Federal toilers receiving **items of value** as a result of such travel must return them to the **nearest transportation office,** say Air Force travel officials. **Included** are point-accumulation games, entitling frequent travelers to gifts or free tickets.

The VA is running a computer check to see whether **benefits payments** are going to individuals who may, in fact, be **deceased.** The computer matching operation is checking approximately 7,700,000 veterans' benefits files against a commercially owned roster of deceased individuals. Any matching records will be thoroughly investigated for possible recovery action. VA urges persons receiving VA benefits checks **after the death of the beneficiary** to contact the nearest VA regional office promptly.

A new law requires DoD to **change the time-honored method of computing retirement pay.** The change requires that service credit be computed to the nearest whole month actually completed. Under former law, service of six months or more was credited as a full year for the retired pay multiplier. Informed sources speculate that the "next shoe dropped" will be a requirement to **round down retired pay to the previous dollar.** In other words, Uncle would keep any loose change up through ninety-nine cents.

Senior Staff Changes

RETIREMENTS: B/G John R. **Budner;** M/G Charles E. **Woods.**

CHANGES: B/G William M. Constantine, from Vice Cmdr., 22d Air Force, MAC, Travis AFB, Calif., to Cmdr., 40th AD, SAC, Wurtsmith AFB, Mich., replacing B/G (M/G selectee) Robert E. Messerli . . . **B/G Archer L. Durham,** from Cmdr., 76th AD, MAC, Andrews AFB, Md., to Vice Cmdr., Mil. Traffic Management Ctr., Washington, D. C., replacing retired B/G Richard T. Drury . . . **Col. (B/G selectee) Albert C. Guidotti,** from Cmdr., 436th MAW, MAC, Dover AFB, Del., to Cmdr., 76th AD, MAC, Andrews AFB, Md., replacing B/G Archer L. Durham.

B/G (M/G selectee) Robert E. Messerli, from Cmdr., 40th AD, SAC, Wurtsmith AFB, Mich., to DCS, PACOM, Camp Smith, Hawaii . . . **Col. (B/G selectee) Albert L. Pruden, Jr.,** from Cmdr., 26th TRW, USAFE, Zweibrücken AB, Germany, to Dir. of Inspections, Hq. AFISC, Norton AFB, Calif. . . . **Col. (B/G selectee) Paul N. Scheidel,** from Chief of Security Police, Hq. USAFE, Ramstein AB, Germany, to Chief of Security Police and Cmdr., Hq. AFOSP, Kirtland AFB, N. M.

AIRMAN'S BOOKSHELF

The Craft of Spying—A Trio of Histories

Following are reviews of three books concerned with an always-fascinating subject: espionage.

The Survival Factor—Israeli Intelligence From World War I to the Present, by Stanley A. Blumberg and Gwinn Owens. G. P. Putnam's Sons, N. Y., 1981. 299 pages. $15.95.

Harkening back to the injunction of Moses in Numbers (13:17–18) to "spy out the land of Canaan" and to "see the land, what it is; and the people that dwelleth therein, whether they be strong or weak, few or many . . ." the authors of this interesting overview of Israeli intelligence ground its origins firmly in antiquity.

And, indeed, they aver, this unbroken and personal connection accounts for the successes they chronicle. Their overriding theme, in fact, is that the ability of the Jewish people to practice "intelligence," defined as being able to "outthink, outguess, outwork, and, if possible, outwit" the many hostile forces arrayed against them over the millenia, made it almost inevitable that today's Israeli intelligence services should be considered a model.

This philosophical conjecture aside—and the authors do dwell inordinately on this—the book can be read with interest on many levels. For the historian, it offers a well-researched, if admittedly partisan, look at the events of this century that led to the creation of the State of Israel, and, indeed, carries the reader right into today's headlines.

The last paragraph of the book, for example, notes with prescience: "There is reason to believe that tiny Israel, faced with the possibility of being confronted by nuclear weapons in the hands of so volatile an enemy as Iraq, will do everything in its power to prevent such a catastrophe. The brilliant history of Israeli intelligence, plus Israel's proven ability at sabotage and lightning preemptive strikes, would indicate that this chapter is far from ended."

For the student of intelligence, the book is a storehouse of insights into not only Israeli intelligence but counterintelligence efforts of other nations as well. Very readable is the incredible story of the blue-eyed, fair-skinned Wolfgang Lotz, who, after rising to the rank of major in the regular Israeli army, served as a spy in Egypt, posing as, of all things, a German ex-officer/storm trooper. He carried this off for more than four years, winning the trust of senior Egyptian officials. At one point, the book claims, he was given a guided tour of an Egyptian missile base whose commandant wanted to impress the "ex-Nazi," and detailed the tight security, commenting, "the Israelis have an excellent intelligence service. They must not learn anything about this until we strike the final blow."

On yet another level, the book is a "good read" for anyone who likes spy stories, and is chock-full of new interviews and eyewitness accounts by participants. It evenhandedly covers both successes and failures. Air Force-oriented readers would probably find most interesting the chapter "The Great Mirage Blueprint Switch," which details how Israel circumvented a French embargo on spare parts needed to keep French-bought Mirages flying—a critical requirement since at the time the aircraft made up the bulk of the Israeli Air Force.

The chapter also introduces us to an interesting figure—the managing director of Israel Aircraft Industries, Al Schwimmer. Schwimmer, who never got around to learning Hebrew, was from Bridgeport, Conn. After spending World War II as a civilian pilot for the Air Transport Command—and making a flight to Palestine that made a lasting impression on him—he volunteered, in 1947, at age twenty-seven, to "help" Israel. His role in helping to build today's Israeli Air Force is a story in itself.

The exploits of Mossad, Israel's intelligence service; the smuggling of Jews from Nazi-dominated Europe to Palestine through the British blockade; the efforts of Jewish sabotage teams who worked for the British in World War II; the development of Israeli nuclear power—all of these stories and more come cascading from the pens of the authors in support of their thesis that, for the Jewish people, intelligence has been "The Survival Factor."

—Reviewed by James A. McDonnell, Jr., Military Relations Editor.

Eavesdropping the Ultra Way

The Enemy Is Listening, by Aileen Clayton. Hutchinson, 3 Fitzroy Square, London W1P 6JD, 1980. 381 pages, with photographs, maps, and index. £9.95.

In 1974, F. W. Winterbotham published the incredible story of *The Ultra Secret.* It told how the Allies broke the German Enigma coding system and, for most of World War II, read the most sensitive Axis traffic. So effective were code breakers that communications at every level were being intercepted and deciphered.

In this era of planted leaks and "freedom of information," it is hard to believe that Ultra remained the best-kept secret of the war. It gave the Allies a frequent peek at the other fellows' cards. The Ultra revelations were so extensive that many historians believe that histories of the war will need to be reexamined. With the publication of *The Enemy Is Listening,* we find out how much of the Ultra tactical communications raw material was derived.

Even before the war erupted, Britain had been monitoring radio signals of potential enemy nations. This effort was stepped up in December of 1939. The branch of service responsible for interception of enemy communications (both radio-telephony and non-Morse transmissions) was the "Y Service."

As the war moved closer to the Channel, the service began to pick up Luftwaffe air controller information.

The value of these intercepts was obvious. The Air Ministry immediately began to expand its limited signals intelligence service, which, at the time, consisted primarily of former ham radio operators. One of those selected to take part was Aileen Clayton. She had, as many Europeans did before the war, spent her summers in Germany to "properly" learn the language. When the high command began searching for Women's Auxiliary Air Force (WAAF) members who could speak German, she was in the right place at the right time.

In this very readable memoir, she tells the fascinating story of her career in the Y Service. There is the exciting recounting of what it was like to work under primitive conditions with commercial shortwave sets to intercept enemy traffic as the German Air Force began its raids on England.

From this modest beginning, Y Service not only grew in numbers and sophistication but also in importance as an invaluable and reliable source of intelligence. Its status was confirmed during the Battle of Britain when Y provided the technical data necessary for the successful electronic combat conducted against German aircraft. (Prof. R. V. Jones discusses in detail how the British were able to jam, deceive, or otherwise negate German electronic guidance systems in his book, *The Wizard War.*)

In 1942, the war in the West shifted to North Africa. Aileen Clayton's familiarity with German fighter traffic made her the natural candidate to organize the collection of data in Cairo. Throughout the war in the Mediterranean, Y Service worked closely with the tactical commanders. They developed advisory support and intrusion techniques, ground and airborne jamming systems, as well as an extensive meaconing system. Advisory support was provided by radio-intercept operators flying on bomber aircraft.

Most readers will be surprised at the sophisticated level electronic combat reached during World War II. But some things never change. In a tactical environment, intelligence becomes very perishable if delayed. In Britain, there had been a secure, complex network of telephones and teleprinter lines for quickly passing information. At the front, the fluid situation and great distances required the use of enciphered radio communications. A few slip-ups and the Germans could have caught on to Y Service activities. Speed was important, but security was paramount.

Aileen Clayton also shares with us the more personal story of a lone woman frequently caught in combat zones. She not only served in front-line areas, but also flew missions to develop additional collection techniques. Her bravery was matched by many others in the Y Service who doggedly provided the bits of information necessary to develop a more complete assessment. Perhaps it is the detailing of the routine work of signals intelligence personnel during the war that will be her most important contribution to history. It is a story that had not been told before and one that is not likely to be improved in the retelling.

The tables used by Luftwaffe personnel for encoding messages during the war carried a warning notice in bright red, *"DER FEIND HOERT MIT"* (THE ENEMY IS LISTENING). Despite this admonishment, the Y Service continually collected invaluable data on German plans. Communications, then as now, remain perhaps the most vulnerable link in military operations. This is a primary reason for the growing emphasis on command control and communications countermeasures (C^3CM).

To ensure the lessons learned by Aileen Clayton and the Y Service in World War II are not lost, *The Enemy Is Listening* should be required reading for all personnel concerned with electronic warfare. Those of us in the military have found we owe an enormous debt to intelligence pioneers such as Aileen Clayton and R. V. Jones.

—Reviewed by Lt. Col. Pat O. Clifton, USAF.

The Soviet Apparatus

The KGB—The Eyes of Russia, by Harry Rositzke. Doubleday & Co., Garden City, N. J., 1981. 295 pages. $14.95.

Harry Rositzke worked for the CIA for twenty-five years, and during much of that time he worked against the KGB. He has written a workmanlike book that looks at the secret operations of the Soviet espionage agency through the eyes of a professional intelligence operative. He has "been in Macedonia" and speaks from first-hand experience.

His book is a complete look at the KGB, which he believes is the best intelligence service in the world. He describes its organization, how agents are recruited, how they are controlled, how the KGB gets information back to the USSR, and how the KGB has been involved in almost every major political crisis since World War II. He also details how they manage to intercept and decode American messages, how they placed Kim Philby at the heart of the British Secret Intelligence Service, etc.

Rositzke doesn't go in for ideological rationalizations or justifications and is definitely not a "Commie hater." He writes in the detached manner of a professional, filing a report on someone else's department. He is a professional evaluating other professionals.

The gathering of intelligence by the Soviets is based on photographic and electronic coverage, the interception and deciphering of messages and reports from agents. However, the Soviets know optical and electronic intelligence has one major drawback—it can't see into men's heads. A camera can see the roof of a research laboratory, but it can't tell what is going on inside and it can't determine intentions. Agents are the only way to get these important elements of intelligence, and a major portion of KGB resources are in human intelligence. Agents can determine what an enemy can do, what he knows, what he is thinking, and what he is planning to do.

Rositzke portrays today's KGB as the best and the brightest segment of Soviet society, expert in languages and local customs . . . a far cry from the leather-coated ruffians with ill-fitting suits of the '50s and '60s. In addition to more sophisticated clothing, they are also an increasingly sophisticated challenge to the United States.

Far more than any Western service, the KGB focuses on documents. Moscow is skeptical of information filtered through the human head. An agent's knowledge, judgments, and opinions are soft. They are subject to the limitations of memory or judgment and they need to be evaluated. Documents are hard facts. A Minox camera provides clear reports, easily hidden in a dead drop.

The author identifies with detached thoroughness the way the KGB has successfully "bought" American secrets; such data as the CIA satellites known as Rhyolite, Argus; data on US crypto systems; and now their frenzy to buy computers, components, lasers, and other high-technology items. The KGB works on the basic assumption that every person can be had, and results like these tend to support their assumption.

Rositzke believes it is a fair estimate that eighty to ninety percent of the KGB's budget and manpower spent on American targets has been devoted to scientific and technical in-

telligence, both military and industrial.

The KGB is a bold service, unhampered by bureaucratic timidity. It knows what it wants and goes after its targets with simple directness; it is willing to pay the price when it loses. Many Soviet agents have been arrested and imprisoned, but Moscow is not deterred. Its mistakes are not heralded in the Soviet press.

—Reviewed by Benjamin S. Catlin, AFA Special Assistant for Personnel Matters.

New Books in Brief

First of the Many, by John R. "Tex" McCrary and David E. Scherman. This book is a reprint of a contemporary "journal of action with the men of the Eighth Air Force." Author McCrary ignored the orders of his boss and left his job on the New York *Mirror* in 1940 to fly to England to observe the war there. With America's entry into the war, McCrary became a photographer-gunner with the Eighth Air Force, flying on ten missions. But through it all he reported on the men of the Eighth—their feelings, fears, and experiences. Teamed with *Life* photographer David Scherman's photos, this personal account of the air war over Europe provides today's reader with a taste of what it was like to be there with the "first of the many." With a foreword by General Ira C. Eaker, and an introduction by Roger A. Freeman. Aviation Book Co., 1640 Victory Blvd., Glendale, Calif. 91201, 1981. 242 pages. $27.50.

Military Helicopters of the World, by Norman Polmar and Floyd D. Kennedy, Jr. Filling a partial void in the literature, this directory brings together in one place a comprehensive listing of the military rotor-wing aircraft of the world. Beginning with a short perspective essay, the book goes on to describe by country and manufacturer more than 200 models of military helicopters, including many no longer in service. Descriptions of the use of helicopters by Germany (and to a lesser extent, Japan) in World War II will be of special interest to aviation historians. This book is sure to become a standard reference in the years ahead. With a foreword by Sergei Sikorsky, and illustrations, glossary, appendices, and index. Naval Institute Press, Annapolis, Md. 21402, 1981. 370 pages. $29.95.

Warplanes of the World, 1918—1939, by Michael J. H. Taylor. Following the oft-neglected development of military aviation between the war years, this directory provides in concise format an accounting of all the major aircraft types in service during that period. With photos and index. Charles Scribner's Sons, New York, N. Y., 1981. 192 pages. $17.95.

—Reviewed by Hugh Winkler, Ass't Managing Editor.

AIRMAN'S BOOKSHELF

E-A-R INTERVIEW: DON GASAWAY

A noted military hearing conservationist speaks candidly about hearing protection and noise.

E-A-R: What do you feel are some of the most significant breakthroughs in hearing conservation in the past 25 years?

GASAWAY: Instrumentation and trained personnel that allow early detection of noise-induced hearing loss. Plus, effective hearing protection.

E-A-R: How does one know when they are encountering a potentially dangerous noise?

GASAWAY: If one must shout at three feet to communicate or use a loud voice at a one-foot distance, they are in a potentially hazardous noise area.

E-A-R: Obviously, noise-induced losses that you observed over the years must have presented a challenge to you, so what did you do about it?

GASAWAY: Education was my route. I tried to better educate medical personnel who were responsible for the health and welfare of Air Force, military and civilian personnel.

E-A-R: Have things changed? I mean, do people more readily accept noise as a real threat today – more so than when you first got involved with the Air Force program?

GASAWAY: Yes. All military and other education programs are more dynamic today than they were in the past. Both public and private sectors are more aware and are initiating hearing conservation programs.

E-A-R: What led you to get involved with the area of hearing conservation?

GASAWAY: Seeing hundreds of Air Force personnel who had lost hearing due to excessive noise was the ultimate challenge. Something had to be done. I was truly motivated.

We will never achieve a noise-safe environment.

E-A-R: Do you believe that we will ever achieve a noise-safe environment?

GASAWAY: No!

E-A-R: Why not?

GASAWAY: The by-product of advanced society is noise. We readily accept it.

E-A-R: Is there a solution?

GASAWAY: Yes! Hearing protectors that are effective, easy-to-use, and comfortable. Protectors like E-A-R™ Plugs. In my years of experience, they were the most accepted and readily worn of the various hearing protectors available. They attenuate noise remarkably well, and they do prevent noise-induced hearing loss for one simple reason, they are worn.

For free samples of E-A-R Plugs and further information, please reply on letterhead.

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"If one must shout at three feet to communicate... they are in a potentially hazardous noise area."

"I tried to better educate medical personnel..."

"There have been breakthroughs... E-A-R Plugs."

What do these birds have in common?

FIREBRAND

EA-6B

LAMPS MK III

F-18

YAV-8B

E-2C

P-3C

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CONTROL DATA

(Continued from p. 18)

AIRMAIL

Strike on Schweinfurt

I am searching for a member of a strike against Schweinfurt/Regensburg on February 25, 1943.

A B-17 from Foggia, Italy (Joe Hurley and crew) was downed over the target or on the way home. There may have been a survivor. I believe it was the tail gunner, who had a Polish surname and came from the Boston area. Please contact me with any information at the address below.

Thomas P. Ross
91 Nassau Ave.
Freeport, N. Y. 11520

Collectors' Corner

I am interested in unit patches or patches on the SR-71 Blackbird, and information on Soviet warplanes.

Anyone with patches or information on Soviet warplanes, please contact me at the address below.

Roger Veach
Maysville, W. Va. 26833

I am a collector of USAF fighter and other squadron patches, and I would like to hear from retired and active Air Force people who have obsolete patches (especially CCTS), and from other collectors who are interested in selling or trading USAF patches for other USAF or Royal Netherlands Air Force patches.

I am also attempting to get Vietnam patches, such as "100 Missions F-4," "SAM Slayer," "Wild Weasel," "366th TFW Gunfighters," "River Rats," "200 Missions F-4," "Night Owls," "F-111 North Vietnam," and many others.

Anyone with interesting material and collectors who want to trade are requested to contact me at the address below.

Bauke Jan Douma
Bonifaciusstraat 7
3768 CR Soest
The Netherlands

I have been searching fruitlessly for the Young-Crippen and Engle-Truly STS mission patches. I see them all over the place on TV, but can find none in this neck of the woods.

I would greatly appreciate help in obtaining these patches and would, of course, send prompt reimbursement for the patches and their shipping.

Mark W. Powell
828 Ridge Rd.
Wilbraham, Mass. 01095

I would like to buy or receive donations of squadron patches of any organization—anytime or anywhere.

I also collect pictures of aircraft and other USAF memorabilia. Please contact me and state cost and condition of your material. (Please include also your phone number.)

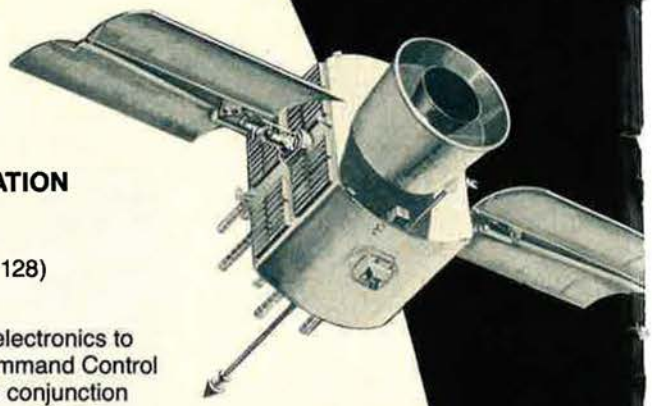
A1C Rodney D. Winters, USAF
366th CRS
Mountain Home AFB,
Idaho 83648

As a long-time Air Force supporter and recent AFA patron, I have begun to collect USAF patches.

If any readers have extras from their current or former assignments that they might care to donate, I would be happy to give these patches a good home. Flying or support, bright or subdued, all would be appreciated. Please contact me at the address below.

John R. Ehart
13341 Lakota Rd.
Apple Valley, Calif. 92307

ELECTRONICS AND THE AIR FORCE



A NATIONAL SYMPOSIUM OF THE AIR FORCE ASSOCIATION
(In conjunction with Air Force Systems Command)

Hilton at Colonial, Wakefield, Mass. (near Hanscom AFB on Route 128)
April 26–27, 1982

An authoritative review and expert preview of the importance of electronics to the Air Force, with special emphasis on Electronic Warfare and Command Control Communications and Intelligence (C^3I) for national security. Held in conjunction with Air Force Systems Command and timed to coincide with congressional hearings on the Administration's proposed $18 billion upgrade of strategic C^3, this program is a must for planners in government and industry concerned with the scope and trends of the military application of modern electronics. It will also provide excellent background for all those interested in the role of electronics in future planning for our nation's security.

Keynoter will be Gen. Robert T. Marsh, AFSC Commander. Four individual panels of prominent military and civilian experts will probe and analyze the challenges and prospects of Command Control Communications and Intelligence (C^3I) and Electronic Warfare in a uniquely informative manner.

SPEAKERS AND PANELISTS INCLUDE:

(1) Requirements Panel:

Dr. Robert S. Cooper
Director, DARPA

Lt. Gen. Hillman Dickinson
Director for C^3 Systems, JCS

Dr. Robert J. Hermann
Special Assistant to the Under Secretary of Defense for R&E

(2) Capabilities Panel:

Chairman
Lt. Gen. James W. Stansberry
Commander, Electronic Systems Division, AFSC

Dr. Robert R. Everett
President, MITRE

Lt. Gen. Richard C. Henry
Commander, Space Division, AFSC

Hon. Alton G. Keel
Assistant Secretary of the Air Force, R&D/Logistics

(3) Organization Panel:

Chairman
Dr. Alexander H. Flax
President, IDA

Gen. Bennie L. Davis
CINC SAC

Lt. Gen. Lincoln D. Faurer
Director, NSA

Gen. James V. Hartinger
CINC NORAD/ADCOM

(4) Electronic Warfare Panel:

Chairman
Dr. Donald C. Latham
Assistant Secretary of Defense/R&E for C^3

Gen. Charles A. Gabriel
CINC USAFE

Maj. Gen. Doyle E. Larson
Commander, Electronic Security Command

Lt. Gen. Lawrence A. Skantze
Commander, Aeronautical Systems Division, AFSC

Dinner Speaker (tentative acceptance)
The Honorable Frank C. Carlucci III, Deputy Secretary of Defense

Registration fee for all Symposium events is $175. This fee includes all presentation sessions, coffee breaks, continental breakfast, lunch, and dinner. For information and registration, call Jim McDonnell or Dottie Flanagan at (202) 637-3300, Air Force Association, Suite 400, 1750 Pennsylvania Avenue, N.W., Washington, D.C. 20006.

INTERCOM

AFA Finance Committee and Executive Committee Make Plans for 1982

AFA elected leaders took actions in meetings during December 1981 that will guide Association activities during 1982 and improve AFA operations.

The Finance Committee, meeting in Washington, D. C., proposed a 1982 budget for the Association, reviewed financial statements, and established a subcommittee for investment policy. It endorsed an Audit Committee recommendation that the external auditor firm be changed without prejudice. These recommendations were forwarded to the Executive Committee, also meeting in the nation's capital.

Following review and discussion, the Executive Committee approved the Finance Committee recommendations, including the proposed 1982 budget. At the meeting, AFA President John G. Brosky congratulated AFA members and staff for the success of "Operation War Veteran," which achieved its goal of increasing the number of war veteran members. The Executive Director was asked to begin long-range planning for the Association.

The Committee approved expanding the Association's awards program to include annual recognition of an outstanding Air Force lawyer. It noted President Brosky's appointment of an Awards Study Committee to examine policy for selecting AFA "Family" award recipients. A proposal was approved to draft a new statement of responsibility for the Audit Committee.

The Executive Director was asked to report on all national personnel actions adversely affecting DoD military and civilian retirement programs. Guidelines for the operation of AFA Chapters in foreign lands were adopted. Also, the staff was directed to establish formal procedures for AFA to respond to recommendations made by the Junior Officer Advisory Council and the Enlisted Council. In addition, actions to strengthen Association ties with AFROTC and the Arnold Air Society were directed.

AFROTC Det. 670 at Oklahoma State University beat out AFROTC Det. 675 at the University of Oklahoma in the third annual "Top AFA Cadet Membership Recruiter" competition sponsored by AFA's Central Oklahoma Chapter. Ron Wallis, Chapter VP for Aerospace Education, presented the plaque to OSU Cadet Steve Hamlett. Others present at the ceremony included (from right): Doug Pangborn, Chapter VP for Membership; OSU Cadet Hunt; OSU Professor Col. Dick Moore; and luncheon host Jerry Swetland.

Judy M. Swindle Named Outstanding Civilian of the Year by MAC

Mrs. Judy M. Swindle is a mother, wife, coach, teacher, boss—and Military Airlift Command's Outstanding Civilian of the Year. She is Chief of the Washington Area Computer Center's Software Office at Andrews AFB Md. Mrs. Swindle was chosen for this honor from more than 27,000 civilian employees.

Judy Swindle was chosen to be MAC's Civilian of the Year from among more than 27,000 civilian employees. (Photo by SSgt. Wes Layton)

In recommending Mrs. Swindle for the award, Harvey E. Radtke, Chief of System Support Division for the computer center, stated that through her outstanding planning and leadership, the Washington Area Computer Center has become a trend-setter in computer regionalization and unique system development. He pointed out that Mrs. Swindle has developed computer systems and programs that have been incorporated throughout the Air Force and the Department of Defense.

"The award was based on her experience and work here, plus the fact that she does a lot of things that aren't her job or function," explained Mr. Radtke. According to Mr. Radtke, Mrs. Swindle is constantly involved in the unit's training program, fund drives, coaching youth sports, civic activities, and is also highly active in off-duty education.

"Mrs. Swindle is an extremely dependable person," he remarked. "She handles any project you give her and

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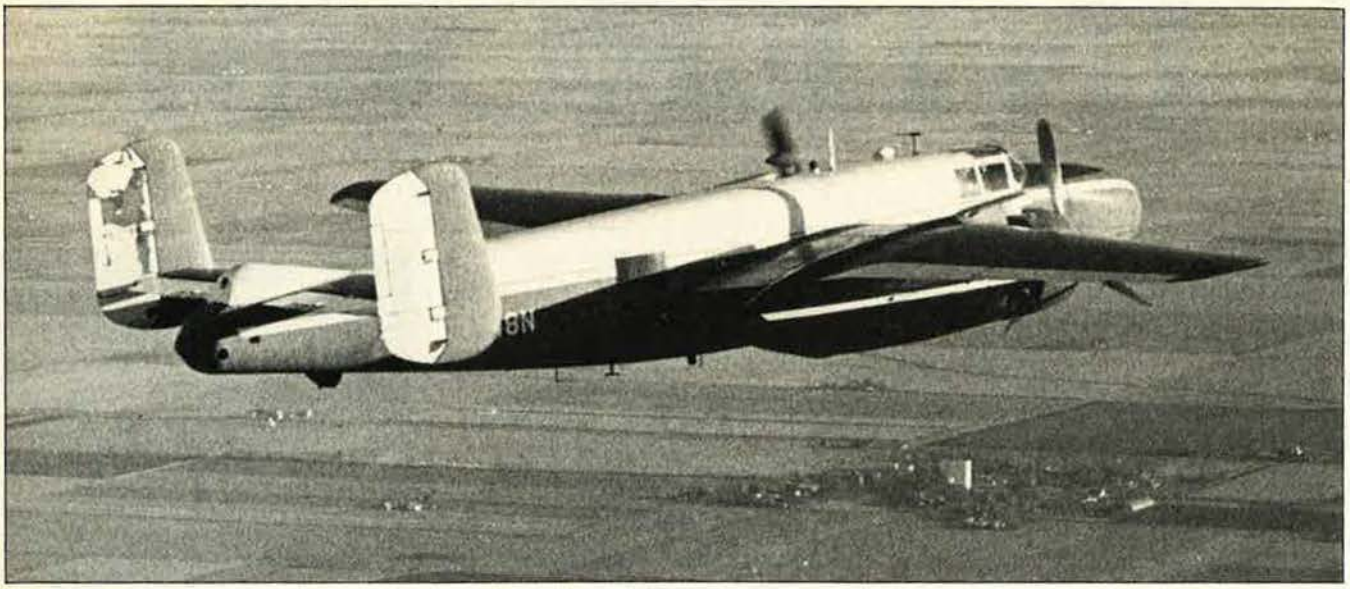

The Heritage in Flight Museum will restore this B-25H for public display. See item. (Photo courtesy The State Journal-Register*)*

produces excellent team work. She's a true professional."

Mr. Radtke explained that Mrs. Swindle's office is the "troubleshooting" section of the computer center. She and the four people she supervises provide the expertise in handling programming design problems the unit may encounter. Because of the nature of the work, she and her people have to be very proficient in computer operations.

Judy Swindle has been working for the government since 1965, twelve of those years with the Air Force. Her first job was as a secretary at Langley AFB, Va.

"I then got into a supply-related job and started getting involved in data-related tasks," she said. Shortly afterward, Mrs. Swindle learned that the Army was looking for people willing to train as computer systems analysts.

Following a year and a half of formal training, she was assigned to Fort Monroe, Va., where one of her major accomplishments was developing a computerized system for controlling the Army's training records.

"It took about a year, but it was the first system ever put out into the field without a reported problem," she related.

Since moving into the Washington, D. C., area in 1975, Mrs. Swindle has become involved in youth sports and activities—an interest greatly influenced by her son Matt's interest in baseball and soccer. It was her efforts that brought about a special league that helps prepare youngsters for Little League teams.

"She was instrumental in organizing and setting up our program of instructional league baseball," said Mrs. Joy Tolley, director of the Andrews Youth Center. "She and her husband put together rules, guidelines, by-laws, helped plan the schedules, and recruited and helped to train the coaches."

According to Mrs. Tolley, Mrs. Swindle also has helped the Youth Center in programming their minicomputer, which keeps track of the Center's 2,500 members.

"She's quite a person. We hope she'll be working with us again next year," Mrs. Tolley said.

Somehow, Mrs. Swindle finds time to teach both a Sunday school class for fifth graders and a Prince George's County Community College computer programming course at the Andrews adult education facility.

Mrs. Swindle said that her husband, Ray, a retired Air Force member and now a management consultant in the Washington area, wasn't surprised when he learned of the award.

"He felt I really deserved the award. Me, I was surprised," she said. Ray Swindle is an AFA member.

—By SSgt. Wes J. Layton, USAF

Gen. James R. Allen, Commander in Chief of MAC, congratulates William L. Junipher, Jr., on the birth of his new baby sister during General Allen's recent visit to the Bolling AFB Child-Care Center. (USAF photo by Mickey Sanborn)

New Life for an Aging Warrior: B-25 Being Restored in Illinois

The Heritage in Flight Museum in Springfield, Ill., is rebuilding a World War II B-25H bomber as its first project. "We plan to put it on public display and fly it at air shows," said Gerald Oliver, Jr., the museum's president and an AFA Patron.

The aircraft, serial number 43-4106, is hangared in the museum facilities at Capital Airport in Springfield. According to Oliver, it sat abandoned on a grass airstrip south of Chicago for ten years. Heritage in Flight volunteers put it into condition for the ferry flight to Springfield.

Heritage in Flight is a nonprofit, tax-exempt Illinois corporation. Membership is $30 per year. Its address is P. O. Box 2447, Springfield, Ill. 62705.

The United States Air Force Band and Singing Sergeants were honored recently at a concert held in Birmingham, Ala. Col. Arnald Gabriel, Band Conductor, received a plaque from AFA's Birmingham Chapter and the Arnold Air Society and Angel Flight, which cosponsored the free concert. With Colonel Gabriel are AAS Squadron Commander Chris Canfield (left) and Birmingham Chapter Past President Donald Krekelberg (right).

Deadline Is April 5 for Entries in This Year's AFJROTC Contest

One of the Aerospace Education Foundation's objectives is to perpetuate knowledge of the rich military and civilian aerospace history of our nation and to ensure national appreciation for our aerospace heritage. The theme for

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Secretary of the Air Force Verne Orr was honored at a recent luncheon sponsored by AFA's General Curtis E. LeMay Chapter of Orange County, Calif., and the World Affairs Council of Orange County. Secretary Orr received an honorary membership in the LeMay Chapter at the luncheon. Presenting Secretary Orr his membership certificate is LeMay Chapter President Ray Villareal (right).

AFA's Silver and Gold Chapter in Colorado sponsored a "Needy Family" project this last Christmas, collecting $3,000 in cash, food, clothing, and toys for distribution to fifty-seven families and the Olney Springs Child Development Services Center. Mary Icovetta and SrA. Kathy Varilly show AFAFC Commander Maj. Gen. George C. Lynch and ARPC Vice Commander Col. Tom Walsh (right) a sample Needy Family basket.

the current Air Force Junior ROTC (AFJROTC) Contest supports this objective. Two options are given to competing AFJROTC units:

- Conduct research and create an original presentation on the founding, milestones, personalities, and events forming your Air Force Junior ROTC unit, including the accomplishments and whereabouts of former members of your unit.
- Identify, conduct research, and create an original presentation on an aviation pioneer, person, businessman, enthusiast, or event in your state.

Of course, AFJROTC units that have been in existence for less than five years and that do not have a long history may wish to concentrate on the second theme. However, all units may choose either subject.

Presentations may take any form. Winners are selected in the following categories:

- Videotapes and motion pictures.
- Sound/slide presentations.
- Audio presentations.
- Essays.
- Other (poems, songs, games, etc.).

Each category winner will receive a $500 cash prize and a distinctive plaque for display at their units. An overall winner from these five categories will be selected, and will receive an additional $1,500. There will also be twenty honorable mentions, which will receive certificates.

For this year's contest, 158 (or fifty-five percent) of the AFJROTC units have registered for the event. It is sponsored by AFA through its affiliate, the Aerospace Education Foundation. This is a much larger group of competitors than in previous years, and is attributed to the aggressive work of AFA members and chapters that encouraged units to register and to Air Force Junior ROTC Hq., Maxwell AFB, Ala., for their continuing support.

Entries must be postmarked by April 5, and should be sent to Director of AFJROTC Affairs, Air Force Association,

INTERCOM

Rollout of the newly refurbished C-47 "Gooney Bird" of the Lower Slobbovian Air Force. Powered by two Slobbovian-built rubber-band-driven "Windski-Spinski" engines, the aircraft is seen here during tests of the innovative landing system. Slobbovian airmen are "crazy-glued" to the fuselage and wings, and "hit the ground running" during a landing, giving the C-47 excellent unprepared field capabilities.

1750 Pennsylvania Ave., N. W., Washington, D. C. 20006.

New Mexico Group Plans Litigation Asking Both Retired, Disabled Pay

A group of service-connected disabled military retirees who reside in New Mexico have formed an organization to contest the law that requires waiver of an equal amount of military retired pay if a retiree receives Veterans Administration disability compensation. They plan to sue the federal government for relief on the basis that they are denied equal protection under the law, since no such offset is imposed on other federal retirees.

The organization is called Uniformed Services Disabled Retirees, Inc. It is at 5909 Alta Monte N. E., Albuquerque, N. M. 87110. According to Stephen Wolonsky, President of USDR, the group seeks members and contributions to help defray the costs of the planned litigation.

AFA supports legislation allowing disabled veterans retired from military service on a longevity basis to receive both retired pay and VA disability compensation. According to Mr. Wolonsky, Congress has refused to change the rule.

UNIT REUNIONS

Air Transport Command
A reunion of India-China Division personnel will be held on March 26–28, 1982, at Fort Hamilton, Brooklyn, N. Y. **Contact:** Irving Mednick, 1258 E. 85th St., Brooklyn, N. Y. 11236. Phone: (1-212) 531-3207.

American Defenders of Bataan and Corregidor
Members of the American Defenders will hold a reunion on May 2–9, 1982, at the Galt House, Louisville, Ky. **Contact:** John Crago, Convention Chairman, 615 Lehmeyer St., Huntington, Ind. 46750.

Jolly Green Rescue Forces
The Jolly Green Rescue Forces's thirteenth annual reunion will be held on April 23–24, 1982, Ramada Inn, Fort Walton Beach, Fla. **Contact:** Col. Ed Modica, 222 Sotir Ave., Fort Walton Beach, Fla. 32548. Phone: (904) 863-1959.

River Rats
The Red River Valley Fighter Pilots Association will hold a reunion on April 23–25, 1982, at the Sahara Hotel, Las Vegas, Nev. **Contact:** Al Krisch, 3135 Palora Ave., Las Vegas, Nev. 89121. Phone: (702) 457-2797. Red River Valley Association, 8612 Tamarac Lane, Wichita, Kan. 67206. Phone: (316) 685-2915.

1st ABCCS
The twentieth anniversary reunion of the 1st Airborne Command & Control Squadron and the National Emergency Airborne Command Post will be held on June 25, 1982, at the Andrews AFB, Md., Officers Club. All active-duty, retired, and former members of "Nightwatch" are invited. **Contact:** Bob Madel, 15402 Potter Ct., Bowie, Md. 20716. Bob Coble, 8405 Berwick Rd., Upper Marlboro, Md. 20870.

2d Bomb Sqdn.
Members of the 2d Bomb Squadron (22d Bomb Group) will hold a reunion on June 17–19, 1982, at the Majestic Hotel, Hot Springs, Ark. **Contact:** Jim Bradley, 5803

THIS IS AFA

The Air Force Association is an independent, nonprofit, aerospace organization serving no personal, political, or commercial interests; established January 26, 1946; incorporated February 4, 1946.

OBJECTIVES

The Association provides an organization through which free men may unite to fulfill the responsibilities imposed by the impact of aerospace technology on modern society; to support armed strength adequate to maintain the security and peace of the United States and the free world; to educate themselves and the public at large in the development of adequate aerospace power for the betterment of all mankind; and to help develop friendly relations among free nations, based on respect for the principle of freedom and equal rights for all mankind.

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Pittsburgh, Pa.

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Dover, Del.

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Information regarding AFA activity within a particular state may be obtained from the Vice President for the Region in which the state is located.

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Columbus, Ohio

INTERCOM

N. W. 70th Ave., Fort Lauderdale, Fla. 33319. Phone: (305) 721-9262.

11th Service Sqdn.
The 11th Service, 482d Service, Headquarters Squadrons, and 8th Service Group will hold a reunion on June 4–6, 1982, in Lancaster, Pa. **Contact:** John J. "Jack" Heckler, 76 E. Harbor Dr., Teaticket, Mass. 02536. Phone: (617) 540-1303.

19th Bomb Group and Wing
The 19th Bomb Group and Wing will hold a reunion in Tulsa, Okla., on June 21–27, 1982. **Contact:** Herbert A. Frank, 90-13 201st St., Hollis, N. Y. 11423. Phone: (212) 465-5740.

34th Photo Recon. Sqdn.
The eighth reunion of the 34th Photo Reconnaissance Squadron, based in England, France, and Germany during WW II, will be held April 21-24, 1982, at the MGM Grand Hotel, Reno, Nev. **Contact:** Harold L. Vaughn, 6520 Sandale Dr., Columbia, S. C. 29206.

44th Fighter Sqdn. Ass'n
Members of the 44th Fighter Squadron will hold their second annual reunion in Palm Springs, Calif., on May 11–14, 1982. **Contact:** Jack Laurie, 3885 Oak Trail Rd., Santa Ynez, Calif. 93460. Phone: (805) 688-6508.

P-47 Thunderbolt "Jug Lovers" Alumni Ass'n
P-47 engineers, mechanics, crew chiefs, clerks, technical representatives, and secretaries will meet on May 7–9, 1982, at the Stouffer's Riverfront Inn, St. Louis, Mo. **Contact:** Larry "Butch" Micallizzi, 428 Locust Ave., Uniondale, N. Y. 11553. Phone: (516) 486-3880.

P-47 Thunderbolt Pilots
The twenty-first annual reunion for the P-47 Thunderbolt Pilots will be held May 7–9, 1982, Stouffer's Riverfront Inn, St. Louis, Mo. **Contact:** Robert V. Brulle, 38 Chieftain Dr., Creve Coeur, Mo. 63141. Phone: (314) 872-7323.

Class 52-B
Class 52-B will hold its thirtieth reunion on March 21–23, 1982, at the St. Anthony International Hotel, San Antonio, Tex. **Contact:** Dan Fulgham, 12715 Prima Vista, San Antonio, Tex. 78233. Phone: (512) 656-4436 or (512) 349-3925.

494th Bomb Group (H)
The 494th Bomb Group "Kelly's Cobras" will hold its third reunion on June 18–20, 1982, at the Stouffer's Dayton Plaza, Dayton, Ohio. **Contact:** Richard W. Graham, 90 Purdue St., Pueblo, Colo. 81005. Phone: (303) 561-4400.

57th Fighter Group
I urgently need the addresses and phone numbers of those who served in this group from January 15, 1941, through November 7, 1945. I want to get information to you about the first 57th Fighter Group of WW II reunion since WW II, and the christening of a restaurant bearing our name and memorabilia. Write or call me at the address below.

Wayne S. Dodds
P. O. Box 10423
Glendale, Calif. 91209
Phone: (213) 240-6868

71st Tactical Recon. Group
A reunion is being planned for August 19–22, 1982, in Buffalo, N. Y. I would like to hear from all former members of the 71st TRG (Strafin' Saints), 82d Tactical Reconnaissance Squadron (Wreckoneers), 17th Tactical Reconnaissance Squadron (B), 110th Tactical Reconnaissance Squadron (Musketeers), and 25th Liaison Group (Guinea Short Lines), so that we may proceed with all the arrangements.

Truman A. Partridge, Sr.
40 South Lane
Angola, N. Y. 14006

Coming Events

April 9–12, **Arnold Air Society/ Angel Flight National Conclave,** New Orleans, La. . . . April 26–27, **AFA Symposium, "Electronics and the Air Force,"** Hilton at Colonial, Wakefield, Mass. . . . April 30–May 1, **Northeast Regional Meeting,** Harrisburg, Pa. . . . May 7–8, **South Carolina State Convention,** Myrtle Beach . . . May 8, **Connecticut State Convention,** Vernon . . . May 14–15, **Tennessee State Convention,** Chattanooga . . . May 28, **AFA Nominating Committee and Board of Directors Meeting,** The Broadmoor, Colorado Springs, Colo. . . . May 29, **Twenty-third Annual Outstanding Squadron Dinner,** The Broadmoor's International Center, Colorado Springs, Colo. . . . June 18–19, **Ohio State Convention,** Columbus . . . June 24–25, **AFA Symposium, "Airlift—The Key to Modern Military Mobility,"** St. Louis Marriott Hotel at Lambert International Airport, St. Louis, Mo. . . . June 25–27, **New Jersey State Convention,** Cape May . . . June 25–27, **New York State Convention,** Garden City . . . July 9–11, **Texas State Convention,** Kerrville . . . July 16–18, **Pennsylvania State Convention,** Coraopolis . . . July 23–25, **Florida State Convention,** Tallahassee . . . August 27–28, **Colorado State Convention,** Vail . . . September 12–16, **AFA National Convention,** Washington, D. C. . . . October 21–22, **AFA Symposium,** Hyatt House Airport Hotel, Los Angeles, Calif.

AFA CHAMPLUS ... New, Strong Protect

When a Single Accident or Illness Could Cost *You* Thousands of Dollars, You Need AFA CHAMPLUS . . . for *Strong* Protection against Costs CHAMPUS Doesn't Cover!

For military retirees and their dependents . . . and dependents of active duty personnel . . . more and more medical care is being provided through the government CHAMPUS program.

And, of course CHAMPUS pays 75% of allowable charges.

But today's soaring hospital costs—*up to $500 a day* in some major metropolitan medical centers—can run up a $20,000 bill for even a moderately serious accident or illness.

Your 25% of $20,000 is no joke!

AFA CHAMPLUS protects you against that kind of financial catastrophe *and* covers most of your share of routine medical expenses as well.

HOW AFA CHAMPLUS WORKS FOR YOU!

WHO IS ELIGIBLE?

1) All AFA members under 65 years of age who are currently receiving military retired pay and are eligible for benefits under Public Law 89-614 (CHAMPUS), their spouses under age 65 and their unmarried dependent children under age 21 (or age 23 if in college).
2) All eligible dependents of AFA members on active duty. Eligible dependents are spouses under age 65 and unmarried dependent children under age 21 (or age 23 if in college).

EXCEPTIONAL BENEFIT PLAN

(See chart at right)

FOUR YEAR BASIC BENEFIT. Benefits for most injuries or illnesses may be paid for up to a four-year period.

PLUS THESE SPECIAL BENEFITS . . .

1) Up to 45 consecutive days of in-hospital care for mental, nervous, or emotional disorders. Outpatient care may include up to 20 visits of a physician or $500 per insured person each year.
2) Up to 30 days care per insured per year in a Skilled Nursing Facility.
3) Up to 30 days care per insured per year and up to 60 days lifetime in a CHAMPUS-approved Residential Treatment Center.
4) Up to 30 days care per insured per year and up to 60 days lifetime in a CHAMPUS-approved Special Treatment Facility.
5) Up to 5 visits per insured per year to Marriage and Family Counselors under conditions defined by CHAMPUS.

YOUR INSURANCE IS NON-CANCELLABLE

As long as you are a member of the Force Association, pay your premiums time, and the master contract remains force, your insurance cannot be canc ed.

ADMINISTERED BY YOUR ASSOCIATION . . . UNDERWRITTEN BY MUTUAL OF OMAHA

AFA CHAMPLUS insurance is admin tered by trained insurance professiona on your Association staff. You get prom reliable, courteous service from peo who know your needs and know ev detail of your coverage. Your insurance underwritten by Mutual of Omaha, largest individual and family health ins ance company in the world.

AFA OFFERS YOU HOSPITAL BENEFITS AFTER AGE 65

Once you reach Age 65 and are cove under Medicare, AFA offers you pro tion against hospital expenses covered by Medicare through the *Sen Age Benefit Plan* of AFA Hospital Ind nity Insurance. Members enrolled in A CHAMPLUS will automatically receive information about AFA's Medicare s plement program upon attainment of A 65 so there will be no lapse in covera

AFA CHAMPLUS BENEFIT SCHEDULE

Care	*CHAMPUS Pays*	*AFA CHAMPLUS Pays*
	For Military Retirees Under Age 65 and Their Dependents	
Inpatient civilian hospital care	CHAMPUS pays 75% of allowable charges	CHAMPLUS pays the 25% of allowable charges not covered by CHAMPUS.
Inpatient military hospital care	The only charge normally made is a $5.00 per day subsistence fee, not covered by CHAMPUS.	CHAMPLUS pays the $5.00 per day subsistence fee.
Outpatient care	CHAMPUS COVERS 75% of outpatient care fees after an annual deductible of $50 per person ($100 maximum per family) is satisfied	CHAMPLUS pays the 25% of allowable charges not covered by CHAMPUS after the deductible has been satisfied.
	For Dependents of Active Duty Military Personnel	
Inpatient civilian hospital care	CHAMPUS pays all covered services and supplies furnished by a hospital less $25 or $5.00 per day, whichever is greater.	CHAMPLUS pays the greater of $5 per day or $25 of the reasonable hospital charges not covered by CHAMPUS.
Inpatient military hospital care	The only charge normally made is a $5.00 per day fee, not covered by CHAMPUS.	CHAMPLUS pays the $5.00 per day subsistence fee.
Outpatient care	CHAMPUS covers 80% of outpatient care fees after an annual deductible of $50 per person ($100 maximum per family) is satisfied.	CHAMPLUS pays the 20% of allowable charges not covered by CHAMPUS after the deductible has been satisfied.

NOTE: Outpatient benefits cover emergency room treatment, doctor bills, pharmaceuticals, and other professional services.

There are some reasonable limitations and exclusions for both inpatient and outpatient coverage. Please note these elsewhere in the plan description.

Against Costs CHAMPUS Doesn't Cover

APPLY TODAY!
JST FOLLOW THESE STEPS

oose either AFA CHAMPLUS In-patient verage or combined In-patient and Out-tient coverage for yourself. Determine e coverage you want for dependent mbers of your family. Complete the closed application form in full. Total the mium for the coverage you select from premium tables on this page. Mail the plication with your check or money der for your initial premium payment, yable to AFA.

Get AFA's new

CHAMPLUS

QUARTERLY PREMIUM SCHEDULE

Plan 1—For military retirees and dependents

In-Patient Benefits

Member's Attained Age	*Member*	*Spouse*	*Each Child*
Under 50	$19.03	$23.30	$11.00
50-54	$23.78	$29.10	$11.00
55-59	$30.13	$36.90	$11.00
60-64	$39.65	$48.55	$11.00
In-Patient and Out-Patient ***Benefits***			
Under 50	$26.80	$31.05	$27.50
50-54	$33.48	$38.80	$27.50
55-59	$42.43	$49.18	$27.50
60-64	$55.83	$64.73	$27.50

Plan 2—For dependents of active duty personnel.

In-Patient Only	None	$ 8.80	$ 4.40
In-Patient and Out-Patient	None	$35.20	$22.00

Note: Plan II premiums are listed on an annual basis. Because of the very low cost, persons requesting this coverage are asked to make annual payments.

MITATIONS

verage will not be provided for condi-ns for which treatment has been re-ved during the 12-month period prior to effective date of insurance until the iration of 12 consecutive months of in-ance coverage without further treat-nt. *After coverage has been in force for consecutive months, pre-existing* con-ons will be covered regardless of prior atment.

XCLUSIONS

is plan does not cover and no payment all be made for:

- routine physical examinations or immu-tations
- domiciliary or custodial care
- dental care (except as required as a cessary adjunct to medical or surgical atment)
- routine care of the newborn or well-y care
- njuries or sickness resulting from lared or undeclared war or any act reof
- jjuries or sickness due to acts of inten-al self-destruction or attempted sui-, while sane or insane
- eatment for prevention or cure of al-olism or drug addiction
-) eye refraction examinations
-) Prosthetic devices (other than artificial mbs and artificial eyes), hearing aids, rthopedic footwear, eyeglasses and con-act lenses
- expenses for which benefits are or may e payable under Public Law 89-614 HAMPUS)

APPLICATION FOR
AFA CHAMPUS SUPPLEMENT INSURANCE

Group Policy GMG-FC70
Mutual of Omaha Insurance Company
Home Office: Omaha, Nebraska

Full name of Member _____
Rank Last First Middle

Address _____
Number and Street City State ZIP Code

DATE OF Birth _____ Current Age ____ Height ____ Weight ____ Soc. Sec. No. _____
Month/Day/Year

This insurance coverage may only be issued to AFA members. Please check the appropriate box below:

☐ I am currently an AFA Member.

☐ I enclose $13 for annual AFA membership dues (includes subscription ($9) to AIR FORCE Magazine).

☐ I am over 65 years of age. Please send information on AFA's Medicare Supplement.

PLAN & TYPE OF COVERAGE REQUESTED

Plan Requested (Check One)	☐ AFA CHAMPLUS PLAN I (for military retirees & dependents) ☐ AFA CHAMPLUS PLAN II (for dependents of active duty personnel)	
Coverage Requested (Check One)	☐ Inpatient Benefits Only ☐ Inpatient and Outpatient Benefits	
Person(s) to be Insured (Check One)	☐ Member Only ☐ Spouse Only ☐ Member & Spouse	☐ Member & Children ☐ Spouse & Children ☐ Member, Spouse & Children

PREMIUM CALCULATION

All premiums are based on the attained age of the AFA member applying for this coverage. Premium payments are normally paid on a quarterly basis (see table for rate table). Upon request, however, they may be made on either a semi-annual or annual basis.

Quarterly premium for member (age ____) $_____

Quarterly premium for spouse $_____

Quarterly premium for ____ children @ $____ $_____

Total premium enclosed $_____

Requests for active duty dependent coverage under Plan 2 should include annual premiums.

If this application requests coverage for your spouse and/or eligible children, please complete the following information for each person for whom you are requesting coverage.

Names of Dependents to be Insured	Relationship to Member	Date of Birth (Month/Day/Year)

(To list additional dependents, please use a separate sheet.)

In applying for this coverage, I understand and agree that (a) coverage shall become effective on the last day of the calendar month during which my application together with the proper amount is mailed to AFA, (b) only hospital confinements (both inpatient and outpatient) or other CHAMPUS-approved services commencing after the effective date of insurance are covered and (c) any conditions for which I or my eligible dependents received medical treatment or advice or have taken prescribed drugs or medicine within 12 months prior to the effective date of this insurance coverage will not be covered until the expiration of 12 consecutive months of insurance coverage without medical treatment or advice or having taken prescribed drugs or medicine for such conditions. I also understand and agree that all such pre-existing conditions will be covered after this insurance has been in effect for 24 consecutive months.

Date _____, 19____ _____
Member's Signature 3/82

NOTE: Application must be accompanied by check or money order.
Send remittance to:
Insurance Division, AFA, 1750 Pennsylvania Ave., NW, Washington, D.C. 20006.

Form 6173GH App.

Bob Stevens'

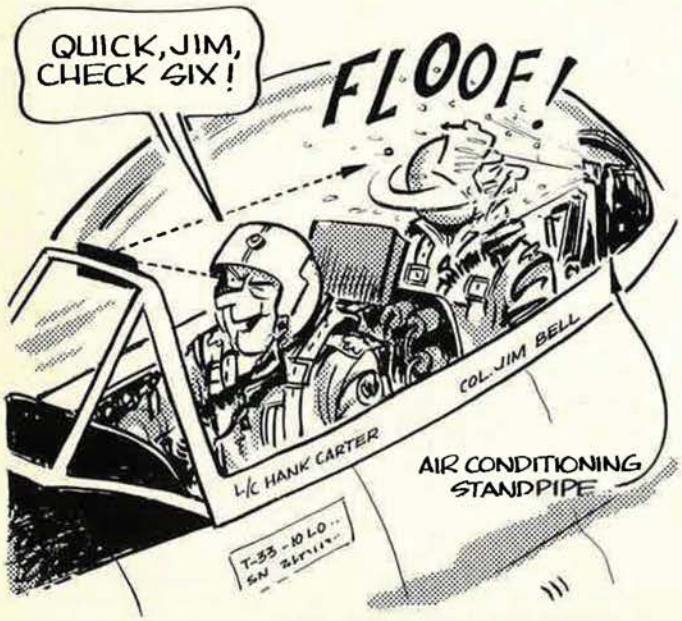
"There I was..."

THERE'S A "DIRTY TRICKS" DEPARTMENT IN THE USAF, TOO. PILOTS OF TWO-PLACE MACHINES FORM THE NUCLEUS OF THIS GROUP. THE MODUS OPERANDI VARIES FROM BIRD TO BIRD, BUT FOR SHEER INVENTIVENESS YOU COULDN'T BEAT A T-33!

SET-UP: GIB (GUY IN BACK) IS FLYING. FAST LETDOWN.

WHEN GIF (GUY IN FRONT) BENDS DOWN, GIB PULLS MAX Gs...

ANOTHER GAMBIT WAS TO TURN THE TEMP. CONTROL TO FULL COLD (WHICH PRODUCED SNOW ON MOIST DAYS) and WITH THE CORRECT TIMING—



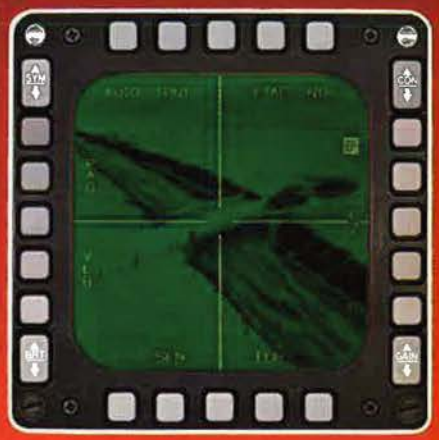
AND FOR GETTIN' ATTENTION—PLUS SCARIN' THE SOCKS OFF THE GIF—PAPER AIRPLANES MADE OUT OF OLD FORM 21As DID THE TRICK!

Sperry's F-16 display system: digital flexibility for a multirole aircraft.

The Air Force's F-16 Fighting Falcon must excel at both air-to-air and air-to-ground missions.

An advanced display system, being developed by Sperry as part of the Multinational Staged Improvement Program, will ease the pilot's workload by presenting navigation, radar, and weapons-aiming information clearly and precisely. Consisting of a digital programmable display generator and two four-inch-square CRT displays, the system includes two processors and 32K words of memory for display format control and other purposes. Display formats can thus be changed quickly, and without hardware alteration, an important asset for the multirole F-16. We're working on even more advanced systems for next-generation aircraft, too.

How can we help you? Write Sperry Flight Systems, Defense Systems Division, Box 29222, Phoenix, Arizona, 85036, or call (602) 869-2780. *We understand how important it is to listen.*



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Shoots down whatever's up.

Blows up whatever's down.

F-15 Eagle

MCDONNELL DOUGLAS